

E-GOVERNMENT, FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH

Muhammad Tariq MAJEED* and Amina MALIK**

The growing importance of e-government and financial development has captured the attention of policy makers who are determined to enhance the per capita income of a country. This study aims to present new findings of the impacts of e-government and financial development on economic growth, using a cross sectional multi-year average dataset of 147 economies across the globe. To the best of the knowledge of authors, this is the first empirical research work which determines relationship between the economic growth and e-government, with particular focus on the role of financial development in shaping this relationship. The possible problem of endogeneity using both the internal and external instruments is also addressed in this study. Empirical findings suggest that growth impact of e-government is positive and significant while the direct growth impact of financial development turns out to be insignificant. However, the positive impact of financial development is explained thorough implementation of e-government as interactive term of financial development and the e-government which turns out to be positive and significant in all regressions. Findings of this study are not sensitive to control additional variables. The study concludes that economies of the world can significantly benefit from financial development if satisfactory quality of e-government can be assured.

I. Introduction

E-government is a concept of practicing tools and infrastructure of information and communication technology (ICT)¹ in public administration, authorizing citizens, ameliorating the provision of public sector services, boosting transparency, and upgrading the efficiency of public policy. The UNDP (2006) defines e-government as a government which adopts the tools of ICT infrastructure in order to share information and provide service to masses of people, more efficiently.

The growing importance of financial development on economic prosperity of a country has been generally underscored in many studies [Schumpeter (1911), Gurley and Shaw (1960), McKinnon (1973), and Shaw (1973)]. The financial development influences the economic growth in presence of strong electronic government because it employs tools of ICT for rapid and efficient delivery of its services. Levine (1997) highlights two channels due to which financial development can lift the economic prosperity: one is the capital accumulation and other is the technological progress; where, the second channel stimulates the e-government through dispersal of ICT infrastructure.

* School of Economics, Quaid-i-Azam. University, ** State Bank of Pakistan, Islamabad, Pakistan.

¹ The term ICT refers to the information and communication technology, whereas e-government refers to online availability of government that hires services of ICT tools for delivery of its responsibilities towards citizens, businessmen, and stakeholders.

E-government facilitates financial development by mitigating the market frictions, transactional cost, information cost, and market information. It ease project financing and directs financial resources from surplus to deficit sectors through dissemination of information. E-government lowers friction in smooth financing of projects which might halt development activities, by disclosure of information and facilitating interaction between the borrowers and lenders. There are few studies in literature which have explored the impacts of ICT and financial development on economic growth [Sassi and Goaiad (2013), and Andrianaivo and Kpodar 2011)]. Nevertheless, these studies have ignored the role and importance of e-government in determining the economic growth.

Claessens, et al. (2002) stated that electronic financing, use of telecommunication technology, and the online services in financial transaction have rapidly increased in recent years. E-financing has radically changed the nature of financial services across the world.² E-government promotes financial development due to e-financing, online availability of public administration, and contribute significantly to economic growth [Andrianaivo and Kpodar (2011), Shamim (2007), Sassi and Goaiad (2013)].

The literature on financial development is rooted from the work of Schumpeter (1911). Many researchers have mainly emphasized on development of banking sector as a regulator of economic development by assuring efficient allocation of financial resources, shifting financial capital from surplus to deficit, enhancing technological progress and ameliorating the efficiency of financial resources [Gurley and Shaw (1960), McKinnon (1973), and Shaw (1973)]. The positive relationship between economic growth and financial development is supported by many researchers [Arestis, et al. (2001)] and long-run relationship has also been advocated in many studies [Hondroyannis, et al. (2005) and Van Nieuwerburgh (2006)]. There are various studies which have doubted the positive association between financial development and growth because this relationship depends on particular situation prevailing in a country [Gregorio and Guidotti (1992), Fernandez and Galetovic (1994), Favara (2003), Ben Naceur and Ghazouani (2007)]. There are few studies which have empirically conducted the research on macroeconomic effects of e-government. In theoretical literature the positive effects of e-government on economic prosperity of a country has been discussed but the empirical studies on e-government are missing. In this study, we explore whether or not the growth impact of financial development depends on the quality of e-government of an economy.

The paper is arranged as follows: Section II enunciates the literature on financial development, e-government, and the economic growth and Section III discusses the framework of the model. Section IV presents data description and statistical analysis of dataset, where as, Section V presents the empirical results and interpretation. Finally Section VI concludes the results and offers policy implications.

² E-government is a broader term that refers to the use of ICT tools in all government sectors, whereas, e-financing refers to the use of ICT tools, merely in financial transactions.

II. Review of Literature

1. *E-Government and Growth Nexus*

E-government refers to implementations of ICT in public sector, planning and administration [Von (2004)]. In other words, the provision of rapid, convenient, efficient, and transparent services by the public sector through information technology is named as e-government [Tandon (2005), and Chen et al. (2009)]. The theoretical literature advocates a positive relationship between e-government and economic development. E-government helps to tap the actual potential of an economy by diffusion of knowledge and information.

Krishnan and Teo (2013) conducted an empirical research on environmental degradation, corruption, and e-government using Structural Equation Modeling (SEM) for a cross sectional data on 105 countries from 2004 to 2008. They found a significant effect of e-government on growth through environmental degradation and corruption. Czernich, et al. (2011) empirically explored the broadband-growth nexus for OECD countries for the years 1996 to 2007. Findings of their study support positive relationship between the broadband and economic growth.

Choi and Yi (2009) studied empirical relationship between growth and internet of 217 countries for the period 1991 to 2000. Finding of the study shows that increase in internet subscription boosts economic growth by about 0.05 per cent. Internet is a component of e-government and facilitates online availability of public administration that contributes in economic growth by mitigating information cost and disseminating information. Software development has captured the attention of policy makers as it has a significant contribution in information technology industry. Summers (1999) sheds light on importance of information technology in contributing economic development of a country. The study, mainly focus on software development which contribute significantly to upsurge the economic performance of a country.

Mahyideen, et al. (2012) examine the contribution of ICT in economic prosperity of ASEAN countries by employing heterogeneous co-integration techniques over the period 1976 to 2010 and finds that ICT improves marginal productivity of inputs and increases economic growth. Their empirical findings confirm a long-run relationship between the ICT and economic growth.

2. *Financial Development and Economic Growth Nexus*

Hondroyannis, et al. (2005), empirically examined the long-run relationship between the financial development and economic growth in Greece during 1986 to 1999, by employing VAR model. The empirical findings supported the long-run relationship between financial development and economic development in Greece. Van (2006) Ref.2004 also analysed the long-run causal relationship between growth and finance in Belgium and showed that financial development has driven the economic growth

during 1873 to 1914. Arestis, et al. (2001) investigated the role of stock market and banks' development on economic growth of a country, using a sample of five developed economies. Empirical results of their study showed that banks' development has more contribution to economic growth of a country than the stock market.

Huang and Lin (2009) explored the contribution of financial development in economic growth by employing the instrumental variables techniques. The results of their study inferred the relationship between growth and financial development which is stronger in developing countries, than the developed countries. Leitaó (2010), empirically investigated the links between the financial development and economic growth for European Union and the BRIC (Brazil, Russia, India, and China) countries, from 1980 to 2006. The results postulated that financial development drives economic growth in the European and BRIC countries.

Hnatkovska and Loayza (2003), empirically found the negative relationship between volatility in liquidity due to financial integration and economic growth. To find the volatility-growth nexus, cross country data was taken. The authors infer that negative relationship between volatility and growth dominates, when institutions are weak and less developed. Ram (1999), empirically confirmed that relationship between finance and economic growth is not general. It was proposed that financial development influence the economic growth positively, only in 9 countries, whereas in the sub-sample of 16 countries, the relationship was negative. Luintel and Khan (1999) analyzed the financial development-growth nexus for 9 countries and illustrated that financial development has positive effect on economic growth only in 2 countries, whereas it was negative in the remaining countries.

Favara (2003) studied the relationship between finance and growth in 87 countries across the world. Two measures of financial development were taken: one, the banks' liquidity and second the credit provided to private sector. The results contradict the robustness of positive association between financial development and economic growth. The author proposed that positive relationship between financial development and growth is not general but heterogeneous in different regions.

3. E-Government and Financial Development

Andrianaivo and Kpodar (2011), empirically examined the contribution of ICT infrastructure in financial inclusion for 44 African countries from 1988 to 2007. It was found that the impact of ICT on economic growth was facilitated by financial inclusion, rural development, capital accumulation, and efficient markets. Shamim (2007), empirically investigated the relationship between financial development, ICT, and economic growth using a system panel data for 61 countries from 1990 to 2001. The study found that financial system equipped with telecommunication infrastructure bolster the economic growth due to low information and data processing cost, absence of asymmetric information, and interaction between lenders and borrowers.

Sassi and Goaid (2013), empirically explored the interactive impact of ICT and financial development on economic growth. The analysis was conducted for 17 countries of MENA region for the period 1960 to 2009. Results of their study support the positive effects of ICT on growth and negative effect of financial development on economic growth. Their interactive impact turns out to be positive. Claessens, et al. (2002) enunciated the importance of e-financing in economic development. E-financing assures the efficiency of economy through cheap access to information, credit, and loan. The author stated that countries with well developed electronic based financial system, tends to grow rapidly than the countries having poor e-financing system. Due to e-financing, all people are able to access credit and financial resources which discourage the income inequality.

The financial development and growth nexus was studied by many researchers in the past; but they failed to reach any consensus on positive relationship between financial development and the economic growth. The literature, mainly focus on ICT while relating to the economic growth with financial development. To the best of the knowledge of authors of present study, there is not a single study in the literature that has taken into account the e-government, while addressing the financial development and economic growth nexus. The rising importance of e-government has opened an avenue of research on e-government and its consequences on macroeconomic variables. This study explores the impact of financial development on economic growth in the presence of e-government.

III. Model Framework

A macroeconomic model given by Mankiw, Romer and Weil (1992) is followed in this study.

$$y = f(A, k, n, h)$$

$$y_i = \beta_0 + \beta_1 A_i + \beta_2 k_i + \beta_3 n_i + \beta_4 h_i + e_i \quad (1)$$

where, y is per capita income, A refers to the state of technology, k is physical capital, n is work force, and h refers to human capital. Following Barrow (1998), initial level of per capita income is introduced as independent variables to control the convergence effects.³

$$y_i = \beta_0 + \beta_1 A_i + \beta_2 y_{initial,i} + \beta_3 k_i + \beta_4 n_i + \beta_5 h_i + e_i \quad (2)$$

The state of technology also explains the divergence amongst income of countries. The technological progress has been proxied by different factors, such as, information

³ Poor countries are likely to capture the income of rich countries due to high marginal productivity of capital. The sign of initial per capital will be positive, provided the countries are developing and under-developed; whereas, positive in the case of developed countries.

technology [Clarke and Wallsten (2006), Meijers (2014), Noh and Yoo (2008)], information and communication technologies [Sassi and Goaid (2013), Oliner, et al. (2008)]. However, the authors of the present study have proxied the technology by e-government which is a wider measure of technological progress. It covers wide range of ICT infrastructure and skilled human capital that can operate the e-government. The quality of e-government does not merely explain the state of technology in a country but also explains the state of implementation and adoption of the technologies. Equation (2) can be written as:

$$y_i = \beta_0 + \beta_1 Egovernment_i + \beta_2 y_{initial,i} + \beta_3 k_i + \beta_4 n_i + \beta_5 h_i + e_i \quad (3)$$

The rising importance of financial development captured the attention of policy makers who are determined to promote the economic development of a country. The idea of introducing financial development in regression is based on the same concept.

$$y_i = \beta_0 + \beta_1 y_{initial,i} + \beta_2 Egovernment_i + \beta_3 k_i + \beta_4 n_i + \beta_5 HC_i + \beta_6 FD_i + e_i \quad (4)$$

The theoretical literature on e-government has underscored its positive contribution on economic growth. It is likely that impact of increase in quality of e-government may be different provided there is a difference in financial development in the countries. This idea can be expressed by introducing the interactive terms of ($Egovernment_i \times FD_i$) on right side of the linear production function.

$$y_i = \beta_0 + \beta_1 y_{initial,i} + \beta_2 Egovernment_i + \beta_3 k_i + \beta_4 n_i + \beta_5 h_i + \beta_6 FD_i + \beta_{26} Egovernment_i \times FD_i + \beta_8 Z_i + e_i \quad (5)$$

where, FD refers to financial development, e is an error term and Z is a vector of control variables. The impact of change in financial development on economic growth can be different, provided there are differences in e-government quality. The direct impact of financial development on economic growth is measured by coefficient β_6 , whereas, the net marginal impact of financial development in relationship to e-government will also depend on coefficient β_{26} .

$$\frac{\partial y_i}{\partial FD_i} = \beta_6 + \beta_{26} Egovernment_i \quad (6)$$

The presence of financial development and interactive term of e-government and financial development will scrupulously explore the impact of financial development on economic growth in the presence of e-government. The exclusive effect

of e-government on economic growth is represented by β_2 of interactive term which is omitted. The net marginal impact of e-government on growth will also depend on the coefficient β_{26} .

$$\frac{\partial y_i}{\partial E_{government}_i} = \beta_2 + \beta_{26} FD_i \quad (7)$$

The net marginal impact of e-government on growth is not constant but depends on financial development. Similarly, the net marginal impact of financial development on economic growth is also not constant and depends on e-government.⁴

IV. Data Description and Statistical Analysis

The data taken from the World Development Indicators and e-government Development Index was provided by the World Bank and the United Nations. The multi-year average of data ranged from 2003 to 2012. The data of e-government was extracted from the E-governance Development Index (EGDI). E-government data refers to the online availability of government and the web connections to deliver its services. E-government index is the weighted average of three indexes, that is, web connectivity, telecom infrastructure, and skilled labor. All components were given equal weights of 0.33. Data ranging from zero to one refers, worst to best quality of the e-government.

Economic growth is measured by per capita income (2005 constant Dollar). Financial development index is generated by taking the principal components analysis of total credit, provided to private sector by financial market and by the banks. Workforce is proxied by labor provided by people of age ranging 15 to 60 years. Capital stock measures the fixed capital formation in percentage of GDP; human capital measures the enrollment in secondary school (gross); and the trade measures the total trade (export plus imports), as percentage of GDP. The initial income which addresses the convergence hypothesis is proxied by per capita income in 1990 (2005 constant US\$).

Table 1 gives the summary statistics of dataset. Denmark has the best quality of e-government, whereas the Niger has the worst. The credit provided to private sector by the financial sector is highest in Japan and lowest in Equatorial Guinea. The 148.7 US\$ Luxembourg has the highest per capita income, whereas, Burundi has the lowest.

⁴ It is noteworthy that β_2 is a slope coefficient of e-government and capture the effect of e-government on economic growth when $FD=0$; similarly, β_6 is a slope coefficient of FD if $e\text{-government}=0$. If β_{26} is not equal to zero, then it indicates that the effect of e-government on growth depends on financial development, and the effect of financial development on growth depends on e-government. In presence of the interactive term, it is meaningless to interpret the exclusive coefficients of e-government and financial development because their impact on growth is not constant but endogenous.

TABLE 1

Summary Statistics of Data

Variable	Observation	Mean	Std. Dev.	Min	Max
Y	147	10236.79	15088.87	148.7533	80924.27
Y _{initial}	147	8221.263	13899.56	141.3696	109705
Capital	147	23.4887	7.512512	9.85652	68.78322
Labor	147	63.29	9.697958	41.42	86.63
HC	147	76.3208	28.36609	11.7616	135.829
E-government	147	0.44781	0.18921	0.08738	0.87
Online_Service	147	0.72186	0.185519	0.20911	0.98432
Telecom_Infras	147	0.22639	0.216321	0.00478	0.77418
Inflation	147	212.8189	0.510817	61.9757	2815.721
CGDP	145	66.62632	60.0877	-13.81456	319.5881
CFGDP	145	56.25028	51.04549	3.187823	250.3732
Trade	147	89.4306	40.11524	27.0795	303.446
Regulation	147	-0.021954	0.954997	-1.812663	1.923543
Urban Population	147	55.85076	22.82284	9.5005	100.00
Fix_Telephone	147	19.693	17.90749	0.04629	65.9294
EG _{initial}	145	0.40274	0.2078423	0.0	0.92706

V. Empirical Findings

Table 2 presents the empirical findings of Equation (5) estimated by OLS. The results indicate that e-government exerts a positive and significant influence on economic growth. The coefficient on e-government implies that one per cent increase in the quality of e-government increases the growth by about 1.86 per cent. The financial development has a negative and insignificant effect on economic growth; but however, this effect turns out to be positive in the presence of e-government.

The net marginal impact of e-government on economic growth can be expressed as:

$$\frac{\partial y_i}{\partial Egovernment_i} = 1.865 + 0.386 FD_i$$

The net marginal effect of e-government on economic growth is 2.25 per cent whereas its independent impact is 1.87 per cent, if we the interactive term omitted. The exclusive impact of financial development on growth is insignificant and the coefficient sign of financial development is consistent [Luintel and Khan (1999), and Favara (2003)]. The net marginal effect of financial development on economic growth is calculated as:

$$\frac{\partial y_i}{\partial FD_i} = 0.139 + 0.386Egovernment_i$$

The net impact of financial development on economic growth is 0.247 and its influence depends on e-government. The direct effect of financial development in absence of e-government is negative but in presence of e-government it turns out to be positive. The positive influence of financial development on economic growth is strengthened by e-government; nevertheless, the coefficients on financial development are insignificant. The coefficient of e-government remained positive in all regressions. The negative influence of financial development has been offset by the e-government promotion that comes

TABLE 2
Economic Growth, E-Government and Financial Development -OLS

Per Capita GDP	Results of Ordinary Least Square Methods				
	(1)	(2)	(3)	(4)	(5)
Y _{initial}	0.654*** (0.0592)	0.646*** (0.0592)	0.636*** (0.0600)	0.668*** (0.0601)	0.587*** (0.0638)
Labor	-0.104 (0.331)	-0.194 (0.335)	-0.0964 (0.329)	0.0236 (0.348)	-0.300 (0.334)
Capital	0.362** (0.157)	0.365** (0.156)	0.317** (0.158)	0.334** (0.160)	0.347** (0.154)
Human Capital	0.188 (0.180)	0.250 (0.184)	0.175 (0.179)	0.225 (0.184)	0.0916 (0.180)
E-government	1.865*** (0.574)	1.794*** (0.573)	1.951*** (0.573)	1.370** (0.686)	2.561*** (0.626)
Financial_Dev.	-0.139 (0.187)	-0.186 (0.188)	-0.172 (0.187)	-0.123 (0.188)	-0.161 (0.183)
EG*FD	0.386 (0.309)	0.427 (0.309)	0.456 (0.311)	0.341 (0.312)	0.428 (0.304)
Inflation	-	-0.125 (0.0834)	-	-	-
Trade	-	-	0.173 (0.111)	-	-
Govt-Consumption	-	-	-	0.0428 (0.0311)	-
Population	-	-	-	-	-0.0719** (0.0284)
Constant	0.635 (1.705)	1.453 (1.784)	0.128 (1.728)	-0.796 (2.058)	3.248 (1.967)
Observations	146	146	146	144	146
R-squared	0.887	0.889	0.889	0.889	0.892

Standard errors are in parentheses. ***p < 0.01, *p < 0.05, *p < 0.1.

from the technological channel of financial development [Levine (1997)]. Initial per capita income and physical capital also have positive significant impact on economic growth whereas human capital and work force have insignificant effect on economic growth. In order to conduct a sensitivity analysis, inflation, trade openness, general government consumption, and population growth have been incorporated, as control variables.

1. Simultaneity

There is a possibility of simultaneity between the e-government and economic growth because the quality of e-government is derived by economic growth of a country. The poor countries can not afford the diffusion of ICT infrastructure. The installation of modern technology depends on economic development of a country [Czernich et al. (2009)] and most of the latest technology had first penetrated in the developed countries and later it spilled over towards the developing countries [Comin and Hobjin (2004)]. The 2SLS techniques were employed to produce unbiased results. E-government is instrumented with initial (e-government) quality (2003, taken as initial value of e-government), share of urban population, regularity of government (ability to design sound policies in order to promote private sector development), and fixed telephone lines.⁵

The government intervention and legal property rights protections depends on legal origin of a country. Financial development and technological promotion are driven by the government intervention and company laws in a country. La Porta, et al. (1998) described the legal origin data of commercial laws and country codes.⁶ Legal origin is categorized into five categories: English Common Law, Socialist Law, French Commercial Code, German Commercial Code, Scandinavian Commercial Code.

Table 3 presents the first stage results of 2SLS which indicate that fixed telephone lines, regularity, and the initial e-government quality have significant impact on economic growth. We have instrumented the e-government and interactive term also with the same variables. In the first regression all instruments except regularity, have a positive and significant impact of e-government, whereas, only regularity and fixed telephone lines have significant impact on interactive term of e-government and the financial development. In the 3rd and 4th regression, dummies of legal origins have been introduced as instrumental variables. All instruments accept dummies of legal origin have positive significant impact of e-government quality. The F-stat of the first stage regression is very high which indicates the strength of instruments. On an average 94 per cent variation in e-government is explained by instruments and 0.54 per cent variation in the interactive effect of e-government and financial development is explained by instruments.

⁵ Following Czernich, et al. (2009) and Anderson (2008) this study have introduced the fixed telephone lines and share of urban population as instrument of the e-government. According to Czernich, the broadband service is usually delivered through cable TV lines and fixed telephone lines and therefore, fixed telephone lines subscription can explain the e-government quality. Anderson emphasize on urban density theory, according to which increase in urbanization mitigates the cost of information technology due to competition in the market. The e-government penetration also depends on the ability and willingness of government to formulate effective policies to promote private sector development because it invest on ICT technologies.

⁶ The data describe by using information from the foreign laws, CIA World Facts Book (1996), and the current source of basic legislative jurisdiction of the world.

TABLE 3
Empirical Result of First Stage of 2SLS

	First Stage Results of Two Stage Least Square			
	(1) E-government	(2) EG*FD	(3) E-government	(4) EG*FD
EG _{initial}	0.597*** (0.0407)	0.271 (0.361)	0.578*** (0.0384)	0.365 (0.355)
Urban-Population	0.000864*** (0.000245)	0.00203 (0.00215)	0.000994*** (0.000245)	-0.00246 (0.00222)
Fix_Tele	0.00223*** (0.000446)	0.0137*** (0.00394)	0.00181*** (0.000443)	0.0176*** (0.00404)
Regularity	0.0128 (0.00790)	0.213*** (0.0691)	0.0194** (0.00777)	0.141** (0.0705)
English Law	-	-	-0.0142 (0.0221)	0.0783 (0.201)
Socialist Law	-	-	0.0307 (0.0233)	-0.286 (0.212)
French Law	-	-	-0.0253 (0.0225)	0.0994 (0.204)
German Law	-	-	0.0119 (0.0299)	-0.0247 (0.271)
Omitted. Scandid. Law	-	-	-	-
Constant	0.118*** (0.0154)	-0.128 (0.136)	0.137*** (0.0262)	-0.234 (0.239)
Observations	145	144	144	143
R-squared	0.939	0.548	0.950	0.602
F-statistics	540.68	42.05	323.37	25.29

Standard errors are in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Table 4 presents the second stage results of 2SLS which denote that independent effect of e-government on economic growth in the absence of financial development is positive but insignificant. The net marginal effect of e-government is not constant but depends on financial development that can be calculated as:

$$\frac{\partial y_i}{\partial Egovernment_i} = 1.203 + 3.448FD_i$$

The net marginal effect of e-government on economic growth is 4.611 per cent. It can be interpreted as one per cent increase in e-government in relationship to financial development which boosts the growth (about 4.61 per cent). The positive contribution of e-government on economic growth is likely to be stronger in financially developed countries. Similarly, the exclusive effect of financial development is negative on eco-

conomic growth. The sign of coefficient of financial development is negative and significant in the absence of e-government. The net marginal effect of financial development can be expressed as:

$$\frac{\partial y_i}{\partial FD_i} = 1.883 + 3.448Egovernment_i$$

TABLE 4
Empirical Results Second Stage of 2SLS

Per Capita GDP	Second Stage Results of Two Stage Least Square				
	(1)	(2)	(3)	(4)	(5)
E-government	1.203 (1.114)	0.752 (1.278)	1.426 (1.073)	1.13 (1.255)	2.322** (1.057)
EG*F	3.448** (1.664)	4.093** (1.905)	3.463** (1.669)	3.593** (1.596)	2.897** (1.411)
Y _{initial}	0.511*** (0.0978)	0.486*** (0.109)	0.480*** (0.102)	0.511*** (0.102)	0.446*** (0.0972)
Labor	-0.739 (0.518)	-0.977 (0.599)	-0.696 (0.507)	-0.762 (0.564)	-0.882* (0.479)
Capital	0.463** (0.207)	0.487** (-0.225)	0.385* (0.203)	0.443** (0.215)	0.425** (0.186)
Human-Capital	0.923* (0.516)	1.205* (0.617)	0.896* (0.510)	0.956* (0.494)	0.640 (0.443)
Financial_Dev.	-1.883** (0.950)	-2.289** (1.099)	-1.894** (0.953)	-1.971** (0.909)	-1.566* (0.804)
Inflation	-	-0.208 (0.135)	-	-	-
Trade	-	-	0.00330** (0.00167)	-	-
Govt-Consumption	-	-	-	0.00499 (0.0451)	-
Population	-	-	-	-	-0.0851** (0.0355)
Constant	0.851 (2.288)	1.939 (2.537)	0.886 (2.255)	0.782 (2.948)	4.190* (2.483)
Observations	143	143	143	141	143
R-squared	0.87	0.774	0.813	0.799	0.842
Sargan test	0.1257	0.2869	0.0905	0.1619	0.1257
Basman test	0.1391	0.3238	0.1017	0.1846	0.1426
Wu-Hausman	0.0244	0.0093	0.0263	0.0082	0.0456

Standard errors are in parentheses. ***p < 0.01, *p < 0.05, *p < 0.1.

The net marginal impact of financial development on economic growth is 1.57 per cent. The negative impact of financial development is offset by the promotion of e-government through technological advancement due to financial development. In order to extract the positive impact of financial development on economic growth the good quality of e-government should be assured. To check sensitivity of results policy variables in second, third, and fourth regressions was incorporated but the findings remained robust. The coefficients of initial per capita income, physical capital, and human capital are positive and significant, whereas coefficient of work force is negative and significant. The initial per capita income has positive significant impact on per capita income of a country. It indicates that there is an inertia in the per capita income of countries which depends on its initial per capita income. Most of the countries are developing or are under developed or are in the process of development; therefore, if looked in terms of convergence, then its sign is consistent with the theory. The p-value of Sargan test accepts the null hypothesis and indicates that instruments are valid.⁷ The p-value of Basman test of over identified restriction also accepts the null hypothesis of valid instruments. Endogeneity was also checked in the model before estimation by applying the 'Hausman test'. The p-value of Hausman test support the endogeneity in the model.

VI. Conclusion and Policy Recommendations

The aim of this study is to find the growth effects of financial development via the channel of e-government. Empirical analysis was conducted in the framework of macroeconomic growth model. The scope of the study is cross sectional multi-year average dataset of 147 countries, across the globe. The model was estimated with *Ordinary Least Squares (OLS)* and the *Two Stage Least Squares (2SLS)* econometric techniques. To tackle the problem of endogeneity, both internal and external instruments were used.

The results show that exclusive growth impact of financial development is not significant. However, financial development enhances economic growth significantly, via the channel of e-government. It can therefore be stated that interactive effect of e-government and financial development has positive and significant influence on economic growth. The net marginal impact of e-government indicates that one per cent increase in e-government in relationship to financial development will enhance the per capita income (about 4.6 per cent). Similarly, one per cent increase in financial development in relation to e-government will boost the per capita income (about 0.25 per cent to 1.57 per cent).

It can therefore be seen from the results that development of e-government is a pre-requisite to promote economic growth. E-government promotes e-financing that cut down the data processing, shoe-leather (transportation), and the information cost

⁷ Sargen test checks the validity of instrumental variables that have been used in the instrumental variable technique. Sargen (1964) proposed the 'Sargen test of instrumental variables' to find the validity of instruments.

depict in primitive and outdated financial system. Without e-government, policy makers will be less optimistic to enhance the economic development. Similarly, promotion of e-government has positive effect on per capita income of a country, if e-government promotes e-financing. Thus, the practice of e-government in financial development can strengthen its positive influence on economic growth. Lack of practicing e-government in financial system or other sectors of economy, will void its benefits on economic growth.

*School of Economics, Quaid-i-Azam. University, Islamabad
and State Bank of Pakistan, Islamabad, Pakistan.*

Bibliography

- Andersen, T.B., 2008, E-government as an anti-corruption tool, Department of Economics, University of Copenhagen.
- Andrianaivo, M., and K. Kpodar, 2011, ICT, Financial inclusion and growth evidence from African countries, International Monetary Fund working paper 11/73.
- Arestis, P., P.O. Demetriades and K.B. Luintel, 2001, Financial development and economic growth: The role of stock markets, *Journal of Money, Credit and Banking*, 33(1): 16-41.
- Barro, R.J., 1998, Determinants of economic growth: A cross-country empirical study, 1st edition, Massachusetts: USA, MIT Press Books, The MIT Press.
- Ben, Naceur S., and S. Ghazouani, 2007, Stock markets, banks and growth in some mena region countries, *Research in International Business and Finance*, 21: 297-315.
- Chen, A.J., S.L. Pan, J. Zhang, W.W. Huang and S. Zhu, 2009, Managing e-government implementation in China: A process perspectives. *Information and Management*, 46(4): 203-212.
- Choi, C., and M. Hoon Yi, 2009, The effect of the internet on economic growth: Evidence from cross-country panel data, *Economics Letters*, 105(1): 39-41.
- Claessens, S., T.C. Glaessner and D. Klingebiel, 2002, Electronic Finance: A new approach to financial sector development? 431, World Bank Publications.
- Clarke, G.R., and S. Wallsten, 2006, Has the internet increased trade? Developed and developing country evidence, *Economic Inquiry*, 44(3): 465-484.
- Comin, D., and B. Hobijn, 2004, Cross-country technology adoption: Making the theories face the facts, *Journal of Monetary Economics*, 51(1): 39-83.

- Czernich, N., O. Falck, T. Kretschmer, and L. Woessmann, 2011, Broad band infrastructure and economic growth, *The Economic Journal*, 121(552): 505-532.
- Gregorio, J., and P.E. Guidotti, 1995, Financial development and economic growth, *World Development*, 23(3): 433-448.
- Gurley, J.G., and E.S. Shaw, 1960, *Money in a theory of finance*, Washington, DC: Brookings Institution.
- Favarra, G., 2003, An empirical reassessment of the relationship between finance and growth, International Monetary Fund working paper 03/123.
- Fernandez, D., and A. Galetovic, 1994, Schumpeter might be right—but why? Explaining the relation between finance, development and growth, Johns Hopkins University, SAIS working paper in International Economics, : 96-101.
- Hnatkovska, V., and N. Loayza, 2003, Volatility and growth, No. 3184, World Bank, Working Paper Series.
- Hondroyannis, G., S. Lolos and E. Papapetrou, 2005, Financial markets and economic growth in Greece, 1986-1999, *Journal of International Financial Markets, Institutions and Money*, 15: 173-188.
- Huang, H., and S.C. Lin, 2009, Non-linear finance-growth nexus: A threshold with instrumental variable approach, *Economics of Transition*, 17(3): 439-466.
- Krishnan, S., and T.S. Teo, 2012, Moderating effects of governance on information infrastructure and e-government development, *Journal of the American Society for Information Science and Technology*, 63(10): 1929-1946.
- La Porta, R., F. Lopez-de-Silanes, A. Shleifer and R. Vishny, 1999, The quality of government, *Journal of Law, Economics, and Organization*, 15(1): 222-279.
- Leitao, N.C., 2010, Financial development and economic growth: A panel data approach, *Theoretical and Applied Economics*, 10: 15-24.
- Levine, R., 1997, Financial development and economic growth: Views and agenda, *Journal of Economic Literature*, 35(2): 688-726.
- Luintel, K., and M. Khan, 1999, A quantitative re-assessment of the finance-growth nexus: Evidence from a multivariate VAR, *Journal of Development Economics*, 60: 381-405.
- Mahyideen, J.M., N.W. Ismail and L.S. Hook, 2012, A pooled mean group estimation on ICT infrastructure and economic growth in ASEAN-5 countries.
- Mankiw, N.G., D. Romer and D.N. Weil, 1992, A contribution to the empirics of economic growth (w3541), National Bureau of Economic Research.
- Meijers, H., 2014, Does the internet generate economic growth, international trade, or both?, *International Economics and Economic Policy*, 11(1-2): 137-163.
- McKinnon, R.I., 1973, *Money and capital in economic development*, Washington, DC: Brookings Institution.
- Nieuwerburgh, S.V., F. Buelens, and L. Cuyvers, 2006, Stock market development and economic growth in Belgium, *Explorations in Economic History*, 43(1): 13-38.

- Noh, Y.H., and K. Yoo, 2008, Internet, inequality and growth, *Journal of Policy Modeling*, 30(6): 1005-1016.
- Oliner, S., D. Sichel and K. Stiroh, 2007, Explaining a productive decade.
- Ram, R., 1999, Financial development and economic growth: Additional evidence, *Journal of Development Studies*, 35(4): 164-174.
- Sargan, J.D., 1964, Wages and prices in the United Kingdom: A study in econometric methodology, *Econometric analysis for national economic planning*, 16: 25-54.
- Sassi, S., and M. Goaid, 2013, Financial development, ICT diffusion and economic growth: Lessons from MENA region, *Telecommunications Policy*, 37(4): 252-261.
- Schumpeter, J.A., 1911, *The theory of economic development*, Massachusetts: Cambridge.
- Shamim, F., 2007, The ICT environment, financial sector and economic growth: A cross-country analysis, *Journal of Economic Studies*, 34(4): 352-370.
- Shaw, E.S., 1973, *Financial deepening in economic development*, New York: Oxford University Press.
- Summers, Lawrence, 1999, Reflections on managing global integration, *Journal of Economic Perspectives (U.S.)*, 13: 3-18.
- Tandon, H., 2005, E-governance: An Indian perspective, *Policy and Society*, 24(3): 142-169.
- United Nations Development Program, 2006, Fighting corruption with e-government applications, APDIP e-note 8, Available from <http://www.unapcict.org/ecohub/resources/apdip-e-note-8-fighting-corruptionwith-e>.
- United Nations Development Program, 2008, *Tackling corruption, transforming lives: Accelerating human development in Asia and the Pacific*, New Delhi, India: Macmillan Publishers.
- United Nations, 2008, *UN e-government survey 2008: From e-government to connected governance*, New York: Department of Economic and Social Affairs.
- United Nations, 2010, *United Nations e-government survey 2010: Leveraging e-government at a time of financial and economic crisis*, New York: Department of Economic and Social Affairs, Available from http://www.unpan.org/egovkb/global_reports/08report.htm.
- Von, Haldenwang, C., 2004, Electronic government (e-government) and development, *The European Journal of Development Research*, 16(2): 417-432.

APPENDIX-A**TABLE A-1**

Summary of Variables of Interest and their Data Sources

Variables	Definition	Source
Per capita GDP.	GDP per capita at constant (2005) U.S dollars.	World development indicator (2014).
E-government.	The online presence and web connection of government in order to deliver responsibilities.	Global e-government reports.
Online service.	Degree of the webconnectivity and online accessibility of government.	Global e-government reports.
Telecom service.	Degree of telecommunication substructure of the government.	Global e-government reports.
Human capital.	Gross secondary school enrollment of total population.	World development indicator (2014).
Physical capital.	Fixed capital formation (Gross) percentage of GDP.	World development indicator (2014).
Labor supply.	Share of labor force participation total % of population.	World development indicator (2014).
Financial development.	Self generated index by taking the principal component analysis of ratio of credit provided to private sector by bank and GDP and ratio of credit provided to private sector by financial sector and GDP.	World development indicator (2014).
Trade.	Export plus import percentage of GDP.	World development indicator (2014).
Inflation.	GDP deflator.	World development indicator (2014).
Regulation.	Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	World governance index (2014).
Urban population.	Percentage of urban population in total population.	World development indicator (2014).
Fix_Telephone.	Fixed telephone lines per 100 inhabitant.	ITU statistics.
Legal Origin.	Five dummies of different legal origin of commercial law and country code.	La Porta et al. (1998).

TABLE A-2
Correlation Matrix

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Y	1.000	-	-	-	-	-	-	-	-	-	-
2. Initial Y	0.735	1.000	-	-	-	-	-	-	-	-	-
3. Labor	-0.09	-0.08	1.000	-	-	-	-	-	-	-	-
4. Capital	-0.11	0.020	0.049	1.000	-	-	-	-	-	-	-
5. Human-Cap.	0.581	0.495	-0.436	0.006	1.000	-	-	-	-	-	-
6. EG	0.757	0.610	-0.293	-0.062	0.839	1.000	-	-	-	-	-
7. FD	0.662	0.491	-0.193	-0.084	0.529	0.689	1.000	-	-	-	-
8. Inflation	-0.15	-0.12	-0.203	0.116	0.039	-0.086	-0.201	1.000	-	-	-
9. Trade	0.220	0.170	-0.150	0.188	0.182	0.145	0.064	-0.05	1.000	-	-
10. GC	0.384	0.298	-0.056	-0.03	0.208	0.381	0.483	-0.07	-0.23	1.000	-
11. Population	-0.05	-0.06	0.009	0.235	-0.040	0.023	0.129	-0.02	-0.21	0.304	1.000

APPENDIX-C

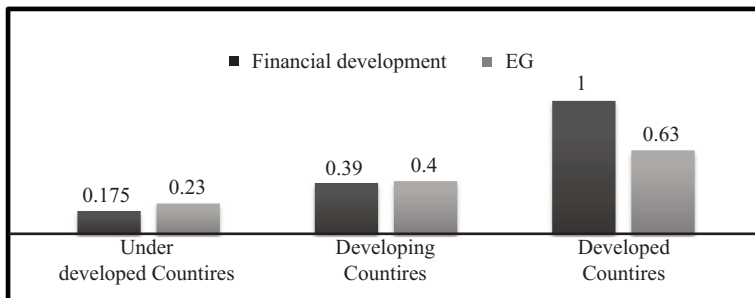


FIGURE C-1
Mean value of EG and FD across the World

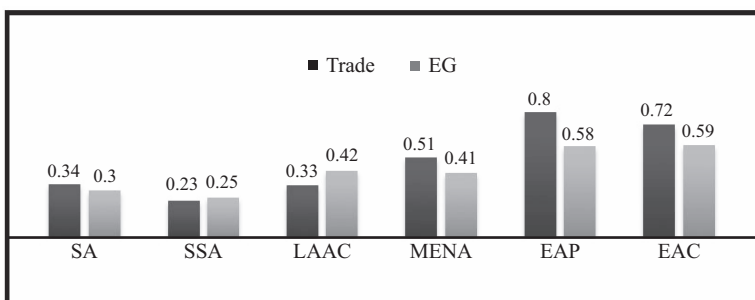


FIGURE C-2
Mean value of EG and FD in different geographical region of World

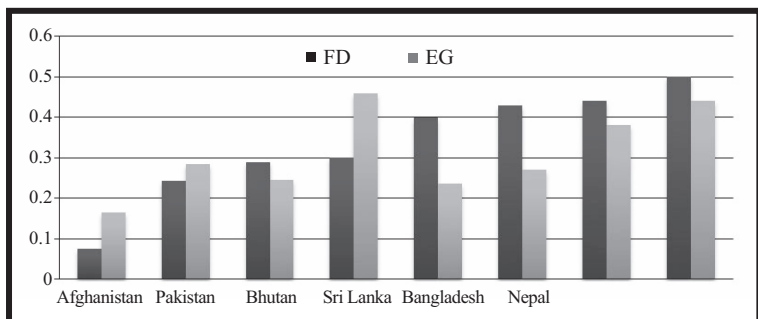


FIGURE C-3
Mean value of EG and FD in South Asian Countries

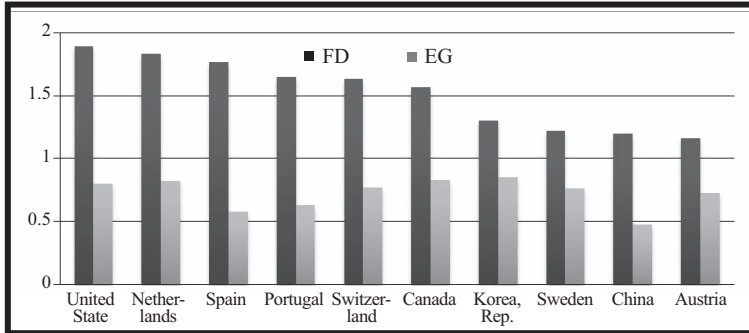


FIGURE C-4

Average quality FD and EG in top 10 financial developed countries of EAP

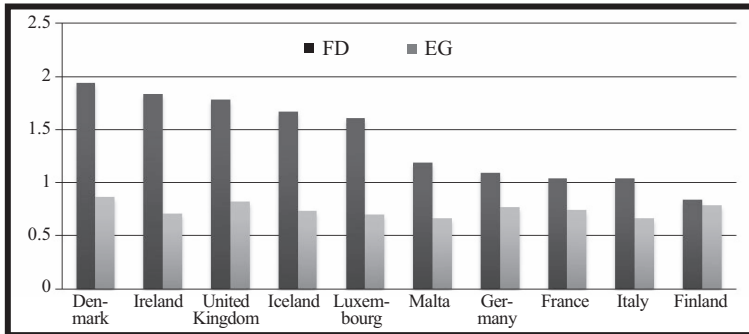


FIGURE C-5

Average quality FD and EG in top 10 financial developed countries of ECA

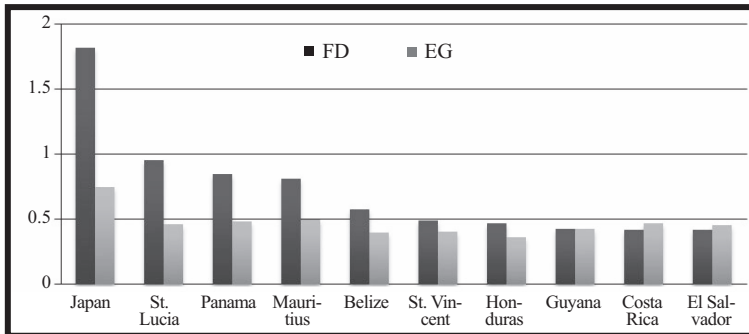


FIGURE C-6

Average quality of FD and EG in top 10 financial developed countries of LAAC

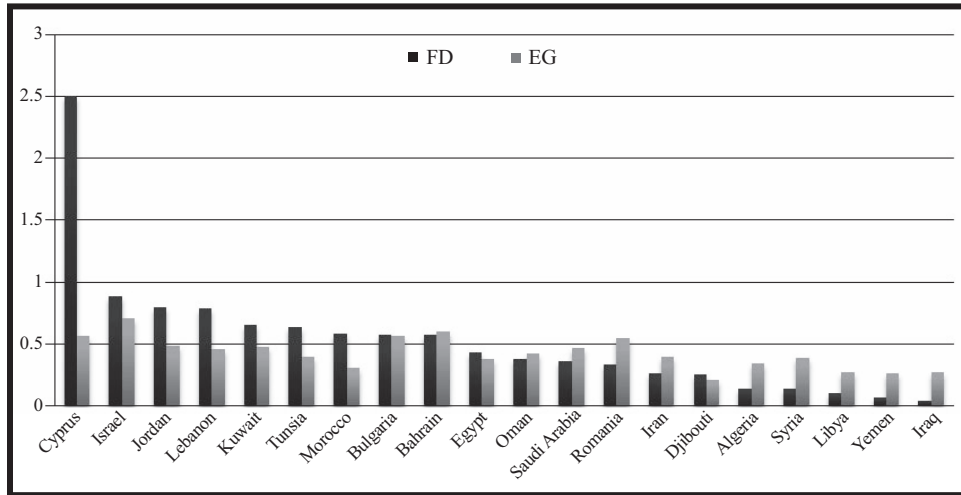


FIGURE A7

Average quality of EG and FD in
MENA countries