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Application of Vector Measure Construction Methods to Estimate Quality of Institutions: Nations in Transition*

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Abstract:

Purpose: *The aim of the article is a multi-criteria assessment of the quality of institutions in countries of Central and Eastern Europe (CEE) and Central Asia, which in the early 1990s introduced a market system in their economies. The analysis was carried out taking into account the division of 28 analysed countries into two groups - current EU members and those that do not belong to this group.*
Design/Methodology/Approach: *The economies under studies were analysed by selected 8 dimensions quality of institutions. Data from 1995, 2004 and 2018 were collected and compared, taking into consideration the EU members and other countries. The economies were compared and classified using the Vector Measure Construction Method (VMCM).*
Findings: *The effects of introducing major transformation reforms turned out to be different in the analysed countries. The initial conditions for the transformation and the timing of reforms seem to have influenced them. Also accession to the EU had a significant impact on the improvement of the quality of institutions in the EU member states. It has led to a large stratification of two groups of countries – the EU members and other analysed countries.*
Practical Implications: *VMCM method is dedicated to the study of complex economic processes. These approach allows for making rankings, classifications of objects and the analysis of the change dynamics. The performed assessment of the quality of institutions may be helpful for the governments of the surveyed countries and constitute a justification for a change in institutional policy, or may support the decisions of investors looking for an appropriate country of location.*
Originality/Value: *Due to the advantages of VMCM, applying it to the analysis and comparison of the quality of institutions in the surveyed countries allowed for taking into account the multidimensionality of the problem and its better, in-depth assessment.*

Keywords: *Institutions, multi-criteria analysis, CEE and Central Asia countries.*

JEL codes: *O17, P37, P52.*

Paper type: *Research article.*

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1. Introduction

Economic and social phenomena are usually characterized by multidimensionality. Their essence can be described by many variables that carry a certain amount of information, which makes it difficult to assess them in a relatively comprehensive manner (Thalassinos and Thalassinos, 2006). This also applies to the quality of institutions, determined with the use of many variables, which characterize features of institutions or assess the effects of their performance (Aron, 2000).

The concept of an institution has been introduced to the main stream of economy by the new, institutional economy. North (1991), which is the most eminent representative of this economy and a Nobel prize winner, delineates institutions as the rules of the game in a society or, more formally, are the humanly devised constraints that shape and structure political, economic and social human interactions. They shape the subjective mental constructs that individuals use to interpret the world around them and make choices. Moreover, by structuring the interaction of human beings in certain ways, formal institutions affect the price we pay for our actions (North, 1991). Institutions considered as legal, administrative and customary relationships of repetitive human interactions form a system of formal rules (determined as to the forms, i.e. defined, and set down in writing by a human being – e.g. legal norms, property rights) and informal (not defined as to the forms i.e. customary patterns of behavior – e.g. traditions, customs, conventions, standards) (North, 1997; North, Acemoglu, Fukuyama, and Rodrik, 2008). The formal institution are created and set down in writing, and often complement and increase effectiveness of the informal institutions. The informal institutions are embedded in traditional social practices and culture which can be equally binding.

According to Rodrik (2003), institutions refer to the quality of formal and informal socio-political arrangements, from the legal system to broader political institutions that play an important role in promoting or obstructing economic activity. The relevant institutions, such as secure property rights, legislation, the independence of the judiciary appropriate regulatory structures as well as bureaucratic capacity and others are needed to structure, enforce and reduce the uncertainty of agreements. The good institutions, i.e. creating the structure of incentives reducing uncertainty and supporting effective markets for goods and production factors, contribute to the improvement of economic results. They play a vital role in reducing transaction costs and shaping the appropriate incentives that drive long-run economic growth and development, create stability within firms and economies, should encourage efforts and eliminate errors, facilitate collective action, create order, facilitate exchanges and the management of conflicts (North, 1991; North, 1997; Rodrik, 2002; Bardhan, 2006; Easterly, 2001; Ostrom, 2010; Ostrom, 2014).

The differences in institutions can explain the differences in economic performance across time and space (North, 1991; Olson, 1996; Hall and Jones, 1999; Rodrik *et. al.*, 2004; Acemoglu and Robinson, 2012). Therefore, according to Acemoglu *et al.*

(2005; 2012) the distinction between "extractive" and "inclusive" institutions is very important. The first one refers to non-democratic political institutions on one hand and weak rule of law and the absence of private property rights on the other. While the "inclusive" institutions are a web of democratic political institutions, strong rule of law and the protection of private property for a broad cross section of society. The "inclusive" institutions are considered to be the one of fundamental growth factors (deep roots of growth) that directly or indirectly influence two other determinants (geography and openness of economy) (Acemoglu *et al*., 2001; 2002; Rodrik, 2003; Bloch and Tang, 2004; Rodrik, *et al*., 2004; Owen and Weatherston, 2007; Economides and Egger, 2009; Besley and Persson, 2011; Acemoglu and Robinson, 2012). And as stated in the latest literature, formal and informal institutions are considered as an important determinant of growth, quality of live and subjective well-being (Bjørnskov, Dreher, and Fischer, 2010; Helliwell, Huang, and Wang, 2014; Nikolova, 2015; Graafland and Lous, 2018; Graafland, 2020; Roka, 2020).

According to Rodrik (2003), presence of good institutions cannot be taken for granted in many countries - these institutions would not emerge endogenously and effortlessly as a by-product of economic growth, they rather are the basic preconditions and determinants of growth. Roland (2004), referring to the institutions' ability to change, proposed a classification into "slow-moving" and "fast-moving" institutions. A prime example of a slow-moving institution are values, beliefs, and social norms. Fast-moving institutions, political institutions or formal, do not necessarily change often but can change more quickly.

As Acemoglu (2009) emphasizes, the institutions are social choices and they can be potentially reformed so as to achieve better outcomes. While laws and regulations are not directly chosen by individuals and some institutional arrangements may be historically persistent, in the end the laws, policies and regulations under which a society lives are the choices of the members of that society. If the members of the society collectively decide to change them, they are capable to change them. Such reforms may not be easy, they may encounter a lot of opposition, and often we may not exactly know which reforms will work.

Thus, economists coming from the new, institutional economy proclaim that institutions, especially formal ones, can be created and changed quite quickly depending on the needs of a dynamically changing economy. However, the slow pace of changes in informal institutions may undermine the effectiveness of changing formal rules, and only formal rules can be introduced top-down, while informal ones change bottom-up and evolutionary. It should also be remembered that identical institutions will not function equally well in every economy, because it is determined by the historical, geographic, cultural and social conditions of these economies.

The systemic transformation of the former socialist countries is perceived as a long process of changes in institutions (Morawski, 1998; Lisowska, 2004; Godłów-

Legiędź, 2005; Nikolova, 2015). It was a sudden, radical change introduced top-down, breaking the continuity of institutions and implementing a new institutional order. These fledgling democracies had to create the legal and institutional fundamentals that underpin democratic and capitalists states and the importance of institutions for the economic performance in the countries in transition was large and increasing over time (Grogan and Moers, 2001; Havrylyshyn, 2001; Guriev and Zhuravskaya, 2009; Havrylyshyn *et. al*., 2016). Some of these countries joined the EU, which required the adaptation to the institutional conditions in force in the EU. The Eastward enlargement of the European Union represents one of the greatest social and economic transformations in modern times. Candidate countries adopt, implement and enforce the EU acquis. These adaptation to the EU acquis is a slow-moving process, and political conditionality create major obstacles to the accession. The institutional change mandated by the EU is very wide and extends both to general areas of a state, such as the judiciary and the state bureaucracy, but also to several dozens of regulatory fields and changes in informal institutions (Schimmelfennig and Sedelmeier, 2004; Sedelmeier, 2008; Vachudova, 2009; Bruszt and Lundstedt, 2016). And the opinion is that the new member states had integrated the EU system rather smoothly (de Vitte, 2019).

Both the systemic transformation and accession to the EU should contribute to the improvement of the quality of institution. However, the institutions cannot be directly observed or measured. Instead, proxies are used to estimate quality of institutions and various measures to assess the quality of institutions operating in different areas e.g. are applied:

- Worldwide Governance Indicators (WGI),
- Freedom in the World (FIW),
- Economic Freedom of the World (EFW),
- Index of Economic Freedom (IEF),
- Freedom of the Press,
- Corruption Perception Index (CPI),
- Doing Business (DB).

There is no clear consensus on which indicators are the best. These study uses the first two measures, which allow the assessment of eight dimensions of institutional quality. Trends for the selected indicators, which show change direction of the quality of institutions in the surveyed countries have been analyzed.

2. Data and Methods

In the paper, authors used Vector Measure Construction Method (VMCM) as a methodical apparatus, to assess the problem related to quality of institutions (Hanias *et al.*, 2007; Ugurlu *et al.*, 2014). The time series analysis of economic variables reflecting quality of institutions in the selected 24 countries of CEE and Central Asia was performed. At the beginning, to assess the quality of institutions in 1995, 2004

and 2019 (based on the adopted variables), a ranking of 24 countries of CEE and Central Asia according to the so-called artificial pattern was made from data of 1995, as the base year. The purpose of this research concept was to enable the general ranking of the selected 24 countries of CEE and Central Asia, with regard to development of quality of institutions, and the possibility of making comparison with respect to the result of the ranking for each country in year 2004 and 2019 related to 1995, as a reference year.

The following countries (variants) were analysed: Slovenia (SI), Hungary (HU), Czech Republic (CZ), Poland (PL), Estonia (EE), Slovak Republic (SK), Lithuania (LV), Latvia (LT), Moldova (MD), Bulgaria (BG), Romania (RO), Croatia (HR), North Macedonia (MK), Armenia (AM), Albania (AL), Ukraine (UA), Kyrgyz Republic (KG), Belarus (BY), Russian Federation (RU), Georgia (GE), Kazakhstan (KZ), Azerbaijan (AZ), Uzbekistan (UZ), Tajikistan (TJ). Division into countries which belonged to the EU in 2019 and others has been taken into account.

The eight dimensions (indicators) of the quality of institutions used in study were selected:

X_1 – Political Rights (PR),
X_2 – Civil Liberties and Status (CL),
X_3 – Voice and Accountability (VA),
X_4 – Political Stability and Absence of Violence/Terrorism (PS),
X_5 – Government Effectiveness (GE),
X_6 – Regulatory Quality (RQ),
X_7 – Rule of Law (RL),
X_8 – Control of Corruption (CC).

PR and CL ($X_1 – X_2$) variables are indicators of the quality of institutions assessed within the FIW. The other variables ($X_3 – X_8$) form the evaluation of the quality of institutions within WGI. The FIW dimensions score (PR and CL) are measured on a one-to-seven scale, with 1 representing the highest degree of Freedom and 7 the lowest[3]. The WGI indicators ranges from -2.5 to +2.5 - the higher the value, the better the evaluation of the institutions in a given economy in the six key dimensions of the WGI – a measure obtained to embrace various aspects of institutional structure of economies and a base for the rating of country achievements in the quality of institutions[4].

[3]*FIW dimensions refer to political freedoms (e.g.: free elections, pluralism, government transparency, corruption) and citizen liberties (e.g.: free media, freedom of speech, freedom of association, independence of the courts, equality of citizens before the law, protection of private or economic property rights) (Freedom House, 2020).*

[4]*WGI indicators refer to the election and change of government, monitoring of its activities , government capacity to effectively formulate and implement good policies, and the attitude of citizens to the state and its institutions (Kaufmann, Kraay, Mastruzzi, 2010).*

The indicators value was collected for three years:

- 1995, when all of the analysed countries accomplished implementation of the set of major transformation reforms[5];
- 2004, when eight of the countries under studies joined the EU, and two others were admitted to this group in 2007,
- 2019 is the last year, when comparable data are available.

Data referred to these three years were obtained from the Freedom House database (for two FIW dimension) and World Bank database (for six WGI dimension). In the problem under consideration, the quality of the institution, is an complex socio-economic phenomena described by many indicators therefore the VMCM method was selected for its evaluation, as a Multidimensional Comparative Analysis method. VMCM allows for making a ranking, of socio-economic objects (countries) described with many indicators and study their change dynamics (Nermend, 2009). The procedure of VMCM comprises 8 stages (Nermend, 2017):

1-2. Selection and elimination of variables - in the research, all the significance coefficient values of the variables were within the range <0;0,1> therefore all variables were carried forward for further stages of research.
3. Defining the character of diagnostic variables - one of the most important step in the VMCM method is defining the character of diagnostic variables. The diagnostic variables may have character of: stimulants, destimulants and nominants. Stimulants are such variables, which greater values mean the higher level of complex socio-economic process under studies. In the research the variables which have stimulants character are: X3 – VA; X4 – PS; X5 – GE; X6 – RG; X7 – RL; X8 – CC. Destimulants are such variables which smaller values mean the higher level of complex socio-economic studied process. In the research variables X1 – PR and X2 – CL have destimulant character. While nominants are such variables, which desired values are within a specific range.
4. Defining the diagnostic variables weight - in our case we didn't use weights system because all selected diagnostic variables were equally important.
5. Normalization of variables - the next stage in the construction of the aggregate measure of the quality of institutions provides for the elimination of different units of measure of diagnostic variables, which additionally hinder any arithmetic operations.
6. Determination of the pattern and anti-pattern - in the paper the pattern and anti-pattern was automatically determined. It was made under 1995 data, as the base year. For the variables which have stimulant character the pattern was constructed

[5]*It is not possible to fully assess changes in the quality of institutions from the beginning of transformation, because studies have not been started for all countries since 1990. It is known, however, that in terms of the quality of institutions, the post-socialist countries formed quite homogenous group at the beginning of transformation, with a very large distance from democratic market economies(Kitschelt 2003, p. 49; Piątek 2011).*

based on the first quartile and the third quartile for destimulants. For the anti-pattern it was the third quartile for variable values which are stimulants and the first quartiles for destimulants.

7-8. Construction of the aggregate measure and classification of objects - the last two stages of the VMCM method. The value of the aggregate measure is within the range from zero to one. The aggregate measure is the value equal to zero for anti-pattern and the value equal to one for the pattern. The objects which have the value of measure more than one are better than the pattern. Objects that are worse than the anti-pattern will have a negative value of measure. In order to better visualize the results of calculations, objects can be divided into classes with similar measurement values. In the research we have four classes (Class number 1 is for the best objects, Class 2 for good objects, Class 3 is for objects which have mean value of the aggregate measure and Class 4 for the objects with lowest value of the aggregate measure).

Detailed mathematical description of the VMCM method the authors described in the two works (Piwowarski *et al*., 2018; 2019).

3. Empirical Results

The results of the analysis carried out allow to answer the questions whether the quality of institutions (aggregate measure) estimated on the basis of 8 variables is a stable feature of the surveyed countries which underwent systemic transformation in the 1990s of the twentieth century , or whether it changes over time and whether EU membership improves the quality of the institution? The ranking of the quality of institutions (aggregate measure) in the surveyed countries from three annualized years is presented in Table 1.

In the 1995 year the highest aggregate measure value (Class 1) is observed in 5 countries: Slovenia, Hungary, Czech Republic, Poland, Estonia. These are countries providing potentially the best quality of institutions among the selected 24 countries of CEE and Central Asia. On the other side, four CEE and Central Asia countries: Georgia, Kazakhstan, Azerbaijan, Uzbekistan, Tajikistan have the lowest aggregate measure value of the quality of institutions (Class 4).

In 2004 we can see that all the countries belonging nowadays to the EU are in class 1 and 2. However, in 2004 the quality of institutions in Poland deteriorated and this country moved from Class 1 to Class 2. While Croatia changed its position and moved up from Class 3 to 2. In 2019, in total 4 countries were classified to Class 1 (Estonia, Slovenia, Czech Republic, and Latvia). In 2019 the quality of institutions in Hungary deteriorated and moved from Class 1 to Class 2. In turn, Estonia is the leading country in this ranking. We can also see changes at the end of ranking. Russian Federation moved down from Class 3 to 4. While Kazakhstan moved up from Class 4 to 3 and Georgia moved up from Class 4 to 2.

Table 1. *Ranking of the quality of institutions - Index in 24 countries of Central and Eastern Europe and Central Asia, in 1995, 2004, 2019 (made with the use of VMCM).*

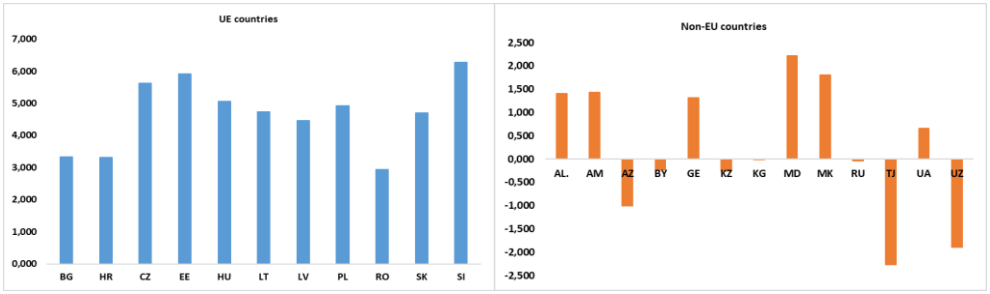
Artificial pattern and anti-pattern (quartile)								
Date from year 1995			**Date from year 2004**			**Date from year 2019**		
Name	Measure	Class	Name	Measure	Class	Name	Measure	Class
Slovenia	6,316	1	Slovenia	6,250	1	Estonia	7,012	1
Hungary	5,683	1	Estonia	5,860	1	Slovenia	6,246	1
Czech Republic	5,610	1	Hungary	5,701	1	Czech Republic	5,987	1
Poland	5,426	1	Czech Republic	5,292	1	Latvia	5,631	1
Estonia	4,863	1	Slovak Republic	5,022	1	Lithuania	5,156	2
Slovak Republic	3,958	2	Latvia	4,698	2	Slovak Republic	5,140	2
Lithuania	3,889	2	Poland	4,430	2	Poland	4,885	2
Latvia	3,874	2	Lithuania	4,312	2	Croatia	4,421	2
Moldova	2,709	2	Croatia	4,083	2	Georgia	4,095	2
Bulgaria	2,691	2	Bulgaria	3,503	2	Hungary	3,801	2
Romania	2,444	2	Romania	2,799	2	Bulgaria	3,774	2
Croatia	1,408	3	North Macedonia	1,703	3	Romania	3,569	2
North Macedonia	1,194	3	Moldova	1,459	3	North Macedonia	2,536	3
Armenia	1,010	3	Albania	1,295	3	Moldova	2,501	3
Albania	0,511	3	Armenia	1,232	3	Albania	2,393	3
Ukraine	0,498	3	Georgia	0,813	3	Armenia	2,055	3
Kyrgyz Republic	0,462	3	Ukraine	0,285	3	Ukraine	1,174	3
Belarus	0,450	3	Russian Federation	-0,341	3	Kazakhstan	0,833	3
Russian Federation	0,375	3	Kazakhstan	-0,579	4	Kyrgyz Republic	0,341	4
Georgia	-0,960	4	Kyrgyz Republic	-0,826	4	Belarus	0,157	4
Kazakhstan	-1,012	4	Azerbaijan	-0,922	4	Russian Federation	-0,153	4
Azerbaijan	-1,649	4	Belarus	-1,303	4	Azerbaijan	-0,432	4
Uzbekistan	-2,170	4	Tajikistan	-1,549	4	Uzbekistan	-1,199	4
Tajikistan	-3,299	4	Uzbekistan	-2,308	4	Tajikistan	-1,968	4

Source: *Authors' calculations.*

The calculated mean value of the measure for each country from the three analysed years shows how large the differences exist in the assessment of the quality of institutions in the analysed countries. In this respect, both the group of the EU and non-EU countries is diverse (Figure 1). In the group of the EU countries, the lowest quality of institutions is found in the countries that joined the EU as the latest ones– Croatia (HR), Bulgaria (BG), Romania (RO) (see Figure 1A). The diversity of non-EU countries is much greater, and the more south-east a country is located, the lower the quality of its institutions is – Azerbaijan (AZ), Uzbekistan (UZ), and Tajikistan (TJ) (see Figure 1B).

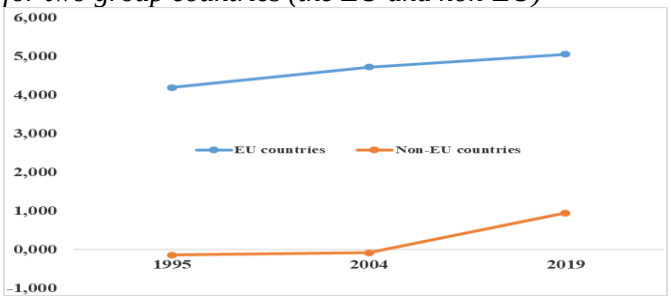
Figure 1. *The average value of the institution quality measure (from the three analysed years) for each countries the EU (**A**) and non-EU (**B**)*

A ***B***



Source: *Authors' elaboration.*

Figure 2. *The average value of the institution quality measure in individual years for two group countries (the EU and non-EU)*



Source: *Authors' elaboration.*

Looking at the average of aggregate measures in individual years for these two groups of countries, we can see an upward trend in both groups (Figure 2). The pace of changes in the quality of institutions in non-EU countries was initially small (the average value of the aggregate measure increased by half in the period 1995-2004). However, the quality of institutions in those countries increased in the period 2004-2019 - the average value of the aggregate measure increased 11 times, however, compared to the EU countries remained very low. The average for the EU countries grew much faster in the initial period of the analysis (by approximately 13% in the period 1995-2004), and then its growth rate, although positive, was slightly lower (approximately 10% in the period 2004-2019).

4. Discussion and Conclusions

The VMCM is a method dedicated to analysis of a complex socio-economic issues described by many indicators. The method have both features of the multidimensional analysis - Multidimensional Comparative Analysis and Multi-Criteria Decision Making Methods – both used to solve the multifactorial problem. VMCM due to appropriate processing and automatic data ordering allow for

'objectification' of the obtained results (Nermend 2017; Piwowarski *et al*., 2018; 2019).

Its application to the research conducted for the purposes of this article allowed for the study of long-term trends in shaping the quality of institutions in post-socialist countries, drawing conclusions and giving the direction of further research. Despite the fact that at the beginning of the transformation all post-socialist countries formed a fairly homogeneous group in which the institutions inherited from the period of socialism were inadequate to the market economy (Piątek, 2011), during the transformation period a clear differentiation of post-socialist countries, what is supported by the research conducted, and division of these countries into two groups – the EU members and the other analysed post-socialist countries is justified.

The first group of countries is characterized by a much higher quality of institutions, and most of the countries declared their willingness to join the EU already in the initial period of transformation and introduced sets of major reforms faster and with a view to their membership. This is one of the main reasons for the huge difference in the average level of aggregate measures for these two groups of countries in 1995 and 2004. However, the decline in the rate of increase in the value of the aggregate measure for the first group of countries after 2004 confirms the observation described in the literature that for EU Member States EU membership was a stronger motive for reform improving the quality of institutions in the pre-accession phase than in the post-accession period (Bruszt and Lundstedt, 2016; Bruszt and Compos, 2018).

And although the second group of countries managed to improve the quality of institutions and the pace of this improvement in the last 15 years was faster than in the group of the EU countries, still the majority of these countries have low level of democratization, economic and political freedom and civil liberties, high corruption and authoritarianism. This may be the result of insufficient transformations of informal institutions and acceptance of corrupt behaviour. Therefore, the distance of this group of countries to the group of EU members remains large (EBRD, 2020). Future research on this group of countries could therefore focus on finding differences in the dimensions of the quality of institutions in the individual countries that constitute the EU.

Both groups of countries are also internally different. As the results of our research show, it is much higher precisely in the group of non-EU countries (higher value of the standard deviation in each of the analysed years). In recent years, however, attention has been drawn to some post-socialist countries that are the EU members, such as Hungary and Poland (characterized by a reduction in the aggregate measure of the quality of institutions in the analysed period), where democracy and civil liberties become limited, and corruption grows, while the ruling populist groups use a pattern of hasty legislating and restricting the participation of the opposition, appropriating political institutions, taking over the media, trying to transform them

into a vulnerable tool (Miłaszewicz, 2019; Csaky, 2020). These changes indicate the potential direction of future research, which could focus on an in-depth analysis of those aspects of institution quality that deteriorate and the impact of this deterioration on the achieved socio-economic results.

The indicators adopted in this article to assess the quality of institutions take into account, first of all, more measurable formal institutions, although some elements of informal institutions are taken into account when assessing corruption or the rule of law. Therefore, it can be concluded that the variables collected for the research constitute a fairly comprehensive picture of the quality of institutions in the analysed countries. However, this picture may be supplemented in future research, in order to obtain the fullest possible assessment, by taking into account additional dimensions of the institution's quality, i.e. including in the analysis components of other measures - EFW, IEF, FP, CPRI or DB.

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