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LISBON STRATEGY IMPLEMENTATION IN 12 NEW EU MEMBERS - MULTIVARIATE ANALYSIS OF STRUCTURAL INDICATORS

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Lisbon Strategy implementation in 12 New EU Members – multivariate analysis of structural indicators

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Abstract

The aim of this article is to identify diversity between the EU-15 and the New Members in their implementation of the Lisbon Strategy in the period 2000-2010. By analyzing a set of structural indicators, we aim to fill a gap in the literature: a lack of publications providing complex evaluation of the implementation of the Lisbon Strategy using measurable indicators. The results of our analyses confirm the hypothesis of a large gap between the EU-15 countries and the 12 New Members in key areas of the Lisbon Strategy. According to rankings given by our taxonomic analyses, a high level of the indicators selected is confirmed only for the EU-15 countries and only three New Members belong to a group presenting the average level of these indicators. This study demonstrates a need for a significant intensification of the EU cohesion policy, which is one of the main tools for achieving the Lisbon Strategy goals.

JEL Classification: C00, E60, O52, P11

Keywords: Lisbon Strategy, Lisbon targets, European Union, multivariate analysis, structural indicators.

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I. Introduction

The original Lisbon Strategy was launched in the year 2000 and assumed that the EU would "become the most dynamic and competitive knowledge-based economy in the world by 2010, capable of sustainable economic growth with more and better jobs and greater social cohesion and respect for the environment" (Daniel, 2009). Unfortunately, the strategy's goals have not been fully achieved (Codogno, Odinet, Padrini, 2009). Some of the main reasons for this were: multiple objectives and programmes in the strategy with an unclear division of responsibilities; an unfavourable economic situation outside Europe (the economic crisis); no link between the Lisbon Strategy and other EU instruments and the various sectoral initiatives and policy measures (Barbier, 2010; Barell, Kirby, 2007).

Therefore, in order to better prepare the EU for the next decade, the European Commission has announced a new "Europe 2020 Strategy", with three key drivers: smart growth (fostering knowledge, innovation, education and a digital society); sustainable growth (making production more resource-efficient while boosting competitiveness); and inclusive growth (increasing participation in the labour market, the acquisition of skills and the fight against poverty). The strategy sets five targets, which define where the EU should be by 2020 and against which progress can be tracked: 75 % of the population aged 20-64 should be employed; 3% of the EU's GDP should be invested in R&D; the "20/20/20" climate/energy targets should be met; the share of early school leavers should be under 10%; at least 40% of the younger generation should have a tertiary education qualification; and 20 million fewer people should be at risk of poverty (Papadimitriou, 2012).

The achievement of these objectives requires even greater cooperation between the Member States and the ongoing monitoring of each country’s implementation of this strategy. This applies in particular to the 12 New Members of the EU. In publications relating to the new EU strategy, we meet the statement that the main barrier to achieving its objectives may be a large gap in key areas between the EU-15 countries and the 12 new EU Members (Cantillon, 2010). The aim of this article is to verify this hypothesis of a large and sustained diversity between the EU-15 and the 12 New Members in their implementation of the Lisbon Strategy’s objectives between the years 2000 and 2010.

The article’s research questions are as follows. Over the years 2000-2010, how do the New EU Members differ in relation to the EU-15 countries in the key indicators of implementation of the Lisbon Strategy? Which country (among the New Members) could be called the leader in the implementation of the strategy? What are the strengths and weaknesses

of one transition economy (taking the case of Poland) compared to the other new member states according to the indicators selected? The answers will help determine the distance between the New EU countries and the EU-15 in their achievement of the Strategy's goals and provide an assessment of the starting position of the New Members for implementation of the Europe 2020 Strategy.

II. Literature review

So far, analyses relating to assessment of the Lisbon Strategy's achievements do not give a complete picture of the process (Amstrong, Begg, Zeitlin, 2008; Borsi, 2009). The available reports mainly focus on two aspects (European Commission, 2004; 2005; 2007). Firstly, they identify and analyze the bottlenecks at the EU level, which are common to most countries, that mainly contributed to the Lisbon Strategy's failure (European Commission, 2010a; 2010b; 2010c). In some cases, we find reports evaluating the realization of a selected aspect of the Lisbon strategy, e.g. a report concerning employment and social policy (European Parliament**,** 2010; Barbier, 2012; Krings, 2012**)** or one related to the knowledge economy (Johansson, Karlsson, Backman, Juusola, 2007).

Secondly, among the empirical analyses, reports on national Lisbon Strategy implementation dominate, e.g. a report on Austria (Ederer, Janger, Kaniovski, 2010), on Poland (Koczor, Tokarski, 2011) and one on the Czech Republic (Sojka, 2007). These evaluations focus mainly on identifying the necessary steps in the adjustment of national economic policy to support a growth in coherence of the EU market and thus the achievement of the objectives of the Lisbon Strategy. Very often these analyses are based not on measureable indicators, but rather on benchmarking (Balezentis, Balezentis, Brauers, 2011; Balezentis, Balezentis, Bauers, 2012), peer comparison or best practices (Arpaia, 2007).

What type of evaluation of the implementation of the Lisbon Strategy can be found in the existing analyses? First of all, they focus on macroeconomic factors, which fail to provide a clear assessment of the implementation of the strategy and they recommend a cautious interpretation of the macroeconomic data. The period analyzed is a time when Europe and the world were affected by the economic crisis and the EU expanded with 12New Members. But numbers alone speak for themselves and it is difficult to get a positive answer to the question "Was the Lisbon Strategy successful?" (Treidler, 2011). The fundamental objectives, such as a 70% employment rate in the EU market (only 64.6% in year 2010) and an expenditure on R&D at the level of 3% of GDP (2% in the year 2010), have not been met (Eurostat, 2012).

Moreover, the EU has not become an area of high-speed Internet access, as only 30% of the EU's rural population have access to the Internet (Eurostat, 2012). Furthermore, various negative phenomena in key areas of the Lisbon Strategy do not allow us to positively evaluate the process, e.g. high long-term unemployment in several EU countries (Slovakia, Ireland, Latvia, Spain and Greece), high levels of poverty risk in many MS countries, such as Bulgaria, Romania, Latvia and Lithuania (Bertolini, Pagliacci, 2010), a high level of early school leavers, especially in Spain, Malta, Portugal and Italy (European Commission, 2011), and low levels of lifelong learning in several countries, such as Bulgaria, Greece, Romania, Hungary, Slovakia and Poland (Panitsidou, Griva, Chostelidou, 2012).

Of course some of the objectives of the Lisbon Strategy have been met. The female employment rate increased by four percentage points, i.e. from 54% to 58% in the years 2000-2010. Additionally, the Strategy has had some impact on the employment rate of older workers aged between 55 and 64, which increased from 37% in 2000 to 47% in 2010 in the EU (Destefanis, Mastromatteo, 2012). Implementation of the Lisbon Strategy has contributed to public acceptance of social reforms in some countries, e.g. France's pension reform in 2002 and Germany's unemployment reform in 2004 (Zgajewski, Hajjar, 2005).

Reports assessing the Lisbon Strategy provide much detail about the causes of failures in its implementation. The most often cited reasons are: a multiplicity of targets and a lack of commitment at national level to priorities (Mundschenk, 2006); deficiencies in economic governance with open coordination methods (Mundschenk, 2006); no link between the Strategy and other EU instruments (Blanke, Kinnock, 2010); a lack of good publicity about the Strategy's goals (Radło, 2006); and the uneven impact of the European Commission's recommendations for different EU countries (European Commission, 2010d). Sometimes, the emphasis is put on structural causes of failure to implement. Generally, in the opinion of many economists, the structures of the European economies were not prepared for such quick changes as were proposed in the Lisbon Strategy (Moniz, 2011). According to Tausch, for example, the disappearance of enterprising capitalist families and the current incompatibility of work and family life explain much of the failure of the Lisbon process (Tausch, 2009).

Therefore, effective implementation of the objectives of the New 2020 Strategy will require overcoming a few new challenges. The success of the New Strategy will mostly depend on an ability to learn from the limitations of the Lisbon Strategy (Vilpišauskas, 2012). First of all, priorities such a climate change, sustainable energy, the retirement age, and investments in education and skills must be closely connected with key reforms in the EU area (Kedaitiene, Kedaitis, 2009; Fischer, Gran, Hacker, Jakobi, Petzold, Pusch, Steinberg,

2010). A political commitment to reform is necessary, i.e. the choice between a social model and the competitiveness of the EU economy must be made (Gros, 2012). The chosen priorities should strengthen Europe's approach to globalization and make the European economy more resilient to global challenges (Rodrigues, 2009). All this requires further reinforcement of existing governance mechanisms, with the Commission in the driver's seat (Soriano, Mulatero, 2010).

Sometimes, a *sine qua non* condition for achieving the objectives of the New Strategy is indicated to free the potential of the European market. EU countries, whose priority is to increase competitiveness, cannot pursue the integration process on the basis of the lowest common denominator. They must form themselves into small groups to later give impetus to the growth of the entire EU market. This is why not only the present complex analysis of the implementation of the Lisbon Strategy, but also an assessment of the similarity between countries in the implementation of the EU strategy is so important. The literature offers no such publications relating to a complex evaluation of the implementation of the Lisbon Strategy using measurable indicators that would allow an assessment of the effects of the implementation strategy of each EU country in comparison to the others. It is hoped that the present article will fill this gap.

III. Methodology and selection of diagnostic variables.

For the analysis, a set of structural indicators are used which were established by the European Commission to monitor the implementation of the Lisbon Strategy. A shortlist has been chosen consisting of 14 key indicators, although the full detailed list contains a set of seventy-nine indicators. The structural indicators selected have been chosen to track the progress of the four main objectives: investing in knowledge and innovation; unlocking business potential; investing in people and modernizing labour markets; and climate and energy changes.

The analysis employs data for the 12 New EU members and for the EU-15 average in 2000 and 2010. The data refer to 14 structural indicators, defined as diagnostic variables x1 to x14 (Table1).

[Table 1 about here]

First, the usefulness of the diagnostic variables was determined by examining their degree of variation and correlation. The analysis requires those variables which have sufficient spatial variability and are not correlated too strongly with each other. Only in this case will they be good carriers of information, allowing different processes to be identified. (Grabiński, Wydmus, Zeliaś, 1993). The threshold value chosen for the coefficient of variation is 0.1, and for the correlation coefficient, 0.7. (Nowak, 1990). Due to the very low value of the coefficient of variation for variable x_3, it was excluded from the analysis.

[Table 2 about here]

In the next step we normalize the data. This is necessary due to differing scales or magnitudes among the variables. In general, variables with greater dispersion (i.e. with higher standard deviations) have more impact on the final similarity measure, so the purpose of standardization is for each variable to be equally represented in the distance measure. The Z-score standardization method is used, which compares each value of variable x_i to the mean and then divides it by the standard deviation:

$$z_{ij} = \frac{x_{ij} - \bar{x}j}{sd_j}, \quad (1)$$

where z_{ij} is the standardized value of the *j*-th variable on object *i*; x_{ij} is the value of the *j*-th variable on object *i*; $\bar{x}_j$ is the mean value of the *j*-th variable; and sd_j is the standard deviation of the *j*-th variable. After standardization, the average of each standardized variable is equal to zero and the standard deviation for each variable is equal to 1.

In this article, two taxonomic methods are used to identify diversity between the UE 15 and the 12 New Members in their implementation of the Lisbon Strategy. First, to group the countries analyzed in relatively homogeneous groups we apply cluster analysis (Gordon, 1999; Everitt, 1993). This method allows a determination of the similarity of objects, without establishing a hierarchy among them. We use Ward's method, which is based on an analysis of variance to evaluate the distances between clusters, i.e. it attempts to minimize the sum of the squared distances of points from the cluster's centroid. The cluster procedure in Ward's method is as follows. The pair of sample units that yield the smallest error sum of squares, that is, the largest r^2 value, forms the first cluster. In the second step of the algorithm, n - 2

clusters are formed from the *n* - 1 clusters defined in step 2. These may include two clusters of size 2, or a single cluster of size 3 including the two items clustered in step 1. Again, the value of r^2 is maximized. Thus, at each step of the algorithm clusters or observations are combined in such a way as to minimize the results of error from the squares, in other words maximizing the r^2 value. The algorithm stops when all the sample units are combined into a single large cluster of size *n.* (Ward,1963). The error sum of squares and r^2 values are then computed, using the following formula:

ESS (error sum of squares)=$\sum_i \sum_j \sum_k \left|X_{ijk} - \overline{x_{ik}}\right|^2$, (2)

Total Sum of Squares: TSS= $\sum_i \sum_j \sum_k \left|X_{ijk} - \overline{x_{..k}}\right|^2$, (3)

R-Square (r^2)=$\boldsymbol{TSS - ESS/TSS}$, (4)

where x_{ijk} denotes the value for variable k in observation j belonging to cluster i.

From among very different distance (similarity) matrices, Euclidean distance is chosen as it is the recommended distance measure for Ward's method (Kaufman, Rousseeuw, 1990; Everitt, Landau, Leese, 2001). The Euclidean distance is the geometric distance in multidimensional space and it is computed as the square root of the sum of the squared differences in the value of the variables.

The second method used is a ranking of the objects (countries), which is based on the value of a synthetic variable (Johnson, Wichern, 2007). There are a variety of methods for creating a synthetic variable (Hellwig, 1968; Strahl, 1978; Grabiński, 1992; Grabiński, Wydmus, Zeliaś, 1993; Zeliaś, 2002). We use two different methods to calculate the synthetic variable. First, we obtain a synthetic value (*y*) as the arithmetic mean of the normalized features of each variable. The synthetic value (y_i) is calculated using the following formula:

$$y_i = \sum_{j=1}^{m} (x'_{i,j} * b_j), \quad (5)$$

where: *m* is the number of features, $b_j = 1/m$, $\sum_{j=1}^{m} b_j = 1$, and $x'_{i,j}$ are the normalized values of the matrix X, where all the features are stimulants.

The synthetic variable is in the range [0,1]. A higher value indicates the object having a more favourable position. Before starting to calculate the synthetic variable, de-stimulants must be replaced by stimulants in the variable matrix and then the matrix must be normalized.

For the first operation we use the following formula:

$$z_i = 2\bar{x} - x_i. \quad (6)$$

Then, for the normalization we use the formula:

$$\acute{x_i} = (x_i - x_{min}/x_{max})^p, \quad (7)$$

where x_i is the de-stimulant value, $\bar{x}$ is the mean value of the de-stimulants and p=1.

Calculating the synthetic variable by a second method, we follow the methodology proposed by Hellwig. In this method we first choose an "ideal object", which is described by a set of the maximum values of each variable. Of course, the variable matrix must be normalized and contain only stimulants. Then we calculate the synthetic variable using the following formula:

$$d_i = 1 - \frac{c_{io}}{c_o} \quad (8)$$

where d_i is the taxonomic measure of development proposed by Hellwig, c_{io} is the Euclidean distance between the country and the "ideal object", c_o is the critical distance between objects and the "ideal object", and $c_o = \overline{c_o} + 2Sd$, $\overline{c_o} = \frac{1}{n}\sum_{i=1}^{n} c_{io}$, $Sd = \left[\frac{1}{n}\sum_{j=1}^{n}(c_{io} - \overline{c})^2\right]^{1/2}$.

Based on the value of the synthetic variable (the average $\bar{d_i}$ and the standard deviation Sd_i), all the countries analyzed can be divided into four groups. The first group includes the best countries, for which the distance from the "ideal object" exceeds values $\bar{d_i} + Sd_i$. The second group consists of countries, for which the distance from the "ideal object" is in the range $\bar{d} < d_i < \bar{d} + Sd_i$. In the third group belong countries for which the distance from the "ideal object" is in the range $\bar{d} - Sd < d_i < \bar{d}$. The last group (the worst one) is comprised of countries having a distance from the "ideal object" not exceeding the value $\bar{d_i} - Sd_i$.

All the statistical analyses in this article were performed using the statistical software Statistica 11.0, SPSS version 21.0 and R software.

IV. Empirical analysis

After verification of the determinants which describe the degree of implementation of the Lisbon Strategy by the New Members of the EU-27, similarity matrices of the objects, called distance matrices, are built for the years 2000 and 2010. Based on these matrices, two dendrograms are created. They show how many clusters, i.e. homogeneous groups of countries, can be found among the 12 New Members of the EU-27. The interpretation of the dendrogram, i.e. the identification of the number of clusters, depends on which bond distance we choose as the point of interpretation. In this analysis we choose a sixth bond distance as the interpretation line.

Using Ward's method, in 2000 four large homogenous groups of countries (clusters) can be distinguished (Figure 1).

[Figure 1 about here]

Group A includes the EU-15, Cyprus and Malta. This group can be divided into two smaller clusters, i.e. the EU-15 countries in the first and Cyprus and Malta in the second. Group B consists of four countries: The Czech Republic, Hungary, Slovakia and Slovenia. In this group, The Czech Republic and Slovenia are very similar to each other and form a small separate cluster, as do Hungary and Slovakia. Group C contains five countries: Romania, Poland, Estonia, Lithuania and Latvia. Here too, we can distinguish small homogeneous clusters: Estonia with Lithuania, Latvia with Poland, and a one-object cluster, Romania. The last group D consists of only one country, Bulgaria, which is a very different object from the rest of group C. Furthermore, the dendrogram analysis shows that countries in groups A and B differ strongly from those in groups C and D.

Analyzing the dendrogram for 2010 reveals significant changes. Only the number of large homogeneous clusters does not change during the period analyzed (Figure 2).

[Figure 2 about here]

In group A, there are only two objects, Cyprus and the EU-15 countries, and also in group B, Slovenia and the Czech Republic. Clusters A and B have become significantly more similar to each other, reducing the distance between them from nine to six bond distances between over the period 2000-2010. Therefore, the EU-15 countries, Cyprus, the Czech Republic and Slovenia can be treated as one big cluster of similar countries in terms of the intensity of their implementation of the Lisbon Strategy.

In groups C and D, very big changes have taken place. Bulgaria has joined group C but Poland has left it. In 2010, group C can be divided into two smaller clusters: Estonia, Lithuania and Latvia, with Lithuania and Latvia being much more similar to each other than to Estonia, and a second cluster consisting of Romania and Bulgaria. Group D consists of three countries that still in 2000 were relatively similar to the EU-15, Malta, Hungary and Slovakia, plus Poland, which has joined them. In this group, over the ten years, Poland has become much more similar to Hungary. The difference (distance) between the two larger groups of countries, A plus B and C plus D, has changed very little over the years studied.

The above analysis allows grouping countries on the basis of the taxonomic similarity of multivariate objects (a distance matrix). If we assume that the New Member States aimed to achieve a similar level of structural indicators to those of the EU-15 countries, it is worth considering the distance that separates each New EU Member from the EU-15. For this purpose, we normalize the distance matrix, taking as a reference country the EU-15 group (see Table 3). Four countries definitely have the smallest distance from the EU-15, in both 2000 and 2010: Cyprus, Slovenia, Malta and the Czech Republic. The second group (a pursuit group) is unchanged and consists of the following countries: Slovakia, Poland, Hungary, Latvia and Estonia. The furthest from the EU-15 in achieving the Lisbon Strategy objectives in both years are three countries: Lithuania, Romania and Bulgaria.

[Table 3 about here]

To answer the question of which of the thirteen objects surveyed (12 New EU Member states and the countries of the EU-15) is the leader in the implementation of the Lisbon Strategy, it was decided to rank them according to the criterion of synthetic value. Table 4 shows the ranking of countries based on the value of the synthetic index, calculated as the arithmetic average of the normalized variables for each country. The leader in both years is the group of EU-15 countries, while the second place belongs to Cyprus. In the top 5 group in both years also belong Slovenia, Malta and the Czech Republic. The Czech Republic has moved up most in the ranking between 2000 and 2010, i.e. from fifth to third place. In addition, the countries that record the biggest positive jumps in the ranking are Poland, Slovakia and Lithuania. The country with the lowest degree of achievement of the Lisbon Strategy objectives, i.e. with the last place in the ranking, is Bulgaria. Moreover, two countries, Romania and Hungary, show the biggest drops in the ranking between 2000 and 2010.

[Table 4 about here]

Objects that are next to each other in the ranking may not be similar. The best strategy to improve a position in the ranking is to conform with the object which has a better ranking but is also the most similar. So what is the best strategy for Poland to faster achieve the

objectives of the Europe 2020 Strategy? A strategic development path is presented in Figure 3.

[Figure 3 about here]

Poland should mainly follow the path of the other Baltic States standing higher in the ranking, i.e. Lithuania, Latvia and Estonia and try to become more similar to the Maltese economy. It should therefore focus on increasing expenditures on research and development, and on improving the employment rate, particularly among older people (55-64 years). It would be inadvisable for it to embark on programmes to increase the degree of similarity of its economy to Cyprus or to the Czech Republic, because they are structurally quite different.

In order to verify the above ranking, the objects are also designated into four groups according to the Hellwig synthetic value calculated (table 5). This method allows the identification of countries with high, average, low and very low levels of achievement of the Lisbon Strategy's goals.

[Table 5 about here]

The results are consistent with the previous findings. A high level of implementation of the Lisbon Strategy is presented by only the EU-15 countries; a medium level by only three countries: Cyprus, the Czech Republic and Slovenia. Sadly, the majority of the New Members of the EU-27 (as many as eight countries in 2010) are characterized by a low level of the structural indicators analyzed. Again, both in 2000 and 2010, Bulgaria is definitely an outsider among the countries surveyed.

V. Conclusions

This article has focused on analysing the differences in the implementation of the Lisbon Strategy goals among the 12 New Members and the EU-15 countries in 2000 and 2010. The reference point has been the results achieved by the EU-15 countries. The taxonomic analysis carried out allows some important conclusions to be drawn.

The European Union is an area with high differentiation among the 12 New Members and the EU-15 in terms of the levels of their structural indicators. This finding is confirmed by the synthetic value for each country analyzed. The synthetic variable for the leader in the ranking (EU-15) is almost 3.5 times higher in 2000 and 2.5 times in 2010 than the indicator for the last country in the ranking, Bulgaria. Also according to the Hellwig synthetic measure,

in 2010 among the objects analyzed only the EU-15 countries have a high level of the indicators selected. Moreover, only three New Members belong to the group with an average level of these indicators, and as many as eight countries have a low level of implementation of the Lisbon Strategy. One country (Bulgaria) is evaluated as a country with a very low level of Lisbon Strategy implementation. These results confirm the hypothesis of a large gap between the EU-15 countries and the 12 New Members in implementing key areas of the Lisbon Strategy.

The study has also revealed the instability of the similarity identified between countries in their degree of implementation of the Lisbon Strategy in 2000-2010. Although the number of large homogeneous clusters does not change during the period analyzed, the countries and the number of them included in each group change significantly. Therefore, these changes do not allow us to conclude that there exists a permanent pattern of structural ratios in each country among the 12 New Member countries.

Taking into account the Hellwig synthetic value, both in the years 2000 and 2010 Poland is classified in a group of countries with a low level of Lisbon Strategy implementation. The greatest structural weakness of the Polish economy is still low expenditures on research and development and a low employment rate, particularly among older people (55-64 years). The positive aspect of the Polish path towards the Lisbon Strategy goals is a jump of two places in the ranking of the 12 countries analyzed in the years 2000-2010. It is also positive that during the years studied Poland conformed significantly with Malta and Slovakia, which are ranked higher than her.

It is hoped that this study will prompt a significant intensification of the EU cohesion policy, which is one of the main tools for achieving the Lisbon Strategy goals. In future, we can expect that the differences among the New Members in the key areas covered by the Lisbon Strategy will be reduced, however it seems that this process will take much longer than may be expected.

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Annex.

Tables and figures.

Table 1. A set of diagnostic variables (structural indicators).

	Structural indicators	Definition	Policy objectives
X_1	Per capita Gross Domestic Product	Per capita GDP in Purchasing Power Standard (PPS). EU15 = 100 Per capita GDP in Purchasing Power Standard (PPS).EU15 = 100	Standard of living. Social and environmental welfare.
X_2	Labour productivity.	Work productivity per person employed GDP in PPS per person employed.EU15=100	Overall efficiency of the economy.
X_3	Education level of young people (aged 20-24).	Percentage of young people aged 20-24 having reached at least higher secondary education or training, expressed as a percentage of the total population of the same age group.	National education systems performance.
X_4	Research and technological development (R&TD).	Gross domestic expenditure on research and development (GERD) as a percentage of GDP.	R&D effort.
X_5	Comparative price levels.	Ratio between purchasing power parities (PPP) and market exchange rates for each country.	Price convergence.
X_6	Business investment.	Gross fixed capital formation (GFCF) in the private sector as a percentage of GDP.	Business confidence in the economic situation.
X_7	Employment rate.	Employed persons aged 15-64 as a percentage of the total population of the same age group.	Full employment. Combating social exclusion.
X_8	Employment rate of older workers.	Employed persons aged 55-64 as a percentage of the total population of the same age group.	Full employment. Combating social exclusion.
X_9	At-risk-of-poverty rate after social transfers.	Percentage of persons with an equivalised disposable income below the risk-of-poverty threshold after social transfers.The threshold is set at 60% of the national median equivalised disposable income (after social transfers).	Combating poverty and social exclusion.
X_{10}	Dispersion of regional employment rates.	Coefficient of variation of employment rates across regions (NUTS 2 level) within countries.	Economic and social cohesion
X_{11}	Long term unemployment.	Total long-term unemployed (over 12 months) as a percentage of the total active population aged 15-64.	Full employment. Combating social exclusion.
X_{12}	Greenhouse gases emissions.	Percentage change in aggregated emissions of 6 main greenhouse gases (CO2, CH4, N2O, HFCs, PFCs and SF6) expressed in CO2-equivalents. The base year for the Kyoto Protocol objectives and the Decision of the EU Council Decision is 2008-2012. Index base year = 100	Climate change and implementation of Kyoto Protocol.
X_{13}	Energy intensity of the economy.	Gross domestic consumption of energy divided by GDP (at constant prices, 1995 = 100).	More efficient energy use.
X_{14}	Freight transport volume.	Index of freight transport volume relative to GDP. Measured in tonne-km/GDP and indexed on 1995.	Decouple transport development from economic growth.

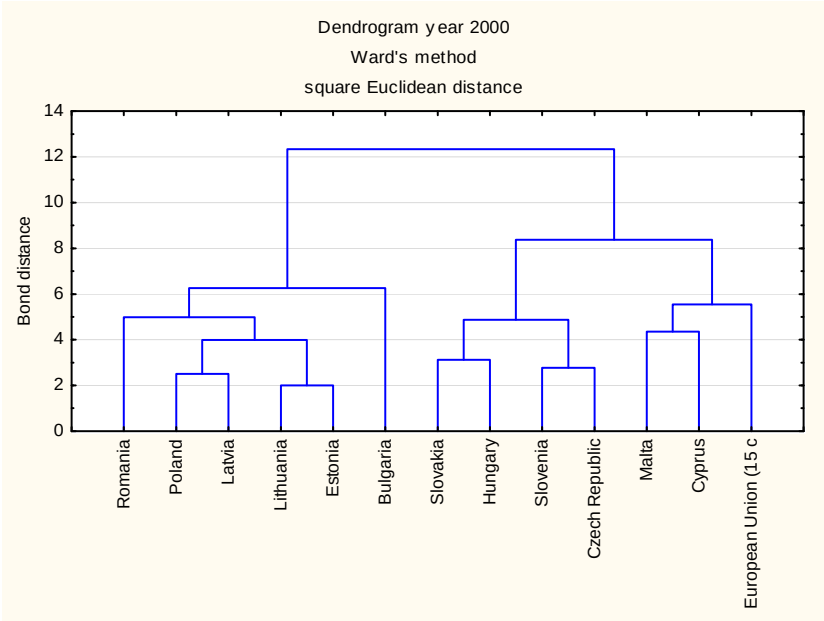
Source: http://epp.eurostat.ec.europa.eu/portal/page/portal/structural_indicators/introduction/.

Table 2. The coefficients of variation and correlation for diagnostic variables.

	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{13}	x_{14}
UE15	29100,0	100,0	67,5	2,1	100,0	5300,0	65,5	49,5	16,7	4,1	5,1	89,0	137,8	89,5
BG	11900,0	40,1	75,2	0,6	43,5	1100,0	58,5	43,9	22,3	6,3	6,5	54,0	671,1	156,2
CZ	21100,0	68,2	86,1	1,8	69,5	3600,0	65,7	47,6	9,8	2,7	3,5	71,0	374,6	85,7
EE	17800,0	62,2	82,1	2,4	67,0	2600,0	65,1	57,2	17,5	7,1	5,3	50,0	545,9	67,1
CY	26700,0	83,0	71,5	0,5	84,8	3500,0	68,1	55,2	14,5	1,6	4,3	168,0	177,6	67,0
LV	24300,0	57,7	80,4	0,7	62,9	2100,0	61,8	51,1	19,3	8,8	6,6	45,0	363,3	107,0
LT	15400,0	59,7	84,4	0,9	58,0	1800,0	60,7	50,5	20,0	8,0	5,8	42,0	311,1	128,5
HU	16400,0	65,2	76,2	1,2	57,7	1800,0	55,8	35,8	13,8	5,2	3,9	70,0	295,5	131,6
MT	17500,0	84,8	33,1	0,7	68,9	2300,0	57,6	31,7	15,4	3,0	4,1	149,0	169,2	85,4
PL	17300,0	63,3	82,7	0,8	56,0	2000,0	59,7	36,9	17,7	3,6	5,0	88,0	330,5	139,7
RO	13000,0	47,0	70,6	0,5	49,2	1400,0	58,5	40,0	22,2	3,1	6,2	48,0	395,5	105,8
SI	22200,0	75,2	80,3	2,5	78,1	3300,0	64,4	31,2	13,6	3,6	3,5	106,0	231,4	160,2
SK	19500,0	73,9	84,5	0,7	65,2	2900,0	59,5	41,4	13,0	9,2	3,8	64,0	371,3	85,8
min	*11900,0*	*40,1*	*33,1*	*0,5*	*43,5*	*1100,0*	*55,8*	*31,2*	*9,8*	*1,6*	*3,5*	*42,0*	*137,8*	*67,0*
max	*29100,0*	*100,0*	*86,1*	*2,5*	*100,0*	*5300,0*	*68,1*	*57,2*	*22,3*	*9,2*	*6,6*	*168,0*	*671,1*	*160,2*
median	*17800,0*	*65,2*	*80,3*	*0,8*	*65,2*	*2300,0*	*60,7*	*43,9*	*16,7*	*4,1*	*5,0*	*70,0*	*330,5*	*105,8*
average	*19400,0*	*67,7*	*75,0*	*1,2*	*66,2*	*2592,3*	*61,6*	*44,0*	*16,6*	*5,1*	*4,9*	*80,3*	*336,5*	*108,4*
standard deviation	*5122,8*	*16,0*	*13,9*	*0,7*	*15,0*	*1131,0*	*3,8*	*8,6*	*3,7*	*2,5*	*1,1*	*39,8*	*149,7*	*31,9*
coefficient of variation	*0,3*	*0,2*	*0,2*	*0,6*	*0,2*	*0,4*	*0,1*	*0,2*	*0,2*	*0,5*	*0,2*	*0,5*	*0,4*	*0,3*

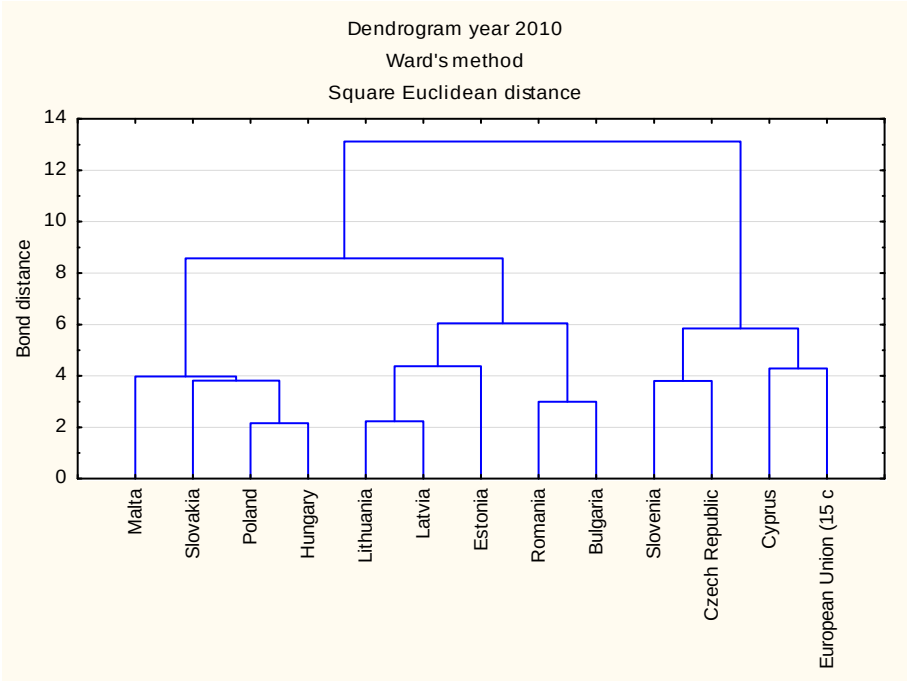
Source: own calculation.

Figure 1. Classification of 12 New EU Members and the EU-15 group, based on Ward's method and square Euclidean distance in year 2000.



Source: own calculations.

Figure 2. Classification of 12 New EU Members and the EU-15 group, based on Ward's method and square Euclidean distance in year 2010.



Source: own calculations.

Table 3. Normalized distance matrices for 12 New UE Members in years 2000 and 2010 (reference country = the EU15).

	Year 2000		*Year 2010*
UE 15	**0,000**	**UE15**	**0,000**
Cyprus	0,386	Czech Republic	0,486
Slovenia	0,391	Cyprus	0,488
Malta	0,417	Slovenia	0,541
Czech Republic	0,562	Malta	0,554
Poland	0,620	Slovakia	0,600
Hungary	0,628	Poland	0,623
Latvia	0,663	Hungary	0,635
Estonia	0,721	Latvia	0,656
Slovakia	0,742	Estonia	0,682
Lithuania	0,746	Lithuania	0,702
Romania	0,823	Romania	0,759
Bulgaria	1,000	Bulgaria	1,000

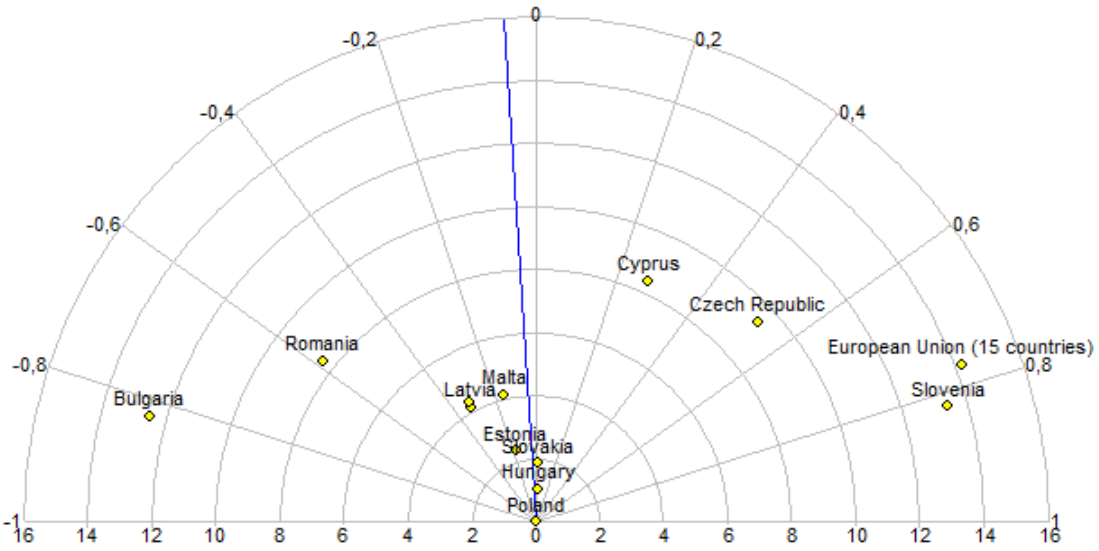
Source: own calculations

Table 4. Countries ranking base on synthetic variable in years 2000 and 2010. (reference value = max value, method - the arithmetic mean)

	Year 2000		**Year 2010**	**Ranking changes 2010/2000**	
UE15	0,535	UE15	0,494	UE15	no
Cyprus	0,467	Cyprus	0,416	Cyprus	no
Slovenia	0,388	Czech Republic	0,384	Czech Republic	2
Malta	0,361	Slovenia	0,372	Slovenia	-1
Czech Republic	0,345	Malta	0,326	Malta	-1
Latvia	0,323	Estonia	0,322	Estonia	1
Estonia	0,314	Latvia	0,316	Latvia	-1
Hungary	0,314	Lithuania	0,312	Lithuania	2
Romania	0,301	Poland	0,310	Poland	2
Lithuania	0,299	Slovakia	0,310	Slovakia	2
Poland	0,284	Hungary	0,304	Hungary	-3
Slovakia	0,236	Romania	0,298	Romania	-3
Bulgaria	0,153	Bulgaria	0,209	Bulgaria	no

Source: own calculations.

Figure 3. Recommended Polish path on Lisbon Strategy implementation



Source: own calculations base on calculations from table 4.

Table 5. Countries ranking base on synthetic variable (Hellwig methodology) , in years 2000 and 2010.

Year 2000			
ranking	**level**	**criterion**	**Country**
I	high	di>0,5150	UE 15
II	middle	0,3481<di< 0,5140	Slovenia, Cyprus, Malta, Czech Rep., Hungary
III	low	0,1811<di<0,3481	Latvia, Poland, Estonia, Lithuania, Slovakia
IV	very low	di<0,1811	Bulgaria
Year 2010			
ranking	**level**	**criterion**	**Country**
I	high	di>0,4376	UE 15
II	middle	0,2964<di< 0,4376	Czech Rep., Slovenia, Cyprus
III	low	0,1552<di<0,2964	Poland, Malta, Hungary, Slovakia, Latvia, Lithuania, Estonia, Romania
IV	very low	di<0,1552	Bulgaria

Source: own calculations.

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