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Contact to corresponding author: rafal.zelazny@ue.katowice.pl, University of Economics in Katowice, Faculty of Economics, 1 Maja 50, 40-287 Katowice, Poland
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Rafał Żelazny
University of Economics in Katowice, Poland

Jacek Pietrucha
University of Economics in Katowice, Poland

Measuring innovation and institution: the creative economy index

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Abstract
Research background: A literature review on innovativeness and institutions pointing to their correlation and the possibility of their joint examination.
Purpose of the article: This paper attempts to devise a measurement method for a creative economy, where as a result of feedback between institutions, human capital and technology conditions facilitating the development of creativity are created.
Methods: An empirical meta-analysis of indicators characterising innovativeness and institutional environment was carried out, following the hypothesis that at least in part they contain common information on creative economy.
Findings & Value added: The new synthetic index, a creative economy index (CEI), was constructed. The study was conducted for a group of 34 economies of the European Union and its associated states for the period of 2005–2014.

Introduction

Innovations and institutions are regarded as key factors supporting economic growth. The question, therefore, arises whether and to what extent innovations and institutions constitute a common element of pro-effective and pro-growth solutions, in which a crucial role is played by the free creativity factor — a creative economy. The paper presents a measurement method of a creative economy seen in this way. To this end, empirical meta-analysis of indicators characterising innovativeness and institutional environment was performed following the hypothesis that at least in part they contain common information about a creative economy, and next a new synthetic index, a creative economy index (CEI) was constructed. The first part of the paper presents a literature review on innovativeness and institutions, highlighting correlations and the possibility of their joint examination. The second part describes the method and the data used. The third part discusses the results of factor analysis and a new creative economy index.

Aim and scope of the research

The significance of innovation and institutions for the effectiveness of the economy and, as a consequence, for economic growth is stressed in numerous studies (Schumpeter, 1934; Schumpeter, 1939; Solow, 1957; Machlup, 1962; Kuznets, 1966; Kuznets, 1972; Romer, 1986; Lucas, 1988; Romer, 1990; Aghion & Howitt, 1992; Romer, 1994; Acemoglu, 2009). When expounding the determinants of long-term economic growth in the light of diminishing marginal productivity of inputs law, attention has been paid to the special role of the productivity factor. It is factor productivity which should be increased in order to maintain output at a given level or to increase it. Solow (1957) pointed to the substantial share of productivity growth in economic growth. In his model, factor productivity was viewed as a 'technical change', any kind of shift in the production function (Solow, 1957, p. 312). Moreover, Kuznets (1966, p. 81) observed, that labour and capital accumulation constitute more or less a tenth of the rate of growth in per capita product. According to Kuznets (1966), a quantitative increase in workers' hours and physical capital is a small part of the output. Identifying the sources of productivity gains required a shift from an exogenous to an endogenous approach. The origins of the endogenisation of the technical change category go back to Schumpeter's work (1934, 1939). Schumpeter was regarded as a forerunner of innovation theory who attempted to introduce the issue of technological advancement into the marginal produc-

tivity theory. He defined innovations as the formation of new products or services, new production methods, new markets, new raw materials and new organizations (Schumpeter, 1934, pp. 65–66). According to Schumpeter, the mechanism of practical implementation of inventions by entrepreneurs is a driving force behind economic growth. However, Schumpeter did not explain the source of invention provenance. Subsequent attempts to explain the sources of technological advancement can be found in the work of Knight (1944), von Neumann (1945), Arrow (1962), Uzawa (1965), Schmookler (1966), Nordhaus (1969), Romer (1986), Lucas (1988), Romer (1990), Aghion & Howitt (1992). Generally, two sources of this advancement can be seen, i.e. accumulation of scientific and technological knowledge, as well as an increase of human capital. Results of activity in these fields indirectly and directly contribute to factor productivity growth through, inter alia:

- increasing the number and/or quality of intermediate goods, which are innovations applied to the manufacturing of final goods, enabling the limiting of the decreasing marginal productivity of production factors (Romer, 1990; Rivera-Batiz & Romer, 1991; Aghion & Howitt, 1992),
- improving the resource of final goods of higher utility level for households (Grossman & Helpman, 1991),
- increasing human capital stock and/or productivity of human capital, in particular, those engaged in R&D activities (Romer, 1990; Lucas, 1988),
- the occurrence of positive externalities connected with the lack of possibility to entirely appropriate benefits from an innovation by the entity bearing the risk and cost of implementing the solution (Romer, 1986; Romer, 1994).

The quantification of innovation's influence on economic growth is undertaken within the framework of three general approaches. The first is connected with so-called 'growth accounting' based on the above mentioned neoclassical models of growth and a new growth theory with endogenous models of growth. In neoclassical models, the essential role of factor productivity in economic growth is stressed (Solow's residual, total factor productivity — TFP) as an exogenous variable, i.e. a technical change was given as outside of the model (Swan, 1956; Solow, 1957; Mankiw *et al*., 1992).

Factor productivity modelling has become a subject of studies within the endogenous models of growth. The endogenous growth theory encompasses a variety of different models. Empirical research based on these models is proven by the following determinants of factor productivity growth and economic growth:

- human capital stock and population quantity (Mankiw *et al*.,1992[1]; Bashir & Darrat, 1994; Strulik, 2005),
- scientific knowledge stock, R&D expenditures and R&D workers (Jones, 1995; Howitt, 1999; Freire-Seren, 2001),
- government policy (King & Rebelo, 1990; Rebelo, 1991; Freire-Seren, 2001),
- externalities (Lucas, 1988; Becker *et al*., 1990).

A different approach, i.e. a non-model approach, to the measurement of innovation influence on economic growth was proposed by Machlup (1962). In the era of aggregate production function popularity, instead of growth accounting he applied national accounting (System of National Accounts).

Machlup's approach is partly used to diagnose the degree of innovativeness of the economy in the currently popular indicator approach. It consists of collecting a set of qualitative and/or quantitative variables on the basis of which composite indices (CI) are built, diagnosing the innovativeness level of a given economy. The following can be distinguished from among the most popular in this field of research: OECD (1996), World Bank (2012); Hollanders *et al*. (2015), Dutta *et al*. (2015). Most of these pieces of work resulted in composite indices developed on the basis of the adopted methodology. CI values calculated for individual countries allow for the evaluation of the innovativeness level, technological potential or quality of human capital based on adopted criteria and drawing up rankings, and benchmarking (e.g. Balcerzak, 2016; Balcerzak, 2016a).

In another research trend, the significant role of institutions in economic growth is highlighted. The revival of an institutional approach in economics is particularly connected with O. Williamson and D. C. North's work of the 1980s. However, it is a multi-trend, methodologically diverse field of studies with origins going back to the American institutionalism of the 1930s, its continuators (e.g. G. Hodgson, 1998), and even outsiders of mainstream economics from 1940-80, such as F.A. Hayek. Broadly speaking, it also embraces evolutionary economics (R. Nelson) with its origins in the works of J. Schumpeter, and even considerations in the field of constitutional economics and public choice (e.g. J. Buchanan).

A belief shared by the proponents of new institutionalism is that institutions play a significant role and can be analysed with methods developed by economics (Williamson, 2000). According to North (1990), existing

[1] This model is a link between neoclassical models of growth and new growth theory with endogenous models of growth; it accounted for human capital as argument production function

institutions create a framework in which activities are undertaken and incentives to develop these activities (or not to develop them) are created. Organisations operate to maximise their wealth within such constraints and react to incentives originating from the institutional environment. They carry out activities that allow them to make the best use of existing opportunities, look for information, learn-by-doing, invest in knowledge and adjust to the existing institutional framework. Hence the type of activities, including the type of acquired knowledge, depends on the institutional framework, defining the possibilities of an organisation's activities. For example, if an institutional framework provides incentives for speculative activities, but not for manufacturing ones, then organisations improve the former, including searching for knowledge on this subject, and do not improve manufacturing techniques. The institutional framework co-defines the direction in which the search for knowledge and skills heads. The existing institutional framework can thus be an incentive for pro-developmental behaviour, or, conversely, for speculative, non-productive activity. In the literature there are several researches concerning the quality of institutional environment for innovative economy (e.g. Balcerzak & Pietrzak, 2016)

Interdependencies between technological advancement and institutions were noticed relatively early. Initially, there was a conviction that institutions adjust to technological changes. However, new institutionalism perceives this issue differently. Seminal works in this field were created, inter alia, within evolutionary economics, leading to the development of an approach called the National Innovation System (Edquist, 2005). The starting point was a discussion on the dissimilarities in the innovation process among countries due to institutional, organisational or structural differences. It is said that institutions favour innovation because it gives rise to the necessary stability for fluid knowledge exchanges and learning processes (Carlsson & Jacobson, 2005). Nevertheless, at the same time, to innovate implies to break or alter routines and behaviours, i.e. to alter institutions (Nelson & Winter, 1982). At any time, the institutional structure has a profound effect on, and reflects, the technologies that are in use and which are being developed (Nelson & Nelson, 2002). Hence we deal here with the interdependence or co-evolution of innovation and institution.

Acemoglu (2013), summarising his research on dependencies between technology, innovations, institutions and economic growth, states that at the roots of economic growth lie technological changes, but it is institutions that define the nature, pace and scope of technological changes. He distinguishes between inclusive and exclusive institutions. Inclusive institutions are those that provide opportunities and incentives for the development of innovations and economic activity. These incentives are based on, inter

alia, aligned property rights, while opportunities are enhanced by a level playing field, absence of entry barriers and the provision of basic public services. Economic inclusive institutions are reinforced by political inclusive institutions characterised by a wide distribution of political power (restriction of the monopolisation of political and economic power) and centralisation of the state which allows for the performance of its basic functions. On the other hand, exclusive institutions are characterised by the absence of economic and political freedom, transfer of resources to narrow elites and the absence of a level playing field. Acemoglu and Robinson (2012) carried out a broad historical analysis on this subject in a book entitled *Why Nations Fail: The Origins of Power, Prosperity, and Poverty.*

Hence the question arises: whether and to what extent innovations and institutions are a common element of pro-effective and pro-growth solutions, in which the key role is played by a free creativity factor – creative economy. In the literature, there are several research approaches to the term of creative economy. Howkins (2001) points to fifteen creative industries building creative economy, i.e. advertising, architecture, art, crafts, design, fashion, film, music, performing arts, publishing, research and development, software, toys and games, TV and radio, and computer games. Economic properties of the creative industries were described by Caves (2000). Florida (2002) identified a new social group — creative class; it is composed of people who have a creative ethos. The characteristics of the creative class are creativity, individuality, diversity, openness, talent and tolerance. Florida is an author of the 3T growth theory based on technology, talent and tolerance.

In this paper, the term 'creative economy' will mean an economy where as a result of feedback between institutions, human capital and technology conditions facilitating the development of creativity, which is an accelerator of innovativeness on micro, meso and macro level, is created. Such an approach does not merely confine creativity to the cultural sector and cultural industries (i.e. film, music, performing arts), a creative economy is based on the pillars of good quality institutions, talented people as well as embodied and disembodied knowledge.

The paper's goals are: (1) the empirical meta-analysis of the indicators characterising innovativeness and institutional environment following the hypothesis that, at least in part, they contain common information on a creative economy; (2) the construction of a new synthetic index, a creative economy index (CEI).

Methodology and data

The accomplishment of the set research goals required the following steps to be taken:

Step 1. Literature review on the methods of constructing composite indicators.

On the basis of the literature studies, the following stages of developing CI were identified: developing a theoretical framework, selecting variables, imputation of missing data, normalisation of data, multivariate analysis, weighting and aggregation, and presentation of CI (OECD, 2008). Additionally, an analysis of the benefits and drawbacks connected with the development and implementation of the CI to study an economic phenomenon was performed (Żelazny 2016; Grupp & Schubert, 2009).

Step 2. Selection of variables characterising innovativeness and institutional environment

In connection with the research goal (empirical meta-analysis), the list of innovation and institutional variables was drawn from existing databases.

The database of innovation indicators — Innovation Union Scoreboard Database (2015) includes 25 indicators grouped into three types and eight dimensions. In the last column, the variables are attributed the order numbers (V1–V25). The details are shown in Table 1 (Annex).

In the basic version of the database, the values of most indicators for EU-28 as well as Turkey, Iceland, Norway, Switzerland, Serbia and the Former Yugoslav Republic of Macedonia for the period of 2005–2012 were collected.

A characteristic feature of the existing databases describing institutional solutions is that even the indicators published in a given database show a significant level of mutual correlation, i.e. the fact that they convey similar information, such correlations also exist between databases. For research purposes, indicators characterising institutions were taken from several databases. In the last column, the variables are attributed order numbers (V26–V71). The details are shown in Table 2.

Finally, the database of institutional indicators includes 46 variables for EU-28 as well as Turkey, Iceland, Norway, Switzerland, Serbia and the Former Yugoslav Republic of Macedonia for the period of 2005–2014. Altogether, the database includes 71 variables. It is worth stating that

among the 71 variables there are stimulants accounting for the majority of data, as well as variables which are destimulants. Stimulants are variables whose increasing values are desirable from the standpoint of the general characteristics of the studied phenomenon, and destimulants are variables whose decreasing values are positively evaluated from the point of the phenomenon.

Step 3. Supplementing missing data

The database was modified both in the time and space range. If data for the latest year was not available, the most recent available data was used. Data not available at the beginning of the time series was replaced with values from the next available year.

Step 4. Standardization of data

First, the values of every variable for different years and countries were grouped together into new variables. Then, the standardization procedure (i.e. z-scores), which converts variables to the common scale with a mean of zero and standard deviation of one, was used.

Finally, we obtained a matrix of 71 variables for 340 objects, where the number of objects results from the sample size (34 countries) and the length of the time horizon (10 years — 2005–2014). The values of variables are within the range <-6.55; 4.79>.

Step 5. Multivariate analysis

In order to group and reduce the 71-element set of primary variables on innovation and institutions describing 340 objects, factor analysis applying the principal component method (Hair Jr. *et al*., 2009; Loehlin, 2011) was used. Factor analysis reduces a large number of variables into a smaller set of uncorrelated variables, and removes redundancy or duplication from a set of initial variables. It should be used when the researcher has no a priori hypothesis about factors or patterns of measured variables. This method allows the determination of the so-called principal components, which are uncorrelated with each other and contain most of information on the studied phenomenon. It is based on a correlation matrix. It is assumed that the differentiation of each variable can be decomposed into a common variance resource, which can be linked with factors, and specific variance resource. The higher the common variance resource, the better the explanation of diagnostic variable differentiation by factor analysis model. The

basis for result interpretation is the matrix of factor loadings, on the basis of which variables are attributed to individual factors — principal components. The first principal component is the combination that accounts for the largest amount of variability in the sample, the second accounts for the next largest amount of variance and is uncorrelated with the first and so on (Nicoletti *et al*., 2000, p. 19). The decision on the final number of analysed factors requires a combination of the quantitative criteria, which is known from the literature, and the researcher's knowledge on the analysed phenomena. There is no single criterion for selecting the number of factors. In literature the following criteria are mentioned: explained variance[2], scree criterion and Kaiser's criterion (Loehlin, 2011). The final decision lies with the researcher and may depend on the possibility of interpreting the results.

Step 6. Weighting, aggregation and presentation of CI

On the basis of the matrix of factor loadings after rotation, the proportion of the total unit variance of the factor which is explained by the factor loading of a specific variable (the square of factor loading divided by the variance) was defined. Using the results, individual variables with the highest outcomes (weights) should be rearranged into the specific number of intermediate composite indicators (ICI). This number is identical to the number of principal components pointed to at Step 5. The intermediate composites are aggregated by assigning a weight to each one, equal to the proportion of the explained variance in the data set (OECD, 2008, p. 90; Nicoletti *et al*., 2000, p. 19). In the cases when the obtained weights do not add up to unity, they should be rescaled accounting for the total value of the explained variance in the data set. The final composite indicator is expressed by the formula:

$$\mathrm{CI} = \sum_{i=1}^{n} w_i ICI_i \tag{1}$$

where:

w_i – weight of ICI_i satisfying conditions $0<w_i<1$ and $\sum w_i = 1$

n – number of ICIs

[2] Cumulative percentage of variance (criterion) is an area of disagreement in the factor analysis approach. No fixed threshold exists, although certain percentages have been suggested. In natural sciences, factors should be stopped when at least 95% of the variance is explained. In humanities, the explained variance is commonly as low as 50-60%.

Empirical results

The reliability of conducting factor analysis was tested in Step 1. The matrix of correlations was analysed and measure to sample the adequacy Kaiser-Meyer-Olkin — KMO was carried out (the analyzed set of data has a value of KMO=0.926).

In Step 2, factors were selected that applied the principal factor method. In cases of the variables analysed in this paper, the individual factor selection criteria allowed for the selection of 1 to several factors. It was assumed that factors explaining at least 60% of the initial database variance in total are taken into consideration (criterion advocated by OECD, 2008, p. 89 or Nicoletti *et al*., 2000, p. 20), which allowed for the selection of 4 factors. Table 3 presents information on eigenvalues and the explained variation before rotation.

In Step 3, an analysis of 4 selected factors was conducted and the rotation of factors was carried out. The most commonly applied normalised varimax rotation was used and other rotation methods were also utilized (results were also analysed for a normalised Biquatimax rotation). Individual rotations did not give fundamentally different results. In general, 4 factors explaining at least 60% of variability of the whole variable set are subject to a relatively unambiguous interpretation.

Factor 1 (f1) — inventive economy (IE). This factor explains the variability of institutional indicators describing the rules of conducting economic activity, in particular its freedom and most of the innovation indicators. This factor explains (depending on the rotation) from 36% to 45% of the total variability of the output data set.

Factor 2 (f2) — political institutions (PI). This factor includes the variability of factors measuring political institutions, especially from the Polity2 database, Freedom in the World (PR, CL), Freedom of the Press and also most of the Political Stability and Absence of Violence/Terrorism rotations, as well as voice and accountability, and the World Bank database. What could be considered somewhat surprising in this context is the role of "sound money," although this variable is heavily influenced by the autonomy of a central bank, which can be considered from the perspective of check and balance mechanisms in the political system, thus it can be interpreted from the standpoint of political institutions.

Factor 3 (f3) — business regulations (BR) — a factor that is hard to interpret unambiguously, including some regulations, in particular those directly connected with conducting economic activity (registration and property rights transfer, regulations on establishing and conducting economic

activity, i.e. taxes, labour market, redundancies etc., access to financial information, availability of credit).

Factor 4 (f4) — fiscal institutions (FI). This factor groups information on institutional solutions in the field of public finance, including fiscal freedom and also size of government.

Next the creative economy index was determined. The four intermediate composite indicators identified can be aggregated, and each intermediate indicator is weighted according to its contribution to the portion of the explained variance in the dataset, i.e. the normalised sum of squared loadings (Nicoletti *et al*., 2000, p. 19). Finally, the creative economy index is expressed by the following formula:

$$CEI = 0.57IE + 0.19PI + 0.11BR + 0.13FI \quad (2)$$

The values of the index are presented in Table 4.

The ranking of studied countries for the year 2014 based on the values of the creative economy index is presented in Figure 1. Quartile groups were denominated. The group of leading economies, in respect of creative economy as defined in this paper, consists of: Finland, Switzerland, Sweden, Denmark, the Netherlands, Luxemburg, the United Kingdom, Ireland and Norway. They are characterized by the highest quality institutional environment (V26, V28, V29, V30, V31, V32, V33, V36, V43, V44, V48, V49, V50, V51, V52, V53, V54, V55, V56, V57, V58, V64, V71) directly stimulating creativity and innovativeness (V4, V5, V6, V9, V11, V14, V15, V18, V21) — the same list of countries appears in CEI and IE scoreboards with some order changes. They also have the highest ranks in political institutions (V27, V29, V45, V46, V69, V70), business regulations (V47, V61, V62) and fiscal institutions (V34, V35, V42).

The second group is constituted: Germany, Austria, Iceland, Belgium, Estonia, France, Malta and Portugal. They generally have solid institutions that form relatively good conditions for creative economy development. It is a heterogenous and specific group. Germany and France have stable, innovative and competitive economies but specific institutional arrangements (more than in the first group's administrative obstacles). The rest of the group consists of countries that rather follow than propose new solutions.

The third group of countries may be called creative economy catching up countries, i.e.: Cyprus, the Czech Republic, Estonia, Lithuania, Slovenia, Poland, Latvia and Hungary. Most of these are transition countries that build the institutional environment necessary not only for a market economy development but also, and perhaps above all, for creative economy

development. The preparation of efficient solutions in the areas of: inventive economy, political institutions, business regulations and fiscal institutions will allow them to shift towards creative economy followers or even leaders). The implementation of bad solutions or a lack of any activities will place them in the group of creative economy laggers.

The fourth group, characterised by the lowest values of the index, includes: Slovakia, Italy, Macedonia, Greece, Croatia, Romania, Turkey, Bulgaria and Serbia. We called them creative economy laggers. Excluding Italy, Slovakia and Macedonia, they have the worst three of four subindexes of CEI. Incentives for innovative activities are not stimulated, because of their institutional weaknesses.

Conclusions

A creative economy is an economy in which conditions for the development of creativity exist and are regarded as an accelerator of innovativeness on micro, meso and macro level. The empirical meta-analysis of 71 variables characterising innovativeness and institutional environment in 34 countries in the period of 2005–2014 proved the hypothesis concerning the simultaneous role of innovations and institutions in describing the creative economy phenomenon. Four main components of the studied phenomenon were distinguished, i.e. inventive economy, political institutions, business regulations and fiscal institutions. These become the basis for building the creative economy index (CEI). CEI is an alternative measurement method of creative economy development combining variables characterising innovativeness and the institutional environment in a given country.

The measurement of the level of creative economy development based on the creative economy index allowed the presentation of the index values for 34 countries, longitudinal changes in the period of 2005–2014, and distinguished four groups of countries based on the so-called 'quartile groups'.

An interesting field for further research seems to be the dependence analysis between CEI (and the four components of the creative economy index) and economic growth. It will be the aim of the next step of our research, after supplementing the time series of CEI.

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Annex

Table 1. Indicators describing innovation according to Innovation Union Scoreboard Database 2015

	Enablers	No.
Human resources	1.1.1 New doctorate graduates (ISCED 6) per 1000 of the population aged 25-34	V1
	1.1.2 Percentage of the population aged 30-34 having completed tertiary education	V2
	1.1.3 Percentage of youth aged 20-24 having attained at least upper secondary level education	V3
Open, excellent and attractive research systems	1.2.1 International scientific co-publications per million population	V4
	1.2.2 Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	V5
	1.2.3 Non-EU doctorate students as a % of all doctorate students	V6
Finance and support	1.3.1 Public R&D expenditures as % of GDP	V7
	1.3.2 Venture capital (early stage, expansion and replacement) as % of GDP	V8
	Firm activities	
Firm investments	2.1.1 Business R&D expenditures as % of GDP	V9
	2.1.2 Non-R&D innovation expenditures as % of turnover	V10
Linkages & entrepreneurship	2.2.1 SMEs innovating in-house as % of SMEs	V11
	2.2.2 Innovative SMEs collaborating with others as % of SMEs	V12
	2.2.3 Public-private co-publications per million population	V13
Intellectual assets	2.3.1 PCT (Patent Cooperation Treaty) patent applications per billion GDP (in PPS€)	V14
	2.3.2 PCT patent applications in societal challenges per billion GDP (in PPS€)	V15
	2.3.3 Community trademarks per billion GDP (in PPS€)	V16
	2.3.4 Community designs per billion GDP (in PPS€)	V17
	Outputs	
Innovators	3.1.1 SMEs introducing product or process innovations as % of SMEs	V18
	3.1.2 SMEs introducing marketing or organisational innovations as % of SMEs	V19
	3.1.3 Fast-growth in innovative industries	V20
Economic effects	3.2.1 Employment in knowledge-intensive activities (manufacturing and services) as % of total employment	V21
	3.2.2 Medium and high-tech product exports as % of total product exports	V22
	3.2.3 Knowledge-intensive services exports as % of total service exports	V23
	3.2.4 Sales of new to market and new to firm innovations as % of turnover	V24
	3.2.5 License and patent revenues from abroad as % of GDP	V25

Source: European Commission (2015); Hollanders *et al*., (2015).

Table 2. Indicators describing institutions according to selected databases

Database	Indicator	No.
Worldwide Governance Indicators	1.1 Voice and Accountability	V26
	1.2 Political Stability and Absence of Violence/Terrorism	V27
	1.3 Government Effectiveness	V28
	1.4 Regulatory Quality	V29
	1.5 Rule of Law	V30
	1.6 Control of Corruption	V31
Index of Economic Freedom	2.1 Property Rights	V32
	2.2 Freedom from corruption	V33
	2.3 Fiscal Freedom	V34
	2.4 Government Spending	V35
	2.5 Business Freedom	V36
	2.6 Labor Freedom	V37
	2.7 Monetary Freedom	V38
	2.8 Trade Freedom	V39
	2.9 Investment Freedom	V40
	2.10 Financial Freedom	V41
Economic Freedom of the World	3.1 Size of Government	V42
	3.2 Protection of property rights	V43
	3.3 Legal System & Property Rights	V44
	3.4 Sound Money	V45
	3.5 Freedom to trade internationally	V46
	3.6 Regulation	V47
Global Competitiveness Report	4.1 Property rights	V48
	4.2 Intellectual property protection	V49
	4.3 Diversion of public funds	V50
	4.4 Public trust in politicians	V51
	4.5 Judicial independence	V52
	4.6 Favoritism in decisions of government officials	V53
	4.7 Wastefulness of government spending	V54
	4.8 Burden of government regulation	V55
	4.9 Efficiency of legal framework in settling disputes	V56
	4.10 Efficiency of legal framework in challenging regulations.	V57
	4.11 Transparency of government policymaking	V58
Doing Business	5.1 Starting a Business	V59
	5.2 Dealing with Construction Permits	V60
	5.3 Registering Property	V61
	5.4 Getting Credit	V62
	5.5 Protecting Minority Investors	V63
	5.6 Paying Taxes	V64
	5.7 Trading Across Borders	V65
	5.8 Enforcing Contracts	V66
	5.9 Resolving Insolvency	V67
Polity IV	6.1. Polity	V68
Freedom in the World	6.2 Political Rights	V69
	6.3. Civil Liberties	V70
Freedom of the Press	8.1 Freedom of the Press	V71

Source: Kaufmann & Kraay (2015); The Heritage Foundation (2015); Fraser Institute (2015); World Economic Forum (2015); World Bank (2015); Freedom House (2015).

Table 3. Eigenvalues and factor explained variation

	eigenvalue	explained variation	cumulative explained variation
f1	**33.6**	**47.4**	**47.4**
f2	**4.3**	**6.0**	**53.4**
f3	**3.8**	**5.4**	**58.8**
f4	**2.9**	**4.1**	**62.9**
f5	2.5	3.6	66.4
f6	2.2	3.1	69.5
f7	1.9	2.7	72.2
f8	1.8	2.5	74.7
f9	1.7	2.3	77.0
f10	1.5	2.1	79.1

Table 4. CEI values for selected countries in the period of 2005–2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
BE	0.33	0.33	0.37	0.39	0.36	0.35	0.37	0.39	0.40	0.40
BG	-1.05	-1.03	-0.99	-0.97	-0.93	-0.91	-0.92	-0.88	-0.92	-0.96
CZ	-0.36	-0.37	-0.40	-0.39	-0.38	-0.42	-0.43	-0.39	-0.37	-0.28
DK	1.15	1.14	1.19	1.22	1.19	1.09	1.11	0.93	0.89	0.94
DE	0.65	0.66	0.69	0.65	0.62	0.61	0.56	0.58	0.61	0.62
EE	0.02	0.05	0.11	0.19	0.18	0.19	0.28	0.24	0.21	0.27
IE	0.59	0.60	0.62	0.63	0.58	0.55	0.60	0.63	0.67	0.75
EL	-0.52	-0.48	-0.50	-0.59	-0.63	-0.65	-0.79	-0.88	-0.82	-0.77
ES	-0.09	-0.12	-0.10	-0.10	-0.14	-0.18	-0.17	-0.17	-0.24	-0.33
FR	0.28	0.28	0.31	0.33	0.30	0.34	0.34	0.29	0.26	0.25
HR	-0.93	-0.89	-0.81	-0.80	-0.78	-0.78	-0.76	-0.77	-0.77	-0.77
IT	-0.43	-0.48	-0.47	-0.53	-0.54	-0.49	-0.49	-0.55	-0.56	-0.62
CY	-0.08	-0.02	0.07	0.18	0.17	0.16	0.13	0.02	-0.09	-0.14
LV	-0.56	-0.52	-0.53	-0.55	-0.60	-0.63	-0.59	-0.50	-0.48	-0.45
LT	-0.51	-0.47	-0.41	-0.42	-0.48	-0.48	-0.45	-0.39	-0.39	-0.35
LU	0.67	0.68	0.69	0.74	0.82	0.81	0.76	0.73	0.72	0.77
HU	-0.36	-0.33	-0.34	-0.42	-0.42	-0.43	-0.45	-0.54	-0.55	-0.59
MT	-0.13	-0.09	0.02	0.03	-0.01	-0.05	-0.07	-0.05	0.01	-0.06
NL	0.84	0.85	0.87	0.86	0.84	0.85	0.90	0.99	0.95	0.94
AT	0.66	0.67	0.77	0.71	0.65	0.64	0.56	0.49	0.49	0.51
PL	-0.70	-0.70	-0.70	-0.70	-0.58	-0.47	-0.42	-0.41	-0.40	-0.37
PT	-0.09	-0.06	-0.05	-0.04	-0.11	-0.21	-0.25	-0.18	-0.14	-0.09
RO	-1.26	-1.21	-1.03	-0.96	-0.94	-0.91	-0.93	-0.97	-0.93	-0.80
SI	-0.30	-0.27	-0.17	-0.17	-0.11	-0.23	-0.29	-0.30	-0.34	-0.36
SK	-0.51	-0.46	-0.46	-0.49	-0.52	-0.56	-0.58	-0.57	-0.63	-0.62
FI	1.05	1.04	1.08	1.04	1.03	0.99	1.05	1.13	1.14	1.11
SE	0.95	0.98	1.07	1.15	1.19	1.20	1.16	1.10	1.07	0.97
UK	0.72	0.73	0.65	0.60	0.59	0.61	0.67	0.73	0.72	0.76
TR	-1.15	-1.10	-1.02	-1.06	-1.06	-1.01	-0.93	-0.88	-0.86	-0.92
IS	0.89	0.83	0.81	0.74	0.66	0.53	0.56	0.54	0.45	0.45
NO	0.69	0.69	0.71	0.70	0.72	0.68	0.66	0.68	0.71	0.73
CH	0.93	0.92	1.00	1.01	0.99	0.98	0.99	1.03	0.99	0.99
RS	-1.42	-1.31	-1.23	-1.22	-1.17	-1.14	-1.14	-1.18	-1.17	-1.15
MK	-1.34	-1.27	-1.14	-1.06	-1.02	-0.98	-0.94	-0.82	-0.73	-0.63

Source: own evaluation. The database is available on the website http:// http://rzelazny.pl/category/cei.

Figure 1. Ranking of economies based on CEI values in 2014 according to quartile groups