THE IMPACT OF E-GOVERNMENT ON ECONOMIC GROWTH IN GCC COUNTRIES

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Abstract

This study is the first to empirically examine the impact of e-government on economic growth in Gulf Cooperation Council countries. The dataset used in the study covers the period 2003-2018 and is obtained from the World Development Indicators and the United Nations E-Government knowledgebase. The conducted empirical analysis brings out many interesting findings. First, there is evidence that the e-government development stimulated economic growth in GCC during the last two decades. Second, when considering the different components of e-government, it has been shown that only the Online Service Index and the Telecommunication Infrastructure Index have positive effects on economic growth. Finally, it has been also revealed that out from six countries, the positive impact of e-government is proved in only four countries, namely Bahrain, Kuwait, Saudi Arabia and the United Arab Emirates. In Oman and Qatar, the effect is not statistically significant. Global and country-specific policy recommendations are accordingly presented.

Keywords: e-government, e-government development index, economic growth, gulf cooperation council

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Introduction and Background

During the last decades, significant achievements regarding technological progress have been reached. Although some disparities between developing and developed countries regarding the adoption of new technologies have been observed, a common trend toward increased use of these technologies has been recorded. It has been often advanced that the adoption of new technologies is of great importance since it facilitates the access to services for citizens, supports economic growth, and improves the well-being of nations. The adoption of new technologies has touched almost all economic sectors, such as industry, agriculture, and transportation.

One of the crucial features of the emergence of new technologies in modern societies is undoubtedly the adoption of electronic government (e-government). Indeed, the concept of e-government came out in the mid-nineties of the last century [1] and has been developed first in developed countries and then in developing ones. Since then, many definitions of e-government have been proposed. For example, the U.S. E-Government Act of 2002 defines e-government as “*the use by the Government of web-based Internet applications and other information technologies, combined with processes that implement these technologies*” [2].

The World Bank (2002) defines e-government as “*the use by government agencies of information technology tools, such as Wide Area Networks (WANs), the Internet, and mobile computing, that have the ability to transform relations with citizens, businesses, and other*

arms of government” [3] (World Bank, 2002, p. 2). Finally, the OECD [4] (defines e-government as “*the use of ICTs, and particularly the Internet, as a tool to achieve better government*” [4]. Although a significant number of definitions have emerged in the literature, there is no consensus on a precise definition of e-government [5].

Thanks to its advantages, e-government policies have been overgrowing during the last three decades. According to the United Nations E-Government Survey 2018, the average E-Government Development Index (EGDI) rises from 0.47 in 2014 to 0.55 in 2018. Moreover, 40 countries obtained a “very-high” EGDI score ranging between 0.75 and 1.00 in 2018, while there have been only 10 countries in 2003. The development of e-government and the availability of needed datasets have incited scholars to focus on many topics linked to e-government. Some of them studied the determinants of e-government implementation [6], [7], while others dealt with barriers and challenges to the expansion of e-government [8], [9] and finally the economic and societal effects of e-government [10], [11], [12].

This paper aims to study the effect of e-government on economic development in six Gulf Cooperation Council countries between 2003 and 2018. It is motivated by the fact that these countries have implemented e-government services since many years ago and also driven by the lack of empirical researches focusing on the response of economic growth to e-government development. For example, Saudi Arabia jumped from the 105th rank in 2003 to the 44th out of 193 nations included in the 2018 United Nations E-Government Survey.

During the same year, good results have also been achieved by the United Arab Emirates (21st) and Bahrain (26th). The study conducts an empirical exploration using data obtained from the World Development Indicators produced by the World Bank and the UN E-Government Knowledgebase produced by the United Nations Department of Economic and Social Affairs (Division for Public Institutions and Digital Government).

The remainder of this paper is organized as follows. In Section 2, we review the related literature. Section 3 is dedicated to the presentation of model and data, while in Section 4, we interpret empirical results. The conclusion is developed in Section 5.

Literature Survey

While the literature on the economic outcomes of e-government is relatively recent, the economic theory has attributed an essential role to the technological progress as a determinant of economic development. Indeed, e-government may affect economic development through many channels. First, the set up and development of e-government may reduce the time to generate and deliver services to citizens [13]. As a result, e-government may reduce the cost of public services and administrative burdens. According to Gustova [14], the cost reduction induced by the use of e-government is due to three main reasons, namely savings in labor costs, savings in service delivery, and savings in electronic invoicing. Second, Thanh and Kim [15] point out that the e-government strategy makes the efficiency and effectiveness of public services better. Regarding this point, Von Haldenwang [16] states that e-government allows more internal and production efficiency of the public sector. By doing so, e-government may lead to less bureaucracy in public services [17], [18]. Third, e-government may reduce corruption and improve transparency in the public sector and then encourage business [19], [20]. This is done through the possibility of accessing to the public information by citizens [14]. The reduction of corruption will exert a positive effect on the economic progress, as stated by many authors, such as Ahmad *et al.*, [21] and Hassan [22].

Srivastava and Panigrahi [12] conducted an empirical analysis on the outcomes of e-government and e-business on per capita gross domestic product in a sample composed of 145 countries. The authors show that e-business exerts a positive impact in developed countries, while e-government positively affects growth in developing countries. Majeed and Malik [11]

analyzed the linkages between financial development, growth and e-government in 147 economies and concluded that e-government significantly boosts economic growth.

Moreover, e-government is an essential prerequisite for the success of financial development in boosting economic progress. Chaushi *et al.*, [23] studied the reaction of economic growth to e-government in a large number of countries between 2003 and 2014.

The growth model has been estimated using the fixed effects model, Hausman-Taylor technique and the difference Generalized Method of Moments technique. Results show the presence of positive outcomes of e-government on economic development.

Gustova [14] studies the effects of e-government on GDP in 34 European countries. The author showed that e-government had been associated with higher economic growth between 2003 and 2014. Hassan [22] studied the linkage between corruption, e-government, the environment, and economic growth in 11 Asian economies between 2003 and 2013. The most important finding of the study is that e-government participated in boosting economic growth and fighting corruption in the studied countries. These results have been confirmed by those of Majeed and Shah [20] who explore the outcome of e-government on economic progress in 34 Asian countries. Using a wide range of estimation techniques, the authors confirm the importance of e-government in stimulating growth in the studied countries. Bahrini and Qaffas [24] examine the effects of Information and Communication Technology (ICT) on development growth in a sample composed of the Middle East and North Africa (MENA) countries and Sub-Saharan Africa (SSA) countries. Various indicators of ICT adoption have been used, such as broadband adoption, internet usage and mobile phones. Results show that all indicators, except fixed telephone, positively affect economic development. Besides, the effect is smaller in Sub-Saharan African countries than MENA countries.

Research Methodology and Data

Research Methodology

The paper aims to analyze the impact of e-government on economic growth in 6 Gulf Cooperation Council countries, namely the United Arab Emirates, Kuwait, Qatar, Saudi Arabia, Oman and Bahrain during the period 2003-2018. The following model will be estimated:

$$GDPPC = \omega + \alpha EGOV + \beta X + \varepsilon \quad (1)$$

GDPPC is the per capita gross domestic product, ω is a constant, *EGOV* is the e-government indicator, *X* represents control variables (labor '*L*' and capital '*K*'). The research methodology of the paper is summarized in Figure 1.

Fig. 1. The research methodology

Data

Two sources of data are employed. First, the e-government indicators are from the UN E-Government Knowledgebase produced by the Division for Public Institutions and Digital Government of the United Nations Department of Economic and Social Affairs.

Table 1. Definition of e-government indicators

Abbreviation	Indicator	Construction
EGDI	E-Government Development Index	EGDI = 1/3 (OSI+HCI+TTI)
TTI	Telecommunication Infrastructure Index	1. Internet users per 100 inhabitants
		2. Number of main fixed telephone lines per 100
		3. Number of mobile subscribers per 100 inhabitants
		4. Number of wireless broadband subscriptions per 100 inhabitants
		5. Number of fixed broadband subscriptions per 100 inhabitants
HCI	Human Capital Index	1. Adult literacy rate
		2. Tertiary, secondary and primary gross enrolment
		3. Expected years of schooling
		4. Average years of schooling
OSI	Online Service Index	Scope and quality of online services

Source: [26]

The dataset contains a global e-government indicator (E-Government Development Index, EGDI). It is the average of the three indices, namely the Telecommunication Infrastructure Index (TTI), the Online Service Index (OSI), and the Human Capital Index (HCI). Table 1 below gives an idea on the construction of the e-government indicators. The second source of data is the World Development Indicators of the World Bank. From this dataset, we obtained the per capita GDP, investment, and employment. A big progress in the implementation and development of e-government in almost all GCC countries has been recorded during the period 2003-2018. Scores obtained by all countries are very high since they ranged between 0.8 and 1 (the maximum) in 2018. The United Arab Emirates have the highest score for the global E-Government Development Index (0.829), the Telecommunication Infrastructure Index (0.856) and the Online Services Index (0.944) in 2018, while Saudi Arabia obtained the highest Human Capital Index (0.81) during the same year. In Table 2, some descriptive statistics of variables are presented. The average EGDI during the whole period is relatively low (0.58598) with a maximum of 0.82950. The EGDI was low in the 2000s and started to grow to reach high levels in 2018. The OSI has the highest score with 0.9444 recorded in the United Arab Emirates in 2018.

Table 2. Descriptive statistics

	Mean	Maximum	Minimum	Std. Dev.
<i>GDPPC</i>	10.3380	11.1516	9.65911	0.48989
<i>EGDI</i>	0.58598	0.82950	0.28841	0.12613
<i>OSI</i>	0.55729	0.94440	0.05019	0.22737
<i>TTI</i>	0.43279	0.85640	0.11928	0.18782
<i>HCI</i>	0.76859	0.89326	0.66240	0.06440
<i>K</i>	24.1692	26.0909	21.8228	1.15683
<i>L</i>	14.4330	16.3604	12.6645	1.01595

Note: GDPPC, K and L are taken in natural logarithm

Regression Results

The Impact of the E-Government Development Index (All Countries)

Table 3 reports the effects of the E-Government Development Index on gross domestic product. Results show that the coefficient is positive and significant at the 99 % likelihood, which means that the coefficient is highly significant.

Table 3. The effects of the E-Government Development Index (All countries)

	Coefficient	Std. Error	Sig.
Constant	11.50590***	0.775272	0.000
E-Government Development Index	0.457584***	0.164884	0.007
Investment	0.160081***	0.044351	0.001
Employment	-0.369167***	0.056965	0.000
R-squared	0.3870		

Note: * significance with 90% likelihood; ** significance with 95% likelihood; *** significance with 99% likelihood

Consequently, we conclude that there is a positive connection between e-government and economic growth in GCC countries as a whole between 2003 and 2018. These results are expected since GCC countries made significant efforts during the last two decades to develop their e-government infrastructure. This is materialized by the improvement of their rankings according to the United Nations E-Government Survey 2018. These findings are in line with those of Majeed and Malik [11], Chaushi *et al.*, [23], and Gustova [14] who report the importance of e-government in boosting economic growth.

Moreover, our results corroborate those of Hodrab [25] who concludes that economic growth in some Arab countries. Table 3 also indicates that investment has a positive effect economic development in GCC, while employment represents an obstacle to the improvement of growth. Coefficients are significant at 1% level. Finally, the R-squared is about 0.39, meaning that the selected variables explain 39% of economic growth in GCC countries, which is relatively acceptable.

The Impact of Components of the E-Government Development Index (All Countries)

While the overall impact of the E-Government Development Index on economic growth is positive, nothing can be said about the impact of the different components of the global index.

The purpose of this section is to estimate the impact of the three components of the E-Government Development Index, namely the Online Service Index, the Telecommunication Infrastructure Index, and the Human Capital Index. Results are summarized in Table 4.

Results show that coefficients of the Online Service Index and the Telecommunication Infrastructure Index are positive and statistically significant in the group of GCC. While the coefficient of the Online Service Index is highly significant (1%), the coefficient of the Telecommunication Infrastructure Index is less significant (10%). Besides, the coefficient of the Online Service Index (0.248103) is more significant than the coefficient of the Telecommunication Infrastructure Index (0.179525).

Table 4. The effect of components of the E-Government Development Index (All countries)

	Coefficient	Std. Error	Sig.
Constant	11.64791***	0.72076	0.000
Online Service Index	0.248103***	0.072861	0.001
Investment	0.160307***	0.042771	0.001
Employment	-0.370519***	0.05396	0.000
R-squared	0.4166		

	Coefficient	Std. Error	Sig.
Constant	10.68732***	0.683629	0.000
Telecommunication Infrastructure Index	0.179525*	0.098287	0.072
Investment	0.190120***	0.044005	0.000
Employment	-0.349536***	0.059566	0.000
R-squared	0.3500		
	Coefficient	Std. Error	Sig.
Constant	10.33433***	0.550132	0.000
Human Capital Index	-0.506271***	0.188657	0.009
Investment	0.22767***	0.044708	0.000
Employment	-0.355720***	0.055364	0.000
R-squared	0.3830		

Note: * significance with 90% likelihood; ** significance with 95% likelihood; *** significance with 99%

Consequently, we conclude that there is a positive connection between e-government and economic growth in GCC countries as a whole between 2003 and 2018. These results are expected since GCC countries made significant efforts during the last two decades to develop their e-government infrastructure. This is materialized by the improvement of their rankings according to the United Nations E-Government Survey 2018. These findings are in line with those of Majeed and Malik [11], Chaushi *et al.*, [23] and Gustova [14] who report the importance of e-government in boosting economic growth. Moreover, our results corroborate those of Hodrab (2016) who concludes that economic growth in some Arab countries. Table 3 also indicates that investment has a positive effect economic development in GCC, while employment represents an obstacle to the improvement of growth. Coefficients are significant at 1% level. Finally, the R-squared is about 0.39, meaning that the selected variables explain 39% of economic growth in GCC countries, which is relatively acceptable.

The Impact of the E-Government Development Index (For Each Country)

We now estimate the impact of the E-Government Development Index for each country.

Table 5 summarizes the regression results. As shown, the coefficient of the E-Government Development Index is positive and statistically significant in four countries: Bahrain, Kuwait, the United Arab Emirates and Saudi Arabia. Coefficients are significant at 1% in Bahrain, the United Arab Emirates and Saudi Arabia, while it is significant at 10% in Kuwait. These findings reveal that the adoption and development of e-government services in these 4 Gulf Cooperation Council countries positively affected economic growth starting from 2003. The highest coefficient is found in United Arab Emirates (0.97567) and Saudi Arabia (0.67860).

Table 5. The effects of the E-Government Development Index (Each country)

	Coefficient	Std. Error	Sig.
Bahrain			
Constant	11.49022***	0.54867	0.0000
E-Government Development Index	0.60402***	0.13830	0.0011
Investment	0.14899***	0.03789	0.0023
Employment	-0.39872***	0.08089	0.0005
R-squared	0.6184		
Kuwait			
Constant	24.05320***	1.98356	0.0003
E-Government Development Index	0.67728*	0.26230	0.0612
Investment	-0.57825***	0.06798	0.0010
Employment	-0.00848	0.08375	0.9242
R-squared	0.9749		

Oman			
Constant	10.94771***	1.16478	0.0000
E-Government Development Index	0.21947	0.29006	0.4652
Investment	0.07375**	0.03246	0.0442
Employment	-0.21426***	0.06705	0.0085
R-squared	0.6594		
Saudi Arabia			
Constant	12.17422***	1.62593	0.0000
E-Government Development Index	0.67860***	0.19709	0.0049
Investment	-0.00921	0.02505	0.7195
Employment	-0.15066	0.09246	0.1292
R-squared	0.8966		
Qatar			
Constant	10.02984***	0.50107	0.0000
E-Government Development Index	-0.32576	0.19406	0.1214
Investment	0.01876	0.03900	0.6399
Employment	0.05671	0.05445	0.3200
R-squared	0.3214		
United Arab Emirates			
Constant	17.01272***	1.69608	0.0000
E-Government Development Index	0.97567***	0.22036	0.0010
Investment	0.17968	0.10225	0.1066
Employment	-0.75149***	0.07939	0.0000
R-squared	0.9441		

Note: * significance with 90% likelihood; ** significance with 95 % likelihood; *** significance with 99%

These findings are expected since the four countries recorded good ranks in the United Nations E-Government Survey 2018: 21 for United Arab Emirates, 26 for Bahrain, 41 for Kuwait and 52 for Saudi Arabia. R-squared are also relatively high (ranging from 0.6184 in Bahrain to 0.9749 in Kuwait) and show that the independent variables well explain economic growth in GCC. Regarding Oman and Qatar, the regression results show that the coefficients are not statistically significant since p-values are higher than 10% (0.4652 for Oman and 0.1214 for Qatar). These results suggest the adoption of e-government policies did not exert effects on economic development in these two countries during the last two decades. Indeed, Oman and Qatar recorded the lowest E-Government Development Index during previous decades. It seems that more efforts should be made in these two countries in terms of e-government implementation and development so that it will enhance economic growth in the future. R-squared is relatively low in these two countries (compared to other countries), especially in Qatar (0.3214), meaning that there are other variables that explain better economic growth.

Conclusions

During the last decades, GCC countries have adopted many structural reforms to support economic development and enhance well-being. One of the reforms that have been paid considerable attention since the 1990s is the implementation of e-government services. This study aims to examine the outcomes of e-government on economic development in six GCC countries. To the best of our knowledge, it is the first and only research that conducts an empirical examination of the economic effects of e-government in GCC countries. The study is based on data covering the period 2003-2018 and extracted from the World Development Indicators (World Bank) and the UN E-Government Knowledgebase (United Nations). Our empirical strategy consists of estimating: i) the impact of the global E-Government

Development Index on economic growth in the overall sample; ii) the impact of the E-Government Development Index components (Online Service Index, Telecommunication Infrastructure Index, and Human Capital Index) on economic growth, and iii) the impact of the global E-Government Development Index on economic development in each country.

The empirical study shows interesting results. First, it has been found that the E-Government Development Index positively affects economic growth in the overall sample. In other words, efforts made to implement e-government services in GCC countries have stimulated economic progress in those nations during the last two decades. Second, when considering the three sub-indices of the E-Government Development Index in the full sample of countries, results show that the Telecommunication Infrastructure Index and Online Service Index have positive effects on economic growth, while the effect of the Human Capital Index is negative and significant. It has also been shown that the effect of the Online Service Index is higher than the one associated with the Telecommunication Infrastructure Index. Third, when conducting a country-by-country analysis, we conclude that the E-Government Development Index stimulates economic growth only in four countries out from six. Countries in which economic growth responds positively to e-government are Saudi Arabia, Kuwait, the United Arab Emirates and Bahrain. Among these four countries, the highest impact is found in United Arab Emirates. These results are as expected since United Arab Emirates are the best performer in terms of e-government development among the six GCC countries, as discussed earlier. In Oman and Qatar, the outcomes of e-government are not significant.

As policy recommendations, additional efforts should be made to develop more the human capital in GCC countries, since our estimations show the presence of a negative impact on economic growth. Actions may be particularly related to the adoption of information and telecommunication technologies. Furthermore, Qatar and Oman should improve more their infrastructure and online services because e-government as it nowadays seems to not stimulate economic development in these two countries. Finally, it is also vital to implement suitable laws and regulations to encourage the development e-government by policymakers and the use of e-government by citizens.

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