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Does E-Government Raise Effectiveness and Efficiency?
Examining the Cross-National Effect

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ABSTRACT

This article examines the influence of e-government maturity on government effectiveness and efficiency with a cross-country view. To that end, it uses two-stage least square regression, considering the endogeneity of e-government. The regression-based analysis on various global indicators finds that e-government significantly contributes to enhancing government effectiveness but fails to substantially raise government efficiency. Political, economic, and cultural disparities across countries affect the variation in the impact of e-government on government effectiveness and efficiency. The level of democracy has a curvilinear relationship with government efficiency, and thus this study identifies non-democracies with well-performing governments.

KEYWORDS

Cross-National Study, E-Government, Government Effectiveness, Government Efficiency

INTRODUCTION

The commonly-used definition of e-government connotes its expected effects. E-government refers to "the use of information and communication technology and its application by the government for the provision of information and basic public services to the people," and its four goals, among others, are of vital importance and of relevance: "efficient government management of information to the citizens"; "better service delivery to citizens"; "improved access and outreach of information"; and "empowerment of the people through participatory decision making" (United Nations, 2004: 15). Therefore, e-government has been considered a key driver to boost government effectiveness and efficiency.

Nevertheless, little research has shed light on the global impact of e-government on effectiveness and efficiency. An array of empirical studies has investigated whether e-government leads to its promised results, but the studies have rarely paid close attention to its performance in terms of effectiveness and efficiency with a cross-national view. Motivated by this paucity in the relevant research, this study raises a research question—"Does e-government maturity contribute to increasing the level of government effectiveness and efficiency across countries?"—and, to answer the question, examines the extent to which countries actualize what e-government promises for greater effectiveness and efficiency. To that end, the study employs diverse global-scale indicators.

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This article is structured into six sections, including the foregoing introduction. The second section discusses theoretical underpinnings and empirical evidence. The third section describes the data, measures, and empirical strategy. The fourth section reports the results of the analysis in detail, and then the fifth section addresses the theoretical implications, practical suggestions, and research limitations for further discussion. The final section concludes this article.

GOVERNMENT EFFECTIVENESS AND EFFICIENCY

Conceptualization

A good government means a quality government or better performing government. The quality of government and government performance are understood through various attributes such as effectiveness and efficiency (La Porta et al., 1999), impartiality and lack of corruption (Rothstein, 2011; Rothstein & Teorell, 2008; Wilson, 2008), financial performance (Knack, 2002; Rayp & Van De Sijpe, 2007), and democracy and accountability (Adserà, Boix, & Payne, 2003). Effectiveness and efficiency are central to a good government, but historically a government has had a bad reputation as an inefficient producer (Carrick, 1988; Marshall, 1998).

The academic understandings of effectiveness and efficiency are basically no different from their lexicographic definitions. While the Merriam-Webster Dictionary defines efficient as "productive without waste" and effective as "producing a decided, decisive, or desired effect," the Oxford Dictionary defines them as "achieving maximum productivity with minimum wasted effort or expense" and "successful in producing a desired or intended result," respectively. In a similar vein, Barnard (1938) claimed, as a classical view on government effectiveness, that an organizational action would be effective if "a specific desired end is attained" (p. 19). Addressing government effectiveness and efficiency in academic research unavoidably involves how to accurately measure the terms in practice rather than how to refine the theoretical conceptualization beyond the common definition in dictionaries. In that sense, what Osborne and Gaebler (1992) wrote is notable:

Efficiency is a measure of how much each unit of output costs. Effectiveness is a measure of the quality of that output: how well did it achieve the desired outcome? (p. 351)

While measuring efficiency is related to how much it costs a government to achieve a specific output, measuring effectiveness is related to whether the government's investment is worthwhile. While efficiency implies "doing things right" and "doing better what is already being done," effectiveness implies "doing the right thing" and "deciding what to do better" (Drucker, 1974, 1999; Drucker & Wilson, 2001).

For government efficiency, most studies consider inputs (government expenditure) and outputs (public goods) chiefly in the aspect of financial management, economic performance, and expenditure efficiency (Afonso, Schuknecht, & Tanzi, 2005; Geys, 2006; Gupta & Verhoeven, 2001; Hauner & Kyobe, 2010; Rayp & Van De Sijpe, 2007; Tanzi & Schuknecht, 1997, 2000). Government expenditure as input is a readily available proxy of government size (Wu & Lin, 2012). Main outputs include health (e.g., infant mortality and immunization) and education (e.g., youth illiteracy and school enrollment).

Government effectiveness is more difficult to measure than government efficiency because the former is a matter of quality. Government effectiveness as a subindicator of the World Governance Indicators has been popularly used (Magalhães, 2014). The indicator defines government effectiveness as "perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies" (Kaufmann, Kraay, & Mastruzzi, 2010: 4). With a more concrete view, Rainey and Steinbauer (1999) thought they could measure government effectiveness as the answer to whether a government does what it is supposed to do

well, whether its actions, procedures, and members help achieve its mission, and eventually whether it achieves its mission.

Traditional Determinants

La Porta et al. (1999) cast an important inquiry pertinent to the quality of government: "How did some countries come to have good government and others did not?" (p. 223). The answer was found in political, economic, and cultural determinants of government performance. Researchers have spotlighted these three determinants in general.

Strong theoretical arguments support that political and economic freedom enhances the quality of government. According to classic theories (Knack & Keefer, 1995; North, 1981, 1990), a good government is noninterventionist, protects property rights and keeps regulations at a minimum. On the contrary, an intervening government is able to do its work efficiently (Mauro, 1995; Treisman, 1997). La Porta et al. (1999, p. 225) contrasted more liberty-based efficiency with less liberty-based efficiency; for example, 18th-century Britain's noninterventionist efficiency versus Prussian Frederick's interventionist efficiency. Although the latter case may result in government efficiency to some extent, greater interventionism on average is believed to eventually cause lower efficiency. Méon and Weill (2005) saw misleading interventionism as bad governance, lowering government efficiency, and suggested a theoretical reason for it. The bad governance system is typically characterized as "an ill-designed regulatory framework" and "a weak rule of law that results in widespread theft that constrains agents to invest in the protection of their property," and provides "an incentive to divert efforts from productive activities" (Méon & Weill, 2005: 79).

Various aspects of political freedom influence government effectiveness. Since cooperation between citizens and their formation of non-state institutions enable them to exert more effective control over politicians and bureaucrats (Gellner, 1994; Putnam, 1993), the maturity of civil society has a decisive role to make the government more effective. A high level of democracy increases government accountability, thereby contributing to effectiveness, especially when it is understood as "the quality of policy-making formulation and implementation" (Magalhães, 2014: 77). In addition, political volatility could complicate consistent budgetary planning and undermine efficiency (Hauner & Kyobe, 2010; Rayp & Van De Sijpe, 2007). Therefore, the durability of the government and political stability can determine the level of efficiency. Rayp and Van De Sijpe (2007) included the rule of law as one of the key institutional determinants. In sum, countries with a better rule of law, stable political regime, and liberal civil society are likely to experience reduced political risk and increased accountability, thereby raising government effectiveness and efficiency. This conjecture, however, has not always had empirical support. For example, Holmberg et al. (2009) argued that "there is no straightforward relationship between establishing electoral representative democracy and QoG [Quality of Government]" (p. 138).

On the other hand, economic freedom has gained importance in explaining the difference in the level of government effectiveness and efficiency. One can expect that more integration in the world economy compels a national government to market discipline and hence increases government efficiency (Rayp & Van De Sijpe, 2007). Cross-national competition provoked by economic liberalism may increase government efficiency to some extent (Carrick, 1988; Marshall, 1998).

Though it is naturally expected that national culture can exogenously influence the quality of government, one cannot describe and characterize national culture in a clear-cut way. Much research has remarked on the importance of national culture in government performance, but few have considered it in an empirical way (La Porta et al., 1999). Given this gap, Hofstede's (1980, 1983) contribution to measuring country-level cultural characteristics is phenomenal. His explanation involves four cultural dimensions: power distance, individualism versus collectivism, masculinity versus femininity, and uncertainty avoidance. Power distance deals with how a society handles inequalities among people. Individuals in low power distance societies can strive to equalize the distribution of power and demand justification for inequalities of power. How equally power is distributed can influence the impact of

democratic participation on managerial effectiveness and efficiency (Hofstede, 2007; Newman & Nollen, 1996; Stone, Stone-Romero, & Lukaszewski, 2007). Individualists with a preference for a loosely-knit social framework take care of only themselves and their immediate families. By contrast, collectivism shows conformity with, obedience to, and loyalty for affiliated groups or organizations. Individualism has been a rudiment of political and economic liberalism, which can affect government effectiveness and efficiency (Nibler & Harris, 2003; Triandis, 1988). Masculine cultures prioritize quantitative improvements, independence, and achievement in terms of power, wealth, and status; whereas feminine cultures stress qualitative improvements, interdependence, relationships, and the welfare of the weak. It is expected that the former would support efficiency over effectiveness, and the latter would take a reverse approach (Altaf, 2011; Ringov & Zollo, 2007). Uncertainty avoidance involves how a society deals with the unknown future. High uncertainty avoidance cultures prioritize ensuring survival over ensuring legitimacy. In countries like the U.S., cultural tolerance for uncertain, ambiguous, and unstructured situations may foster social long-term stability, which contributes to country-level effectiveness and efficiency (Elenkov, 1998; Gorodnichenko & Roland, 2011). Conversely, a high level of government effectiveness and efficiency appears in countries like Germany, where people tend to plan everything carefully and rely on rules, laws, and regulations to avoid uncertainty and keep risks to a minimum (Brodbeck, Frese, & Javidan, 2002; MacArthur, 2006).

Corruption stemming from political, economic, and socio-cultural roots is an intuitive determinant of efficiency because "corruption breeds waste" (Hauner & Kyobe, 2010: 1534). Expectedly, it is also a critical impediment to government effectiveness. However, this study does not intentionally include a corruption-related indicator itself because corruption per se is another face of an inefficient and ineffective government rather than a determinant.

E-Government as a New Determinant

As mentioned in the introduction, e-government means the use of information communication technology by the government to achieve certain goals. It can generate the following outcomes (Yildiz, 2007: 659): government effectiveness and efficiency (Eyob, 2004; Hackney, Jones, & Lösch, 2007; Janssen & Estevez, 2013; Moon & Norris, 2005; Norris & Moon, 2005); trust in government (Carter & Bélanger, 2005; Grimmelikhuijsen et al., 2013; Im et al., 2014; Im, Porumbescu, & Lee, 2013; Porumbescu, 2013, 2016a, 2016b, 2016c; Tolbert & Mossberger, 2006; Warkentin et al., 2002); accountability (Bertot, Jaeger, & Grimes, 2012; Justice, Melitski, & Smith, 2006; Pina, Torres, & Acerete, 2007; Wong & Welch, 2004); transparency (Bonsón et al., 2012; Ciborra, 2005; Relly & Sabharwal, 2009); anti-corruption (Andersen, 2009; Bertot, Jaeger, & Grimes, 2010; Cho & Choi, 2004; Kim, Kim, & Lee, 2009; Shim & Eom, 2008); and users' perceptions of service quality (Reddick, 2006, 2009; Welch, Hinnant, & Moon, 2005; West, 2004).

E-government at its earlier stage had not obtained many of the expected outcomes such as cost savings and downsizing (Moon, 2002), but over time its wide diffusion across municipalities and countries has exerted a significant impact on organizational outputs and outcomes in terms of effectiveness and efficiency (Evans & Yen, 2005; Norris & Moon, 2005). Specifically, e-government has led to reducing time demands on staff, administrative costs, and the number of staff. Designers of the e-government stage model thought that a higher stage (full integration) of e-government maturity would realize visions of effectiveness and efficiency (Layne & Lee, 2001). A recent practical notion further elaborated the role of e-government for effectiveness and efficiency by describing it as "the use and application of information technologies in public administration to streamline and integrate workflows and processes, to effectively manage data and information, enhance public service delivery, as well as expand communication channels for engagement and empowerment of people" (United Nations, 2014: 2). E-government can determine the overall level of effectiveness and efficiency in an individual country's whole government, but its effects may vary with the political administrative system, economic development, and institutional and cultural contexts, as discussed in the traditional determinants of government effectiveness and efficiency (Schuppan, 2009).

EMPIRICAL STRATEGY

Data

This study created a dataset aggregating recent global-scale indicators derived from eight reliable sources. Table 1 reports the data sources and the descriptive statistics of the indicator variables.

Both dependent variables, government effectiveness and government efficiency, score perceived evaluations based on international expert surveys. According to Parks (1984), performance measures are objective (constructed from archives or records of performance) or subjective (constructed from survey responses about performance). Whereas objective measures cannot approximate the complex dimensions of performance (Lee & Whitford, 2009: 254), subjective measures are biased due to an informant's recall (Golden, 1992) and self-reported responses (Spector, 2006). Effectiveness and efficiency can be quantitatively related to outputs and outcomes, but it is impossible to take a completely objective account of them. While many existing studies contributed to developing objective measures of effectiveness and efficiency, "the perceived efficiency and effectiveness of a country's entire government" and comparison of such perceived evaluations across countries could be an important focus for cross-national research (Lee & Whitford, 2009: 250).

Government effectiveness draws from the homepage (govindicators.org) of the World Governance Indicator (WGI) in 2016. The standardized indicator combines the views of a large number of enterprise, citizen, and expert survey respondents over the world. A rationale for employing such a perception-based indicator is that satisfaction with the way a country works is related to features of the actual or perceived quality of government (Curini et al., 2012; Linde & Erlingsson, 2013; Wagner et al., 2009). WGI measures government effectiveness as follows: "perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies" (Kaufmann, Kraay, & Mastruzzi, 2010: 4). This indicator is built upon 15 different data sources with expert assessments on the quality of the bureaucracy, the supply of basic public goods, policy implementation, and the quality of budgetary and financial management.

Table 1. Descriptive statistics

Variable	Data Source	N	Mean	S.D	Min	Max
Government effectiveness	WGI	209	0.00	1.00	–2.22	2.25
Government efficiency	GCI	140	3.65	0.78	1.41	5.77
E-government maturity	UN E-GOV	191	0.39	0.27	0.00	1.00
Democracy	EIU	163	5.56	2.19	1.08	9.93
Political stability	WGI	211	0.00	1.00	–2.94	1.92
Economic prosperity	World Bank	179	4.00	0.51	2.87	5.15
Economic freedom	Heritage	178	60.68	11.03	2.30	88.60
Corruption control	WGI	209	0.00	1.00	–1.83	2.29
Rule of law	WGI	209	0.00	1.00	–2.34	2.07
Human capital	UN E-GOV	191	0.66	0.20	0.00	1.00
Power distance	Hofstede Center	102	64.27	20.82	11	100
Individualism	Hofstede Center	102	38.86	21.98	6	91
Masculinity	Hofstede Center	102	47.42	18.58	5	100
Uncertainty avoidance	Hofstede Center	102	64.21	21.44	8	100
Public employee ratio	ILO	92	19.40	11.76	2.60	85.20

Government efficiency comes from subindicators of the Global Competitiveness Index 2016 released by the World Economic Forum (reports.weforum.org/global-competitiveness-report-2015-2016/). It is a composite of "wastefulness of government spending" (how efficiently does the government spend public revenue?), "burden of government regulation" (how burdensome is it for a business to comply with governmental administrative requirements, e.g., permits, regulations, and reporting?), "efficiency of legal framework in settling disputes" (how efficient is the legal framework for a private business in settling disputes?), and "efficiency of legal framework in challenging regulations" (how easy is it for private businesses to challenge government actions and/or regulations through the legal system?). While the first subindicator gauges financial efficiency, the others are related to institutional efficiency. Institutional efficiency is considered an important dimension of predicting performance and growth of countries (e.g., Assane & Grammy, 2003; Borner, Bodmer, & Kobler, 2004; Chousa et al., 2005). Each indicator and the aggregate range from 1 (worst) to 7 (best), reflecting expert evaluations.

E-government maturity is a focal explanatory variable of this study. It refers to "the level of progress made by a country regarding its development and the sophistication of the features present on its government websites" (Ifinedo, 2011: 100). A mature level of e-government development is expected to provide more effective and efficient services to citizens and stakeholders (Andersen & Henriksen, 2006; West, 2007). This study uses the Online Service Index from the United Nations E-Government Survey (UN E-Gov) dataset in 2016 (United Nations, 2016). UN experts and volunteer researchers assessed national portals (national government, e-service, and e-participation portals) and the homepages of the ministries pertinent to education, labor, social services, health, finance, and environment affairs (United Nations, 2016: 138).

This study employs the Economist Intelligence Unit (EIU) Democracy Index in 2016 to measure the level of democracy (valued from 0 to 10). The index combines two facets of democracy: electoral democracy and civil liberty. EIU experts scored the former as a function of a competitive multiparty system, adult suffrage, and a contested electoral system, and they measured the latter as perception on freedom of speech, expression, assembly, and association. Political stability drawn from WGI 2016 reflects "perceptions of the likelihood of political instability and politically motivated violence, including terrorism."

The data regarding economic prosperity come from the World Bank. They are measured as log values of gross domestic products (GDPs) per capita in US dollars. The data for economic freedom, released from the Heritage Foundation, reflect four aspects of the economic environment over which governments exercise policy control (heritage.org): rule of law in terms of property rights; government size in terms of fiscal freedom and government spending; regulatory efficiency in terms of business freedom, labor freedom, and monetary freedom; and market openness in terms of trade freedom, investment freedom, and financial freedom. Their values range from 0 to 100.

Both corruption control and rule of law are derived from WGI 2016. Corruption control captures "perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption." Rule of law captures "perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence." These two variables have standardized scores.

Human capital comes from UN E-Gov's Human Capital Index, consisting of four components: "adult literacy rate;" "the combined primary, secondary and tertiary gross enrollment ratio;" "expected years of schooling;" and "average years of schooling" (United Nations, 2016: 136–137). Cultural data are downloaded from the Hofstede Center (geert-hofstede.com/national-culture.html). Geert Hofstede has been devoted to developing and refining assessments of national culture dimensions addressed in the second section (Hofstede, 1980, 1983), and his research center publicizes the only unique sources of quantitative evaluation of national cultures. Each cultural dimension is graded with a value from 0 to 100. The public employee ratio is the share of public sector employees in the

total employment of an individual country. The data come from the homepage (www.ilo.org) of the International Labor Organization (ILO).

Method

This study assumes e-government maturity as endogenous because political and economic determinants of government effectiveness and efficiency can substantively influence its level. As such, two-stage least square (2SLS) regression is considered instead of ordinary least square (OLS) regression. The first stage regresses e-government maturity on democracy, economic prosperity, corruption control, and human capital. Then, the second stage regresses government effectiveness and efficiency on traditional determinants discussed in the literature review. Considering the cumulated empirical presence of non-democracies with a quality government (e.g., Bäck & Hadenius, 2008; Charron & Lapuente, 2010; Hegre, 2001; La Porta et al., 1999; Plümper & Martin, 2003), the second stage regression adds the level of democracy as a squared form to the model specification. This is for examining whether the level of democracy has a curvilinear relationship with government effectiveness and efficiency.

Much empirical evidence has bolstered the possibility that e-government is endogenous because its maturity is influenced by macro factors that exercise a crucial effect on the overall quality of a national government. Countries respecting democratic values promote the electronic dissemination of information (Islam, 2006; Martin & Feldman, 1998), and those with high levels of civil liberties and political rights reap the benefits of technological innovations (Azad et al., 2010; Katchanovski & La Porte, 2005). Since e-government requires a substantial amount of financial resources to procure the necessary equipment (Azad, Faraj, & Goh, 2010; Ifinendo, 2011; Ifinedo & Singh, 2011; Norris, 2001; Tolbert, Mossberger, & McNeal, 2008), the availability of national wealth directly affects e-government maturity. In that illiteracy and poor educational attainment seriously inhibit the growth of an information society (Ifinedo & Singh, 2011; Kiiski & Pohjola, 2002; Norris, 2001), human capital is positively related to e-government maturity across countries. Much research has revealed that public perceptions on corruption are significantly associated with e-government progress and diffusion (Armstrong, 2011; Bertot et al., 2010; Cho & Choi, 2004; Wong & Welch, 2004).

RESULTS

This section reports the results of the 2SLS regression analysis conducted to examine the effect of e-government and other explanatory variables on government effectiveness and efficiency. Before describing the regression-based analysis, bivariate relationships merit analytic attention in terms of pairwise correlation and scatterplots. As reported in Table 2, some bivariate relationships show a high correlation ($r > 0.70$). E-government maturity is far more correlated with effectiveness ($r = 0.78$) than efficiency ($r = 0.45$). Economic freedom is also more associated with effectiveness ($r = 0.80$) than efficiency ($r = 0.68$). Rule of law is highly correlated with both effectiveness ($r = 0.93$) and efficiency ($r = 0.71$), and also with political stability ($r = 0.75$) and economic freedom ($r = 0.82$). Cultural dimension variables seem very exogenous because they are not significantly highly correlated with dependent variables and other independents.

A scatterplot can help identify the visual pattern of bivariate relationships. Figure 1 displays scatterplots of government effectiveness against its key determinants. E-government maturity, economic freedom, political stability, and rule of law have conspicuous linearity in their causal relationship with effectiveness. The relationships of economic freedom and rule of law with effectiveness have few exceptional leverages deviating from the predicted line. The public employee ratio does not form a specific pattern. As discussed in the second section, the impact of democracy on effectiveness may differ with the level of democracy. The scatterplot illustrates the predicted line in a quadratic function because some countries with a lower level of democracy experience a higher level of effectiveness. These include Middle East countries such as Bahrain, Jordan, Oman, Qatar, Saudi Arabia, and the United Arab Emirates, and East Asian countries such as China and Vietnam.

Table 2. Pairwise correlation

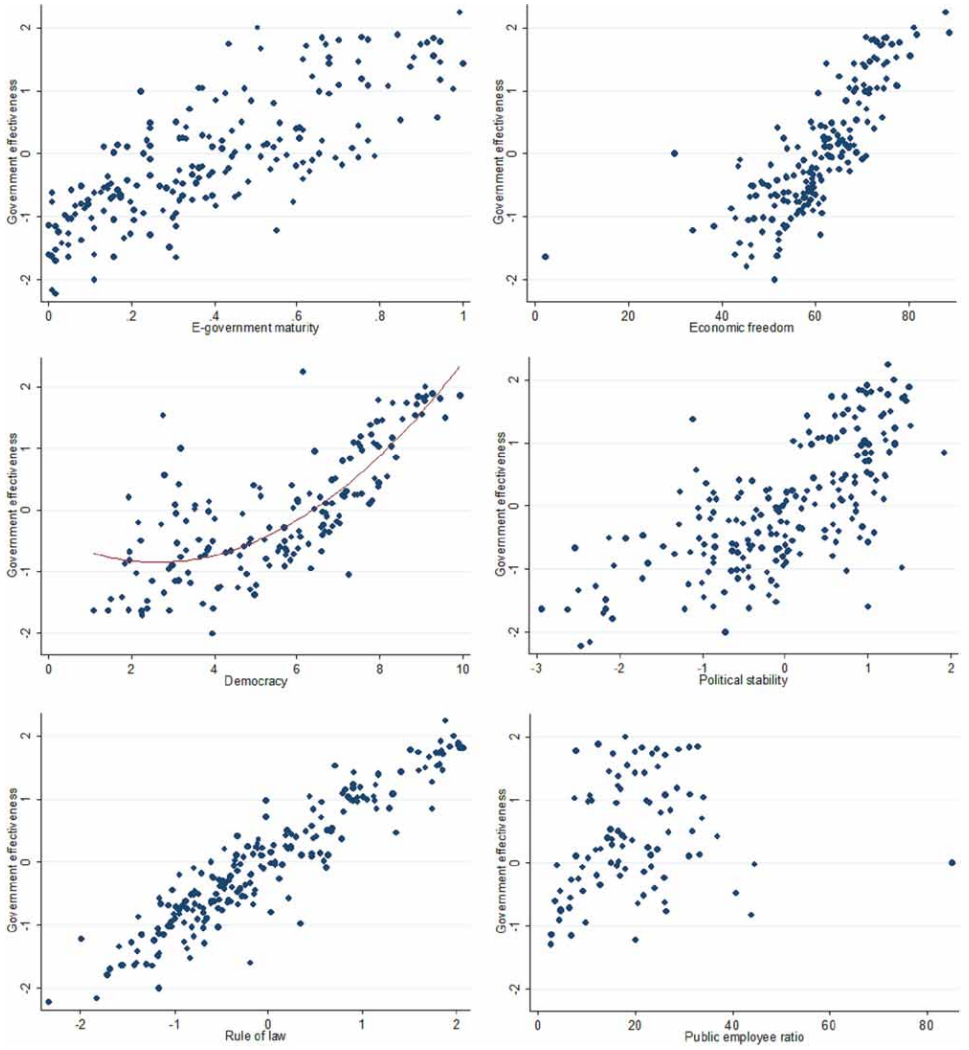
	[Y1]	[Y2]	[X1]	[X2]	[X3]	[X4]	[X5]	[X6]	[X7]	[X8]	[X9]	[X10]	[X11]	[X12]
[Y1] Government effectiveness	1.00													
[Y2] Government efficiency	0.67*	1.00												
[X1] E-government maturity	0.78*	0.45*	1.00											
[X2] Democracy	0.66*	0.13	0.48*	1.00										
[X3] Political stability	0.70*	0.51*	0.32*	0.60*	1.00									
[X4] Economic prosperity	0.79*	0.43*	0.71*	0.45*	0.49*	1.00								
[X5] Economic freedom	0.80*	0.68*	0.62*	0.63*	0.55*	0.61*	1.00							
[X6] Corruption control	0.91*	0.74*	0.64*	0.64*	0.77*	0.65*	0.75*	1.00						
[X7] Rule of law	0.93*	0.71*	0.69*	0.68*	0.75*	0.69*	0.82*	0.94*	1.00					
[X8] Human capital	0.71*	0.26*	0.64*	0.51*	0.56*	0.81*	0.46*	0.61*	0.65*	1.00				
[X9] Power distance	–0.61*	–0.38*	–0.46*	–0.52*	–0.45*	–0.42*	–0.50*	–0.66*	–0.66*	–0.46*	1.00			
[X10] Individualism	0.63*	0.40*	0.49*	0.46*	0.47*	0.57*	0.48*	0.64*	0.67*	0.57*	–0.65*	1.00		
[X11] Masculinity	–0.06	–0.14	0.03	–0.07	–0.12	0.04	–0.01	–0.16	–0.14	–0.01	0.09	0.06	1.00	
[X12] Uncertainty avoidance	–0.11	–0.41*	0.09	0.10	–0.12	0.19	–0.15	–0.17	–0.14	0.21	0.16	–0.13	0.03	1.00
[X13] Public employee ratio	0.20	0.12	–0.02	–0.10	0.25	0.34*	–0.12	0.18	0.14	0.43*	–0.21	0.38	–0.20	–0.03

* $p < 0.001$

Figure 2 displays scatterplots of government efficiency against its key determinants. E-government maturity does not portray a solid pattern in its relationship with efficiency, though it may seem to have a slightly upward line. Similarly with Figure 1, economic freedom, political stability, and rule of law have quite apparent linearity in their association with efficiency. The curvilinear relationship of democracy with the quality of government is more strongly confirmed in the scatterplot of efficiency. Examples of efficient non-democracies supporting curvilinearity are Libya, Sudan, Syria, Turkmenistan, Uzbekistan, and Yemen. Interestingly, the list of effective non-democracies does not overlap with that of efficient non-democracies.

Table 3 reports the results of the 2SLS regression analysis. Three post-estimation tests were conducted to examine the validity of the 2SLS model. Sargan test (χ^2 statistics) checked up the validity of overidentifying restrictions. The test results of the four second-stage regressions do not reject the null hypothesis that overidentifying restrictions are valid. In other words, the instruments are not consistently correlated with the error of the main regression, and therefore they are valid. Wu-Hausman test (F statistics) checked up the endogeneity. By rejecting the null hypothesis of exogeneity, the test results support endogeneity of e-government maturity. Finally, the results of weak instrument test reject the null hypothesis that all instruments are weak at the significance level of 5% and the weak instrument threshold of τ (tau) = 10% as a usually accepted level (Finlay & Magnusson, 2009; Pflueger & Wang, 2014). An F statistic is compared with a 2SLS critical value and LIML (limited information maximum likelihood) critical value. The second-stage regressions passed this test because the F statistics exceed the two critical values.

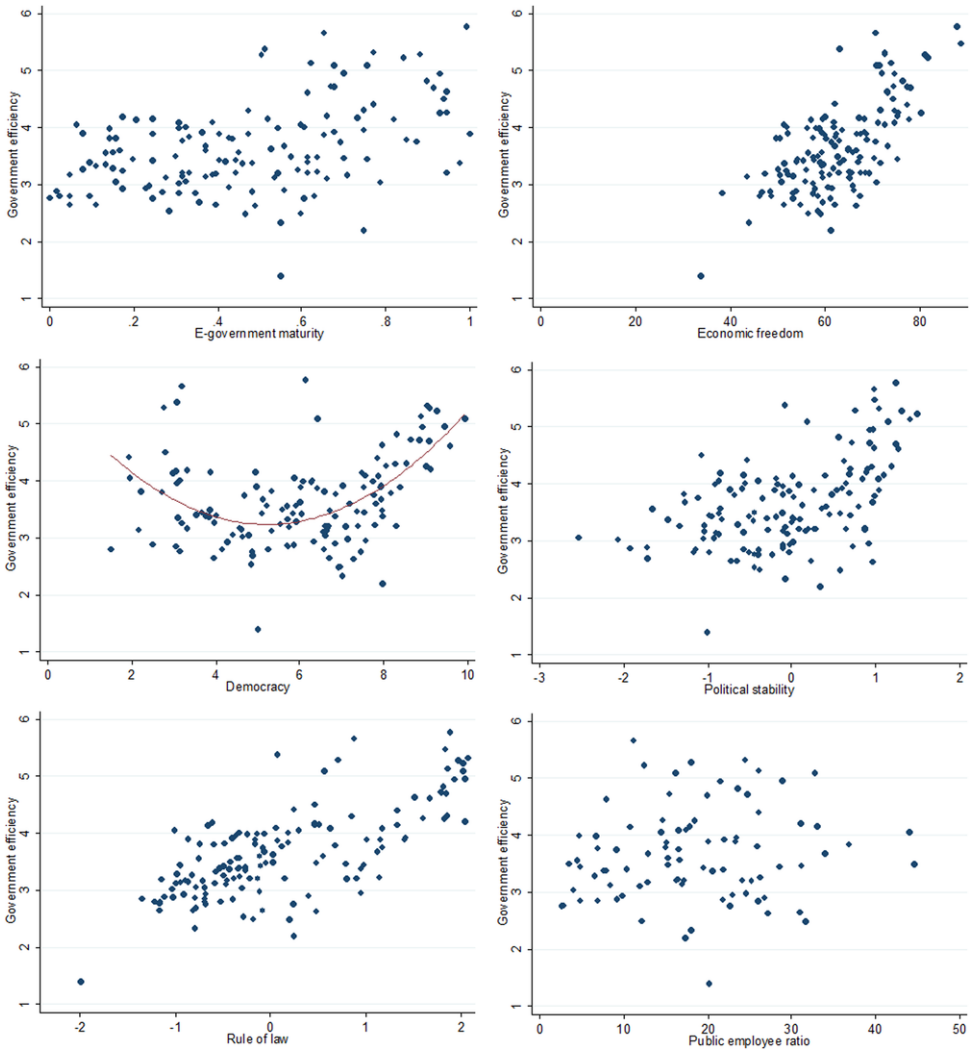
Figure 1. Scatterplots of government effectiveness against determinants



In the first stage regression, democracy does not significantly predict the level of e-government maturity, while the other three determinants determine it significantly. The second stage regressions of government effectiveness and efficiency use the predicted value of e-government maturity as a key independent variable. E-government maturity predicts government effectiveness but fails to predict government efficiency. This is consistent with what the pairwise correlation and scatterplots suggest. Based on these results, e-government does not accomplish its goals as much as the rhetoric proposes. Considering the measure of government effectiveness, one can say that e-government maturity contributes to public perceptions of the overall high quality of government services, civil service, policy formation, and policy implementation. Considering the measure of government efficiency, one can say that e-government maturity fails to create popular satisfaction with the decreasing wastefulness of government spending, minimizing administrative requirements, and enhancing regulatory efficiency.

The second stage models predicting government effectiveness and efficiency are divided into ones including the public employee ratio and ones not including it. The public employee ratio is negatively associated with government efficiency but does not have a significant

Figure 2. Scatterplots of government efficiency against determinants



influence on government effectiveness. To examine the curvilinearity of democracy, its level in a quadratic form is added to the model specification. As illustrated in Figure 2, the regression result identifies the curvilinear relationship of democracy with government efficiency. The level of democracy does not have a significant influence on government effectiveness. Economic freedom also exerts a significant influence only on government efficiency. Rule of law acts as a common determinant of government effectiveness and efficiency in its expected direction. While other cultural dimensions do not have any significant impact, uncertainty avoidance only has a significantly negative influence on the outcome variables. This result can imply that countries valuing legitimacy over survival are more likely to have effective and efficient government than those with national cultures primarily seeking survival and avoiding uncertainty. Of the two possibilities discussed in the second section, American culture-based efficiency (in which uncertainty tolerance leads to efficiency) outperforms German culture-based efficiency (in which risk avoidance and well-planned actions lead to efficiency).

Table 3. 2SLS regression of government effectiveness and efficiency

	First Stage Predicting E-Government Maturity	Second Stage Predicting Government Effectiveness	Second Stage Predicting Government Effectiveness	Second Stage Predicting Government Efficiency	Second Stage Predicting Government Efficiency
E-government maturity		2.084* (0.439)	1.872* (0.522)	–1.117 (0.628)	–0.910 (0.655)
Democracy squared		–0.001 (0.012)	0.003 (0.016)	0.048* (0.017)	0.050* (0.019)
Democracy	0.001 (0.009)	0.050 (0.137)	0.011 (0.183)	–0.671* (0.191)	–0.691* (0.230)
Political stability		0.168* (0.067)	0.154 (0.089)	–0.168 (0.095)	–0.138 (0.112)
Economic prosperity	0.177* (0.048)				
Economic freedom		–0.003 (0.007)	–0.002 (0.008)	0.028* (0.010)	0.027* (0.009)
Corruption control	0.094* (0.022)				
Rule of law		0.443* (0.127)	0.454* (0.142)	0.839* (0.177)	0.748* (0.178)
Human capital	0.259* (0.121)				
Power distance		0.002 (0.002)	0.002 (0.003)	0.005 (0.003)	0.003 (0.004)
Individualism		–0.001 (0.002)	–0.002 (0.003)	–0.005 (0.003)	–0.002 (0.004)
Masculinity		0.001 (0.002)	0.001 (0.002)	0.001 (0.003)	–0.002 (0.003)
Uncertainty avoidance		–0.004* (0.001)	–0.003 (0.002)	–0.008* (0.003)	–0.008* (0.003)
Public employee ratio			0.009 (0.005)		–0.024* (0.007)
Constant	–0.448* (0.162)	–0.799* (0.518)	–0.969 (0.653)	4.753* (0.721)	5.295* (0.820)
N	92	96	69	92	69
F	65.67*	—	—	—	—
Wald χ^2	—	783.08*	535.10*	263.82*	264.57*
R^2	0.632	0.884	0.876	0.731	0.795
Adjusted R^2	0.622	—	—	—	—
Sargan test (χ^2)	—	3.188	0.215	4.487	0.215
Wu-Hausman test (*F*)	—	26.106*	27.756*	4.215*	4.002*
Weak instrument test (*F*) (2SLS=6.46; LIML=3.32)	—	7.442	7.350	6.744	6.674

* $p < 0.01$

FURTHER DISCUSSION

Theoretical Implications

The literature review in the second section identifies a paucity in the global-level examination of e-government effects on government effectiveness and efficiency. This study fills the void by investigating the relationships between various global indicators from reliable sources. A core finding related to e-government expectations is notable; over the globe, e-government contributes to government effectiveness but fails to improve government efficiency. This finding is intriguing when earlier expectations of e-government are considered. People have expected technological innovation by the government to cut out bureaucratic red tape, simplify complicated business processes, and ultimately reduce waste in government spending. Perhaps such effects may happen in practice; however, perceptions of government efficiency are not very favorable for e-government effects.

This finding can be unique because existing research has neglected to analyze perceived effectiveness and efficiency at the same time. Future research should raise two questions in light of this finding. First, does perception matter? Unless this study-based government effectiveness and efficiency upon perception measures, the result might differ from Table 3. Second, why does e-government have a greater impact on effectiveness than on efficiency? If perception measures do not matter much and remain consistent with purely objective indicators, future studies need to quantitatively compare e-government effects on government effectiveness and on government efficiency.

If efficiency is a crucial characteristic of the quality government, why technology adoption and utilization of government does not result in more efficiency deserves further research. Empirical evidence may provide possible reasons. Diffusion of e-government in developing countries has not create a converged result, showing disparities in e-government effects (Udo, Bagchi, & Kirs, 2014). Among factors generating the disparities, institution is considered a cornerstone of technology-driven development in developing countries. Countries with poor institutional readiness of government blocks the efficiency potentials of e-government. Because the efficiency measure of this study reflects both financial and institutional efficiency, the linear impact of e-government on efficiency may be cancelled off between well-institutionalized countries and poorly-institutionalized ones. Evidence from private sector research may help explain the reason. Intermediate ICT adopters ironically made poor performance in terms of efficiency compared to heavy and weak adopters (Scholochow, Fuchs, & Höpken, 2010). As weak firms of ICT may maintain a certain level of efficiency in their own way, countries may also make their government operation efficient without a mature level of e-government. In addition, the increase in ICT investment often entails the increase in other items (e.g., labor force) of firm expenditure (Becchetti, Bedoya, & Paganetto, 2003). In a similar vein, various e-government projects that soaked up lots of resources have failed especially in developing countries, creating less efficiency in a whole country level (Dada, 2006; Heeks, 2002; Heeks & Stanforth, 20007). With these reasons, e-government maturity may not be highly associated with country-level efficiency.

Practical Suggestions

This study offers strong evidence that e-government has dual effects on user perceptions: generating lukewarm expectations on expenditure efficiency and regulatory efficiency versus enthusiastic anticipations for public service quality and policy quality. E-government practitioners not just in national governments but also in international organizations have to find the practical reason for the perception gap and a way to close the gap. One may think that e-government fails to detach the old stigma of an inefficient organization.

Based on the results, e-government goals may conflict with each other. Some non-democracies have governments with a high level of efficiency. Such efficient non-democratic regimes may dampen e-government-driven initiatives for democracy, transparency, openness, and anti-corruption. This is a possible reason that efficient non-democratic countries differ from effective non-democratic ones.

Bias in achieving the particular goals of e-government does not contribute to a good government. Government effectiveness and efficiency are two rabbits that countries should catch simultaneously.

Research Limitations

This study has a weakness in using perception measures based on expert surveys. Survey responses make it difficult to disentangle what determines the quality of government, since they capture the respondents' combined assessment of government policies and productivity (Chong et al., 2014). In addition, survey responses often reflect a mixture of personal experiences and policy views (Glaeser et al., 2004). Even though using subjective measures from expert surveys is considered to be a proxy for the aggregation of individual citizen perceptions, the measures may not be a real aggregate indicator. Public perceptions are contingent upon citizen evaluations of government effectiveness and efficiency. However, the indicators that this study employs have been continuously elaborated on through theoretical and methodological discussions, and a lot of empirical studies have used the reliable data from EIU, UN E-Gov, WGI, and World Bank.

In addition, the number of countries in the data about cultural dimensions and public employee ratio is fewer than that of countries included in other global indicators. Inevitably, this makes the regression-based analysis miss almost half the countries around the world. The overall identified pattern would not change much even in a larger coverage area if differences between sampled and non-sampled countries did not make systematic errors. The identified pattern could be more salient because most non-sampled countries are expected to have a lower level of political and economic liberty and thus experience a lower level of government efficiency and effectiveness.

CONCLUSION

E-government may keep its promises related to government effectiveness and efficiency, but this study found that e-government maturity does not exert a great impact on representative perceptions of financial and administrative efficiency. Interpreting the results can either be painful or fill one with hope. International interests in and endeavors for e-government maturity contribute to raising the perceived quality of public services and policies. On the other hand, e-government itself is not a main contributor to perceived efficiency. This finding requires enhancing efficiency to be a target goal of international e-government practitioners. Government efficiency might have been regarded as a relatively easy and simple goal. However, the traditional goal of public administration still remains as hard to get as recently focused ones like transparency, openness, participation, and collaboration. Both academics and practitioners should keep this in mind.

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