

The Assessment of the Comparative Efficiency of Various Reforms of High-income Countries

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Abstract— The acceleration of the processes of the globalization in the world economy, that tightens and deepens the integration of the economies of different countries, leads to different challenges for the authorities of those countries. Hence, the governments of those countries develop and implement various concepts, strategic and tactical plans. The development and the practice of planned system and its ingredients are implemented in different directions of social life such as economic, political, institutional, social through systematic reforms. In modern literature the assessment of abovementioned reforms is implemented by different international and nongovernmental organizations /World Bank, International Monetary Fund, UNO, etc./ through different indexes /Economic Freedom, Democracy, Legatum prosperity, KOF globalization Indexes, etc/. The main objective of our research is to develop new methodology of the new integral index that we will give us an opportunity based on indexes that quantitatively assess reforms in different directions and create one more integral index that will mostly express the comparative efficiency of various reforms in those countries for 2009-2015. The formation of the new integral index is based on econometric methods (cluster and factor analysis). The analysis of the Integral Index of Life Quality, helps to outline the countries that have implemented reforms with high and less efficiency, directions that provide high effectiveness and areas that reduce the efficiency.

Keywords— Assessment, efficiency, institutional, social, cluster analysis, government, reforms, life quality.

1. Introduction

THE government of each country tries to provide the possible high level of the life quality of its population. In practice governments handle the above-mentioned problem through various reforms. As the quantitative assessment of reforms are mostly expressed through different indexes, we have the goal to create one integral index, that will include as many partial indexes as possible that will express the quantitative measurement of reforms through time.

To create IILQ we have developed a new methodology, which has two main parameters:

1. the change of the score of the country by different indexes for two periods of time,
2. the change of the rank of the country by different indexes for two periods of time.

Afterwards, we normalize the change of the score of the indexes included in the Integral Index in (0,1) interval for 2009-2015.

Main points of the methodology that we develop are:

1. In order to create the Integral Index of Life Quality (IILQ) we used econometric methods (cluster and factor analysis) as with their help based on 17 indexes we calculated the scale coefficient of each index.
2. We have considered the rank and score of country for each period of time as the most important parameters of the IILQ.

3. In order to measure the comparative effectiveness of reforms in countries for each index we have considered the change of the rank from t to $(t+1)$ period.

Taking above-mentioned steps we have the score of IILQ for 2009-2015 that we can compare with the basic year and measure comparative efficiency of reforms for the countries of the same group.

2. Statistical Review

The integral index describes the social-economic development level and through it we assess variety of reforms for 2009-2015. On this purpose we have suggested a new methodology for the assessment of IILQ based on seventeen different indexes.

2.1. The Global Competitiveness Index (GCI)

The Global Competitiveness Index (GCI) released by the World Economic Forum, which is a comprehensive tool, that measures the competitiveness of 148 countries, contains 3 sub-indexes: basic requirements, efficiency enhancers, innovation and sophistication factors, that are based on 12 pillars (institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, etc.) including 119 indicators[1].

2.2. Doing Business

Doing Business released by the World Bank and International Financial Corporation assesses business activity for 189 countries on the basis of 11 areas of regulation (starting a business, dealing with construction permits, getting credits, paying taxes, etc.) with 36 sub-indexes considering the survey results of organizations in different sectors of economies [2]. The important way to improve the methodology of this index is to consider the influence of the macroeconomic factors on the business environment [3].

2.3. The Corruption Perception Index

The Corruption Perception Index published by Transparency International anti-corruption organization measures the perceived levels of public-sector corruption for 177 countries based on different assessments and business opinion surveys [4]. The countries, included in the rank of The Corruption Perception Index, are classified on a scale of 0 to 100. The countries, that get 0 are the highly corrupt in judicial system, media, legislative, police, business, public, educational, military areas [5].

2.4. The Index of Economic Freedom

The Index of Economic Freedom assesses the economic freedom of countries through 10 indicators (Business Freedom, Trade Freedom, Fiscal Freedom, Government spending, Monetary Freedom, Investment Freedom, Financial Freedom, Property Rights, Freedom from Corruption, Labor Freedom) in 185 countries [6]. All ten indicators of the Index are scaled equally. Each of them gets 0 to 100 economic freedom grading scale; countries that get 100 are the freest economies of the world. The Index has been published by The Heritage Foundation and The Wall Street Journal since 1994 [7].

2.5. The Human Development Index

The Human Development Index is a summary indicator that measures a standard of living, the literacy rate, the life expectancy in order to compare and assess the human potential of different countries [8]. In the viewpoint it is important to mention the research which accounted and analyzed multiple criterias of the standard of life in 17 countries of Eurozone [9].

2.6. The Democracy Index

The Democracy Index, compiled by the Economist Intelligence Unit, is the classification of 167 countries by the level of the democracy. The Index includes 60 indicators grouped in five categories: electoral process and pluralism, civil liberties, functioning of government, political participation, and political culture [10].

2.7. KOF Index of Globalization

KOF Index of Globalization compiled by the Economist Intelligence Unit. The KOF Index of Globalization measures the three main dimensions of globalization: economic, social and political. In addition to three indices measuring these dimensions, we calculate an overall index of globalization and sub-indexes referring to actual economic flows:

- economic restrictions

- data on information flows
- data on personal contact
- and data on cultural proximity.

Data are available on a yearly basis for 207 countries over the period 1970 – 2010 [11].

2.8. The Global Innovation Index (GII)

The GII project was launched by INSEAD in 2007. The core of the GII Report consists of a ranking of world economies' innovation capabilities and results. In 2013, the ranking covered 142 economies, accounting for 94.9% of the world's population and 98.7% of the world's Gross Domestic Product (in US dollars). The GII relies on two sub-indexes: the Innovation Input Sub-Index and the Innovation Output Sub-Index, each built around pillars. Five input pillars capture elements of the national economy that enable innovative activities: (1) Institutions, (2) Human capital and research, (3) Infrastructure, (4) Market sophistication, and (5) Business sophistication. Innovation outputs are the results of innovative activities within the economy. There are two output pillars: (6) Knowledge and technology outputs and (7) Creative outputs. The overall GII score is the simple average of the Input and Output Sub-Indices.

2.9. The Global Peace Index (GPI)

The GPI measures the relative position of nations' and regions' peacefulness. The GPI comprises 23 indicators of the existence of absence violence or fear of violence. The indicators were originally selected with the assistance of an international panel of independent experts in 2007 and have been reviewed by the expert panel on an annual basis. All scores for each indicator are normalised on a scale of 1-5, whereby qualitative indicators are banded into five groupings and quantitative ones are either banded into ten groupings or rounded to the first decimal point. The overall composite score and index was then formulated by applying a weight of 60 percent to the measure of internal peace and 40 percent for external peace. The index includes such indicators as Number of external and internal conflicts fought, Relations with neighbouring countries, Level of perceived criminality in society, Political instability, Military expenditure as a percentage of GDP, Financial contribution to UN peacekeeping missions, Level of violent crime, etc. [12].

2.10. Legatum Prosperity Index (LPI)

Legatum Prosperity Index is an annual ranking, developed by the Legatum Institute, of 142 countries. The ranking is based on a variety of factors including wealth, economic growth, education, health, personal well-being, and quality of life. The index is based on 89 different variables. The 8 sub-indexes are:

- Economy
- Entrepreneurship & Opportunity
- Governance
- Education
- Health
- Safety & Security
- Personal Freedom
- Social Capital

2.11. Travel and Tourism Competitiveness Index (TTCI)

The TTCI assesses 140 economies worldwide based on the extent to which they are putting in place the factors and policies to make it attractive to develop the travel and tourism sector. The Index scores from 1 to 6 the performance of a given country based on three main subindexes: 1. regulatory framework; 2. business environment and infrastructure; and 3. human, cultural and natural resources [13].

2.12. Environment Performance Index (EPI)

The EPI ranks how well countries perform on high-priority environmental issues in two broad policy areas: protection of human health from environmental harm and protection of ecosystems. So two objectives that provide the overarching structure of the EPI are Environmental Health and Ecosystem Vitality. Environmental Health measures the protection of human health from environmental harm. Ecosystem Vitality measures ecosystem protection and resource management. The two objectives are further divided into nine issue categories that span high-priority environmental policy issues, including air quality, forests, fisheries and climate and energy among others. Underlying the nine issue categories are 20 indicators calculated from country-level data and statistics [14].

2.13. Global Gender Gap Index (GGGI)

The GGGI was first published in 2006 by World Economic Forum. It benchmarks national gender gaps of 142 countries on economic, political, education- and health-based criteria.

The index examines such areas of inequality as economic participation and opportunity, educational attainment, political empowerment, health and survival. The highest possible score is 1 (equality) and the lowest possible score is 0 (inequality) [15].

2.14. Social Progress Index (SPI)

The Social Progress Index, was created in 2014 by Harvard professor Michael Porter, in cooperation with World Economic forum experts, researchers from the Massachusetts institute of Technology, etc. The Social progress index measures a comprehensive array of components of social, environmental performance and aggregates them into an overall framework.

The Index has been structured around 12 components and 54 indicators consolidated into three dimensions of Social Progress: Basic Human needs (measures how well a country provides for its people's essential needs), Foundations of wellbeing (measures whether a population has access to basis of healthy life) and Opportunity [16].

2.15. The Basel AML Index (Money Laundering, Terrorism, Financing)

The Basel AML /Anti-Money Laundering/ index was created to evaluate levels of riskiness in different countries-taking money laundering and financing of terrorism as main indicators for measuring political and corruption risks in a country. The idea of developing has been discussing since 2000-s, and first published in 2012.

The Basel Anti-Money Laundering (AML) Index was developed by the Basel Institute on Governance. The Basel AML Index was first published in 2012 and since then has been the only measure to rank countries according to their risk of money laundering and terrorist financing.

The Basel AML Index overall score is derived from 14 indicators, and is based on publicly available sources such as the FATF, Transparency International, the World Bank and the World Economic Forum. The scores are aggregated as a composite index using a qualitative and expert-based assessment [17].

2.16. The Networked Readiness Index (NRI)

The Global Information Technology Report features the Networked Readiness Index which assesses the factors, policies and institutions that enable a country to fully leverage information and communication technologies for increased competitiveness and well-being.

The Networked Readiness Index measures, on a scale from 1 (worst) to 7 (best), the performance of 143 economies in leveraging information and communications technologies to boost competitiveness and well-being [18].

2.17. Enabling Trade Index (ETI)

The Global Enabling Trade Report (GETR) series has been published by the World Economic Forum since 2008, on an annual basis. The assessment has been based on the Enabling Trade Index (ETI), which was developed within the context of the World Economic Forum's Enabling Trade program, with the help of leading academia and partner organizations and companies.

The Enabling trade assesses the extent to which economies have needed capacities, infrastructures and services facilitating the free flow of goods.

All trade-enabling factors are grouped in four main categories (or sub-indexes):

1. market access / measures the extent and complexity of a country's tariff regime, as well as tariff barriers faced and preferences enjoyed by a country's exporters in foreign markets/,
2. border administration / assesses the quality, transparency and efficiency of border administration of a country/,
3. infrastructure / assesses the availability and quality of various infrastructures of a country/,
4. operating environment / measures the quality of key institutional factors impacting the business of importers and exporters active in a country/.

These four areas /sub-indexes/ are in turn subdivided into components /pillars/, that capture more specific aspects within their respective broad issue areas. Pillars are composed of a number of indicators [19].

Index	Clusters			
	1	2	3	4
GII	57.0	44.4	34.0	29.7
KOF	82.97	78.34	60.64	54.08

3. Methodological Approach

In this article we have chosen 27 the most representative high-income countries by the classification of the World Bank. We have considered following high income countries: Australia, Austria, Belgium, Canada, Croatia, Czech, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Japan, Latvia, Lithuania, Netherlands, New Zealand, Norway, Poland, Portugal, Russia, Slovakia, Slovenia, Sweden, UK, USA.

For this group of countries we consider 17 indexes by different international organization and describe the improvements in the economies of above-mentioned countries.

The purpose of the assessment is:

- ❖ the interconnection between indexes for the different groups of countries,
- ❖ the quantitative assessment of the level of influence between those indexes.

In our article we had the objective to generate the indicators that describe the directions and the results of social-economic reforms.

In our research we had the challenge to find out the scale coefficients of each index in the integral index. In our previous researches we solved this problem with the help of experimental and panel methods. In this article we developed our methodology based on econometric methods and used the tools of both cluster and factor analysis.

With the help of SPSS program we have done cluster analysis that divides observed objects into homogenous groups (clusters), that have the same descriptive. It means that we solve the problem of the classification and the structure of the data. Moreover, we discover the interconnection and the relationships between the objects of the group. The optimal number of cluster is 4 that is defined with the help of Hierarchical clustering. In addition, through K-means clustering we have the final centers of each cluster and the distance of each object from the center (Table 1).

Table 1. Clusters' final centers

Index	Clusters			
	1	2	3	4
TTCI	4.14	4.08	3.96	4.03
EPI	76.37	69.29	52.28	42.67
NRI	5.48	4.55	3.96	3.46
GCCI	.77	.70	.69	.67
CPI	81	57	40	30
EF	75.3	67.0	63.6	54.1
DI	8.82	7.26	5.59	5.44
DB	79.6	71.7	66.2	55.5
GPI	1.41	1.68	2.16	2.25
GCI	5.2	4.5	4.2	3.9
Basel AML	4.57	4.70	5.63	6.73
ETI	5	4	4	4
LPI	2.837	1.063	-.186	-.790
SPI	85.31	76.14	65.18	57.55
Human Development Index	.90	.83	.74	.64

As we can see from Table 1 the first cluster provides the maximum values. In other words the countries that have the best results are grouped in this cluster. In the contrast, Cluster 4 has the worst values.

Furthermore, in order to define latent variables of objects, with the help of SPSS program we used another statistical method, factor analysis. Based on the results of Communalities, we find out the importance of each object and hence, the scale coefficient of each index (Table 2).

Table 2. The Scale coefficient of each ingredient of the Integral Index of Life Quality

Indicator	Scale coefficient	Indicator	Scale coefficient
LPI	0.071	GCI	0.060
SPI	0.071	KOF	0.060
GII	0.069	HDI	0.057
NRI	0.068	GPI	0.052
CPI	0.067	EF	0.051
ETI	0.066	DI	0.051
EPI	0.061	GCCI	0.039
TTCI	0.061	Basel AML	0.038
DB	0.060		

With the help of the scales we found out the summing influence of 17 indexes for each country and its place in the group.

For the solution of the problem we used this formula.

$$\text{Integral Index} = \text{scale} * \text{Index1} + \text{scale} * \text{Index2} + \text{scale} * \text{Index3} + \dots + \text{scale} * \text{Index17}$$

Finally we create the rank of countries by the integral index [18].

The Integral Index of Life Quality contains following pillars including almost 700 indicators:

- ✓ Economy and Growth,
- ✓ Financial Sector,
- ✓ Social development, social-protection and labour
- ✓ Education
- ✓ Innovation, Science and Technology
- ✓ Health
- ✓ Environment and Climate change
- ✓ Infrastructure
- ✓ Private Sector
- ✓ Public sector,
- ✓ Political sector,
- ✓ Crime
- ✓ International cooperation.

With the help of our methodology we first summarized the above-mentioned 17 indexes and attained 1 general index.

$$H_{\text{int.index}}^j = \sum_{i=1}^{17} \alpha_i^j N_i^j, \quad (1)$$

$H_{int.index}^j$ - the Integral Index of Life Quality,
i and j are indexes
i = 1,2,...,17 – seventeen indexes. For example, i = 4 The Economic Freedom Index,
j=1, 2,...,27 high-income countries we evaluated
j=1 - Australia, j=2 – Austria, ... j=27 - USA
 α_i^j - the scale of each index,
 N_i^j - the rank of the j country by i index

For example, Germany is ranked 8 among 27 countries for 2009-2015 by the Global Competitiveness Index (considering the change of rank and score), therefore $N_1^{11} = 8$

The first stage of creating the index was the rearrangement of the indexes included in analyze. The principle of rearrangement was based on the changes of the ranks and scores of the above mentioned indexes for two periods of time. We also normalized the score of each index to bring them to the same interval and make them more comparable. Then we adjusted the change with scale coefficients substantiated methodologically [20].

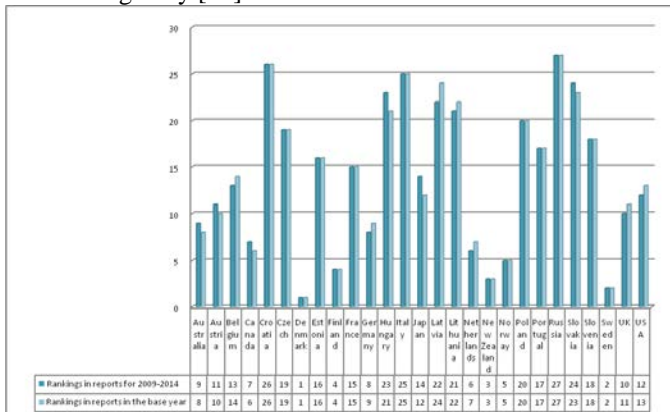


Figure 1. IILQ in reports for 2009-2015 compared with the base year (2009) in 27 high-income countries

Figure 1 represent IILQ in reports for 2009-2015 compare with the base year (2009) in 27 high-income, figure 2 represent IILQ by the new methodology for 2009-2015 compare with the base year (2009).

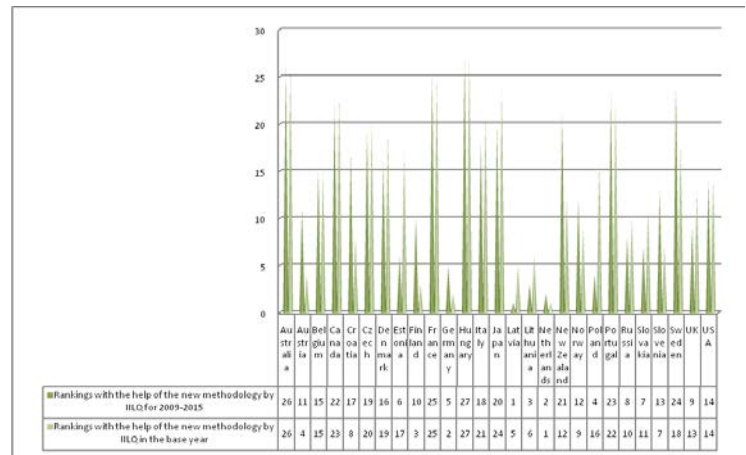


Figure 2. IIT by the new methodology for 2009-2015 compared with the base year 2009 in 27 high-income countries

Figure 3 represent IILQ in reports and by the new methodology in 27 high-income countries 2009-2015.

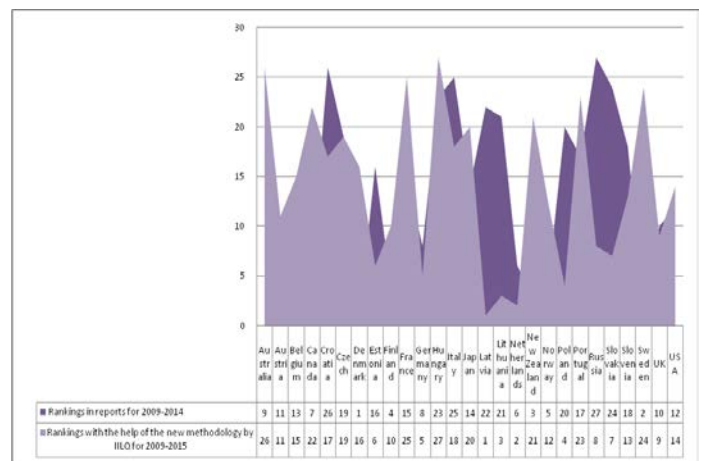


Figure 3. IILQ in reports and by the new methodology in 27 high-income countries for 2009-2015

Putting the indicators of α_i^j and N_i^j in the equation we will have H_i^j .

$$H_{int.index}^j = \sum_{i=1}^{17} \alpha_i^j N_i^j, (2)$$

For $j_1=1, 2, \dots, 27$ –high income countries we assess the average of the summary for 6 years.

$$(H_{i_1}^j + H_{i_2}^j + H_{i_3}^j + H_{i_4}^j + H_{i_5}^j + H_{i_6}^j) / 6 (3).$$

According to the suggested methodology, we measure IILQ for 27 high-income countries, considering the change of rank and score adjusted with scale coefficients for 2009-2015. The results witness, that the reforms for 2009-2015 have more effectively implemented in Estonia, Poland, Netherlands, Germany, Latvia, Lithuania, but less effectively in Hungary, France, Portugal among 27 high-income countries.

4. Conclusion

To sum up, following results are established:

- ❖ The level of the comparative effectiveness of reform that are implemented in high income countries for 2009-2015 with the help of both integral and partial indexes.
- ❖ For each country the areas of reform that provide high efficiency and the directions that reduce the value of the Integral Index for the observed period of time.
- ❖ In the context of integral reforms the directions of reforms are outlined that are considered essential to implement rapidly for development of each country.

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