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Influence of e-government on the level of corruption in some EU and non-EU states

Dan Lupu[a]*, Corina Georgiana Lazăr[b],

[a]*Alexandru Ioan Cuza University of Iasi,Carol I Boulevard, no.11, Iasi 700506, Romania* [b]*National University of Political Studies and Public Administration, 6 Povernei St., Sector 1, 010643, Bucharest, Romania*

Abstract

The development and implementation of e-government was one of the most relevant and important evolutions for public administration. In recent years, the governments in many countries have made efforts to increase their openness and transparency. E-governance is used, being considered an efficient and effective mean to improve public transparency and reduce corruption. This paper explores the relationship between corruption and e-government in two moments: 2004 (2007) and 2012 in EU and non-UE countries. The analysis is performed on two groups of countries to determine if EU accession has improved the fighting against corruption with e-Government, seeking the practical role of e-Government in changing the level of corruption.

1. Introduction

Information and communication technologies (ICT) were the trigger factors for the economic, political and social changes since the invention of the digital computer (mid-1940s), which were accelerated with the advent of the Internet (the early '90s). Currently, the work of public institutions depends increasingly more on the technical and architectural choices that are made at the level of technology. Most of the principles of good governance are

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* Corresponding author. Tel.: 00232201569.
  E-mail address: danlupu20052000@yahoo.com

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expressed in the roles of e-government; in other words, focus on transparency, openness, citizen participation, effectiveness, efficiency, accountability, etc.

The information technologies are important for direct accountability: citizens can have direct access to information about the functioning of public institutions and use communication technologies for public debates (Northrup and Thorson, 2003). Northrup and Thorson (2003) argue that this form of accountability requires transparency and reduces corruption. E-government refers to the use of information and communication technologies by government agencies to transform relations with citizens (G2C), businesses (G2B) and government organizations (G2G). Information technologies have a variety of ends: improving service delivery to citizens, interaction with business and industry, increase public accessibility to information, more efficient government management, and eventually reduce corruption, increase transparency and reduce costs.

ICT offers a new approach to create transparency and promote anti-corruption, leading to improved transparency and accountability in the functioning of public organizations and allowing government to expand its role as a provider of services focused on customers, which is the essence of development activities for e-government.

2. Literature Review

Transparency and the right of access to public information is considered essential to international democratic participation, trust in government, corruption prevention, accuracy of government information and provision of information to citizens (Cullier & Piotrowski, 2009; Mulgan, 2007, Shuler, Jaeger , & Bertot, 2010). ICT can reduce corruption by promoting good governance, strengthening reform initiatives, reducing the potential for corrupt behavior, strengthening relations between government employees and citizens, allowing tracking activities and monitoring and control behavior of government employees by the citizens (Shim & Eom, 2008). In this respect, the Internet posting of documents involving monetary transactions by public institutions is crucial. An increase visibility for administrative activity is closely related to anti-corruption measures.

The relationship between e-governance and corruption has been analyzed by several authors (Anderson, 2009; Shim & Eom, 2008; Mauro, 1997 Martha and Ortega, 2010), but Mistry and Jalal (2012) were the first to establish causality for this important relationship. The results of their study suggest that the use of ICT in e-governance leads to lower corruption. The authors, in their analysis carried out during 2003-2010, have also found that the impact of e-government is higher in developing countries than in developed countries. Martha and Ortega (2010) use in their analysis a corruption model developed by Klitgaard in his study, which includes the factors: number of internet portals of government, monopoly power of the government, discretion of public servants and responsibility of bureaucracy. Using a period of six years (2002-2005 and 2008) for 187 countries and panel data analysis as methodology, they found that electronic government initiatives have reduced corruption worldwide. The authors recommend that international agencies support and promote electronic government projects, in addition to other anti-corruption measures.

Also, other case studies and statistical analyses indicate that the use of information technology has great potential and has already proven benefits in the fight against corruption, notably by enhancing the effectiveness of internal control and management of corrupt behavior by promoting government transparency and accountability (Shim & Eom, 2008). Analyzing changes in data corruption between 1996 and 2006 through the use of information technology - enabled e-Governance initiatives in this period - Anderson concluded that "implementation of e-government significantly reduces corruption, and by the control of any government initiatives to adopt the initiatives wrong" (Anderson, 2009). In turn, Bhatnagar (2003) and Shim & Eom (2008) showed that countries that use e-government have experienced a reduction in corruption; particularly in the areas of taxes and government contracts, e-government is seen as a solution successful corruption issues in many nations in Europe, Asia and America.

The use of e-government can substantially contribute to reduce corruption due to the positive impact on three indicators: monopoly of elements of government by the political class, the discretionary power of state employees, and accountability bureaucracy, indicators first identified as important by Klitgaard (1991).

Generally, the elimination of corrupt government officials does not eliminate corruption. Instead, a change in the organization of government and its decision-making processes is what would make possible to always reduce corruption (Rose-Ackerman, 1978; Dininio and Orttung, 2005). In this type of organizational reform, if the incentives to engage in corrupt activities can be reduced or even eliminated by methods such as increasing transparency of government actions or restrict the discretion exercised by bureaucrats, corruption decreases

(Bhatnagar, 2003; Kumar & Best, 2006; Bolivar Perez and Hernandez, 2007; Baasanjav, 2008; McNeal & Hale, 2010; Heeks, 1998; Svensson, 2005; Florini, 1999; Herrick, 2000).

3. Research methodology

In our empirical analysis, we first examine the relationship between corruption and e-government in three different years: 2004 and 2007 (year of entry into the EU for Eastern Europe countries) and 2012. The analysis will be performed on two categories of countries (entered into EU in 2004 and 2007 and non member of EU) in order to determine whether EU membership has improved fighting corruption with e-government. Also, after the establishment of models for 2004 and 2012, we explore whether there is a relationship between the change in corruption and e-government in this period of 8 years.

The main argument for choosing the study of e-government-corruption interrelation is given by the strong development of information technology sector after 2000 and each state citizens' increased involvement in the control of government corruption.

The **hypotheses** that are personal views regarding the relationship between independent and dependent variables based on the literature review are theoretically presented below:

H1. EU accession lowers corruption by using e-government

It is assumed that the EU accession will increase citizen involvement in solving problems caused by national governments. Thus, due to fulminate development of information technology and the ability to access any information through the Internet, the citizens of the new Member States, also through use of e-government, will initiate a series of actions to control the activity of their governments, which ultimately will lead to a decrease in corruption. Also, we want to study if there is a phenomena of „catching up" for the new EU member states and a translation of rule of law values by western type to the EU newcomers. Ganuza & Hauk (2004) studied the link between corruption and economic integration based on common procurement rules, and demonstrated that even if national governments in countries that enter into an economic union are corrupt, the positive perception of citizens about the benefits of integration economic and political, will eventually lead to the reduction of national corruption.

H2. Between the countries that joined the EU and those not accessing exists a significant difference in reducing corruption by using e-government

Our thesis is that the high level of European integration of new EU member states and the non-acceptance of European values by non-EU states makes that the former experience lower levels of corruption. EU accession affected the level of corruption in a member country from one non-member through two main channels: the action of economic incentives (increase costs and reduce the benefits obtained by the actors engaged in various acts of corruption) and the legislative action (the EU existing laws non-legitimizing and stigmatizing corruption, EU countries that are members are more exposed to economic and normative pressure to fight corruption). Sandholtz & Gray (2010) analyzed 150 countries and concluded that the level of corruption in a country is significantly influenced by the participation to international trade (presence in an economic agreement).

To examine the hypotheses presented above, we use the internationally recognized indicators for corruption and e-government. In addition, to test the validity of our hypotheses, we use the regression model the method of least squares (or OLS).

Next, we present the **variables** (dependent, independent and control) used in econometric modeling, together with their source:

- *Corruption Perception Index* (dependent variable). The indicator is developed by Transparency International since 1995 and considers corruption as the use of public power for private gain. CPI indicates the degree of corruption in a given country as perceived by businessmen and analyst population; it is calculated annually for 180 countries and registers values between 100 (clean) and 0 (highly corrupt).

- *E-government index* (independent variable) represents the digital interaction between citizens and Govern and consists in their ability to participate and supervise all levels of authority (local, regional and national). The indicator is developed by EUROSTAT in 2000 as part of the Lisbon strategy, for each European state and varies between 0 and 100.

- *control of coruption index* (control variable): indicator developed by the World Bank, which captures citizens' perceptions on the use of public power for private interests, including its forms, of small and high corruption and also the state's capture by private interests. The indicator takes values between -2.5 and 2.5.

- *government effectivness* (control variable): indicator developed by the World Bank that captures citizens' perceptions of quality, the degree of independence from political pressures, and the government's commitment to such policies. The indicator takes values between -2.5 and 2.5.

The above assumptions were tested using a classical multiple regression model OLS, the dependent variable is the corruption index, e-Government is independent variable, while Control of Corruption and Government Effectiveness are used as control variables.

$$y(corruption) = a + b(egovernment) + \varepsilon \tag{1}$$

where the dependent variable is the level of corruption (measured as the index of perception of corruption in the years of EU accession (2004 and 2007) and 2012) and the independent one is e-government (measured as an indicator of development of e-government in 2004 and 2012).

Using this equation, we test the relationship between corruption and e-government, separately for the two categories of countries (those who entered into EU in 2004 and 2007 and European countries that have not yet joined the EU).

$$y(corruption_{2012/2004}^{EU\ countries}) = a + b(egovernment_{2012/2004}^{EU\ countries}) + \varepsilon \tag{2}$$

$$y(corruption_{2012/2004}^{nonEU\ countries}) = a + b(egovernment_{2012/2004}^{nonEu\ countries}) + \varepsilon \tag{3}$$

Previously estimated empirical models present interest only if the change in e-government can explain changes in corruption in the specified time interval (the accession to the EU in 2004 and 2012) and between the countries that joined the EU and those who have not joined. Therefore, emphasis should be placed on the variation in the level of corruption as a result of e-Government variation into the period 2004-2012.

Therefore, we develop the next model that attempts to explain changes in the level of corruption reported to changes of e-Government, considering equations 2 and 3:

$$\Delta(y(corruption_{2012/2004}^{EUcountries})) = y(corruption_{2012}^{EUcountries}) - y(corruption_{2004}^{EUcountries}) = a + b*(egovernment_{2012}^{EUcountries} - egovernment_{2004}^{EUcountries}) + \varepsilon \tag{4}$$

$$\Delta(y(corruption_{2012/2004}^{nonEUcountries})) = y(corruption_{2012}^{nonEUcountries}) - y(corruption_{2004}^{nonEUcountries}) = a + b*(egovernment_{2012}^{nonEUcountries} - egovernment_{2004}^{nonEUcountries}) + \varepsilon \tag{5}$$

where ΔCorruption is the change of corruption perception index between 2004/2007 (the accession to the EU) and 2012, Δe- government is change of the e-government index development between 2004 and 2012.

In addition to the above variables, we use a number of control variables to track the impact of corruption in the regression models used. Specifically, we use the following indicators specified as having impact in the specialty literature.

By introducing control variables in equations 4 and 5, the previous models are:

$$\Delta(y(corruption_{2012/2004}^{EUcountries})) = a + b*\Delta(egovernment_{2012/2004}^{EUcountries}) + c*\Delta (controlcorruption_{2012/2004}^{EUcountries}) + d*\Delta(governmenteffectiveness_{2012/2004}^{EUcountries}) + \varepsilon \tag{6}$$

$$\Delta(y(corruption_{2012/2004}^{nonEUcountries})) = a + b*\Delta(egovernment_{2012/2004}^{nonEUcountries}) + c*\Delta (controlcorruption_{2012/2004}^{nonEUcountries}) + c*\Delta(governmenteffectiveness_{2012/2004}^{nonEUcountries}) + \varepsilon \tag{7}$$

4. Empirical Results

Relevant statistical indicators for model variables are presented in Table 1. The analysis is performed for the years (2004 and 2012), and the countries (EU and non-EU). Statistical analyses of the variables were performed using SPSS, version 17.0 and the results are shown in the tables below.

Both country categories have seen improvements for the considered indicators: the average for corruption perception index for EU countries has known an improvement by 8.5 points, and 10.5 for non-EU countries, e-government indicator for EU countries an improvement of 11 points and for the non-EU with 18 points, control variables increased only for non-EU countries.

But what these indicators highlight is the significant difference, of over 10 points, between EU Member States and non-member countries. If for the corruption perception index in 2004, the difference between the two groups of countries was 16 points, in 2012 it was reduced to 14 points. For the e-government indicator, the situation improved from a difference of 18 points in 2004, to 9 points, the non-EU countries reaching the values recorded for EU countries 8 years ago.

Table 1. Descriptive analysis

	EU countries				Non-EU countries			
	Mean	Std. Deviation	Minimum	Maximum	Mean	Std. Deviation	Minimum	Maximum
Corruption 2004	43.27	29.00	60.00	9.79	27.17	4.13	20.00	33.00
Corruption 2012	51.82	7.01	44.00	64.00	37.58	8.38	25.00	52.00
E- Government 2004	0.58	0.52	0.70	0.06	0.40	0.06	0.30	0.48
E- Government 2012	0.69	0.06	0.61	0.80	0.58	0.06	0.50	0.73
Control corruption 2004	0.36	0.38	-0.26	1.02	-0.62	0.24	-0.99	-0.17
Control corruption 2012	0.31	0.37	-0.20	0.93	-0.45	0.39	-1.09	0.10
Government effectiveness 2004	0.64	0.37	-0.17	0.97	-0.41	0.33	-1.08	0.04
Government effectiveness 2012	0.65	0.42	-0.22	1.20	-0.26	0.49	-1.09	0.55

Further analysis of the data is exploratory and is intended to determine the correlations between the model variables. Table 2 presents the Pearson correlation coefficients for EU countries. Note that correlation indicators are statistically significant and high for all variables.

Table 2. Correlations table for EU states

	EU countries							
	c an2004	c an 2012	e an2004	e an 2012	g an 2004	g an 2012	cc an 2004	cc an 2012
c an2004	1							
c an 2012	.782[**]	1						
e an2004	.746[**]	.815[**]	1					
e an 2012	.769[**]	.743[**]	.524	1				
g an 2004	.737[**]	.607[*]	.548	.605[*]	1			
g an 2012	.688[*]	.686[*]	.665[*]	.632[*]	.950[**]	1		
cc an 2004	.951[**]	.772[**]	.750[**]	.778[**]	.841[**]	.796[**]	1	
cc an 2012	.826[**]	.928[**]	.857[**]	.692[*]	.772[**]	.847[**]	.869[**]	1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

In contrast, for non-EU countries, the correlation indicators are significant only for certain variables (table 3).

Table 3. Correlations table for non-EU states

	Non-EU countries							
	c an2004	c an 2012	e an2004	e an 2012	g an 2004	g an 2012	cc an 2004	cc an 2012
c an2004	1	-.050	.159	.001	.126	-.211	.401	.056
c an 2012		1	-.078	-.403	.375	.719[**]	.673[*]	.953[**]
e an2004			1	-.097	.376	.075	.211	.058
e an 2012				1	-.094	-.177	-.270	-.374
g an 2004					1	.722[**]	.733[**]	.505
g an 2012						1	.564	.696[*]

		1	.741[**]
cc an 2004			
cc an 2012			1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Next, we examine the relationship between corruption and e-government, observed in the previous tables, and we test **hypothesis 1** trying to discover if it is true or not. Based on the empirical analysis and the first estimate of the regression equations to the data of 2004 and 2012, the estimating regression equation (1) is presented in model (1) of Table 4. In model (1), in Table 4, it is estimated the difference in the relationship between corruption and e-Government into period 2004-2012.

For the new EU member countries, the estimate coefficient of e-government in the period 2004-2012 is negative and statistically significant (-1.703). Therefore, hypothesis 1, presented above, is valid. However, as shown in Table 4, as a result of the correlation between Corruption and e-government, we have to mention that the input to the process control variables. Coefficient R^2 has a considerable value 0.63, which implies that between the two variables analyzed - corruption index and use of e-government - there is a statistically significant correlation.

Analyzing the three models developed for the period analyzed, 2004 (2007), 2012 and for the entire period we noticed that in all three models, the coefficient of e-government for all periods is negative and statistically significant. Correlation between variables is more powerful for models in 2004 and 2012 ($R2 = 0.89$ and 0.90), and weaker for the entire period (0.63).

Table 4. Regressions results

Independent Variables	2004		2012		2004-2012	
	EU countries	Non-EU countries	EU countries	Non-EU countries	EU countries	Non-EU countries
Constant	3.622793	3.268616	3.575949	4.036779	8.471520	7.512262
E government	-0.120347	-0.514086	-0.458199	-0.329487	-1.703193	-1.221842
Control of corruption	0.596686	0.423387	-0.107089	0.532065	32.32181	17.66003
Government effectiveness	-0.035347	-0.189074	0.380476	0.020750	13.56773	12.76657
R^2	0.898015	0.836375	0.908914	0.939943	0.635096	0.771914
Akaike info criterion	-1.831185	-0.552088	-2.962882	-2.343749	6.090655	6.448276

For non EU countries, testing Hypothesis 2 will be in the same conditions as the previous hypothesis. Also for these countries during 2004-2012, the e-government coefficient is negative and statistically significant, but the influence of e-government is smaller, the coefficient has a lower value (-1.22). In this case, hypothesis 2 is validated: the correlation coefficient is statistically significant. For non-EU members, the correlation between the use of e-government and corruption is even stronger than in the EU countries: an explanation of this fact can be the large influence of information technology in the EU member states, where the regulatory framework is strong.

And for these non-EU member countries, the application of the three previous models reveals that the e-government coefficient is negative and statistically significant (-0.51, -0.32 and -1.22). The models correlation coefficient between variables is stronger for 2004 and 2012 (0.83 and 0.93), and weaker for the entire period analyzed (0.77).

5. Conclusions

In this paper, we examined the relationship between e-government and corruption; specifically we investigated whether changes in the use of information technology are related to changes in the level of corruption. The hypotheses developed in the study examine whether the EU new members and those who are not EU members benefit more from greater use of e-government in fighting corruption. To examine these relationships, we developed two hypotheses and tested these hypotheses using 6 empirical models. The developed models confirm the assumptions and demonstrate that increasing the use of e-government will reduce corruption. Specifically, the models suggest that a 1% increase in the index of e-government can result in a decrease in corruption by 6.7 % for countries entering the EU, and 6.3 for non-EU member. We also found that countries that joined the EU have

benefited most from the increased use of e-government in 2004-2012. Subsequently, we estimated 6 models with additional control variables to check their robustness if the results are acceptable. This study suggests that increased use of e-government reduced corruption in both groups of countries, EU and non-EU members.

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