

# THE ROLE OF E-GOVERNMENT IN MITIGATING CORRUPTION

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**Abstract:** *E-government cannot be a panacea for fighting corruption, but per a lot of studies, it should be considered as a tool for reducing corrupt behaviour of officials in the public sector. Easy access to information for all citizens using e-government can result in greater transparency, which limits the public official to accept or even demand a bribe. This paper analyses, role of e-Government in mitigating corruption in 117 countries, regardless of their geographic location, political regime, or economic development between years 2003 and 2014. It was found that the use of information technology and the development of e-government contribute to reducing the level of corruption in the country. Used correlation and regression analysis confirmed the possible reduction of corruption both for the most economically developed countries by 0,12% for one percent increase of the use of e-government, as well as by 0,14% of the least economically developed countries.*

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**Keywords:** *Corruption, E-Government, Official's Discretionary Power, Anti-corruption Tool, Corruption Perception Index, E-Government Development Index.*

**JEL classification:** *D73, E6, H41.*

## Introduction

The studies that focused on the topic of corruption have shown that corruption discourages investments, reduces economic growth, changes the composition of government spending, undermines government efforts to reduce poverty and hampers the quality of life in rural and poor parts of the developing countries (Bhargava, Bolongaita, 2004; Jain, 2001; Mauro, 1995; Tanzi, 1998). These are the main reasons why governments of individual countries all over the world spend considerable financial and other resources to build an effective anti-corruption policy. One possible way to reduce corruption, especially in the public sector, may be reducing the interactions between officials and the public. This can be achieved by means of e-government. E-government can ensure not only providing more information to the public, but also remove the discretion of public officials (Bhatnagar, 2003; Mistry, 2012; Mistry, Jalal, 2012; Seo, Mehedi, 2016).

The aim of this paper is to prove or disprove the relationship between the level of corruption and the degree of utilization of e-government in the country. The paper examines the relationship between changes in the use of e-government and changes in the level of corruption in a selected group of countries.

## 1 Reducing the official's discretion as a potential way to reduce the level of corruption

The issue of corruption has become a highly-debated topic which troubles governments of countries but their citizens as well. Although corruption is not a new phenomenon, unambiguously and universally accepted definition of corruption does not exist yet.

Different perceptions and understanding of corruption may be a possible barrier to prevent the establishment of a clear definition. A gift that someone considers as an expressing of gratitude, someone else considers as a bribe. The different perception of this concept led to create a lot of definitions. The World Bank created the most known definition. It defines corruption *as an abuse of public office for private gain* (Hellmann, Jones, Kaufmann, 2009). The mentioned definition of corruption is focused just on the abuse of public power. Somewhat the corruption in the private sector is neglected, but it also exists of course. However, most studies focus on corruption in the public sector for one simple reason - the consequences of such abuse of public power hit the broad mass of taxpayers and the state in general. Corruption in the public sector can lead to increased public spending and reduce the amount of taxes collected, thereby increasing fiscal deficits, and create macroeconomic instability (Bhargava, Bolongaita, 2004; Mauro, 1997).

Some studies identified the potential role of E-government in reducing corruption. E-government eliminates the scope for bribing by elimination of intermediary services and it allows for citizens to arrange their transactions by themselves. E-government has become a term encompassing all uses of information technology in public administration and it includes sharing information and conducting transactions between government and government (G2G), between government and business (G2B) and between government and citizens (G2C) on IT background.

Torres, Pina, Acerate (2006) studied the relationship between corruption and E-government and concluded that well-designed ICT policies can be effective in the fight against corruption. Shim and Eom (2008) focus on bureaucratic professionalism factors and quality of the bureaucracy, also found that e-government has a positive effect on these variables. Following the above-mentioned research Shim and Eom (2009) examined the impact of ICT and social capital on corruption and confirmed that ICT has the potential to reduce unnecessary human intervention in the public processes, which reduces the need for corrupt behavior. Panel data from various sources used for their research concluded that information and communication technologies are an effective tool to reduce corruption in the country. E-government reduces the scope for bribery, removing intermediary services and enabling citizens to settle their affairs themselves (Singh, G. et al., 2010).

Researches carried out in this field show that factors supporting corrupt practices in public administration officials, such as monopoly power, discretionary powers or lack of accountability are mitigated by the existence of a functioning legal system and greater transparency (Mistry, 2012). These studies agree that the increased use of E-government can weaken the factors causing corruption and result in a reduction of monopoly power by officials and ultimately lead to greater transparency in public administration functions (Kim, 2007; Mistry, 2012). Mentioned authors in principle agree that an important role in the anti-corruption strategies of individual states play is by providing easy access to information for all citizens using e-government approaches and initiatives. This may result in greater transparency, which limits the possibility of a public official to accept or even demand a bribe.

Specific examples of the efficient use of E-government as a tool to fight corruption can be found in many countries regardless of their economic maturity, the political establishment or geographic location. For instance, a good example of the use of E-government as a tool for reducing corruption opportunities in the United States is The Center for Responsive Politics. It is a non-profit organization that focuses on monitoring financial flows for public policy. The Centre monitors the effects of financial flows

and lobbying on elections and public policy area, and to inform and involve the public runs an online database of information about the activities monitored. The database allows users to track federal campaign contributions, lobbying activities of organizations, individual lobbyists, etc. It also includes personal financial statements of the President, members of the US Congress and senior executives of major public authorities. Bhoomi project is jointly funded by the Government of India and the state government of Karnataka to digitize land records in their original paper form and create software for managing changes in the real estate in Karnataka. The project was designed to eliminate the long-standing problem of inefficiency and corruption in the management of land records in scattered and poorly controlled areas in India. Bhoomi reduces the discretionary powers of public officials by introducing strict rules for creating online records of property and land management. Farmers can now access the database and are entitled to information about their land track. The Bhoomi project has also created several information kiosks, where farmers can for a fee to print information about the owner of the land or the number of parcels that require, for example, getting a loan (Bhatnagar, 2003).

## 2 Methods and used variables

To verify the existence of a relationship between the level of corruption and the utilization rate of E-government, established indexes will be analyzed. Specifically, the Corruption Perception Index and the E-government Development Index will be used. Analyzed time series is the period from 2003 to 2014. This is the longest time series, which could be analyzed. 2003 was the first and 2014 was the last year of calculation of the E-government Development Index, the indicator of the level of E-government in a country.

The issue of quantifying the degree of corruption raises fierce debate. Particularly in the context of international comparisons of countries the number of corruption offenses is not exploited measure. The reason is obvious. It is not possible to determine how many detected cases are attributable to increased activity in the debit justice of the country. **The Corruption Perception Index (CPI)** has been published annually by Transparency International (TI) since 1995. It is an index that is based on corruption perceptions of respondents, which are domestic and foreign entrepreneurs, analysts, and representatives of the professional public in the evaluated countries. The index is published annually. The surveys contain questions aimed at public officials, bribery, or kickbacks in public procurements. Thus, the CPI takes values in the interval from 0 to 100, where 0 is highly corrupt country and value of 100 indicates a country without corruption.<sup>2</sup> The sample of examined countries has changed over time. For example, the index of 1995 included 41 countries, and in the last survey in 2014, there were already 175 countries evaluated. Changing the number of evaluating countries is the reason the order of ranking is not important for assessing of individual countries, but the actual value of the CPI is important for it (Transparency International, 2003, 2014). Although the Corruption Perception Index assesses the level of perceived corruption, the results received a lot of international attention. This is due to its wide-ranging in number compared countries and comparability over time.

**The E-Government Development Index (EGDI)** is a composite indicator measuring the willingness and capacity of national administrations to use ICTs to deliver better services to the public and to have telecommunication infrastructure and human capital that can make

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<sup>2</sup> CPI was until year 2011 in the interval from 0 to 10.

it possible to work and share information more efficiently (SEO, Mehedi, 2016). This measurement is based on a survey compiled in cooperation between the United Nation's Department of Economic and Social Affairs and Civic Resource Group, consulting firm providing technology solutions in the field of E-government. The Web Measure Index shows a general ability of governments to use E-government methods as a tool for information, communication, data transfer etc. The Telecommunication Infrastructure Index defines the IT capacity of the country. Finally, the Human Capital Index is based on measuring the level of human capital development in the country. EGDI has been published since 2003 and takes values in the interval  $<0; 1>$ , where 1 represents the high level of usage of E-government and a value of 0 means a low rate of application of E-government in public administration (United Nations, 2003, 2015). The EGDI variable only measures an e-government's services supply. The real use of smart cards in healthcare, for example, is not directly captured by the variable. However, it seems plausible that offer of e-government services and their actual use by the residents are highly positively correlated (Andersen, Rand, 2006).

Verification of the relationship between E-government and corruption will be carried out by using a *simple linear regression analysis* and *correlation coefficient*. Correlations between defined variables will be verified by the value of the Spearman correlation coefficient ("the correlation coefficient"). The calculation of the correlation coefficient will be conducted by using statistical software STATISTICA, version 1.10. The significance level established for the correlation analysis is 0,05.

The null hypothesis defines that the *monitored variables are not in correlative relationship*. Verification of this hypothesis is based on the subsequent comparison of the level of significance with a value (called p-value) which statistical software generates. Then we can also determine how tight the mutual correlation between the variables is. The correlation coefficient takes values between -1 and 1, inclusive. The values of the correlation coefficient close to a value of -1, respectively 1, can describe a very strong mutual correlation relationship between the observed variables. It is also possible to distinguish the positive correlation relationship (or direct relationship) that occurs when the value of the correlation coefficient becomes positive. Or otherwise, we can specify a negative correlation relationship (or indirect relationship). First will be investigated relationship exists between EGDI and CPI in two time periods (i.e. 2003-2014). Subsequently, analysis of whether there is a relationship between change in EGDI and change in the CPI during the mentioned period will be done.

Most existing studies focus on the impact of E-government in developing countries, and somewhat neglected the possible influence of E-government of corruption in more developed countries. The reason is obvious, the level of corruption among the leading civil servants and politicians is assessed as high, especially in developing countries (e.g. Angola, Mozambique, Congo). At the head of these governments often stand by former military dictators who become political leaders, regardless of transparency and accountability, and who have a low popular support and legitimacy of otherwise necessary for political survival, they compensate for bribing prominent family clans and interest groups (Volejníková, Linhartová, 2014). For these countries one can assume a greater impact any reduction in discretionary powers of officials on corruption in the country. The subject of this analysis will be a total of 117 countries, irrespective of their geographic location or the political establishment. It is a set of countries that are included in the evaluation

and CPI indices EGDI throughout the period analyzed. Eleven years' time period is reasonable to capture the effects of changes in the use of E-government on corruption.

### 3 Analysis of the impact of E-government at the level of corruption in the country

Spearman correlation coefficients for the variables are shown in the following table 1. The values identified using statistics as statistically significant, are highlighted in bold. A positive correlation relationship was found among the variables CPI and EGDI in both years. There is a relationship between corruption and using E-government methods in the analyzed countries. Improvement in the level of E-government in the countries led to improvement in the level of corruption.

**Tab. 1: Correlation matrix**

	CPI 2003	CPI 2014	% change CPI	EGDI 2003	EGDI 2014	% change EGDI
CPI 2003	1,000000	<b>0,935734</b>	<b>-0,517411</b>	<b>0,831197</b>	<b>0,796237</b>	-0,131504
CPI 2014	<b>0,935734</b>	1,000000	<b>-0,225860</b>	<b>0,840767</b>	<b>0,801507</b>	-0,135228
% change CPI	<b>-0,517411</b>	<b>-0,225860</b>	1,000000	<b>-0,290771</b>	<b>-0,308495</b>	0,124155
EGDI 2003	<b>0,831197</b>	<b>0,840767</b>	<b>-0,290771</b>	1,000000	<b>0,871197</b>	<b>-0,334537</b>
EGDI 2014	<b>0,796237</b>	<b>0,801507</b>	<b>-0,308495</b>	<b>0,871197</b>	1,000000	0,132332
% změna EGDI	-0,131504	-0,135228	0,124155	<b>-0,334537</b>	0,132332	1,000000

*Source: author's own processing*

Impact, especially of bureaucratic corruption, and on the economic performance of countries has been a favorite topic of various studies and debates for decades. The strong interaction between politicians, officials, and businessmen, aiming to obtain illegal economic rents from public activities characterizes in many countries the decision-making process of public investment and reduces their economic performance. According to studies (Jain, 2001; Kimbro, 2002; Kim, 2007; Mauro, 1997; Tanzi, 1998) and many others, corruption has an exactly quantifiable negative impact on economic efficiency and economic growth of the state. Empirical evidence shows that corruption does not produce long-term economic stability of the country, because it distorts the priorities of government policy objectives, including monetary and fiscal policies. Comparison of economic development of the country and the level of corruption perception refers to the world's poorest countries as the regions with the highest corrupt activity. These are mainly countries of the African continent, which in global comparisons are the last in the international rankings. In recognition of the significant differences in the evaluated group of 117 countries, not only in terms of the level of corruption and the use of ICT, but in general economic maturity, it is appropriate to analyze the potential impact of E-government on corruption among smaller and more homogeneous groups. As a criterion for dividing 117 countries into smaller units GDP/capita of the country in 2003 according to the World Bank data was used. Analyzed countries were divided into four numerically smaller groups of 29, respectively 30 countries.<sup>3</sup>

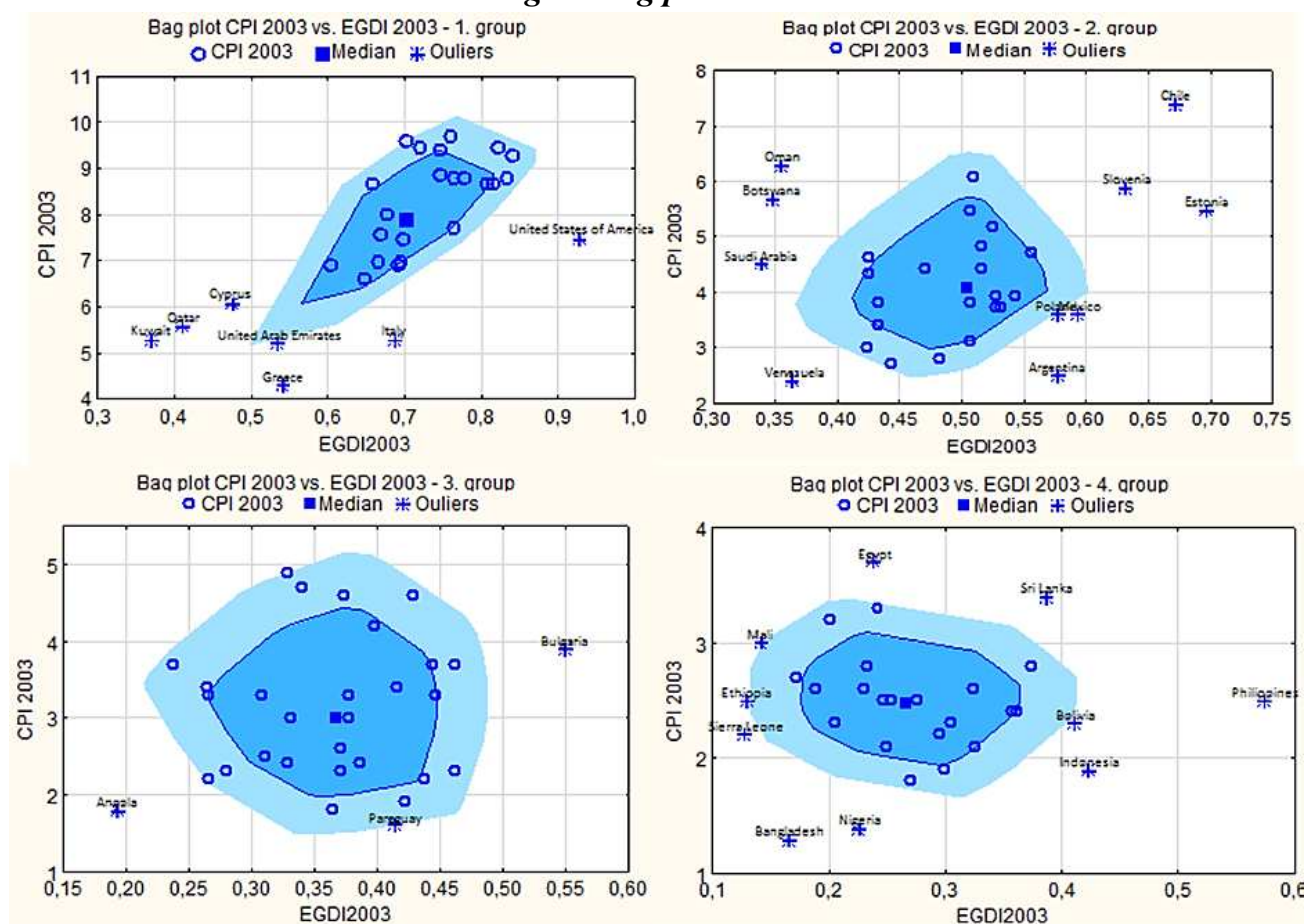
Bag plot was used for graphical interpretation of the examined variables. This is a generalized two-dimensional graph, which serves the graphic interpretation of statistical data. Points in the graph represent a combination of dependent and independent variables of individual countries. Dark -blue area (i.e. Bag) contains 50% of surveyed countries (between the first and third quartile) and dark- blue square represents the median value of the examined countries. The Light blue exterior bag contains other rated states that achieved different values than countries in the dark blue field, but are not outliers. Outside

<sup>3</sup> List of countries is attached.

of this area there are outliers that are shown in the chart with small stars. Bag plot also shows other characteristics of data displayed as the country's position within the evaluated countries, as well as the relationship between the evaluated variables indicated by the orientation of the bag (positive slope of bag indicates a positive relationship between the evaluated variables and negative slope of bag suggests the negative relationship).

Figure 1 shows bag plots of created four groups of countries that use the data from 2003. On the x-axis, there is the EGDI in 2003 and on the y-axis there is the CPI in 2003. As mentioned earlier, higher values of the EGDI indicate better readiness to use IT technology in the field of public administration and higher CPI values indicate less corruption in the country. Slope of the bag plot confirms the positive relationship between variables, especially in the first group of economically advanced countries. To a certain extent, a similar relationship between corruption and the E-government can be attributed also for other groups of countries; in the third group of countries, the relationship is not so significant. The year 2003 showed the impact of E-government at the level of corruption for most groups of evaluated countries. In all, bag plots illustrated several clusters of remote countries that are lagging in their group, both in terms of the use of E-government or the assessment of the extent of corruption. In the group of countries with the highest GDP/capita it is, for example Qatar, Kuwait, Cyprus, United Arab Emirates, Greece, and Italy. These states were included in the first group based on the used data, but in the evaluated variables lag other group members. Conversely, the United States surpassed all members of the first group of countries in assessing the level of E-government in public administration. We can say that in this country the information and telecommunications technology to communicate with customers of public administrations is used most often in the group of countries.

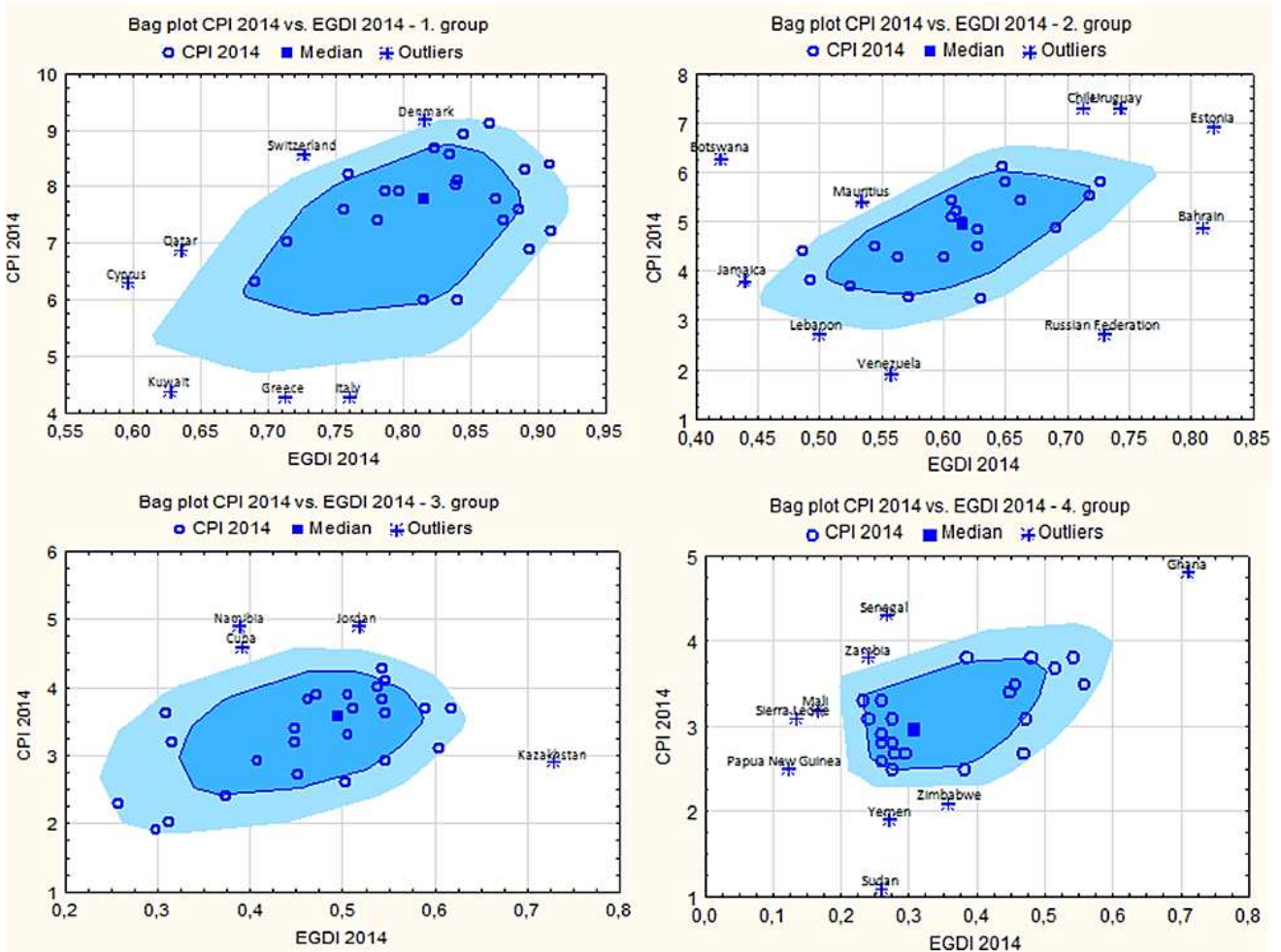
**Fig. 1: Bag plots 2003**



Source: author's own processing according to Transparency International (2003), United Nations (2003)

Figure 2 shows the same bag plots using data of 2014. The EGDI values in 2014 are again plotted on the horizontal x-axis and the CPI in 2014 on the vertical y-axis. Bag plots of 2014 values achieved a positive slope in all groups of countries, which confirms a positive relationship between the variables. There was again the creation of several clusters of remote countries that are identified in terms of the extent of corruption and the level of E-government differs from other countries in its group. For example, in the group of countries with the lowest GDP/capita was a significant separation of Ghana from other countries of the group. Ghana recorded in the reporting period 2003-2014 the most significant progress in the use of E-government in public administration. In the analyzed years, Ghana reached the level of the index EGDI 0.241 in 2003 and 0.712 in 2014, which means an increase of 95% in the level of usage of E-government. In that country, also the level of corruption was decreased by more than 45%. It is worth to mention also the development of the variables of Bangladesh, which recorded improving indicator of E-Government by almost 82%, while improving the value of the indicator of corruption by 104%.

**Fig. 2: Bag plots 2014**



Source: author's own processing according to Transparency International (2014), United Nations (2014)

The following regression function was used to verify the relationship between the CPI and the EGDI. The function is based on the least squares method (Freund, Mohr, Wilson, 2010):

$$y = \alpha + \beta * x + \varepsilon \quad (1)$$

The parameter x denotes the independent variable, in this case the use of E-government (index EGDI) and the parameter y denotes the dependent variable, ie the level of corruption (CPI). The parameter (determines the distance of the intersection of the regression line with the y-axis (the value of the regression function for x = 0). The parameter (is called the regression coefficient and shows the variation of the dependent variable value when the value of the independent variable changes. The symbol  $\varepsilon$  is the residual variance, which is a graphical representation of the distance of points from the regression line.

We can use the following model to estimate changes in the rates of induced changes in E-government in the country (Freund, Mohr, Wilson, 2010):

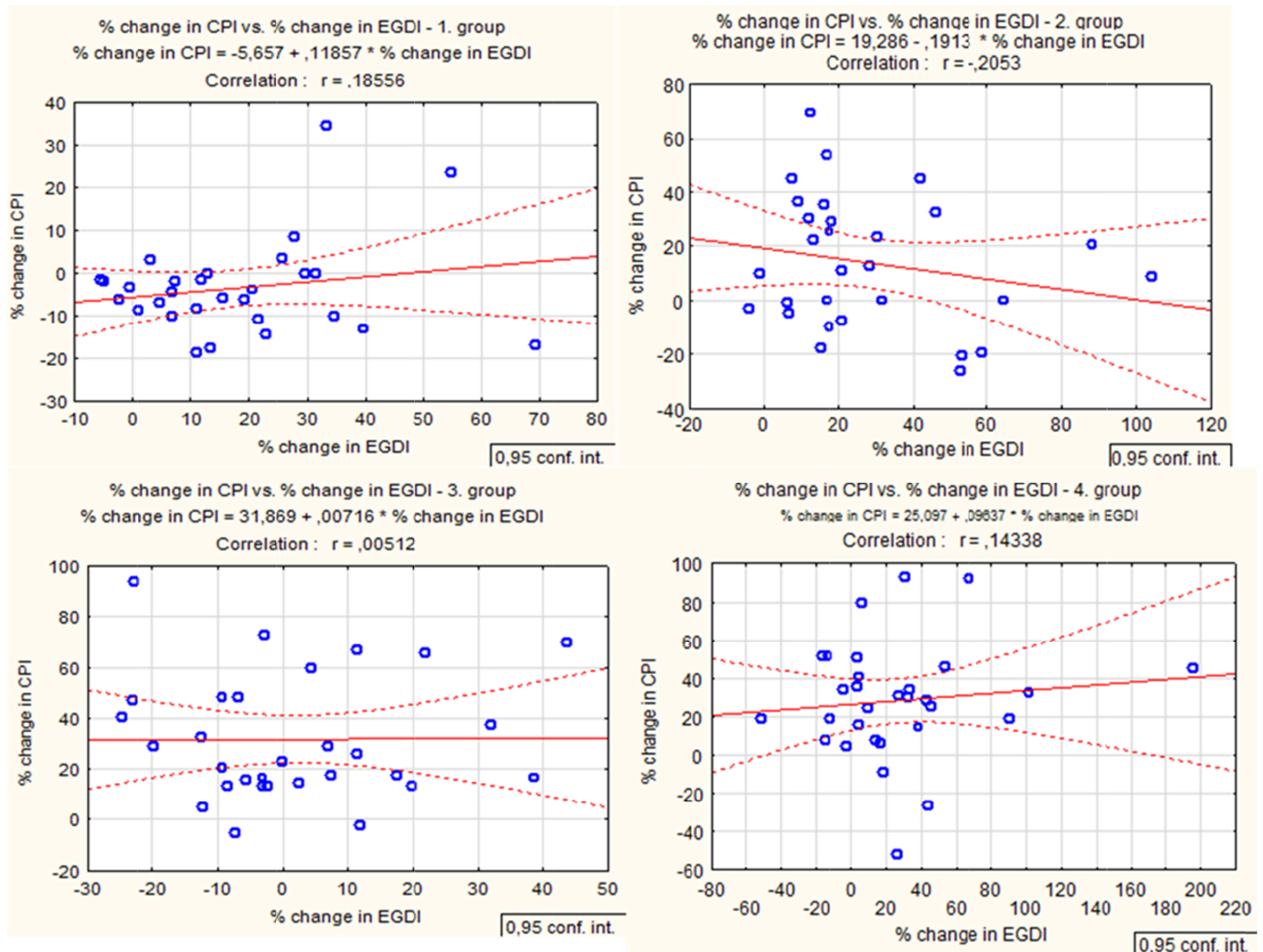
$$\Delta\text{Corruption} = \alpha + \beta * \Delta\text{E-government} + \varepsilon \quad (2)$$

Where  $\Delta\text{Corruption}$  is the change of the Corruption Perception Index between 2003 and 2014, and  $\Delta\text{E-government}$  is the change of the E-government Development Index during the same period.



Figure 3 is focused on how changes in the EGDI may affect changes in the CPI. Figure 3 shows the percentage change in the EGDI between 2003 and 2014 on the horizontal axis and the percentage change in the CPI between 2003 and 2014 on the vertical axis. This graph basically shows the evolution of the CPI and the EGDI during the sampling period. The linear regression line shows that not all countries with raised value of the EGDI recorded also simultaneously decrease of corruption. However, the linear regression line still has a slightly positive slope.

**Fig. 3: Linear regression model for variables change in years 2003-2014**



Source: author's own processing according to Transparency International, United Nations (2003, 2014)

In countries with the highest GDP/capita for the period demonstrated that at constant conditions and other variable results in a one percent change in the index EGDI nearly 0.12% change in the CPI. In other words, improvements in the assessment of E-government in the country by 1%, leads to the improvement of corruption in the country by 0.12%. In contrast, the group of countries with the lowest GDP/capita for the reference period showed that a one percent change in the index EGDI has resulted in more than 0.14% change in the CPI. Thus, improving the assessment of the level of E-government in the country was reflected in a better assessment of the extent of corruption in the country by 0.14%.

## Conclusion

This paper examined the existence of the relationship between corruption and E-government and tried to find an answer for the question, if changes in the exploitation of information technology lead to changes in the level of corruption in the country. To examine these relationships, a defined hypothesis which truth was confirmed by empirical models were stated. It was found that the use of information technology and the development of E-government contribute to reducing the level of corruption in most of the countries. The positive impact of the E-government in reducing corruption in most of the countries was confirmed by using correlation and regression analysis. The positive effect of E-government is not seen in all surveyed countries. Despite the increased level of E-government supply, worsening the state of corruption was proved in some countries. This finding only confirms the well-known fact that there are many causes of corruption, corruption occurs in different areas of public administration and takes various forms. For this reason, it is not possible to find a simple recipe for fighting corruption, which would be effective in all countries worldwide from across the political arrangements or governmental arrangements in a country. However, we can say that E-government as a tool for reducing opportunities for corruption in public administration is one of the good roads for reducing corruption among officials.

For the reporting period 2003-2014, it was found that there was a positive effect in economically more developed countries, but also in group of economically less developed countries. It has been shown that 1% percent increase in the index EGDI in the period caused reduced corruption (increase the value of the CPI) by 0.12% in the first group of countries. 1% percent increase in the index EGDI in the period caused reduced corruption (increase the value of the CPI) by 0.14% in the group of countries with the lowest GDP/capita. It is not possible to generalize the results of this paper to other groups of countries or other time periods. The level of corruption in the country is affected by numerous factors and e-government cannot be a panacea for fighting corruption. The performed analysis of the impacts of E-government on the corruption in the country builds on existing studies (e.g. Kim, 2007; Bhatnagar, 2003; Mistry, 2012; Seo, Mehedi, 2016) and confirms the possible reduction of corruption in the country using E-government for analyzed period and group of countries.

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## **Attachment**

A list of surveyed countries in terms of GDP/capita:

### **1. Group of countries**

Luxembourg, Norway, Iceland, Switzerland, Qatar, Ireland, Denmark, United States of America, United Arab Emirates, Sweden, Netherlands, United Kingdom, Finland, Austria, Belgium, Canada, Japan, Kuwait, France, Germany, Australia, Italy, Singapore, New Zealand, Spain, Cyprus, Greece, Israel, Portugal.

### **2. Group of countries**

Slovenia, Bahrain, Czech Republic, Saudi Arabia, Trinidad and Tobago, Oman, Slovakia, Hungary, Estonia, Croatia, Poland, Lithuania, Mexico, Chile, Latvia, Turkey, Argentina, Malaysia, Venezuela, South Africa, Lebanon, Russian Federation, Botswana, Uruguay, Mauritius, Brazil, Romania, Costa Rica, Panama, Jamaica.

### **3. Group of countries**

Bulgaria, Cuba, Kazakhstan, Dominican Republic, Namibia, Serbia, Colombia, Tunisia, Belarus, Algeria, Ecuador, Bosnia and Herzegovina, Albania, Iran, Peru, Thailand, Jordan, Guatemala, Morocco, Ukraine, China, Congo, Angola, Armenia, Syrian Arab Republic, Azerbaijan, Paraguay, Honduras, Indonesia, Egypt.

### **4. Group of countries**

Sri Lanka, Philippines, Nicaragua, Bolivia, Cameroon, Yemen, Republic of Moldova, Nigeria, Papua New Guinea, Senegal, India, Zambia, Viet Nam, Pakistan, Sudan, Kenya, Ghana, Kyrgyzstan, Zimbabwe, Mali, Bangladesh, United Republic of Tanzania, Sierra Leone, Uganda, Mozambique, Madagascar, Malawi, Ethiopia.