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**Impact of e-government on the level of bureaucratic procedures to businesses and citizens**

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**Table of Contents**

## Abstract

In recent years many governments have adapted numerous e-government programs with the goal of making its state apparatus more effective. The means of information and communications technology (ICT) are seen as the future of delivering government services. However, the benefits of the e-government programs have put into question by several empirical studies. This paper explores the potential impact that the level of e-government should have to various bureaucratic regulations like the time spent dealing with the requirements of government regulations, time required to start a business, time to pay and prepare taxes and lastly, the number of visits required with tax officials. The results of the study suggest that although the level of e-government reduces the time to start a business, then in other cases the level of e-government does not have an effect on bureaucratic regulations or the influence is rather opposite than assumed.

## Introduction

E-government can help governments go green and promote effective natural resource management, as well as stimulate economic growth and promote social inclusion, particularly of disadvantaged and vulnerable groups (United Nations E-government Survey, 2014: 2).

In recent years, e-government has expanded rapidly, with more governments seeking increased effectiveness and cost-efficiency through the use of information and communications technology. This increased trend in recent years is due to the numerous benefits associated with e-government for governments as well as associated stakeholders. The main logic behind this is that the use of e-government should speed-up the governance process and, in doing so, save money and time for both the government and consumers of government services. Thus, from e-government services, all the substantial groups should benefit, including: citizens, governments and businesses. Misra brings forth six concrete benefits to businesses that e-government should bring that in brief are: reduced red tape, online services, more convenient way of dealing with government regulations, online monitoring that gives a better control of transactions, services like e-banking and better conformity to government regulations (Misra, 2007: 4).

Further, the World Economic Forum has embraced how e-government and connectivity have been the key factors in improving the economic climate of developing countries. They bring the examples of Colombia, Uruguay and Panama. Despite their differences in approach, these three countries have invested many resources in e-government development in recent years. Although there are problems with internet access affordability, according to the Global Information Technology Report 2013, e-government has improved a lot of the everyday lives of those people. Moreover, the report states that with the development of e-government, it is now possible to set up a company in less than five minutes. In addition, they bring forth that Rwanda is on the way of transforming its agrarian economy into a knowledge-based economy by 2020.

When we look at concrete case studies, one of the leaders in e-government among Central-European countries is Estonia. Its e-services can be considered one of the biggest success stories in Europe. The small country is even regarded one of the leaders in e-government services in the world. Estonian government boasts that thanks to their e-services, it is now possible to register businesses in 20 minutes, filling tax returns in 5 minutes, signing legally-binding treaties from a mobile phone and, because of the quick e-government services, bureaucracy can be considered something from the past (CCDCOE, 2012: 8). In addition, worldwide famous startups start-ups like Skype, Transferwise, Creative Mobile and Fortumo were all developed in Estonia that all are considered by the government at least partially a result of its development of e-government services that has fostered innovation.

Moreover, if we look studies about the satisfaction of businesses with e-government services, University of Kansas Center for Public Policy & Administration (CPPA) conducted a telephone survey of 1,495 business subscribers in Arkansas, Indiana and Kansas to determine if they have benefited from e-government services offered by their corresponding states. The results of the survey were overwhelmingly positive. 96% of the respondents stated that e-government service delivery resulted in time savings for the company (CPPA, 2013: 1). Moreover, 87% of the participating companies regarded e-government as a tool that makes conducting business easier (*ibid*). Thus, based on the literature and empirical studies, it seems that e-government is connected with several benefits for businesses and citizens. However, despite these cited successes, the literature still questions many of e-government's achievements.

Like The Economist brings forth, a lot of money has been spent on putting government services online, however the results have been rather disappointing or difficult to measure. For example, in the last 7 years it is brought forth that Great Britain wasted nearly £2 billion on projects that have failed or not been implemented. Moreover, the analysis brings forth that although many capabilities have been created, many e-government projects were not generating the expected outcomes. Additionally, not much research has been done on evaluating the success of e-government programs (The Economist, 2008). For example, in 2002 Australia's National Office for the Information Economy evaluated their 38 e-government projects and although the majority of the projects were likely to make transactions more convenient for users and officials, it did not produce significant savings for the government (*ibid*). In the end, it was difficult to evaluate whether businesses and other actors had significantly benefited from the e-government initiatives.

This is an interesting puzzle presented in the literature. This research continues with Misra's framework and assesses that are some of the benefits associated with e-government for businesses and citizens been realized in reality. This is an interdisciplinary comparative international study where the primary research question asks: Is there a linkage between the level of e-government and lesser extent of bureaucratic procedures to businesses and citizens?

The lesser extent of bureaucratic procedures will be analysed from these three perspectives: time required to start a business, time spent dealing with government regulations and the time to pay and prepare taxes with the number of visits required with tax officials. For example, can the level of e-government explain why it is possible to start a company in 5 or 20 minutes or pay taxes in five minutes, as mentioned above? This is a theoretically interesting question because little research has been done in this area. It contributes to the existing literature in two ways. First, it contributes to the theoretical literature by statistically observing the relationship that e-government and these three factors should have. Second, it provides new insights to the policy debate about the benefits of e-government that have been highly contested thus far. This is theoretically interesting as there are many doubts in the literature about the positive impacts of e-government.

More precisely, a significant amount of literature in the field has concentrated on evaluating the benefits that should come with e-government programs, and if these results have been achieved. The underlying reality is that many of the expected advantages of e-government have not been fulfilled. This master thesis is interested in the specific benefits e-government

6

should bring to companies and citizens. This can be considered one of the core debates in the field and it has been researched from different perspectives. For example, in one of the most cited works in the field, Moon (2002) has looked at the development of e-government in local municipalities. In his research he shows that the benefits associated with e-government, such as cost-saving, have not actually been achieved in local municipalities. Thus, the theoretical framework of e-government has not resulted in the benefits that the literature suggests.

Additionally, authors like Tolbert and Mossberg have looked at e-government's effect on trust and confidence in government. They test the theoretical framework of the literature that states e-government should improve the service delivery and also enable citizens to participate more in government decision making processes (Tolbert and Mossberg, 2006: 354). According to Tolberg and Mossberg, trust in the local government increased because of the greater amount of interaction between the government and citizens. However, these same results did not occur at the federal level, where the determinants were more socio-economic, like age and gender, rather than e-government (Tolbert and Mossberg, 2006: 366). In this sense, it is again brought forth that although e-government has some positive effects, many of the expected transformations in public administration did not occur in reality.

Gil-García and Pardo, who have analysed the factors of e-government success, have also researched the question as to why e-government programs have not been as successful as predicted. They acknowledge the fact that the e-government development poses several risks and e-government initiatives are not always successful. For reducing the risks of e-government initiative developments, they have developed a four-recommendation framework. This framework consists of: characterizing risk in context, understanding information and data challenges, using business case analysis when necessary and finally, preparing to face unpredictable future challenges (Gil-García and Pardo, 2005: 205-206). Here we can see that, when adapting a new e-government program, its success depends largely on the commitment to the development of the new service.

Thus, e-government and its effect on different stakeholders is, theoretically, a highly interesting and contentious topic. Moreover, when considering the increasing investments by governments in e-government services, it is also a policy-relevant topic that helps to shed light on a highly disputed topic.

The remainder of this paper is organized into five different sections. Section 2 presents theory and hypotheses, where the term "e-government" is also conceptualized. In Section 3,

methodological comments are presented, and discussion about the research design and hypotheses testing is provided. To continue, Section 4 presents a series of multiple regression analysis to determine the relationship between the time required to start a business, time spent dealing with government regulations, time to pay and prepare taxes with the number of visits required with tax officials and the level of e-government that is expected to predict them. In section 5, the findings of this research are summarized and recommendations for future research are offered.

## 2. Theory and hypotheses

### 2.1. Conceptualizing e-government

Whereas e-government is a highly contested concept and is often confused with e-governance, it needs to be understood what e-government means in terms of this research. In general terms, to avoid confusion, e-governance is a more comprehensive term than e-government. According to the UNESCO definition e-governance is:

E-governance is the use of ICT by different actors of the society with the aim to improve their access to information and to build their capacities (UNESCO, 2011).

Like Almarabeh and Abu Ali bring forth, although there are many arguments how to conceptualize e-government within the field, the research usually agrees on its essence. It is how the government uses ICT to communicate with citizens and businesses and giving them the opportunity to interact with the government (Almarabeh and Abu Ali, 2010: 30). They add that it is all about how the government organizes its administration process (*ibid*). This master thesis uses the definition of e-government from World Bank because of its clarity and wide use. According to World Bank, the e-government is defined as:

E-Government refers to the use of information and communications technologies (ICT) to improve the efficiency, effectiveness, transparency and accountability of government (The World Bank, 2015).

Thus, it can be stated that e-government is a part of e-governance but in its essence much more narrow. It engages with the services that government is offering with the means of ICT with the goal of improving its performance. E-governance is a wider term that looks at the impact of the ICT on the administrations and more on the wider society. It is more interested in conceptual issues like the role ICTs play in engaging more people in the governing process.

8

Moreover, it is concerned with issues due to what e-government exists, like policies and regulations. Thus, e-governance deals with the whole spectrum of ICT use in governance, whereas e-government concentrates on the online services.

To continue, the literature distinguishes several layers of e-government. The World Bank brings these differences and their short definitions forth:

Analogous to e-commerce, which allows businesses to transact with each other more efficiently (B2B) and brings customers closer to businesses (B2C), e-government aims to make the interaction between government and citizens (G2C), government and business enterprises (G2B), and inter-agency relationships (G2G) more friendly, convenient, transparent, and inexpensive (The World Bank, 2011).

This is important because similar labelling is used internationally when talking about e-government and these are considered different usable models in this field. Moreover, this shows that e-government has a much wider spectrum and it does not refer merely to services that are provided by the state. As stated in the research question, this thesis analyses four specific G2B and G2C interactions that e-government should have a positively influence on.

To add another layer of conceptualization to the definition of e-government, it is also considered to be a paradigm shift in public service. Sirajul and Pathrannarakul argue that the use of e-government will make the operations of the state more transparent. This leads to lesser levels of corruption and is a process of transforming government. Moreover, this should increase the participation of citizens and will subsequently lead to a more effective government (Sirajul and Pathrannarakul, 2013: 25). In addition, these two authors use the framework of Taspscott and Caston, who have argued that using ICT in government matters is also a paradigm shift (Sirajul and Pathrannarakul, 2013: 27); this is summarized in Table 1.

**Table 1. Paradigm shifts in public service delivery (Sirajul and Pathrannarakul, 2013: 28).**

|  | Bureaucratic Paradigm | E-government Paradigm |
|---|---|---|
| Orientation | Production cost-efficiency | User satisfaction and control, flexibility |
| Process Organization | Functional rationality, departmentalization, vertical hierarchy of control | Horizontal hierarchy, network organization, information sharing |
| Management Principle | Management by rule and mandate | Flexible management, interdepartmental teamwork, with central coordination |
| Leadership Style | Command and control | Facilitation and coordination, innovative entrepreneurship |
| Internal Communication | Top down, hierarchical | Multidirectional network, with central coordination, direct communication |
| External Communication | Centralized, formal, limited channels | Formal and informal direct and fast feedback, multiple channels |
| Mode of Service Delivery | Documentary mode and interpersonal interaction. | Electronic exchange, none face-to-face interaction |
| Principles of Service Delivery | Standardization, impartiality, equity | User customization, personalization |

Table 1 is important for conceptualizing e-government because it shows how the e-government paradigm shift contributes to saving time and making the whole governance process more effective. Moreover, it also implies how difficult it is measure the level of e-

10

government because of its broad scope, which is further discussed in the methodology section. Table 1 shows that paradigm shift in public service is consistent with e-governance, however it also shows how the public service delivery process should transform with the use of e-government. The information provided indicates that public administration that uses the means of e-government should have a greater potential for responding to the needs and demands of businesses, citizens and civil society actors.

## 2.2. Literature review

When looking at the literature about e-government the most influential research has dealt with questions connected with the development of e-government and what challenges and opportunities it brings. Layne and Lee have created a four stage development model of how e-government can be achieved by governments. They also highlight the importance of three dimensions in the development of citizen-focused e-government: universal access, privacy and confidentiality; and citizen focus in government management (Layne and Lee 2001: 134-135). This paper is the most cited research in the field of e-government, and pivitol to our understanding. In this sense, e-government and its suggested way of reforming government to be more effective has been the central topic in the literature.

However, what interests us the most is as mentioned in the introduction, that the literature on e-government is largely case studies, where it has tried empirically to confirm or neglect e-government benefits that these international organizations and scholars bring forth. Little research has been done on e-government and bureaucratic procedures, therefore we will draw upon the closest research in the field of e-government, where we can attempt to derive explanations and draw linkages from the e-government literature connected with bureaucracy. Whereas e-government literature is still in its early stages of development, many theoretical frameworks are derived from international organizations like the United Nations and European Union and also the author's own theoretical thinking.

Parambil analysed with his empirical study the impact of e-governance projects on bureaucracy and administrative structures. He evaluated the success of different e-government projects. The primary research question that he asks was: "Can the implementation of e-governance projects lead to a transformation of bureaucracy, administrative structures and how departments function?" (Parambil, 2015: 43). To answer this question, Parambil interviewed a wide range of government staff in India. In terms of our research it is important,

because he found that after introducing ICTs, although the paper files were not fully replaced with digital files as it could be assumed, government transactions became more efficient due to faster processing of files and it also resulted in reduction of bureaucracy and red tape (Parambil, 2015: 82-83). In this sense, his research confirms that e-government and less bureaucratic procedures have a connection.

Interestingly, on the other hand, Welch and Pandey examined the interactions between red tape and the intranet use of human service agencies. What they basically look at is have ICT solutions improved effectiveness of a government by reducing red tape. The authors used data from the National Administrative Studies Project, where senior managers were questioned. Interestingly, they did not find strong linkages between the increasing use of the intranet and the reduction in red tape as Parambil's more general research recommends. Although the literature in this regard varies, it could still be assumed that these two factors have a positive linkage. For example, if we look at the Malmö Declaration that was represented at the eGovernment Conference "Teaming up for the eUnion", it set political priorities for the EU administration for future years. Interestingly, the central topic that was highlighted was e-government. There they highlight e-governmnent as one of their four most important priorities:

Efficiency and effectiveness is enabled by a constant effort to use eGovernment to reduce the administrative burden, improve organisational processes and promote a sustainable low-carbon economy (Ministerial Declaration on eGovernment, 2009: 3).

This is again a good example from the e-government literature from where there are two sides of the research that gives different indications. On the one hand, Welch and Pandey would predict that the connections between e-government and bureaucracy are less obvious than they seem. However, looking at Parambil's research and the Malmö declaration and adding here also the aforementioned Misra's framework of economic benefits, and given the evidence, this research still predicts:

H1. The level of e-government is positively related to and significantly reduces the time needed to deal with bureaucratic regulations.

With the same aforementioned logic, it should mean that e-government should also have a positive effect on the time needed to start a business. Like mentioned in the introduction, Estonia boasts that with its e-government it is possible to start a business in five minutes

(CCDCOE, 2012: 8) and the Global Information Technology Report 2013 brings forth that the e-government has given the opportunity in countries like Colombia, Uruguay and Panama to establish a company in less than 20 minutes. Moreover, like the Malmö declaration states, the mobility in the European Single Market is strengthened by e-government services like setting up and running businesses (Ministerial Declaration on eGovernment, 2009: 3). Misra's framework also brings forth reduced time of setting up businesses as the first most obvious benefit that e-government brings (Misra, 2007: 4).

Thus, given the evidence and assumptions in the literature, this research predicts:

H2. The level of e-government is positively related to and significantly reduces the time it is required to start a business.

To continue, saving time and money are the two main factors that e-government should bring to all the stakeholders. This logic should also apply for less time needed to pay taxes and reducing the number of visits for tax officials, because e-government services provide good opportunities to do these procedures online. Moreover, the online tax system is theoretically relevant because it can be considered one of the most well-known e-government services. In the literature it has been highlighted that e-government is one of the most effective ways of reforming a countries tax system to become more effective. Stefani and Claudio bring forth, that modernizing a tax system with the means of e-government has been a top priority for many countries, because of its supposed positive economic impact. They bring forth the example of the e-tax system in Mexico, implemented in 2003 with the capacity to collect 80% of tax revenues online and achieving a higher cost-efficiency (Stefani and Claudio, 2011: 23). Moreover, they derive examples from Chile and Switzerland's cantons. As Stefani and Claudio argue, Chile achieved significant cost-saving and better accuracy with their e-tax system, where in 2003, 200 000 people were submitting taxes online. Moreover, the same system in Switzerland has led to cost reductions and added time saving for users with an increase of overall tax collection transparency (Stefani and Claudio, 2011: 24). Thus, it would be logical to argue that e-tax systems both decrease the time to pay taxes and reduce visits to tax officials.

The e-tax system itself has several problems that were similar as we saw in Hypothesis 1. Chatfield analysed public service reform with the help of e-government through a case study of Japan's e-Tax system. In this study, he brings out that although in theory e-tax systems have significant benefits, he shows that it is in fact an even more complex e-government

transaction because it needs to gain the trust of both internal and external stakeholders (Chatfield, 2009: 135). Like he brings out, then the main problem why e-Tax was initiated was because people had to wait hours and hours in line to pay taxes and the complaints about the quality of the service rapidly increased (*ibid*: 139). With the e-Tax service the efficiency of the tax service was supposed to be rapidly improved. Chatfield brings forth that with the e-Tax program tax offices were less congested with people and the number of tax forms filled increased from 7.3 million in 1975 to 23.5 million in 2007. The last increase can be attributed to the adoption of the new e-Tax system (Chatfield, 2009: 142). Despite its success, it is still brought forth that e-government is not a magical power but, highlighted the importance of long-term and strong leadership in implementing e-Tax programs (*ibid*: 145). Although the success of the e-Tax system, the author continues that public approval of the e-Tax system needs to still be further researched to understand its actual success because it is at the moment questionable (*ibid*). In this sense, with e-government there should be a win in time for the stakeholders but it does not mean that this e-government tool will be automatically more accepted.

Interestingly, Hung et al. continue their research by looking at the user acceptance of the Taiwanese online payment and tax system with a survey of 1099 respondents. They bring worth again the puzzle that although there has been during the last decade huge investments in e-government services like tax filing and payment system (OTFPS) the acceptance rate for this service is still low (Hung et al., 2006: 98). For example, in 2004 it was only 21.06% in Taiwan and the same tendency was in the US where in 2003 it was only 22.61% (*ibid*). With their research they tried to increase the understanding about the overall e-government service acceptance rate with the case study of OTFPS.

With their survey Hung et al. brought forth that almost all of the respondents (91.7%) had adopted the OTPFS (Hung et al., 2006: 105). With the analysis of their empirical findings they bring forth that the e-government service acceptance can be explained by three main factors: "attitude", "subjective norm" and "perceived behaviour control" (*ibid*: 111-112). To elaborate in these terms, then according to the authors, "attitude" means do the users want to adopt the new technology solutions and do they find it makes their life easier. "Perceived behaviour control" refers in its simplest, do the users trust e-government services or not. Lastly, "subjective norms" refers to other opinions on the service, e.g. friends opinions, analysis in the newspaper, mass media etc. (Hung et al., 2006: 110-111). Thus, although the service delivery became faster, it is not the only factor that influences acceptance rate.

Although there are several problems with e-governments e-tax systems that are mostly connected with the general acceptance of the service, it can still be seen that this e-government service should lead to less bureaucratic procedures in the field. Thus, this given research predicts:

H3. The level of e-government is positively related and reduces the time needed to pay and prepare taxes and the number of visits required with tax officials.

In general, the main puzzle is that on the one hand based on the literature it would predict that e-government reduces the time that is needed to deal with bureaucratic regulations regarding the time to start a company and pay and prepare taxes with fewer visits with tax officials based on the overall logic of e-government benefits. Positive linkage of these factors has been brought forth by institutions like the World Bank, United Nations and European Union. Moreover, many case studies (Hung et al. 2006, Stefani and Claudio 2011, Parambil 2015) have confirmed the positive impact of e-government to those three factors. On the other hand, research from researchers like Moon and Tolbert, Mossberg, Chatfield, Welch and Pandey; and Gil-García and Pardo have found that although e-government has in general a positive impact, some of the benefits that should come with implementing e-government did not always provide the results expected in the beginning. These differing studies and perspectives on the benefits of e-government is the puzzle that exists in the literature about regulations, taxes and tax visits and is tried to be solved in this research.

### 2.2.1. Other factors of influence

However, the level of e-government may not be the only factor that causes variance in the aforementioned factors. Using theoretical thinking it would be possible to bring forth a variety of factors, for example state regime, corruption, wealth, history etc. However, looking at these three hypotheses, then according to the existing literature, corruption can be regarded as the most serious factor that may cause variance in the variables used in this research.

Surely corruption has negative consequences in every sphere of life. The theoretical framework as Tanzi brings forth is that most commonly the role of the state is executed by regulations and rules. Without those rules and regulations it is impossible to get among others a passport, borrow money, open a shop etc. (Tanzi, 1998: 566) Thus, this gives the officials a monopoly power in some issues that means their refusal of a permit or license may mean a

delay of a transaction for months or even years (*ibid*). Here the author refers to surveys from different countries (that apply even more on developing countries) that much of the time of the managers is spent with the interactions of public bureaucracies (*ibid*: 567). In this sense, the theoretical framework and surveys support the connection between corruption, regulations and bureaucracy.

To continue, Mauro brings forth that dishonest bureaucracies can delay distribution of permits and licenses. Moreover, when the property rights are not secured it may reduce incentives to innovate, invest and obtain new technologies (Mauro, 1995: 681). In a concrete case study, Dreher and Gassebner looked at their research corruption effect on regulations and entrepreneurship. For finding it out they ran a regression analysis of data from the Global Entrepreneurship Monitor. The results of their research were that corruption indeed affects entrepreneurial activity because more procedures and capital are needed to start a business. Moreover, when regulations are introduced by corrupt officials to undertake bribes, the overall level of regulation will rise (Dreher and Gassebner, 2013: 427). This prevents companies from entering the market (*ibid*: 428). Thus, it can be seen that corruption may affect all the three hypotheses.

In addition, authors like Hindriks et al. have looked at corruption's influence on tax collection. As they bring forth, then the connection between taxes and corruption is twofold. With the higher rate of corruption, taxpayers may try to offer bribes to avoid taxes or the tax officials may just abuse their authority for personal gains (Hindriks et al., 1999: 396). In their paper they tried to assess these issues and the general influence that it may have. For that they analysed different tax models and the interactions of taxpayers and tax inspectors on them. The main results from their paper was that under corruption, collecting progressive taxes is more costly and difficult for the government and tax evasion is more likely under regressive tax systems because the poor do not have much to gain from evading taxes (Hindriks et al., 1999: 421).

However, what interests us is what the authors bring forth with their analysis that corruption in general defeats the effectiveness of the tax instrument in creating revenue (*ibid*). These findings are complemented by Tanzi who also acknowledges the fact that corruption can cause major problems in the tax system. Some major factors that influence it are: complicated tax regulations where taxpayers need help in complying, administrative procedures, which are opaque, and a lack of control by the state etc. (Tanzi, 1998: 567). This and taking into

consideration the aforementioned literature about corruption implies that the rate of corruption should have an effect on H3 in the sense of time needed to pay taxes and visits to tax officials.

Thus, it can be stated that corruption may have also an effect to the three hypotheses because with a high corruption rate it could be argued that bribing officials becomes a factor that counts in the time to establish a company and not the level of e-government. It is arguable that this same logic applies also for bureaucratic regulations and paying taxes. Thus, corruption is taken in this research as a controlled variable and it is held constant to test the effect of e-government level.

## 3. Methodological comments

### 3.1. Research design

The goal of this paper is to test empirical relationships between the level of e-government defined as an independent variable in this research and the four dependent variables mentioned above that are in the analysis controlled by corruption. The main rationale for developing these hypotheses is to understand to what extent e-government may influence bureaucratic regulations measured by these four indicators. This study relies (Table 2) on four datasets: E-Government Development Index (EGDI), World Bank's Enterprise Survey, World Bank's Doing Business Index and Corruption Perceptions Index (CPI) that are briefly described in the further sections.

**Table 2. Variables concluded in the analysis.**

| IV | Assessed by: |
|---|---|
| Level of e-government | E-Government Development Index |
| **DV** | |
| Time spent dealing with the requirements of government regulations (% of senior management time) | World Bank's Enterprise Survey |
| Time required to start a business | World Bank's Doing Business Index |
| Time to pay and prepare taxes (hours) | World Bank's Doing Business Index |
| Number of visits or required meetings with tax officials; If there were visits, average number of visits or required meetings with tax officials. | World Bank's Doing Business Index |
| **CV** | |
| Corruption | Corruption Perceptions Index |
| **Years concluded in the analysis** | |
| 2003, 2004, 2005, 2008, 2010, 2012, 2014 | |

The goal of this paper is to involve as many countries possible to the analysis that the results would be as comprehensible as possible. Whereas the indexes that are tested here have throughout the analyzed time span of 2003-2014 had different amount of countries concluded to the analysis, then the final selection of the countries in the analysis is based on the presumption that all the countries should at least have data for the independent variable (EGDI) and for the controlled variable (Corruption Perceptions Index). Based on that, a set of 124 countries (See Appendix 1 for further information) was chosen for the analysis.

However, it is important to highlight that whereas the presumable DV-s have different amount of observations in each year and in many cases the observations are missing, then the valid

amount of observations strongly depends on the DV variable in the sense how many information it is possible to extract from the datasets.

For assessing these possible interactions a multiple linear regression analysis is used. This method was chosen because it gives the opportunity to assess the influence of the two explanatory variables to the dependent variables defined in Table 2. Moreover, with the help of the regression analysis it is possible to determine how strong and statistically significant the relationship between the variables used in the analysis is. In addition, regression analysis gives the researcher the possibility to evaluate how much the constructed model describes the real-life situation. This is the main argumentation why regression analysis was chosen as the main tool of analysis in this paper. After merging the six aforementioned datasets, the calculations for the multiple regression analyses were performed by using statistical software RStudio.

## 3.2. Sources of data

The data for assessing the interactions between different variables is derived from four established indexes. These indexes are used for establishing or neglecting the linkages between e-government and bureaucratic procedures while controlling for corruption.

For e-government, the E-Government Development Index is used. This index and the main reasons why it was chosen will be further explained in the next section whereas several controversies about this index exist in the literature.

As mentioned in the introduction, for measuring bureaucratic procedures for businesses and citizens, four measurements are used: 1) Time spent dealing with the requirements of government regulations (% of senior management time); 2) Time required to start a business; 3) Time to pay and prepare taxes; 4) Number of visits or required meetings with tax officials; and if there were visits, the average number of visits or required meetings with tax officials. These indicators are all derived from the World Bank database.

Time to pay and prepare taxes is a part of World Bank's Doing Business Index, where it was one of the 11 indicators used in composing the index. Among them were also indicators that dealt with construction permits, enforcing contracts etc. (Doing Business, 2015). The other three variables were derived from the World Bank from its Enterprise Survey databank, the goal of which is to cover a broad range of business environment topics and with the general

19

goal of helping policy makers to implement and prioritize reforms in their areas of need. The data is collected with face-to-face interviews with business owners and top managers (more than 130,000 companies altogether) (Enterprise Surveys, 2015). Thus, for the elected indicators this is the best and most comprehensive dataset that is available.

For determining the level of corruption the Corruption Perceptions Index (CPI) is used. The CPI measures how corrupt the countries public sector is perceived to be. This is used for an assessment because it is most used and acknowledged index that exists today. Like Transparency International explains, there are no meaningful ways of measuring corruption in absolute levels, thus measuring the perceptions of corruption is the most reliable method that exists. Moreover, in the research design the country is evaluated in the scale of 0-100, where 100 means that a country is perceived to have almost no corruption at all and 0 refers to countries with the highest level of corruption possible (Transparency International, 2015). Further strengths of this index are that it covers almost the entire world, dependent on the capability of gathering survey information (for example, in 2013 177 countries were included).

### 3.2.1. Additional explanation why EGDI is chosen for the analysis

#### 1. EGDI

For determining the level of e-government, the EGDI is used. It is an index that is composed by the United Nations Department of Economic and Social Affairs Division for Public Administration and Development Management (UNPACS). EGDI covers all the 193 UN member states and uses three dimensions to compose the EGDI that are regarded to be most important to e-government:

1) Scope and quality of online services (Online Service Index, OSI);

2) Development status of telecommunication infrastructure (Telecommunication Infrastructure Index, TII);

3) Inherent human capital (Human Capital Index, HCI) (UNPACS, 2015).

The formula, which the UNPACS uses is:

$$EGDI = 1/3 \text{ (OSI normalized + TII normalized + HCI normalized)}$$

For each indicator, the UNPACS standardizes the z-scores to make sure that the EGDI is equally determined by the component indexes OSI, TII and HCI (UNPACS, 2015). For the z-score calculation they use the formula:

$$Xnew = (x - \mu)/\sigma$$

X stands for the raw score to be standardized, $\mu$ is the mean of the population and $\sigma$ stands for the standard deviation of the population (*ibid*). It is evaluated on scale 1 to 0 where 1 is the highest mark possible to achieve and 0 is the lowest. Thus, like seen from Figure 1, all the indicators are weighted equally.

**Figure 1. The components of the EGDI (United Nations E-government Survey 2014: 187)**
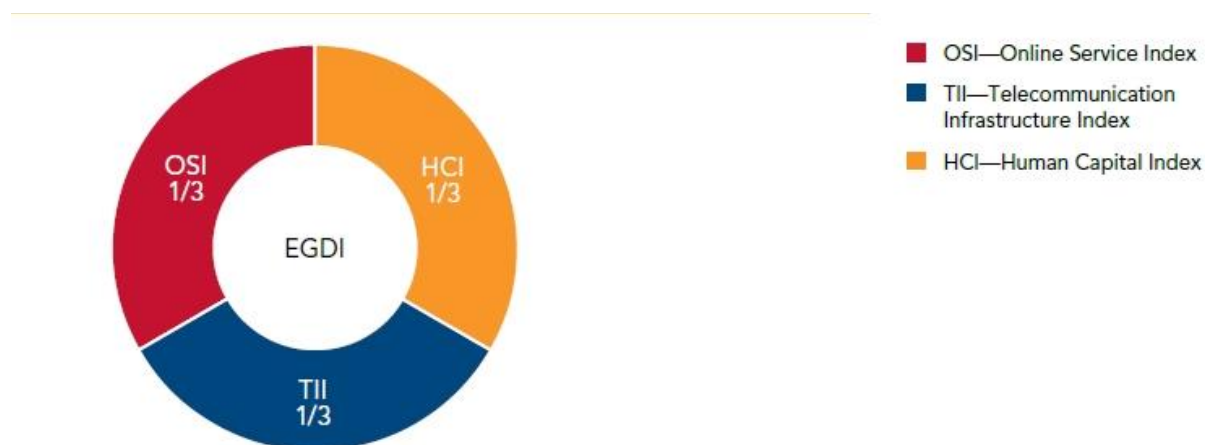


The UNPACS bring forth that the goal of the EGDI is to understand how the e-government has changed and technology evolved.

For understanding the data used, OSI, TII and HCI are explained further.

From Figure 2 it can be seen that similarly, like the EGDI, TII consists of several equal parts that are standardized with the Z-scores:

21

**Figure 2. The components of the TII (United Nations E-government Survey, 2014: 188).**
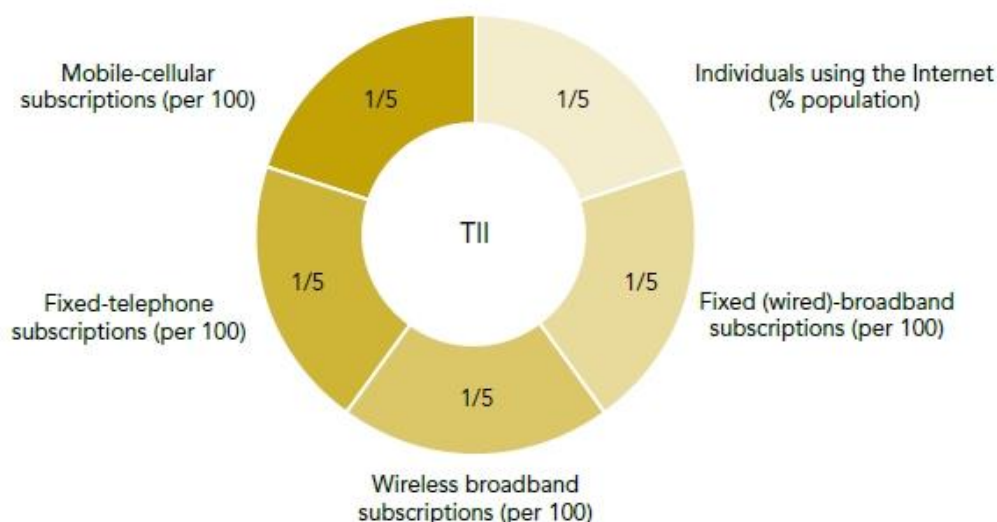


The methodology has been almost unchanged from 2002, except that due to the normal ICT development. From Figure 3 those changes can be seen.

**Figure 3. Changes in TII components 2003-2014 (United Nations E-government Survey, 2014: 188).**

| TII (2002) | TII (2003) | TII (2004) | TII (2005) | TII (2008) | TII (2010) | TII (2012) | TII (2014) |
|---|---|---|---|---|---|---|---|
| Internet users | Internet users | Internet users | Internet users | Internet users | Internet users | Internet users | Internet users |
| Online population | Online population | Online population | Online population | Fixed-broadband subscriptions | Fixed-broadband subscriptions | Fixed-broadband subscriptions | Fixed-broadband subscriptions |
| Personal computer (PC) users | Personal computer (PC) users | Personal computer (PC) users | Personal computer (PC) users | Personal computer (PC) users | Personal computer (PC) users | Fixed Internet subscriptions | Wireless broadband subscriptions |
| Fixed-telephone subscriptions | Fixed-telephone subscriptions | Fixed-telephone subscriptions | Fixed-telephone subscriptions | Fixed-telephone subscriptions | Fixed-telephone subscriptions | Fixed-telephone subscriptions | Fixed-telephone subscriptions |
| Mobile-cellular subscriptions | Mobile-cellular subscriptions | Mobile-cellular subscriptions | Mobile-cellular subscriptions | Mobile-cellular subscriptions | Mobile-cellular subscriptions | Mobile-cellular subscriptions | Mobile-cellular subscriptions |
| Television sets | Television sets | Television sets | Television sets | - | - | - | - |

They are no substantial changes. However in 2014, fixed internet subscriptions were replaced with wireless broadband subscriptions and in 2008 online population was replaced with fixed-broadband subscriptions. In the end the values are normalized by taking into account the lowest and highest composite values for the countries in the survey (United Nations E-government Survey, 2014: 188).

## 2. HCI

If we look at the HCI then at first sight it might not be understood why this is used in an index that tries to measure the development of e-government. However, according to the UN, HCI is used as an indicator in the EGDI to evaluate the country's capacity to participate in the information society without what it would be limited to evaluate the e-government development (United Nations E-government Survey, 2014: 185). This is important for the index because they are measuring the human capital existence in a country that is a precondition for the active to participation in the information society.

From Figure 4 it can be seen that they are using four indicators for measuring HCI: gross enrolment ratio in schools, expected years of schooling, adult literacy and mean years of schooling.

**Figure 4. The components of the HCI (United Nations E-government Survey, 2014: 190).**
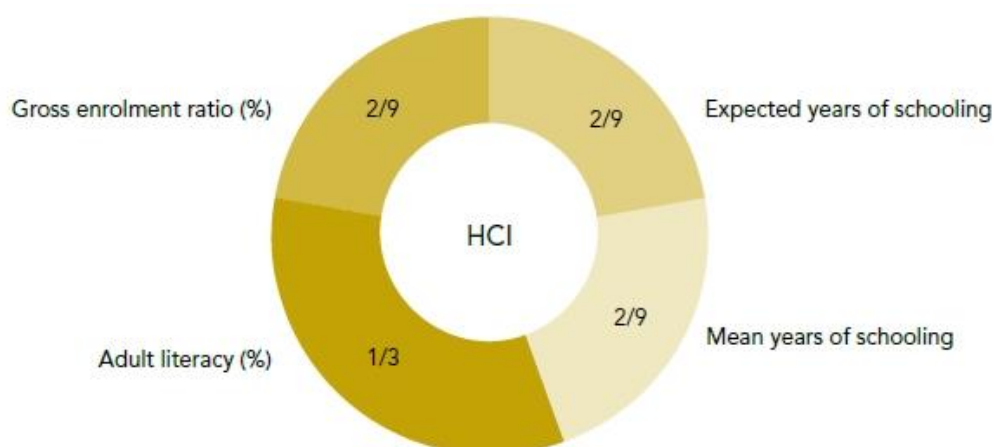


In 2014, compared to the years before, expected years of schooling with mean years of schooling were added to the index (United Nations E-government Survey, 2014: 190). Otherwise, the research design follows the one for TII, where z-scores are used and the values are later normalized.

## 3. OSI

According to the United Nations E-government survey, for determining OSI, a list of more than 90 researchers, postgraduate students and volunteers from the field of public administration assessed the government's web sites and the services that they were offering.

Although with the development of e-government the questionnaires have been changed to respond to the changing environment, in 2014 the topics that the researchers evaluated were:

- Whole-of-government;
- Multichannel service delivery;
- Bridging the digital divide;
- Increasing usage;
- Open Government;
- E-participation (United Nations E-government Survey, 2014: 192).

A discussed, questions needed a binary response to discover patterns and connections in the answers (*ibid*). Like with HCI and TII, the results are normalized in a range of 0 to 1 *(ibid)*.

The EGDI and the three indicators naturally raise questions whether this is the best way of measuring the level of e-government. In the e-government literature, several debates have been held about the accuracy and usefulness of the EGDI in measuring e-government level. Like Whitmore discusses, the problem with e-government measuring surveys is that there is still no consensus that should be the measurement be qualitative or quantitative and what would be the best formal technique for evaluating e-government (Whitmore, 2012: 68). For example, he recommends that factor analysis would be a better way of measuring the level of e-government. The factor analysis itself is simply a method of data reduction, where the connections are looked at in a lower number of observed variables. Whitmore argues that this gives the opportunity to use empirical weights that improves credibility instead of using intuitive weights which the EGDI is doing. Moreover, with this data the researches can identify variables by themselves and therein look for connections (Whitmore, 2012: 74*)*. Thus, although he in general agrees with the research design of the EGDI, he puts into the questions the weights used in EGDI (1/3 of OSI, TII and HCI) and how the weights for the subcategories are composed. This is one of the most noted criticisms for EGDI.

Moreover, Osman et al. have summarized in their research the existing literature, how e-government services have been measured up to the present. The findings of their research are in Table 3.

**Table 3. Summary of the literature of the e-government measurement (Osman et al., 2014: 244).**

| Study | Measurement type | Performed methodology | Models and associated variables |
|---|---|---|---|
| Alanezi, Kamil, and Basri (2010) | Service quality | Conceptual model | Modified version of SERVQUAL that includes seven dimensions and 26 items. The seven dimensions in this scale are: website design, reliability, responsiveness, security/privacy, personalisation, information and ease of use. |
| Batini, Viscusi, and Cherubini (2009) | | | GovQual considers a wide set of quality dimensions: efficiency; effectiveness; accessibility; and accountability |
| Henriksson, Yi, Frost, and Middleton (2007) | | Conceptual model | The instrument questions in the e-government website (eGwet) are grouped into six categories to evaluate the quality of government websites: security/privacy; usability; content; services; citizen participation; and features (the presence of commercial advertising, external links and advanced search capabilities) |
| Horan and Abhichandani (2006) | | Structured equation model | EGOVSAT model consists of: utility; efficiency, customisation, reliability (whether the website functions appropriately in terms of technology as well as accuracy of the content) and flexibility. |
| Kaisara and Pather (2011) | | Descriptive statistics | The e-service quality (eSQ) model includes factors (Information quality, security/trust, communication, site aesthetics, design, access) |

| | | | |
|---|---|---|---|
| Lee, Kim, and Ahn (2011) | | Logistic regression | The model includes: tangible factors (i.e. equipment); reliability; responsiveness; assurance; empathy; promptness of service and overall satisfaction with the filing process to measure the offline service quality. They include 6 control variables. |
| Lin, Fofanah, and Liang (2011) | | Structured equation model | TAM |
| Magoutas and Mentzas (2010) | | Two-sample Z-test | SALT model includes the following factors: Portal's usability, Forms interaction, Support mechanisms and Security |
| Magoutas, Schmidt, Mentzas, and Stojanovic (2010) | | Two-Sample one-tailed Z-test | Model for Adaptive Quality Measurement (MAQM): The model includes 6 quality factors and 33 quality dimensions. |
| Papadomichelaki and Mentzas (2012) | | Structured equation model | e-GovQual: Includes 21 quality attributes classified under four quality dimensions: efficiency; trust; reliability; and citizen support. |
| Rotchanakitumnuai (2008) | | Content analysis | E-GOVSQUAL-RISK model includes service quality (service design; website design; technology support; and user support) perceived risk (performance risk; privacy risk; social risk; time risk and financial risk) |
| Papadomichelak and Mentzas (2009 | | Structured equation model | e-GovQual model includes 25 quality variables (55 questions) classified under 4 quality factors: reliability, efficiency, citizen support and trust. |

| FreshMinds (2006) | Traditional National Satisfaction Index | Surveys and statistical analysis | ACSI: American customer satisfaction index |
|---|---|---|---|
| Kim, Im, and Park (2005) | | Statistical reporting and tools | g-CSI model is based on customer satisfaction index of e-government model. It is an integrated model of customer satisfaction index in Korea and American customer satisfaction index. It is based on perceived quality (information, process, customer service, budget execution, and management innovation) and user expectation to contribute to user satisfaction as a moderator for subsequent user complaints and trust and re-use. |
| Shyu and Huang (2011) | E-government Success | Case study | Perceived enjoyment; Perceived e-government learning value; Perceived usefulness; Perceived ease of use; Attitude; Behavioural intention; and Actual usage |
| Verdegem and Verleye (2009) | | Structured equation model | E-government acceptance model; Communication about services; currency of information; security; help or guidance; personal contact and centralisation/ integration. The indicators are clustered into three groups: 1) access to service; 2) use of service; and 3) impact of service. |

From the literature summarized by Osman et al. the statements that Whitmore highlighted can be confirmed: the measurement of e-government ranges from qualitative to quantitative

studies. Most of the literature in the field has so far concentrated on the measurement of the e-government service quality. For that, authors have used different variables that they have found to be most important in terms of their research however their research designs differ substantially. Table 3 highlights the lack of consensus in what should be measured in evaluating the success of the e-government and how should this be done.

Thus, when measuring e-government and taking into consideration how may contradictions there have been in the literature, the reasons why EGDI is taken as an e-government measurement in this research needs to be explained. As stated before, then e-government is a continuously developing concept that is much contested. Thus, it can be considered to be impossible to compose an index that would be free of criticism and would be suitable for all research purposes. However, EGDIs strength is that it ranks all the UN member states and it has a universal methodology. From the Osman et al. paper it can be seen that different researchers had different methodological approaches for very specific questions they were researching. EGDI is the only index that provides a universal framework for evaluating e-government readiness. Moreover, although the EGDI weights can be disputed, its thorough methodology still gives us the best data available in evaluating e-government levels in the world. In addition, it is the only index that is evaluated yearly and when necessary, altered to respond to the changing global environment. To continue, whereas the EGDI is composed of OSI, TII and HCI, it also means that EGDI takes into account the ability of the whole society to use the e-government services, not only the e-government level itself. This is important because when we look back in conceptualization of e-government, then e-government is also supposed to be a paradigm shift in public service delivery that cannot be properly assessed only taking into consideration the level of e-services the government offers. Lastly, this is the only e-government measurement index that is internationally acknowledged and widely used by academics for e-valuating the e-government level. Thus, it is the best index available for evaluating e-government level and fits best with the goals of this research.

## 4. Empirical Analysis

Table 4 gives a general overview of the six variables used in the following analysis.

**Table 4. Descriptive statistics for the variables used in the analysis.**

| | 6 Variables | 889 Observations |
|---|---|---|

| n | missing | unique |
|---|---|---|
| 889 | 0 | 127 |

### E-Government Development Index

| n | missing | unique | mean | .05 | .10 | .25 | .50 | .75 | .90 | .95 |
|---|---|---|---|---|---|---|---|---|---|---|
| 888 | 1 | 870 | 0.491 | 0.1857 | 0.2474 | 0.3344 | 0.4833 | 0.6308 | 0.7846 | 0.8405 |

### Number of visits or required meetings with tax officials; If there were visits, average number of visits or required meetings with tax officials

| n | missing | unique | mean | .05 | .10 | .25 | .50 | .75 | .90 | .95 |
|---|---|---|---|---|---|---|---|---|---|---|
| 79 | 810 | 41 | 2.372 | 0.59 | 0.60 | 1.00 | 1.50 | 2.70 | 6.28 | 7.33 |

### Time required to start a business

| n | missing | unique | mean | .05 | .10 | .25 | .50 | .75 | .90 | .95 |
|---|---|---|---|---|---|---|---|---|---|---|
| 842 | 47 | 147 | 33.86 | 4.50 | 6.00 | 11.27 | 25.00 | 42.00 | 72.00 | 97.95 |

### Time spent dealing with the requirements of government regulations (% of senior management time)

| n | missing | unique | mean | .05 | .10 | .25 | .50 | .75 | .90 | .95 |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 811 | 60 | 8.428 | 1.10 | 1.77 | 2.50 | 5.20 | 11.67 | 20.32 | 26.08 |

### Time to pay and prepare taxes (hours)

| n | missing | unique | mean | .05 | .10 | .25 | .50 | .75 | .90 | .95 |
|---|---|---|---|---|---|---|---|---|---|---|
| 615 | 274 | 243 | 311.9 | 74.8 | 105.0 | 172.0 | 242.0 | 344.0 | 580.8 | 815.2 |

### Corruption Perceptions Index

| n | missing | unique | mean | .05 | .10 | .25 | .50 | .75 | .90 | .95 |
|---|---------|--------|------|-----|-----|-----|-----|-----|-----|-----|
| 878 | 11 | 86 | 4.296 | 1.9 | 2.1 | 2.6 | 3.5 | 5.7 | 8.2 | 8.9 |

Table 4 shows that the dataset consists of 889 observations of the variables used in the analysis for the years 2003, 2004, 2005, 2008, 2010, 2012 and 2014. What is interesting in the context of the dependent variables analyzed is the different number of observations that can be used for regression analysis. For example, time required to start a business has 842 observations and only 47 observations is missing. On the other hand, for the time spent dealing with the requirements of government regulations (% of senior management time) only 78 valid observations exists and there is no data for 811 observations. Thus, the valid amount of observations for the different variables varies a great deal. Nevertheless, although the number of observations could be higher for some variables, it is still sufficient for exploring the possible interactions between the variables in question. To continue, Table 4 also shows the mean values (for example for Corruption Perceptions Index it is 4.296). In addition, 5, 10, 25, 50, 75, 90, 95th percentiles are seen. To illustrate, in the case of the E-Government Development Index, half of the values are less than or equal to the score of 0.4833.

To continue, as mentioned in the Research design section, for assessing these possible interactions between the EGDI and different bureaucratic regulations, a multiple linear regression analysis is used.

Hypothesis 1 stated that the level of e-government is positively related to and significantly reduces the time needed to deal with bureaucratic regulations. The regression results for the EGDI and the time spent dealing with the requirements of government regulations (% of senior management time) when controlling for the corruption can be seen in Table 5.

**Table 5. Regression results for EGDI and time spent dealing with the requirements of government regulations (% of senior management time) when controlling for corruption.**

| Variable | Coefficient | Standard Error | t statistics | P value |
|---|---|---|---|---|
| EGDI | 4.2982 | 7.1378 | 0.602 | 0.548878 |
| Corruption | -1.2020 | 0.6973 | -1.724 | 0.088896 . |

Multiple R-squared:  0.04395

P-value for the regression as a whole: 0.1854

Note: *** $p \leq 0$, **$p \leq 0.001$, *$p \leq 0.01$, .$p \leq 0.05$

From the data, the coefficient for the requirements of government regulations (% of senior management time) is 4.2982. This implies that that an increase of 1% in the EGDI is associated with a 4.3% increase in the time spent with government regulations. Thus, it seems that higher e-government index on the contrary implies that more time is needed for senior managers to deal with government regulations. However, the R-square indicates that this model only accounts for 4.4% of variance in the time spent with the requirements of government officials. Still, the relatively large p-value of 0.185 implies that there is still a linkage between e-government level and time spent dealing with government regulations, however it is not correlated in the predicted direction.

**Figure 5. Linear regression model of EGDI and time spent dealing with the requirements of government regulations (% of senior management time) when controlling for corruption.**
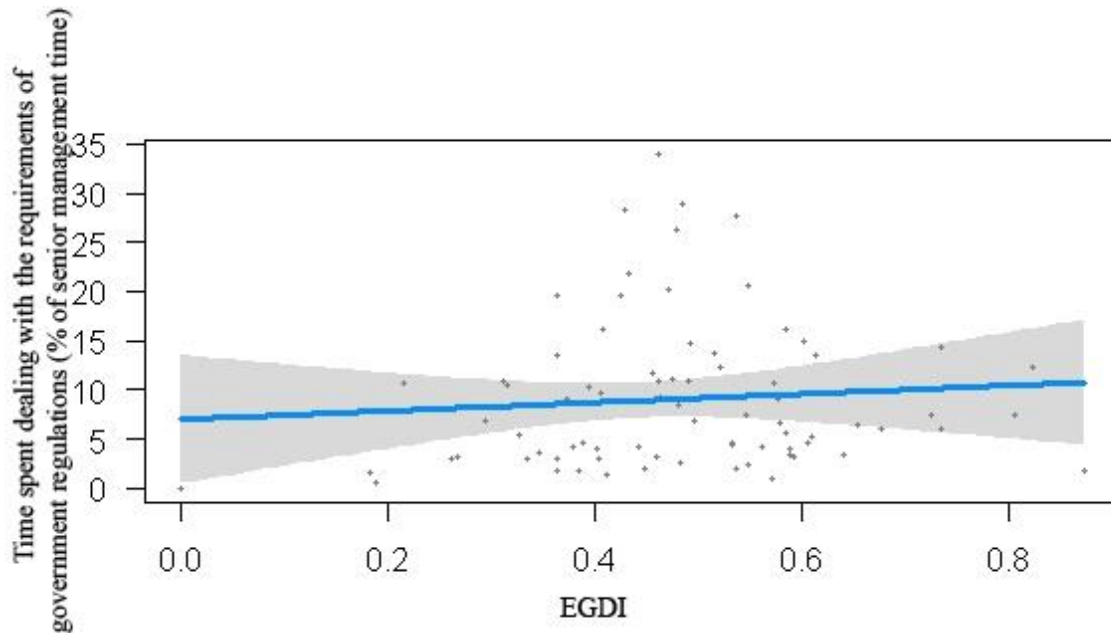


Source: own calculations based on E-Government Development Index, World Bank's Enterprise Survey, World Bank's Doing Business Index and Corruption Perceptions Index for years 2003, 2004, 2005, 2008, 2010, 2012, 2014.

When visualizing these interactions in Figure 5, it can still be seen that there exists no direct linear relationship between the two variables. It cannot be concluded that a larger EGDI implies less time will be spent on government regulations and vice-versa. Thus, Hypothesis 1 that stated the level of e-government is positively related to and significantly reduces the time need to deal with bureaucratic regulations can de declined.

To continue, Hypothesis 2 assumed that the level of e-government is positively related to and significantly reduces the time required to start a business. The regression results for the EGDI and the time it is required to start a business when controlling for the corruption can be seen in Table 6.

**Table 6. Regression results for EGDI and time required to start a business when controlling for corruption.**

| Variable | Coefficient | Standard Error | t statistics | P value |
|----------|-------------|----------------|--------------|---------|
| EGDI | -47.077 | 8.801 | -5.349 | 1.14e-07 *** |
| Corruption | -1.646 | 0.794 | -2.073 | 0.0385 * |
| Multiple R-squared: 0.1451 | | | | |
| P-value for the regression as a whole: < 2.2e-16 | | | | |

Note: *** p ≤ 0, **p ≤ 0.001, *p ≤ 0.01, .p ≤ 0.05

When analyzing the interactions between the time required to start a business and e-government level, then the regression analysis implies that here the relationship between these two variables is statistically significant compared to Hypothesis 1. From the coefficients it can be seen that an increase of 1% in EGDI is associated with a 47.7% decrease in the time required to start a business. Although the R-squared is 14.51%, it still implies that a strong relationship exists.

**Figure 6. Linear regression model of EGDI and time required to start a business when controlling for corruption.**
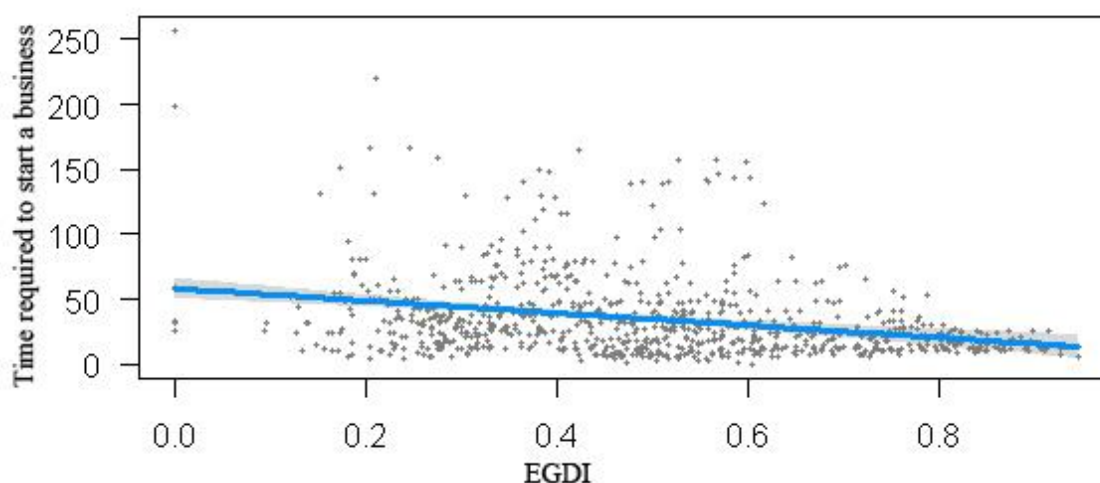


Source: own calculations based on E-Government Development Index, World Bank's Enterprise Survey, World Bank's Doing Business Index and Corruption Perceptions Index for years 2003, 2004, 2005, 2008, 2010, 2012, 2014.

First, when looking at the Figure 6, it can be seen that there is much more data available to analyze the relationship than there was in the case of Hypothesis 1, which assessed the interactions between the EGDI and the time spent on dealing with government regulations. The linear regression implies that an increase of the EGDI causes the time required to start a business to decrease. Thus, Hypothesis 2 that stated the level of e-government is positively related to and significantly reduces the time that is required to start a business can, in regard of this paper's research design, be accepted. However, it would be interesting to further research why the relationship becomes more linear when the EGDI increases.

To continue, Hypothesis 3 stated that the level of e-government is positively related and reduces the time needed to pay and prepare taxes and the number of visits required with tax officials. The regression results for the EGDI and time to pay and prepare taxes when controlling for corruption can be seen in Table 7.

**Table 7. Regression results for EGDI and the time to pay and prepare taxes when controlling for corruption.**

| Variable | Coefficient | Standard Error | t statistics | P value |
|---|---|---|---|---|
| EGDI | 265.77 | 94.89 | 2.801 | 0.00526 ** |
| Corruption | -61.85 | 8.52 | -7.259 | 1.2e-12 *** |

Multiple R-squared: 0.1132

P-value for the regression as a whole: $< 2.2e-16$

Note: *** $p \leq 0$, **$p \leq 0.001$, *$p \leq 0.01$, .$p \leq 0.05$

When looking at the coefficients, then an increase of 1% in EGDI is associated with an immense 265.77% increase in the time to pay and prepare taxes. However, the goodness-of fit measured by R-squared indicates that this model accounts only for 11.3% of variance in the time to pay and prepare taxes. Still, this model implies that there exist statistically significant coefficients in the model. Moreover, it also exists with the case of corruption.

34

**Figure 7. Linear regression model of EGDI and the time to pay and prepare taxes when controlling for corruption.**
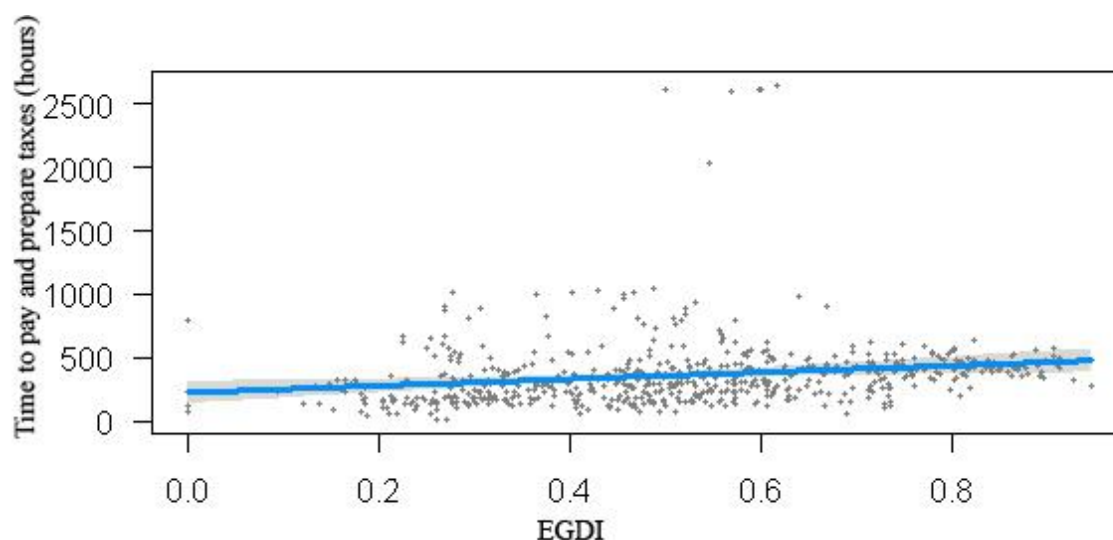


Source: own calculations based on E-Government Development Index, World Bank's Enterprise Survey, World Bank's Doing Business Index and Corruption Perceptions Index for years 2003, 2004, 2005, 2008, 2010, 2012, 2014.

Thus, Figure 7 implies that there exists a relationship between the EGDI and the time to pay and prepare taxes. However, interestingly, the linear function would suggest that the higher the EGDI, the more time is needed to pay and prepare taxes, which is in contrast to the assumptions of Hypothesis 3. This implies that Hypothesis 3, which states that the level of e-government is positively related to the time need to pay and prepare taxes, is false and rather, these variables have a negative relationship.

The regression results for the EGDI and number of visits or required meetings with tax officials, which addresses the second part of Hypothesis 3, can be seen in Table 8.

**Table 8. Regression results for EGDI and the number or visits required with tax officials when controlling for corruption.**

| Variable | Coefficient | Standard Error | t statistics | P value |
|----------|-------------|----------------|--------------|---------|
| EGDI | -4.5167 | 2.3057 | -1.959 | 0.0538 . |
| Corruption | -0.1301 | 0.2254 | -0.577 | 0.5653 |

Multiple R-squared: 0.1148

P-value for the regression as a whole: 0.009711

Note: *** $p \leq 0$, **$p \leq 0.001$, *$p \leq 0.01$, .$p \leq 0.05$

When looking at the coefficients, the coefficient -4.5167 is significantly different from 0. It indicates that an increase of 1% of EGDI is associated with about a 4.51% decrease in the number of visits or required meetings with tax officials. However, multiple R-squared that shows the goodness-of fit indicates that this model accounts only for 11.5% of the variance in the number of visits required with tax officials. Moreover, the p-value helps to determine the significance of the results of the model is 0.0097. This is a small p-value that indicates there is strong evidence against the hypothesis stated and other alternative explanations should be considered.

**Figure 8. Linear regression model of EGDI and the number of visits or meetings needed with tax officials when controlling for corruption.**
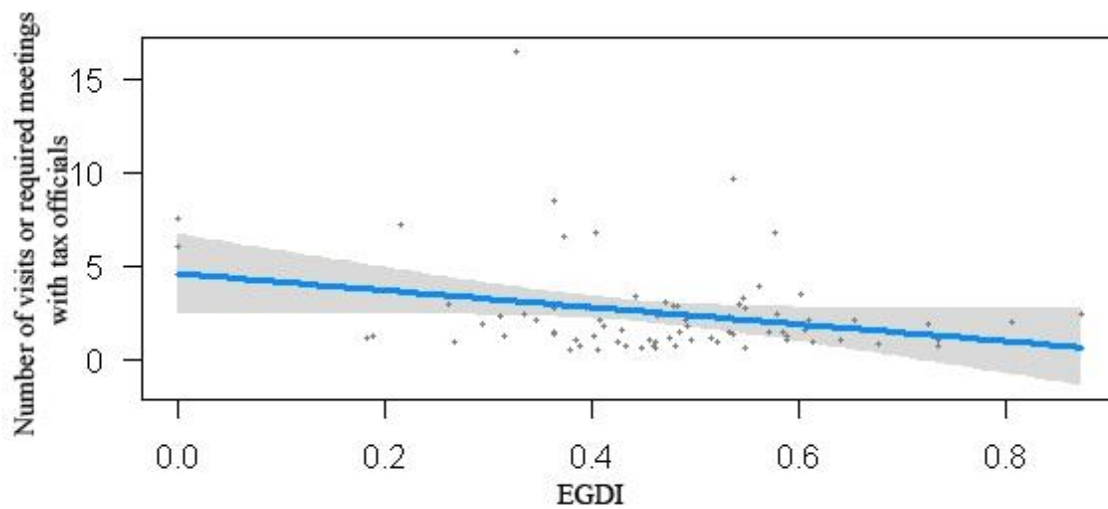
Source: own calculations based on E-Government Development Index, World Bank's Enterprise Survey, World Bank's Doing Business Index and Corruption Perceptions Index for years 2003, 2004, 2005, 2008, 2010, 2012, 2014.

From Figure 8 it can be seen that there exists no direct linear relationship between the EGDI and the number of visits or required meetings with tax officials. Based on the visualized regression results it can be seen that higher EGDI does not refer to lesser amount of visits with the tax officials. To continue, the second part of the Hypothesis 3 that assumed the level of e-government is positively linked to the number or visits required with tax officials can be declined.

Thus, in general the Hypothesis 3 that stated the level of e-government is positively related and reduces the time needed to pay and prepare taxes and the number or visits required with tax officials can be declined.

## 5. Summary

The results of the regression analysis confirm Misra's suggestions that one of the most direct impacts of e-government is the opportunity to start a business with reduced time (Misra, 2007: 4). Moreover, this result is affirmed by many empirical studies like the case study of Estonia, where it is possible to start a company because of its developed e-government service in less

than five minutes. In addition, another example would be Panama, where before the launch of e-government service PanamaEmprende entrepreneurs needed five days for starting a company but now the time is reduced to 15 minutes (Global Information Technology Report 2013). Interestingly, as Parambil's research and Malmö declaration stated, the higher level of e-government does not mean that the time spent dealing with the requirements of government regulations (% of senior management time) would be lower. This seems to be a typical example where a high level of e-government does not give the desired results like it was brought forth in the introduction with the example of Great Britain. In this sense, other explanations should be considered for the interaction of lesser extent of bureaucratic regulations that was in this hypothesis measured by the time spent dealing with the requirements of government regulations (% of senior management time). For example, one explanation that has been brought forth by Jing and Graham is that rather than e-government, the factor that has a strong influence on bureaucratic regulations is the culture. It is brought forth that relationship-oriented cultures are more regulated because of their higher values in regards of maintaining relationships (Jing and Graham, 2007: 13). Moreover, according to the authors, what can influence regulations are simple characteristics like cultural values regarding time (*ibid*). Thus, alternative explanations like culture, rather than e-government, should be further analyzed to understand what factors influence the time needed to spend with government regulations.

When looking back to the Figure 7, it can be seen that although the relationship between the time to pay and prepare taxes and EGDI is not clearly linear in all cases, the results are still immensely interesting. Although as mentioned in the literature review, Chatfield brought forth that besides creating e-Tax programs with the help of e-government means, what contributes to the e-Tax system success is strong leadership. In addition to this result, Hung et al. brought forth the low acceptance rates of e-tax services in Taiwan and US. However, the e-tax system is still considered to be one of the most noted services of e-government. Based on the literature, it could be assumed that e-government has less influence on the time to pay and prepare taxes but that the influence is rather opposite based on the regression analysis is a new puzzle we are faced with. One explanation for that, besides the aforementioned culture, could be how the tax systems themselves have developed throughout the years. For example, when the United States of America has a highly developed e-government (in 2014 it was ranked as the 7th highest in the EGDI) then on the other hand, according to the World Bank's Doing Business Index in 2005, 325 hours was needed in the US to pay and prepare taxes, which is

rather high for an country with highly developed e-government. For instance, every year Americans spend 6 billion hours in total to prepare their tax forms because of the complicated tax code that exists in the country (Burgess 2013). Thus, it may assume that one factor that influences the time needed to pay and prepare taxes is the structure of the tax system. It can be assumed that countries which have flat tax systems (e.g. Estonia, Latvia) have the opportunity to pay taxes with lesser amount of time because of structural reasons.

To continue, the findings of this research are interesting because Hypothesis 3 assumed that the level of e-government has the same influence on the time to pay and prepare taxes and number of visits required with tax officials. Although the number of available observations was different in both cases, then in the case of the time to pay and prepare taxes the relationship was opposite than assumed and in the case of number of visits needed with tax officials the relationship did not exist. What may influence this is that the World Bank's Doing Business Index only concluded to their statistics about the visits required with tax officials the figures that they could collect. If the amount of visits needed was 0, then it was not reflected in the statistics. This may be one factor that has distorted the results. On the other hand, the structure of the tax system may also be another factor of influence like it was assumed with the first part of Hypothesis 3.

## 5.1. Uncertainty of the findings and recommendations for future research

When using different indexes for assessing real life interactions and even if they are the best information available, still the issue of doubt remains how well do they describe these real life situations. Moreover, all four causal models that were constructed have a low R squared score, which means the model fit is significantly low. This means that there are other variables rather than the level of e-government and corruption that have a real and significant causal effect on the dependent variables in this model. In this sense, whereas here the control variable was taken as corruption as the assumed most important factor that may cause variance, future research could also try to expand the analysis by looking other factors that may have influence to these factors, e.g. state regime, wealth etc. In addition, in some cases the standard error of the model almost counted half of the value of the coefficient itself that added more uncertainty to the findings. In addition, outliers in the model (for example Table 5) could have disproportionate statistical effect on the regression results. Thus, to avoid these

shortcomings, one solution would be to increase the number of years in the analysis when more data is published in the future.

However, to complement the findings of this paper, future research could add another layer of analysis to this quantitative research design by using qualitative methods. For example, interpreting the puzzle why a high e-government level rather means that more time is needed to pay and prepare taxes not to the contrary that could be assumed. For assessing this, one possibility would be to conduct expert and elite interviews to get more depth in the topic and get deeper insights and justifications from professionals in its field. In addition, another possibility for the future research would use the same dataset that was composed for this research and also run same tests with different groups of countries. It would be interesting to know, to these relationships exist both for example in the case of the European Union and developing countries.

# Appendixes

## Appendix 1. 124 countries included in the sample.

Albania, Algeria, Angola, Armenia, Azerbaijan, Australia, Austria, Bahrain, Bangladesh, Belarus, Belgium, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Cameroon, Canada, Cape Verde, Côte d'Ivoire, Chile, China, Colombia, Congo, Costa Rica, Croatia, Czech Republic, Cuba, Cyprus, Denmark, Dominican Republic, Ecuador, El Salvador, Estonia, Ethiopia, Finland, France, Gambia, Georgia, Germany, Ghana, Greece, Guatemala, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Latvia, Lebanon, Libya, Lithuania, Luxembourg, Madagascar, Malawi, Malaysia, Mali, Mauritius, Mexico, Morocco, Mozambique, Myanmar, Namibia, Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Portugal, Qatar, Republic of Korea, Republic of Moldova, Romania, Russian Federation, Saudi Arabia, Senegal, Sierra Leone, Singapore, Slovakia, Slovenia, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Syrian Arab Republic, Zambia, Zimbabwe, Tajikistan, Thailand, The former Yugoslav Republic of Macedonia, Trinidad and Tobago, Tunisia, Turkey, Uganda,

Ukraine, United Arab Emirates, United Kingdom of Great Britain and Northern Ireland, United Republic of Tanzania, United States of America, Uzbekistan, Venezuela, Viet Nam, Yemen.

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