

The Investigation of Internet Effect on Financial Corruption

Case study: Iran and Some Selected Developing Countries (2002-2009)

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Abstract:

Using and surfing on Internet has been increased and extended that can be noticed internet is one of essential components of human life. According to this view can be said: Internet should solve a lot of problems in Human life and societies. Corruption is one of the problems that is common in most countries even some developed countries. This has some negative effects on property rights, investing rules and incentives so it is against developing and progressing in society.

On this essay is considered, effects of internet on controlling of financial corruption by using a dynamic panel model consist of 28 developing countries from 2002 to 2009. Firstly is determined one causal relation between internet and corruption index. Research outcomes show us there is a bilateral causal relation between Internet and financial corruption. Also our obtained experience has proved internet has a considerable role on reducing financial corruption.

Keywords: E-government, Internet, Financial Corruption, Causal relation, Dynamic panel model.

JEL: O1; H11; D73; C22 .

Introduction

Rapid development and influence of modern information and communications technology (ICT) means e-government that many governments have accepted them rapidly. Governments can offer many of their services to citizens at all times through ICT especially internet which is the selected medium for e-governments at present. Extensive utilization of modern global technologies will have an unavoidable and indirect effect on economic, political and social scopes. Also, existence of a more efficient government will be more economical. This is while many researchers and policy makers believe that e-government can play a remarkable role in fighting corruption through improved enforcement of laws, reduction of authorities and increasing of information transparency and causes to control and decrease corruption. Current studies have investigated several effective methods for fighting corruption through increased access to information especially those related to politics and performance of the government. Internet plays an effective role in information transparency and information is transferred faster with lower cost through it. Therefore, it can be one of the effective factors on corruption control. Also, a serious act and systemic fight with corruption is essential in order to decrease it. However, this requires accurate recognition of the phenomenon and studying its roots and reasons.

Development and prevalence of corruption in any society has several unpleasant consequences and influences. Corruption is occurred when deviation in the system of rules and policy-making paves the way for it and the controller institution act weakly. It is classified differently and financial corruption is one of such classifications. Occurrence of corruption as an undesirable social phenomenon has had various economic and social reasons and theoreticians have tried to explain reasons of corruption through economic (Rose-Ackerman, 2003; Vinod, 1999), political (Lederman, 2004) and cultural factors (Husted, 1999) given to the importance of issue of corruption in different countries. These empirical studies reveal that corruption is created by various factors in a complex and indigenous form of its social presence. Perhaps, lack of clear structures in doing tasks is the most important reason for prevalence of corruption. It can be claimed, therefore, that the most efficient methods of fighting corruption are information transparency and improvement of responsiveness. Information and communications technology has established a new approach in creating transparency and increased responsiveness in this regard.

The following figure shows the process of increased utilization of this modern technology (internet) across the world. During ten recent years, the use of internet by users has been increased.

Internet users as a percentage of population:

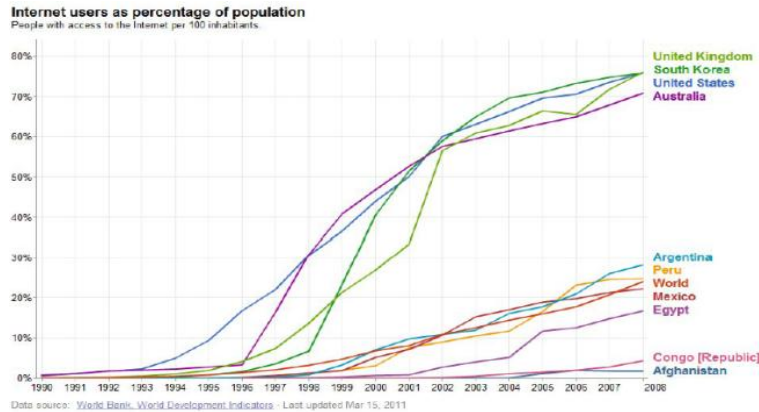


Figure 1. Countries in the world have experienced increased access to the internet.

Primary question of the current paper is proposed as follows: Can internet decrease corruption? To this end, the literature in this regard and research background are reviewed and then data are presented. Afterwards, the model is explained given to data of the model and finally the findings are analyzed and conclusion will be proposed.

Theoretical principles and research background

Definition and range of corruption

Financial corruption is a complex and multi-dimensional phenomenon with multiple reasons and consequences that has different roles and appearances under various conditions. The simplest definition for financial corruption is violation of the existing rules to provide interests and personal profit. In Webster Dictionary, corruption means illegal reward to compel the person to violate his/her task. Financial corruption is a phenomenon originates from mutual interaction between the government and market economy, especially if the government inevitably undertakes an endogenous role. Objective appearances of financial corruption are complex to a large extent, multimodal and have different forms and methods. The phenomenon of financial corruption involves simple act of illegal payment to a public employee to comprehensive dysfunction of a political or economic system. It can be regarded both as a structural political or economic problem and as a moral or individual educational problem (Sadeghi, Sabagh Kermani & Shaghaghi Shahri, 2009). The World Bank (1999) defined corruption as follows: corruption is misuse of public interests for personal interests. The definition proposed by the World Bank is inadequate, because corruption can be occurred monopolistically in the private sector too. It is clear that misusing the governmental resources and possibilities are not always for personal interests; rather it can be to provide interests of a political party and thought (DiRienzo, Das, Cort, and Burbridge Jr, 2007).

Measurement of corruption

It is difficult to measure corruption, because it is a hidden exchange, but some organizations and institutions including the World Bank, Transparency International Organization and Price Waterhouse Coopers Foundation attempt to calculate the corruption index. One of the complex and at the same time common indexes in researches related to economic corruption is corruption perception index (CPI) that is highly comprehensive, because different aspects of

corruption are considered in calculation of it. Every year Transparency International Organization presents a report and ranks different countries by calculating their corruption index. CPI index is between zero (maximum corruption) and ten (minimum corruption).

E-government

Since the time people have used the internet for business and amusement, governments have promoted their service offering electronically in an ascending order. E-government is the use of technology to facilitate the government affairs through offering services and information to citizens and business and manufacturing firms. It is a government without virtual building and organization that offers public services to customers without any intermediary and brings about their participation in political activities (Dehkordi, Sabour & Kosari, 2012). E-government means to use the internet across the world to offer public information and services to citizens (AOEMA report, 2005). "It can be electronic interactions (change of information) among the government, public sector (citizens and business) and employees (Abramson and Means, 2001). The government should develop offering of public information and services and access to them for citizens, business firms, employees, workers and others in the society as well as the elements of government by means of modern technology especially internet use. This is establishment of e-government or digital government (Sanayeei & Rezvani, 2002). The most important conclusion is that an e-government can increase people's satisfaction on the condition that it is implemented accurately and successfully.

Internet

The World Wide Web was launched in 1991 and since then the internet has created a revolution in information technology. Internet is a technological phenomenon that creates supranational networks and has provided the possibility of immediate global communications (Deibert, 2008).

Rapid growth of information and communications technologies has been led to limitations for renters and merchants of the nontransparent environment. According to it, survival and maintenance of public management depends on fundamental change and modifications in order to create more transparency and timely and accurate information (Sharifi Renani, Hajipour & Moshrefjavadi, 2012). Internet is practically a group of tens of thousands of extensive networks across the world. Perhaps the best way to perceive the organization and importance of internet is to compare it with two large global communication systems: postal system and telephone system. Both of these systems contain very little sections which are connected to each other in a big international organization. However, the main advantage of internet is that it is very flexible and rapid (Mohagheghi, 2007: 12).

Internet is one of the most influential modern technologies that has affected all dimensions of human life and all aspects of our individual and collective life are influenced by this information technology and other technologies (Masoudi, 2003: 15). Appearance of the World Wide Web as one of the most prominent information and communications technologies shows technological progress of modern human whose role in creating social changes and especially value changes cannot be ignored (Gromala, 2001: 559).

Relation between information transparency and corruption

It has been assumed in this survey that internet is an appropriate tool for information transparency and dissemination. Transparency is one of the important elements of good governance (Stiglitz, 2002). Countries with more transparency have tendency towards lower levels of corruption (Norris & Zinnbauer, 2002).

Some points are mentioned about information transparency in order to perceive how information affects decision-making process of people and corrupted institutions (Kolstad & Wiig, 2008):

Transparency increases the possibility of corruption detection.

Transparency trains honest and productive workers for public sector.

Transparency directs public authorities to perform accurate acts.

Transparency is led to facilitation of modifications and maintenance of cooperative behavior.

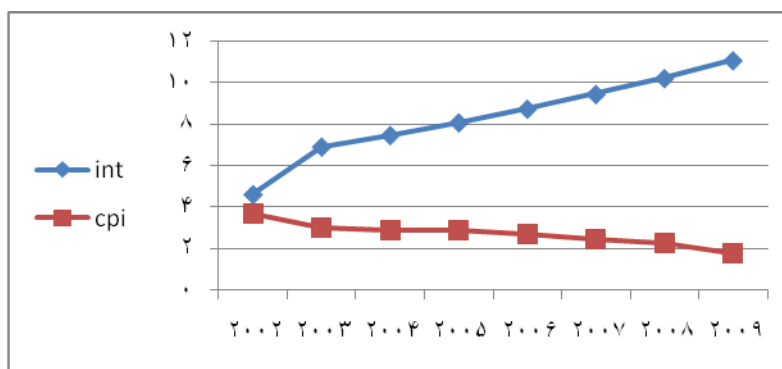
Transparency is led to maintenance of social norms and establishment of trust.

Corruption literature shows that factors such as low wage, inaccurate implementation of plans and large bribes are incentives for corruptive activities but transparency can be an incentive to confront with corruption.

Transparency increases the possibility of detection directly. The costs and rules of distortion of information by individuals and institutions become difficult through transparency. When there is no transparency, corruptive agents are identified with more difficulty; also transparency has an indirect effect on enforcement of law. Transparency enables victims of corruption to collect document and also decrease events for authorities looking for corruption and preventing from punishment through bribery. It means that transparency has affected bribery to some extent and has decreased it. So when there are disperse information, authorities looking for corruption demand higher bribery though increased bargaining power (op.cit).

Transparency increases responsiveness to citizens in investigation of the bureaucratic power and similarly it prevents misuse of power (Lederman, 2004). Corruption can be decreased through merging of technology power with law. Internet can provide the possibility of access to related information through corruption methods (Schroth & Sharma, 2003). The following diagram shows decreasing process of corruption and increasing process of internet use in Iran during the time period 2002-2009.

Diagram 2. Taking a look at changes of the internet and corruption in Iran



Data source: Transparency International Organization (TIO), International Telecommunication Union (ITU).

As Diagram 2 shows, process of corruption extension (corruption perception index, Cpi) in Iran has been decreased along with the increased speed of the Internet use (Int).

Research Background

Sharifi Renani et al (2012) conducted a study entitled "evaluation of the role of information technology in administrative corruption decrease through information transparency, improvement of responsiveness and enhancement of trust in Saderat Bank branches in Isfahan province. Using Kohen, Morgan and Kerjcie Table, 269 employees of Saderat Bank branches in Isfahan province among 900 persons were selected randomly. The information was extracted through questionnaire whose validity was confirmed by experts and reliability was determined through Cronbach's alpha coefficient equal to 0.96 and 0.92. The results were analyzed statistically via descriptive statistics method, Pierson correlation coefficient, multi-variable regression analysis and path analysis. They reveal that there is a direct and significant relationship among information transparency, improved responsiveness, enhancement of trust due to information technology including telephone and fax, computer and e-banking services and decreased administration corruption.

Heeks (1998) conducted a study entitled "information technology and corruption in public sector" and studied five cases of information technology (IT) and corruption in the public sector. He found out that while IT sometimes identifies corruption and omits it, but sometimes it has no effect on corruption and even can be an opportunity to create it. He says information technology systems are effective on signs of a system; thus public managers should have a more comprehensive viewpoint of corruption control and should be able to detect the relationship between information technology and corruption in planning some information systems of the public sector.

Bhathagar (2003) in his paper entitled "e-government and access to information" illustrates that results of researches in the world show many governments have increased transparency, improved responsiveness to the public and attracted more trust of people successfully through information and communications technology. For instance, the on-line system to record rural properties in India brought about information transparency and improved responsiveness besides elimination of the opportunities to receive bribe by public authorities.

Anderson (2009) in a paper entitled "e-government as a strategy to fight corruption" estimated the effects of e-government on corruption control index using a panel model consisted of 149 countries and observation for two times in 1996 and 2006. The primary different estimated results show a positive and interesting effect from economic viewpoint. With the most value of conservative estimation, moving from percentile 10 towards percentile 90 in e-government distribution that indicates reduction of corruption was equal to moving from percentile 10 towards percentile 23 in corruption control distribution. Statistical results and empirical analyses show the effect of e-government on reduction of corruption.

Chi Lio, Chun Liu and Pey Ou (2010) in an article entitled "can the internet decrease corruption?" studied the effect of internet on reduction of corruption for 70 countries during the time period 1998-2005 based on dynamic panel data model. The results demonstrate that

the effect of internet on reduction of corruption is significant statistically but is not considerable. Corruption perception index is increased 0.05% with an increase of ten internet users per 100 people and shows durability of corruption is important. Internet can reduce corruption but however, effects of approving the internet on reduction of corruption during the time period under study are considerable but are not too much.

Methodology and research data

Sources of data and introduction of variables

The data related to the time period 2002-2009 about Iran and 27 developing countries were used in this survey. First, it was tried to consider a shared index such as single-product, being in one economic bloc, the government size or common geographical boundary as a basis for choosing the countries. However, in each case, one group of developing countries with accessible statistical indexes was selected due to tangible statistical limitation.

The variables included internet, corruption perception index (CPI), education and gross domestic product per capita (GDP_{pc}).

Table 1. Introduction of data and resources

Resources	Definition	DATA
ITU	Internet users per 100 population	Internet
Transparency International Organization (TIO)	Corruption Perception Index, with the highest levels of corruption 1 and low levels of corruption 10	CPI
World Bank	GDP per capita, growth(annual%)	GDP_{pc}
World Bank	Gross enrolment ratio in secondary education (%)	Edu

Causality test

In this section, it is studied whether or not there is a causal relationship between internet and corruption. Granger causality test (Hsiao) was used to select the optimum interval because panel data was utilized. Granger causality test technique (Hsiao) has two phases. In the first phase, auto-regression models of the variable under study with one interval are estimated and then regression with two intervals is estimated and this continues. In the next phase, value of final predicted error for each step is calculated (Mehregan, 2007). To this end, corruption variable (CPI) with one interval has been regressed on itself in dynamic panel form in this test. Then this is continued with two, three or even more intervals. Because the number of years is low and no high degree of freedom should be lost, choosing more than three intervals in this model does not seem logical. Total form of the equation is as follows:

$$CPI_t = \beta_0 + \sum_{i=1}^m \beta_i CPI_{(t-i)} + \varepsilon_{it}$$

$$Internet_t = \gamma_0 + \sum_{i=1}^m \gamma_i Internet_{(t-i)} + \theta_{it}$$

where i from one to m shows length of interval that depends on the sample size as well as behavior of the variable. Sum of error squares has been calculated by adding each interval in any phase and have been inserted in the following formula proportional with m :

$$FPE = \frac{T + m - 1}{T - m - 1} ESS(m) / T$$

$$ESS = \sum (\hat{Y} - \bar{Y})^2$$

In the above relation, T shows the number of sample and FPE is final predicted error. Optimum interval is obtained when FPE has its minimum value.

Table 2. Determining optimum interval for Cpi

FPE Corruption: With 1 lag	2.57
FPE Corruption: With 2 lag	4.54
FPE Corruption: With 3lag	6.96

Value of optimum interval for the internet has been calculated in this way.

Table 3. Determining the optimum interval for internet

FPE Internet: With 1 lag	196
FPE Internet: With 2 lag	200
FPE Internet: With 3 lag	217

The obtained results reveal that corruption index and internet have been optimized with one interval. Since the panel data are used, Hsiao causality test cannot be continued. For this reason, the model is written as below with a little innovation and change and the causal relationship between corruption and internet is studied considering testing of the following hypotheses.

$$CPI_t = \alpha_0 + \alpha_1 CPI_{t-1} + \alpha_2 Internet_{t-1} + \alpha_3 Internet_t + \varepsilon_1 \quad \text{Equation (1)}$$

$$Internet_t = \alpha_4 + \alpha_5 CPI_{t-1} + \alpha_6 Internet_{t-1} + \alpha_7 CPI_t + \varepsilon_2 \quad \text{Equation (2)}$$

Testing of hypothesis

Wald test and STATA11 software were used in the new model for causality test and decision-making for causality is as follows.

$$H_0 : \alpha_2 + \alpha_3 = 0$$

$$H_1 : \alpha_2 + \alpha_3 \neq 0$$

If H_0 is rejected, then the causal relationship is from internet to corruption. Also for equation (2), if H_0 is rejected, the causal relationship will be from CPI to internet. There will be no causal relationship among the variables if H_0 in each equation is not rejected.

$$H_0 : \alpha_5 + \alpha_7 = 0$$

$$H_0 : \alpha_5 + \alpha_7 \neq 0$$

Empirical results of causality test are shown in the following table. The above two models were estimated via GMM method and the number of sample was equal to 168.

Table 4. Results of causality test (dependent variable: corruption)

variable	Coefficient	Std. Error	t-Statistic	Prob
α_0	4.447423	0.01190155	37.37	0.000
α_1	-0.0278894	0.0004164	-656.81	0.000
α_2	-0.0845125	0.0012392	-68.20	0.000
α_3	0.0352761	0.0013193	26.44	0.000
Wald test: $\alpha_2 + \alpha_3 = 0$ Prob>chi2=0.000				
Number of obs =168				

Estimation of equation 2:

Table 5. Results of causality test (dependent variable: internet)

variable	Coefficient	Std. Error	t-Statistic	Prob
α_4	2.708505	0.18892272	14.34	0.000
α_5	-0.0875413	0.0035375	-24.75	0.000
α_6	0.09728379	0.0045779	212.51	0.000
α_7	-0.078444	0.0033975	-23.10	0.000
Wald test: $\alpha_5 + \alpha_7 = 0$ Prob>chi2=0.000				
Number of obs = 168				

Considering the obtained results of this test and significance level equal to 0.05, H0 in equations (1) and (2) has been rejected. Thus, there is a mutual and significant causal relationship between internet and corruption.

Estimation of the effect of internet on corruption via two-phase GMM method

Here two-phase GMM method and STATA11 software are used for model estimation. Corruption is a permanent problem and it always exists which depends on its previous periods too. Also results of causality test showed that the causal relationship is mutual. Therefore, the problem of mutual causality should be considered when effects of the internet use on corruption are analyzed. For this reason, GMM model has been used to solve endogenous problem of the dependent variable. F-Limer and Hausman tests were not employed in this study, because panel data were considered from the beginning and then the data were regarded in dynamic form. Also in studies in which GMM method is considered, F-Limer and Hausman tests are not employed. For instance, Mehregan and Mohseni (2007) used two-phase GMM method in a survey entitled "studying the causal relationship between poverty and

corruption in developing countries". They did not use F-Limer and Hausman tests. Also, stationary of variables was not studied, because the number of years under study was less than 10 years (Anders, 2003).

The intended model is considered as below:

$$Cpi_{it} = \beta_0 + \beta_1CPI_{i,t-1} + \beta_2Internet_{it} + \beta_3GDPpc_{it} + \beta_4Edu_{it} + \theta_{it}$$

where $GDPpc_{it}$ is gross domestic product per capita (index of economic growth) for country i in time t and Edu is level of education. Both of these variables are considered as independent variables.

Detection tests

Two types of detection tests are applied to measure accuracy of empirical methods. Sargan test which evaluates limitations after definition was used in this estimation to study validity of explanatory variables. This test assumes that explanatory variables are not related to some remaining sets and thus are acceptable variables. Given to the obtained results, high p-value shows that H_0 (there are no detection limitations) is not rejected. Therefore, the variables are suitable. The second test was presented by Arellano-Band (1991) which studies the assumption that error terms have serial correlation for regression. Indeed H_0 in this test shows non-existence of autocorrelation and H_0 is not rejected given to the obtained results of this test at significance level 0.05; i.e. the variables under study are independent of error terms (are not autocorrelated) and so, they are suitable for estimation.

Table 5. Results of model estimation using two-phase GMM method (dependent variable: CPI)

variable	Coefficient	Std.Error	t-statistic	prob
β_0	3.939731	0.1490529	26.43	0.000
$CPI_{(t-1)}$	-0.406372	0.0007421	-54.76	0.000
Internet	-0.029298	0.0009668	-21.65	0.000
Edu	-0.0038429	0.0015048	-3.07	0.002
GDP	0.0194776	0.0003395	-57.37	0.000
Sargan test=0.4186		AR(1) p-value=0.7521		

Analysis of model coefficients

Given to results of the above table, model estimation shows that there is a negative and significant relationship between corruption in the previous period ($CPI_{(t-1)}$) and corruption in the current period (CPI_t) so that one unit change in $CPI_{(t-1)}$ decreases CPI_t equal to 0.406372 units. Corruption in the current period, thus, has a negative effect on corruption of the next period which can indicate that authorities and the government are looking for strategies to prevent and control corruption due to its existence in each period. These factors are led to reduction of corruption in the next period. The results demonstrated that there is a negative

significant relationship between internet use and corruption so that the corruption index is decreased 0.029298 with an increase of ten internet users per 100 people. It shows that accurate use of the internet accompanied by information transparency and existence of e-government decrease the level of corruption. Similarly, there is a negative significant relationship between literacy level in the society and corruption index. One unit increase in education decreases 0.0038429 units in corruption. According to the findings, there is a negative and significant relationship between GDP_{pc} and corruption and if GDP_{pc} increased one unit, corruption is will be decreased equal to 0.0194776 units, so degree of corruption in the society will be decreased in order to improve economic growth and development in countries.

Conclusion

Considering the findings, based on the arguments proposed by researchers and policy-makers, internet can play a remarkable role in fighting corruption through better execution of rules, information transparency, and reduction of authorities. From a theoretical viewpoint, internet can decrease corruption if it is used adequately. The finding of the current survey is that corruption is decreased considerably with an increase of ten internet users per 100 people.

Generally, this survey concluded that information transparency creates a space in which corruption is less and internet is an advanced device that is able to facilitate the speed of information flow with low economic costs. As all countries have had more access to internet each year monotonously, it shows that if the internet is used properly, it is a suitable tool for fighting corruption and we should observe global reduction of corruption through increased Speed of internet influence in the future.

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Table 6: 28 Countries

Botswana	Morocco
Bulgaria	Namibia
Cameroon	Nigeria
Cuba	Paraguay
Elsalvador	Peru
Ghana	Panama
Indonesia	Romania
Iran	Senegal
Kazathstan	Syria
Latvia	Tajikestan
Madagascar	Uganda
Mali	Uruguay
Mexico	Uzbekistan
Moldava	Venezuela

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