

Explaining Cross-National Variation in Government Adoption of New Technologies¹

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New information and communication technologies provide governments with opportunities to deliver public services more effectively to their citizens. But we know little about the reasons for variation in the adoption of these technologies across countries. Using cross-national data on government use of information technologies to reform public service delivery, or eGovernment, I argue that politicians' expectations about the effects of more transparent service delivery on established patterns of rent-seeking play an important role in shaping variation in the character of reforms. I show that the level of preexisting corruption in a country is a robust predictor of eGovernment outcomes, with more corrupt governments less likely than their less corrupt peers to implement high-quality public service reforms using information technology. This finding contrasts with those analyses that emphasize the role of economic conditions or regime type in explaining technological diffusion.

The global spread of information and communication technologies has created a number of empirical puzzles for analysts: why have new technologies spread more quickly to particular regions and not others? In what ways do the uses of these technologies vary in different parts of the world, and are these variations shaped by economic, political, or demographic conditions? Analyses of technological growth to date have shown that despite overall expansion of access, gaps in the availability of technology—the digital divide—exist both within and across countries and are a prominent characteristic of the overall diffusion of these technologies (World Bank 1998; Tipson and Frittelli 2003). National characteristics such as regime type have been shown to be important factors for driving overall patterns of international diffusion (Kalathil and Boas 2003; Corrales and Westhoff 2006; Milner 2006).

But we know very little about the specific ways in which these technologies are being used across diverse contexts, and the manner in which patterns of use reflect overall patterns of diffusion. If we are to understand the effects of technology access on such diverse outcomes as economic growth, political liberty, and social development (World Bank 1999, 2000, United Nations Development Program 2001; United Nations ICT Task Force 2003), then it is necessary to

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move beyond broad-brush analyses of technological distribution to evaluate variations in the ways in which information technology is being used across countries.

In this article, I address the gap in our understanding of technological use patterns through an analysis of technology adoption by national governments. I do so by asking the question: under what circumstances will governments use new technologies to reform the delivery of services to citizens? While we have some idea of how governments shape technology access in general, we have very little sense of how they shape their own access to, and use of, these technologies. This is despite the fact that a key element of international discussions on the digital divide has been the potential for developing countries to use these technologies to improve public service delivery to citizens.

As noted by the World Bank (2004), “Too often services fail poor people... They are often inaccessible or prohibitively expensive. But even when accessible, they are often dysfunctional, extremely low in technical quality, and unresponsive to the needs of diverse clientele.” The expectation, then, is that governments can use information and communication technologies to overcome these persistent problems in service delivery. As argued by the United Nations, “ICT [information and communication technology] allows a government’s internal and external communication to gain speed, precision, simplicity, outreach and networking capacity. This can be converted into cost reductions and increased effectiveness...It can also be converted into 24/7 usefulness, transparency and accountability” (2003:7).

The reality of government technology use—often termed eGovernment—is, in most cases, far from this ambitious goal. As the United Nations itself admits, the deciding of “if, how and where to use new communication capacities...is a policy choice” (United Nations 2003:7-8). Like all policy choices, the implementation of information technologies in public service delivery is constrained by the interests and incentives of political elites. While some see information technology as a force to break down the bonds of the state, “liberating” the masses (Barlow 1996), other analysts have shown that established interests have the power to shape technological interventions to their own interests (Van Koert 2002; Kalathil and Boas 2003).

Drawing on this line of reasoning, I posit that the incentives created by established patterns of rent-seeking can discourage politicians from implementing public service reforms, particularly through the use of information technologies. While politicians may expect electoral benefits from the provision of improved services to their citizens, they may also be threatened by the prospect of reduced bribes. As a result, variations in the degree to which politicians depend on corrupt income should shed light on the variation in quality of technology-based public service reforms across countries.

This argument reverses the direction of causality often proposed in analyses of eGovernment, which generally suggest that variations in eGovernment can lead to varying degrees of reduction in preexisting levels of corruption. While much of this research, particularly the case-based examples, provides good evidence for links between quality eGovernment initiatives and reduced corruption, these analyses belie the potential confounding consideration that those cases with the highest levels of preexisting corruption did not implement high-quality eGovernment initiatives in the first place. Some cross-national analyses potentially address this concern (Shim and Eom 2008, 2009; Andersen 2009), without explicitly acknowledging it, but are only partially successful.

To evaluate the argument that variations in corruption can lead to variations in eGovernment quality, I analyze cross-national data on the implementation of technology-enabled public services over the period 2000–2007. In addition, I test alternative explanations for variations in technology use, such as regime type, economic conditions, and mechanisms of policy diffusion. I find that the level of

corruption is strongly associated with the quality of national eGovernance initiatives, even while controlling for a range of potential confounding variables and alternative explanations. In addition, corruption presents a more robust relationship with the quality of technology-enabled reforms than either regime type or economic conditions.

Technology, Public Services, and the (Dis)incentives for Reform

In this analysis, I evaluate variations in the quality of government efforts to use technology to communicate with, and deliver services to, citizens. In common parlance, the use of information technology in this manner is typically referred to as eGovernment. Backus (2001:2) defines eGovernment as “the application of electronic means in the interaction between government and citizens and government and businesses as well as in internal government operations, to simplify and improve democratic government and business aspects of governance.” This can involve a range of activities, including the development of a government website, online processing of applications for services, public forums for commenting on policy proposals, and the use of mobile phones for government notifications.

As noted earlier, the growth in national eGovernment efforts over the last decade has been dramatic. West (2001, 2007) finds that in 2007, 26% of countries provided fully executable services online, compared with only 8% in 2001. Similarly, the availability of government databases went from 41% of countries in 2001 to 80% in 2007 (Ibid.).

But the variation in quality of eGovernment implementations is substantial. According to West, while 62% of countries in North America offered executable services online in 2007, only 34% of countries did in Western Europe, and only 9% in Africa (West 2007). Similarly, in its most recent eGovernment survey, the United Nations (2008:xiii) found that “There were large differences between the five regions [of the world] in terms of e-government readiness, with Europe having a clear advantage over the other regions, followed by the Americas, Asia, Oceania, and Africa. Asia and Oceania were slightly below the world average, while Africa lagged far behind.”

To explain the variation in government technology use, I build on previous efforts to understand cross-national growth in access to information and communication technologies. Recent work by Milner (2006) and Corrales and Westhoff (2006) explains variation in citizen access to new technologies through examination of political factors such as regime type. Milner argues that “Political institutions in particular matter for the adoption of new technologies because they affect the manner and degree to which winners and losers from the technology can translate their preferences into influence” (Milner 2006:178). Democratic governments should be more likely to promote access to information technologies than their autocratic counterparts because “The Internet can provide civil society with uncensored information, costless sharing of that information, and tools to overcome collective-action problems for organizing opposition. All of these can threaten the interests of ruling groups in autocracies” (Milner 2006:178). Corrales and Westhoff (2006) arrive at similar conclusions, but with the additional finding that the promotion of technology access in authoritarian countries depends as well on the degree of government economic orientation, with highly market-focused regimes promoting technology access more than their less market-minded peers, but in ways that they expect to foster economic growth.

While these analyses provide an important foundation for understanding the spread of technology access, and in particular the relationship between variation in access and political incentives, they do not explain the use of technology by

the government itself. Government technology use is in most cases a more explicit policy outcome than the general spread of technology.² Executive or legislative branches of government must, at the very least, approve investments in technology, and more often, the plans for government technology adoption are the subject of legislation.³

Because government technology use is typically a policy outcome, analyses of cross-national policy diffusion may also be relevant for explaining eGovernment adoption. Diffusion analysts often emphasize that “governments adopt new policies not in isolation but in response to what their counterparts in other countries are doing” (Simmons, Dobbin, and Garrett 2006:782). There are multiple mechanisms through which this type of decision making may occur. A recent set of articles examining the diffusion of liberalism posited that the most important mechanisms in that case were “coercion, competition, learning, and emulation” (Simmons et al. 2006:782). The relative importance of these mechanisms to a certain extent reflects the nature of the policy under consideration, and I consider the potential importance of diffusion mechanisms to quality of eGovernment outcomes in the section on alternative explanations below.

Cross-national analyses also provide some evidence that eGovernment and corruption are linked. Andersen (2009) argues that growth in eGovernment can explain patterns of reduced corruption over time. Using data from more than 100 countries, he finds that the change in eGovernment over a 10-year period is robustly related to changes in corruption over the same period. Shim and Eom (2008, 2009) similarly find a statistically significant relationship between eGovernment quality and corruption. What these analyses do not consider, however, is the potential reverse argument that corruption influences the degree of growth in eGovernment.

To understand the quality of technology-enabled service reforms, I argue that it is relevant to consider the expected benefits and costs of eGovernment policies to incumbent politicians, which do not flow directly from the character of the regime. Both democratic and authoritarian leaders may potentially benefit from providing improved services to citizens. Democratic leaders have the potential to receive an electoral boost from eGovernment initiatives, which increases their chances of retaining power. Given low standards of service provision, particularly in developing countries, there is substantial room for improvement across a range of service characteristics. High levels of corruption in public services, in particular, are a common problem across developing countries (World Bank 2004), implying that improvements in the transparency of service delivery, using information technology, could offer significant benefits to citizens (Bhatnagar 2003; Transparency International 2003; Bhatnagar and Singh 2009). Improvements in service delivery can potentially be translated into electoral advantages for ruling politicians. Political analysts often note that elected governments must show they can deliver valued goods to citizens to increase chances of reelection (Fenno 1978; Nooruddin and Chhibber 2008). When politicians improve the delivery of goods and services to citizens, as through eGovernment initiatives, they may then expect a positive response from citizens in future elections.

Authoritarian leaders, on the other hand, can shape eGovernment initiatives in ways that improve services but do not necessarily increase access to sensitive information or communication channels, thereby highlighting their bureaucratic capacity while not increasing democratic freedoms. In both cases, politicians can

² Exceptions would include government policies to promote infrastructure, such as open wireless networks implemented by urban municipalities (Cheung 2007; Farivar 2008).

³ Examples of countries that have passed legislation explicitly regarding government technology use include Brazil, India, Singapore, and South Africa.

use these policy initiatives to improve their position vis-à-vis the public, while working within their particular institutions.

But eGovernment initiatives can also pose risks for incumbent politicians. Specifically, I argue that the level of corruption can affect the incentives of politicians to implement technology-enabled services and thus explain an important portion of the variation in service reforms across countries. Because politicians often have access to a portion of the rents collected by the bureaucrats under their control (Wade 1985; De Zwart 1994; Davis 2004), they will face a threat of reduced corrupt income from the introduction of eGovernment, which may overwhelm their expected electoral benefits from improved service delivery. This can be because anticipated corrupt rents are a part of their calculation of the benefits of office, or also because these rents may be used to finance future election campaigns (Wade 1985; Davis 2004). Wherever politicians see a threat to an established flow of income, they will have incentives not to implement eGovernment policies to protect these income flows. Thus, politicians in countries with established institutions of corruption related to service delivery may be more likely to resist service reforms than their counterparts in less corrupt countries. Case studies of eGovernment in countries such as Ethiopia and India support this logic (Pathak, Singh, Belwal, and Smith 2007; Bussell 2010). My argument builds on the work of economists such as Mauro (1995), Bose (2004), and Shleifer and Vishny (1994), who have attempted to measure the effect of corruption on public policies; I contribute to this literature by evaluating the effects of corruption on a specific policy outcome in cross-national perspective.

Expected Outcomes

The overall incentives for and against eGovernment initiatives, according to my argument, should vary in tandem with variations in corruption. I posit that the overall electoral benefit to politicians across countries is relatively constant—because every incumbent should be able to benefit from such a strategy, the overall size of the electoral benefit from services reform should be similar for political incumbents across political units. However, because degrees of corruption vary dramatically across countries (Transparency International 2006, 2007, 2008), the cost of implementing eGovernment initiatives is also liable to vary dramatically. Thus, it is this variation in the national level of corruption that I expect to be correlated with variations in the quality of eGovernance across countries.

Empirical Analysis

Dependent Variables

In this analysis, I evaluate the relationship between multiple country-level variables and government investments in technology-enabled service reforms, or eGovernment. A number of different organizations have conducted cross-national evaluations of eGovernment performance. To evaluate the robustness of the relationship between corruption and eGovernment reforms, I use two measures of eGovernment from separate sources, both of which focus on the provision of eGovernment services to citizens, rather than to the private sector or between government agencies.

The first source is an annual survey of country-level eGovernment, which is one of the longest running and most inclusive analyses of this type. These reports, led by Darrell West and supported by Brown University and the Brookings Institute (West 2008), started in 2001 and evaluate a range of eGovernment characteristics across 198 countries.

The second source is United Nations reports on what it terms eGovernment “readiness,” published on a semi-regular basis since 2002. These reports evaluate not only the provision of eGovernment via government websites, but also related national characteristics such as the character of the telecommunications infrastructure and national human resources. Scores for each of these areas are then combined to produce an overall eGovernment Readiness score. For my purposes, I draw only on the UN’s evaluation of eGovernment provision in the form of government websites, which provides a good alternative measure to that of West.⁴

Independent Variables

To evaluate the relationship between political corruption and technology-enabled service reforms, I use Transparency International’s Corruption Perceptions Index. This measure of corruption is the most comprehensive over-time measure of corruption currently available.⁵ A recent independent analysis of multiple cross-national corruption measures finds that the Transparency International measure, while problematic in some ways, best reflects the perceptions and experience of bribery of domestic citizens in the included countries (Ko and Samajdar 2010). To verify the robustness of the findings, I conducted a secondary analysis using the International Country Risk Guide (ICRG) corruption measure from Political Risk Services (PRS).⁶ These scores are correlated with the Transparency International measure at 0.58.

What other factors may have an effect on government investments in eGovernment reforms? I include a number of independent variables in the statistical models to account for potential alternative explanations and to control for national characteristics that are typically correlated with the level of corruption. Analysts of technology adoption in general have found that economic and demographic factors, such as national income and population, are associated with technology outcomes (see, *inter alia*, Hargattai 1999; Norris 2001; McNeal, Tolbert, Mossberger, and Dotterweich 2003; Corrales and Westhoff 2006; and Milner 2006).

As noted earlier, recent analyses highlight the relationship between regime type and technology access cross nationally (Corrales and Westhoff 2006; Milner 2006). Qualitative evidence indicates that this relationship may not be as strong with regard to technology-enabled services. The case of Singapore suggests that semi-authoritarian regimes may see more effective government services as part of a broader agenda to promote an efficient state. Particularly in those cases where there is not a high degree of corruption in government service delivery, more efficient service provision can be seen by the state as a way better to meet citizen demands outside of fully democratic processes. This is similar to the logic promoted by Corrales and Westhoff (2006), in which market-oriented autocratic states promote technological growth to reap economic rewards.

eGovernment quality might reflect international pressures on domestic governments, as noted in the literature on cross-national policy diffusion. For example, states may be “coerced” into implementing eGovernment reforms through pressure from donors. International organizations such as the World Bank have

⁴ Comments on the methodological differences between the two surveys are available at www.globalintegrity.org.

⁵ The more recently introduced Global Integrity Index (<http://www.globalintegrity.com>) covers only a small number of countries and does not cover the same countries consistently over time, making use of this index in times series cross-national analyses largely infeasible to date.

⁶ The results of this analysis are available online at <http://www.jenniferbussell.com/research>. Models run using the ICRG corruption data do not present dramatically different results than those using the Transparency International corruption measure.

been active proponents of eGovernment (World Bank 2000). In recent years, funding organizations have also begun to incorporate conditions on loans that require development of computerized services (World Bank Consultant, personal interview, April 29, 2007). As a result, the dependence of a country on international aid may affect their likelihood of implementing sophisticated eGovernment systems.

Diffusion analysts also note the importance of learning, particularly from regionally proximate states (Berry and Berry 1990; Simmons and Elkins 2004; Brooks 2005; for a general discussion of learning and diffusion, see Simmons et al. 2006). By observing the actions of neighbors, politicians can learn about the likely outcomes of policy innovations. Because outcomes are unknown at the start, this learning process may result in more or less policy adoption, depending on the experience of early adopters. In the case of eGovernment policies, then, evidence that service reforms can lead to electoral benefits, or that they can threaten established rents, may produce higher or lower quality outcomes in later adopters, respectively.

A final mechanism of diffusion to consider is emulation. Under some circumstances, states may adopt policy innovations “for symbolic reasons, even when they cannot begin to put them into practice” (Simmons et al. 2006:800). Thus, governments may attempt to follow the policy agenda of those countries with characteristics to which they aspire, such as high levels of growth or high gross domestic product per capita.⁷

The presence of a strong information technology industry might also be associated with government adoption of new technology, as a domestic market may lead to lobbying by industry to purchase technology products. To account for this potential relationship, I include a measure of technology exports as a percentage of total exports.

There may also be reason to believe that Internet access should be correlated with technology-enabled service delivery. McNeal et al. (2003) find a statistically significant relationship between higher levels of household Internet access and the provision of online government services by US states. They argue that this relationship is likely due to greater demands by citizens on government for the provision of technology-enabled services in those cases where citizens have ready access to the technology needed to use such services.

However, provision of technology-enabled services need not be correlated with citizen access to technology, particularly in those cases where government can provide mediated access to services. An example of this is the model adopted across India of computerized service centers where employees, rather than citizens, use computers to provide services. This model attempts to overcome minimal to nonexistent at-home technology access among the general population in India. As a result, it seems reasonable to hypothesize that additional factors other than those found to be related to Internet access may have separate effects on government service reforms using information technologies. I include controls for the number of Internet users and phone subscribers, so as to account for the effects of previously existing infrastructure and potential demand for technology-enabled public service offerings. Variables and their sources are provided in Table 1.

⁷ The fourth mechanism proposed by Simmons et al. (2006), competition, does not seem theoretically relevant to eGovernment. Governments are implementing policies to serve their citizens better, and countries are not typically seen to be competing against each other over the satisfaction of their citizens. One exception might be cases in which states have high rates of out-migration and are attempting to lower this rate through improved services policies, but there is little qualitative evidence supporting this motivation.

TABLE 1. Summary Statistics and Sources for Variables

<i>Concept or mechanism</i>	<i>Measure</i>	<i>Mean</i>	<i>SD</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Countries</i>	<i>Source</i>
eGovernment quality (DV)	West eGovernment Score	0.38	0.15	0	1	198	(1)
	United Nations eGovernment Score	0.33	0.26	0	1	193	(2)
Government corruption	Transparency International	0.40	0.23	0	1	177	(3)
	International country risk guide	0.43	0.20	0	1	138	(4)
Regime type	Polity II Score	3.41	6.53	-10	10	153	(5)
Economic conditions	Gross national income per capita, US\$ ('000)	7.42	11.99	0.08	76.45	178	(6)
	Gross national income per capita, PPP ('000)	9.88	11.62	0.2	63.59	178	(6)
International pressures—"Coercion"	Development aid per Capita	66.05	152.78	-448.49	1847.52	178	(6)
Regional learning	Average West eGovernment score of border states	0.39	0.11	0.09	1	198	(1) (7)
Emulation	Average West eGovernment score, top 20 GDP growth countries	0.38	0.04	0.30	0.43	198	(1) (6)
	Average UN eGovernment score, top 20 GDP growth countries	0.29	0.08	0.20	0.38	193	(2) (6)
	Average West eGovernment score, top 20 GNI per capita countries	0.54	0.08	0.41	0.65	198	(1) (6)
	Average UN eGovernment score, top 20 GNI per capita countries	0.72	0.10	0.60	0.87	198	(2) (6)
Industry pressures	High technology as percentage of total exports	0.14	0.18	0	1	178	(6)
Population	Log of population (ln)	15.52	2.07	9.89	21.00	178	(6)
Internet access	Number of Internet users per 100 people (0-1)	0.16	0.20	0	1	178	(6)
Telecom access	Teledensity—fixed/mobile phone subscribers per 100 people (0-1)	0.26	0.25	0	1	178	(6)

Sources: (1) West eGovernment Surveys, 2001-2008; (2) United Nations eGovernment Readiness Report, 2003-2005, 2008; (3) Transparency International Corruption Perceptions Index, 2001-2008; (4) International Country Risk Guide, 2001-2008; (5) Polity IV Project, 2001; (6) World Bank World Development Indicators, 2001-2007; (7) CIA Fact Book.

Regression Results

I utilize a time-series cross-sectional analysis with errors clustered by country to account for the likely case that the eGovernment scores for a country in one year, in addition to other characteristics, are related to scores in other years. I first use bivariate models, regressing both eGovernment scores on the level of corruption. I then implement multivariate models incorporating all of the variables discussed earlier, with alternate models for both eGovernment scores and the two measures of national income per capita. To account for the theoretical question of whether it is corruption that is affecting eGovernment outcomes or eGovernment that is affecting corruption outcomes, I lag the corruption variables so as to evaluate the relationship between eGovernment outcomes in a given year with the level of corruption in the previous year. Results are presented in Table 2.

The primary finding from all models is that country-level corruption is robustly related to eGovernment outcomes across all measures, and in the predicted direction. Governments associated with lower levels of corruption are more likely to implement higher quality technology-enabled service reforms, as measured by both the West surveys and the United Nations. This is the case even when controlling for alternative explanations and factors typically correlated with corruption. Overall, using the Transparency International corruption index, moving from the most corrupt country to the least corrupt country is associated with between a 0.23 and 0.26 increase in eGovernment scores, on a scale from 0 to 1, when all other variables are held at their means.

Among the remaining variables, perhaps the most interesting finding is the inconsistent relationship between political regime type and eGovernment outcomes. The Polity II score exhibited a statistically significant relationship with the United Nations eGovernment score, but not with the West eGovernment score. This finding then differs from those studies of information technology access in general (Corrales and Westhoff 2006; Milner 2006), which have found a consistently strong relationship between regime characteristics, as measured by the Polity scores, and technology diffusion. In the case of the United Nations scores, the relationship between Polity score and eGovernment outcomes is in the predicted direction, with more open states associated with greater provision of technology-enabled government information and services, but it is of minimal theoretical relevance. Moving up one level in the policy score (a 20-point scale) is associated with only a 0.01 increase in the UN eGovernment score.

A second surprising finding is the similarly inconsistent relationship between national income per capita and eGovernment investments. National income exhibits a statistically significant relationship with service reforms only in the model incorporating the West eGovernment score and when national income per capita is measured in purchasing power parity terms. The variation in this finding is likely due to the fact that the cost of technology-enabled service reforms is minimal relative to other types of potential government investment. It is economically feasible for most governments to implement some type of eGovernment initiative, and thus other factors, such as the political incentives to do so, must provide the explanation for variation in these investments both across and within countries, not general economic conditions.

In terms of those arguments proposed by diffusion theorists, these models provide mixed support for diffusion mechanisms. Coercion, as measured by the amount of development aid per capita received by a country on an annual basis, shows no relationship with the character of eGovernment reforms. If international organizations are promoting eGovernment through aid-based mechanisms, there is no evidence from this analysis that these efforts are leading to clear effects in the quality of technology-based reforms.

TABLE 2. Time-Series Cross-Sectional Regressions for eGovernment Scores, Transparency International Corruption Score

Variable	West overall score (1)	West overall score (2)	West overall score (3)	UN overall score (1)	UN overall score (2)	UN overall score (3)
Corruption Polity II	0.34 (9.32)***	0.26 (4.44)***	0.25 (4.41)***	0.71 (12.93)***	0.23 (1.92)*	0.26 (1.98)**
Income per capita (U.S. \$)		0.00 (0.06)	0.00 (0.12)		0.01 (5.10)***	0.01 (5.07)***
Development aid		0.00 (0.90)	0.00 (1.23)		0.01 (1.07)	0.00 (1.45)
Regional learning		0.00 (1.11)	0.00 (1.31)		0.00 (0.71)	0.00 (0.94)
Average eGov Score top 20 growth		0.20 (2.62)***	0.20 (2.50)**			
Average eGov Score top 20 GNI		0.43 (1.91)*	0.43 (1.92)*		-0.07 (-0.65)	-0.04 (-0.39)
Population		0.35 (2.38)**	0.35 (2.35)**		0.71 (4.81)***	0.69 (4.70)***
Technology exports		0.02 (3.44)***	0.00 (3.48)***		0.07 (6.90)***	0.07 (6.94)***
Internet users		0.05 (0.85)	0.05 (0.89)		0.05 (0.63)	0.06 (0.68)
Telephone subscribers		0.00 (0.06)	-0.00 (-0.03)		0.37 (2.57)**	0.37 (2.65)***
Constant	0.25 (19.55)***	-0.55 (-4.55)***	-0.56 (-4.63)***	0.09 (4.10)***	-1.51 (-7.49)***	-1.53 (-7.63)***
N	1041	358	358	631	278	278
Countries	177	79	79	173	87	87
Wald chi-square	86.95	358.79	337.47	167.25	364.49	384.45
Probability > chi-square	0.000	0.000	0.000	0.000	0.000	0.000

Entries are regression coefficients, with z-ratios in parentheses. Standard errors clustered by country. * $p < .10$, ** $p < .05$, *** $p < .01$.

In the case of learning, however, there is some evidence that countries implement eGovernment initiatives similar to those in their neighboring countries, even while holding constant factors such as economic conditions, which might also display regional tendencies. In the West eGovernment score models, the average score for border countries displays a statistically significant relationship with the eGovernment score of the bordered country. Going from the lowest to the highest eGovernment score in the border countries is associated with a 0.2 increase in the eGovernment score of the bordered country.

For the third diffusion mechanism, emulation, there are mixed results. The average eGovernment score of the top 20 economic growth countries is weakly correlated with the West eGovernment scores and does not display a statistically significant relationship with the UN eGovernment scores. This may in part be due to the fact that the countries with the highest levels of growth during this period, in many cases, were not necessarily the countries we would expect other countries to see as role models, such as Angola, Armenia, Cambodia, Chad, Eritrea, Kazakhstan, and the Sudan. While the activities of these states may have influenced their neighbors, as shown earlier, they do not seem to have had a broader effect on the eGovernment choices of countries across the world.

The same cannot be said for high-income countries. The average eGovernment scores of the top 20 richest countries in the world, as measured by gross national income per capita, are robustly related to eGovernment scores across all models. Thus, changes in the quality of eGovernment initiatives among the world's economic leaders, in terms of income, may well have an influence on the reform activities of other states.

These findings are theoretically important, because they provide support for a largely untested argument that the mechanisms affecting the *adoption* of policies across states may also affect the *character* of these policies once they are in place. In other words, it is likely that politicians are not simply observing the implementation of policies and their effects, and making implementation decisions based on these observations; they are also observing how variations in these policies are producing differing effects, and acting accordingly. While this proposition is often implied in the literature on diffusion, it is rarely tested explicitly. Given the evidence presented here, it seems that this is an area ripe for further investigation.

Among the control variables, the findings are also mixed. There is no consistent relationship observed here between technology-related characteristics and service reform outcomes. Countries with an emphasis on technology exports are not more likely to utilize these technologies within their domestic government than other countries. Other domestic technology characteristics, however, show some relationship with service reforms. Higher levels of Internet access exhibit statistically significant relationships with higher United Nations eGovernment scores, but in all but one case not with the West scores. This finding for Internet penetration leaves open the question of whether individual access to technology, rather than access at a government service point, is relevant to the quality of eGovernment reforms across countries. As a result, provision of eGovernment services need not depend on Internet access *per se*, and the resulting variation in government services access strategies likely eliminates our ability to perceive a relationship in one direction or the other in the cross-national context. As has been seen in previous analyses of technology investment, population exhibits a strong relationship with technology outcomes, with countries having larger populations being more likely to invest in public-facing technologies.

Conclusion

Previous studies of technology diffusion provide little guidance for understanding the character of technology adoption by national governments. While regime

type plays an important role in explaining trends in the distribution of technology access, the analysis presented here shows that the relationship between regime characteristics and the quality of eGovernment reforms is mixed, at best. Even in those cases where regime type shows a statistically significant relationship with eGovernment scores, the size of the effect offers minimal theoretical relevance.

Instead, what matters more is the degree of corruption existing in a government prior to and during the implementation of reforms. While all politicians may expect an electoral benefit from implementing technology-based reforms, those politicians accustomed to easily accessible corrupt rents will be incentivized not to implement these reforms.

These findings also highlight the relevance of corruption to policy outcomes across both democratic and authoritarian regimes. While in general, more democratic regimes are also more transparent, this is by no means always the case. Many countries with high Polity scores also have quite low Transparency International scores, implying reasonably high levels of democratic freedom coexisting with reasonably high levels of corruption. India—a highly democratic but very corrupt state—and Singapore—an authoritarian but highly transparent regime—are perhaps the best, but by no means unique, examples of this phenomenon. Future analyses of corruption and policy outcomes should be clear in considering the likely effects on political behavior across the range of regime types.

In addition, the implementation of technology-enabled service reforms has characteristics in common with the adoption of policy innovations in general. eGovernment outcomes in individual countries exhibit strong correlations with both the actions of neighboring countries and of the richest countries in the world, providing support for arguments emphasizing the effects of both learning and emulation on policy outcomes.

However, I also show that the whole of technology-based reforms cannot be understood simply through analysis of external conditions and influences. National leaders observe the actions of neighbors and economic leaders, in addition to policy effects, when determining the most appropriate choices for domestic reforms. But the actions politicians take depend on their own domestic situations. In cases where established systems of corruption are linked to political rents, international examples of corruption-reducing eGovernment reforms, or superficial reforms that allow for the persistence of corruption, are likely to shape domestic outcomes in ways that minimize the quality of any eGovernment initiatives from the perspective of citizens. Unless the incentives of politicians in corrupt regimes can be altered in ways so as to increase the overall benefits of technology-enabled service delivery, it is unlikely that we will see positive effects of eGovernment on transparency and corruption in those places that need it most.

References

- ANDERSEN, THOMAS BARNEBECK. (2009) E-Government as an Anti-Corruption Strategy. *Information Economics and Policy* 21: 201–210.
- BACKUS, MICHEL. (2001) E-Governance and Developing Countries. IICD Research Report No. 3.
- BARLOW, JOHN PERRY. (1996) A Declaration of the Independence of Cyberspace. Available at <http://homes.eff.org/~barlow/Declaration-Final.html>.
- BERRY, FRANCES S., AND WILLIAM D. BERRY. (1990) State Lottery Adoptions as Policy Innovations: An Event History Analysis. *American Political Science Review* 84 (2): 395–415.
- BHATNAGAR, SUBHASH. (2003) *Administrative Corruption: How Does E-Government Help?* Unpublished Report, Indian Institute of Management, Ahmedabad.
- BHATNAGAR, SUBHASH, AND NUPUR SINGH. (2009) Results from a Study of Impact of E-Government Projects in India. Proceedings of the Third IEEE/ACM International Conference on Information and Communication Technologies and Development, April 3–17, Carnegie Mellon

- University, Qatar. Available for download at <http://www.ictd2009.org/documents/ICTD2009Proceedings.pdf>.
- BOSE, GAUTAM. (2004) Bureaucratic Delays and Bribe-Taking. *Journal of Economic Behavior and Organization* 54: 313–320.
- BROOKS, SARAH M. (2005) Interdependent and Domestic Foundations of Policy Change: The Diffusion of Pension Privatization Around the World. *International Studies Quarterly* 49: 273–294.
- BUSSELL, JENNIFER. (2010) Why Get Technical? Corruption and the Politics of Public Service Reform in the Indian States. *Comparative Political Studies* 43(10): 1230–1257.
- CHEUNG, HUMPHREY. (2007) Mexico City to get Urban Wi-Fi. TG Daily, April 3. Available at <http://www.tgdaily.com/content/view/31464/103/>.
- CORRALES, JAVIER, AND FRANK WESTHOFF. (2006) Information Technology Adoption and Political Regimes. *International Studies Quarterly* 50: 911–933.
- DAVIS, JENNIFER. (2004) Corruption in Public Service Delivery: Experience from South Asia's Water and Sanitation Sector. *World Development* 32 (1): 53–71.
- DE ZWART, FRANK. (1994) *The Bureaucratic Merry-go-round: Manipulating the Transfer of Indian Civil Servants*. Amsterdam: Amsterdam University Press.
- FARIVAR, CYRUS. (2008) Free Municipal Wi-Fi Has Hit the Street—Mostly in Places You've Never Heard Of. *Wired Magazine* 16(3). Available at http://www.wired.com/special_multimedia/2008/st_atlas_1603.
- FENNO, RICHARD. (1978) *Home Style: House Members in Their Districts*. Boston: Little, Brown.
- HARGATTAI, ESZTER. (1999) Weaving the Western Web: Explaining Differences in Internet Connectivity Among the OECD Countries. *Telecommunications Policy* 23(10–11): 701–718.
- KALATHIL, SHANTHI, AND TAYLOR BOAS. (2003) *Open Networks, Closed Regimes: The Impact of the Internet on Authoritarian Rule*. Washington, DC: Carnegie Endowment for International Peace.
- KO, KILKON, AND ANANYA SAMAJDAR. (2010) Evaluation of International Corruption Indexes: Should We Believe Them or Not? *The Social Science Journal* 47: 508–540.
- MAURO, PAULO. (1995) Corruption and Growth. *The Quarterly Journal of Economics* 110 (3): 681–712.
- MCNEAL, RAMONA S., CAROLINE J. TOLBERT, KAREN MOSSBERGER, AND LISA J. DOTTERWEICH. (2003) Innovating in Digital Government in the American States. *Social Science Quarterly* 84 (1): 52–70.
- MILNER, HELEN. (2006) The Digital Divide: The Role of Political Institutions in Technology Diffusion. *Comparative Political Studies* 39 (2): 176–199.
- NOORUDDIN, IRFAN, AND PRADEEP CHHIBBER. (2008) Unstable Politics: Fiscal Space and Electoral Volatility in the Indian States. *Comparative Political Studies* 41 (8): 1069–1091.
- NORRIS, PIPPA. (2001) *Digital Divide: Civic Engagement, Information Poverty and the Internet Worldwide*. Cambridge, UK: Cambridge University Press.
- PATHAK, R.D., GURMEET SINGH, RAKESH BELWAL, AND R.F.I. SMITH. (2007) E-governance and Corruption—Developments and Issues in Ethiopia. *Public Organization Review* 7: 195–208.
- SHIM, DONG CHUL, AND TAE HO EOM. (2008) E-Government and Anti-Corruption: Empirical Analysis of International Data. *International Journal of Public Administration* 31 (3): 298–316.
- SHIM, DONG CHUL, AND TAE HO EOM. (2009) Anticorruption Effects of Information Communication and Technology (ICT) and Social Capital. *International Review of Administrative Sciences* 75 (1): 99–116.
- SHLEIFER, ANDREI, AND ROBERT W. VISHNY. (1994) Politicians and Firms. *The Quarterly Journal of Economics* 109 (4): 995–1025.
- SIMMONS, BETH A., AND ZACHARY ELKINS. (2004) The Globalization of Liberalization: Policy Diffusion in the International Political Economy. *American Political Science Review* 98 (1): 171–189.
- SIMMONS, BETH A., FRANK DOBBIN, AND GEOFFREY GARRETT. (2006) Introduction: The International Diffusion of Liberalism. *International Organization* 60 (4): 781–810.
- TIPSON, FREDERICK S., AND CLAUDIA FRITTELLI. (2003) *National Strategies of "ICT for Development."* New York: Markle Foundation.
- TRANSPARENCY INTERNATIONAL. (2003) *Corruption Perceptions Index*. Berlin: Transparency International Secretariat.
- TRANSPARENCY INTERNATIONAL. (2006) *Corruption Perceptions Index*. Berlin: Transparency International Secretariat.
- TRANSPARENCY INTERNATIONAL. (2007) *Corruption Perceptions Index*. Berlin: Transparency International Secretariat.
- TRANSPARENCY INTERNATIONAL. (2008) *Corruption Perceptions Index*. Berlin: Transparency International Secretariat.

- UNITED NATIONS. (2003) *World Public Sector Report: E-Government at the Crossroads*. New York: United Nations Publications.
- UNITED NATIONS. (2008) *E-Government Survey: From e-Government to Connected Government*. New York: Department of Economic and Social Affairs, Division for Public Administration and Development Management.
- UNITED NATIONS DEVELOPMENT PROGRAM (UNDP) WITH ACCENTURE AND THE MARKLE FOUNDATION. (2001) *Creating a Development Dynamic: Final Report of the Digital Opportunity Initiative*. Available for download at http://www.markle.org/downloadable_assets/doifinalreport.pdf.
- UNITED NATIONS ICT TASK FORCE. (2003) *Tools for Development: Using Information and Communication Technology to Achieve the Millennium Development Goals*. United Nations ICT Task Force Working Paper, New York.
- VAN KOERT, ROBIN. (2002) The Impact of Democratic Deficits on Electronic Media in Rural Development. *First Monday* 7 (4).
- WADE, ROBERT. (1985) The Market for Public Office: Why the Indian State Is Not Better at Development. *World Development* 13 (4): 467–497.
- WEST, DARRELL M. (2001) WMRC Global E-Government Survey. Taubman Center for Public Policy, Brown University. Available at <http://www.insidepolitics.org/egovt01int.html>.
- WEST, DARRELL M. (2007) *Global E-Government*. Center for Public Policy, Brown University. Available via <http://www.insidepolitics.org>.
- WEST, DARRELL M. (2008) *Improving Technology Utilization in Electronic Government Around the World*. Governance Studies at Brookings. Available at http://www.brookings.edu/reports/2008/0817_egovernment_west.aspx.
- WORLD BANK. (1998) *Information for Development Program (InfoDev) Annual Report*. Washington, DC: The World Bank Group.
- WORLD BANK. (1999) *World Development Report: Knowledge for Development*. Oxford: Oxford University Press.
- WORLD BANK. (2000) *Information for Development Program (InfoDev) Annual Report*. Washington, DC: The World Bank Group.
- WORLD BANK. (2004) *World Development Report 2004: Making Services Work for the Poor*. Washington, DC: World Bank and Oxford University Press.