Chapter 8

Do Online Public Services Improve Firm Performance? Evidence from Viet Nam

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1. Introduction

e-Government[1] and online public services should, in theory, reduce the costs to businesses and individuals related to finding information and administrative procedures. The reduction in information and administrative costs can occur by decreasing the time and resources that businesses spend on searching and gathering information, reducing the time for submitting application forms and administrative procedures, and minimising face-to-face interactions with government officials. Similarly, publicised procurement and investment information can increase competition in government procurement by making information about government tenders, bidding processes, and contract awards more widely available and transparent. This can reduce the costs of submitting bids, and attract bidders of higher quality, all of which may decrease corruption (Kochanova, Hasnain, and Larson, 2020). e-Invoicing can lead to lower printing, storage and administrative costs, and more secure and accessible information storage (Bellon et al., 2019). All of these will lower business costs and eventually increase the probability of a firm's growth and investment.

e-Government also increases transparency, which is one of the most crucial factors highlighted by academics and development practitioners in distinguishing between environments conducive to developing the private sector. The benefits of transparency are reflected in its ability to reduce risk and uncertainty for investors (Drabek and Payne, 2002; Gelos and Wei, 2005), allowing them to engage in long-term planning, predict legal and macroeconomic changes that may affect their business, and reduce adjustment costs (Broz, 2002; Stasavage, 2003) and the need for self-insurance (Aizenman and Marion, 1993; Feng, 2003).

However, investments in e-government might not bring the expected returns if countries lack the human capital, technology, and good institutions to fully exploit the advantages of information and communication technology (Yilmaz and Coolidge, 2013; Lewis-Faupel et al., 2016; World Bank, 2016). e-Government may fail if businesses do not have access to reliable internet services, if they have to invest considerable time and resources to adapt to new electronic platforms, or if public officials retain discretion in determining what information has been publicised and thus limit competition (Kochanova, Hasnain, and Larson, 2020).

This paper examines whether the use of online public information provided by local governments can improve the business environment and firm performance. Most countries have invested heavily in e-government over the past 2 decades to improve the delivery of a variety of services to citizens and the business community. However, very little is known about the returns on firms' performance. We aim to fill this gap by examining the effects of online public services on the firms' employment and investment.

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[1] e-Government is defined as 'the use of information and communications technologies (ICTs), and particularly the Internet, to achieve better government' (OECD, n.d.: 2).

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Using data from the Vietnam Enterprise Survey and the Provincial Competitiveness Index, we test whether better online public services at the provincial level are more or less likely to make firms invest and hire more workers. The variables proxied for online public services are built using data from surveys that asked businesses about their impression of the openness and quality of provincial webpages. The index ranks provinces based on detailed data on how businesses perceive budget, land and labour policies, recruitment opportunities, local investment incentives and regulations, the provincial gazette of local decisions and circulars, and mechanisms to facilitate online business registration and licensing.

To mitigate the potential biases from omitted variables, we use fixed effects estimation and control for provincial characteristics. We find that better quality websites are associated with a higher level of investment. As better e-government enables the public to be informed about what the government is working on and the policies that are enforced, firms can gain a better understanding of the decisions that are made by local governments and how they will be implemented through transparency, giving investors a better chance of predicting the direction and risk of long-term strategies and increasing their ability to make informed investment decisions. At the same time, a higher percentage of firms accessing provincial government websites also increases firms' investment. These relationships are more profound for foreign firms, firms in industrial zones, and large firms. At the same time, state-owned enterprises invest and employ more when budget documents are published in a timely manner.

The remainder of the chapter is organised as follows. Section 2 provides the institutional context. Section 3 describes the empirical framework and gives an overview of the data used in the analysis. Section 4 describes the results of the analysis. The last section concludes.

2. Background

Since the early 2000s, the Vietnamese government has prioritised e-government (AfD, 2019). The government has, however, accelerated its efforts to modernise and digitise its bureaucracy since 2015. Vietnamese digital government has therefore undergone a significant improvement. Viet Nam was ranked 89th out of 193 nations in the 2016 United Nations E-Government Survey, up 10 places from 2014 (Vietnam News Agency, 2018). Viet Nam's overall rank on the World Economic Forum's Networked Readiness Index (2016) was 79th out of 139 nations, up six places from 2015. In terms of telecommunications affordability, Viet Nam placed third out of 139 nations, particularly in terms of the price of fixed broadband internet and competition in the internet and telephone sectors, which both ranked first. The Vietnamese government's digitisation process is very similar to that of China, although China began the process far earlier, in the mid-1980s. In both cases, the emphasis is on using information and communication technology to increase administrative and management capability while delivering public services through e-government apps. All ministries and provinces had their own local government service platform by the end of 2020 (Vietnam News Agency, 2021).

In 2019, the National Public Service Portal (www.dichvucong.gov.vn) was launched, connecting and integrating with the public service portal and electronic one-stop-shop system in ministries and municipalities. The portal provides information about administrative procedures and public services online, as well as supporting the implementation, monitoring, and evaluation of administrative procedures and online public services, and receiving and processing complaints and petitions from individuals and organisations across the country.

According to the plan, by 2020, the National Public Service Portal will have integrated at least 30% of critical online government services, and it will gradually improve – each year integrating 20% of online government services at the highest level (levels 3 and 4).[23] Some 1,955 administrative procedures are available on the National Public Service Portal, and 507,171 documents online applications had been submitted through the National Public Service Portal as of September 2020. As a result, Viet Nam has seen a considerable shift in the provision of online public services, particularly high-level online public services (levels 3 and 4), with a significant increase in the number of users compared with prior years. This significant achievement is due to the use of information technology in governmental agency activities, which has resulted in the provision of high-quality online public services on a broad scale in both ministries and local governments to benefit citizens and businesses (Hoang, 2021). Nonetheless, Viet Nam's e-government development has some drawbacks. On a technological level, municipal government websites and portals are not yet synchronised, and website address forms diverge. The effectiveness of using online government services is low, and the number of online processing dossiers is still small (Tuan, 2020).

3. Empirical Methodology

3.1. Data description

To examine the relationship between online public services and firm performance, this paper uses two main data sets: business perception about online public services provided by local governments and firm data from the Vietnam Enterprise Survey. We first describe online public service data and then the firm-level data.

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[2] In Viet Nam, online public services are divided into four levels based on the duties that can be completed digitally. The first level allows citizens online access to all relevant information, such as procedures, required papers, and service costs to public services offered. The second level allows citizens to download the necessary paperwork, which they can print and fill out later. At the third level, they can fill out and submit documents online, but they must still pay fees on the spot to the appropriate government agencies. At the fourth level, service payments can be made online.

[3] Prime Minister Decision No. 274/QD-TTg dated 12 March 2019 on the Approval of Scheme for National Public Service Portal.

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Online public service data [4]

The Provincial Competitiveness Index (PCI) is used to assess the quality of online public services. It is a composite index of provincial economic governance that the Vietnam Chamber of Commerce and Industry has calculated every year since 2006. The PCI is based on a questionnaire sent to a random sample of businesses in each province. The poll includes several questions about businesses' impressions of local economic governance as well as concrete measurements of their experience with it. The PCI has the advantage of focusing on areas of local governance that are under the jurisdiction of the provincial government.

The index is based on an annual survey of about 8,500 private businesses, as well as factual data from provincial statistical agencies. As it was created to compare governance across Viet Nam's 63 provinces over time, the PCI contains a lot of geographic variation to exploit. Province samples are stratified to ensure that they accurately reflect provincial populations in terms of age, industry, and legal form. In addition, the PCI permits longitudinal analysis, allowing researchers to track changes in local government over time and see how they influence investment decisions (Malesky and Merchant-Vega, 2009).

The variables proxied for online public services are constructed using information from the surveys asking about the business perception of the openness and quality of provincial webpages based on a 50-point scale. The PCI ranks provinces based on detailed information about businesses' perception of access to budget information, land and labour policies, recruitment possibilities, local investment incentives and regulations, the provincial gazette of local decisions and circulars, and mechanisms to facilitate online business registration and licensing. Besides the aggregate score, we use several sub-indicators to measure the quality of a website. The first is the percentage of firms that have accessed provincial government websites. This indicator captures the usefulness of the provincial government's websites to businesses in the context of the internet and websites being the most effective means of communication in an increasingly connected Viet Nam. The second is the question asking whether online budget documents have enough detail for use in business activities and whether they are published right after being approved. These indicators measure how transparent the local budgets are and the equality of treatment for businesses in Viet Nam.

Access to publicised information could be important and benefit firms in many cases. For example, while all land and provincial planning information is legally required to be open to the public, obtaining such information might be difficult. In the case of Viet Nam, this can harm private sector growth because businesses are not well positioned to take advantage of provincial initiatives. New legislation, implementing documents, provincial rulings, and online governmental services are all examples of information access. When changes in the legal system are not publicly available, a company may

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[4] Data on the PCI can be downloaded from PCI (n.d.).

run smoothly for several years until finding itself in breach of the law due to ignorance. In most circumstances, such ignorance will not cost the company much money, but there is always the risk that some officials might take advantage of the information asymmetry to obtain unauthorised payments (Malesky, McCulloch, and Nguyen, 2015). On the other hand, a company may be eligible for savings, investment possibilities, or tax refunds but never make use of them because it is unaware of them. Lack of transparency can also hinder investment by affecting predictability, or the idea that provincial rules and regulations are executed in a way that allows businesses to forecast and plan for new developments (Hollyer, Rosendorff, and Vreeland, 2011).

Firms can gain a better understanding of the decisions that are made and how they will be implemented through transparency, giving them a better chance of predicting the direction and risk of long-term strategies and increasing their ability to make informed investment decisions (Gelos and Wei, 2005). Publicised information can also have an indirect impact on investment by affecting the equitable utilisation of provincial resources. Lack of information disclosure regarding resources can lead to serious inefficiencies that go beyond a simple transfer of resources from one party to another. Consider the issue of provincial planning, for example. The influence of infrastructure and land conversion plans is restricted if only a few insiders have access to the details. The real estate market's lack of openness is one of the reasons its influence may be limited. Only a few well-informed insiders know where future infrastructure projects and industrial zones will be built. Insiders can then benefit by purchasing land ahead of schedule (Malesky, McCulloch, and Nguyen, 2015).

Table 8.1 presents a summary of the statistical description of different measures of online public services. For example, 67% of firms have accessed provincial government websites. Information on the share of firms that have accessed the provincial budget online and how they felt about the quality of that information shows that nearly 82% of firms thought that the quality of the budget information was good enough for their business purposes. Further, 71% believed that budget documents are published in a timely manner.

Table 8.1. Descriptive Statistics

Variables	N	Mean	SD	Min	Max
Dependent variables					
ln(Investment)	71,802	7.8	3.7	-2.3	18.6
ln(Employment)	71,802	4.0	1.7	0.0	11.3
Online public services					
Openness of province webpage score	71,802	33.4	6.3	15.0	44.0
Firms have accessed province websites (%)	71,802	66.7	7.5	47.0	87.0
Budget documents have enough details for use (%)	71,802	81.8	7.2	53.0	97.0
Budget documents are published in a timely manner (%)	71,802	71.3	9.5	46.0	95.0

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Variables	N	Mean	SD	Min	Max
Firm-level controls					
Firms in industrial parks=1	71,802	0.2	0.4	0	1
Foreign investment firms=1	71,802	0.1	0.2	0	1
State own firms=1	71,802	0.2	0.4	0	1
Private firms=1	71,802	0.7	0.4	0	1
Small firms=1	71,802	0.49	0.50	0	1
Medium firms=1	71,802	0.33	0.47	0	1
Large firms=1	71,802	0.18	0.38	0	1
Province-level variables					
Landlines per capita (%)	71,802	9.9	4.9	1.9	28.4
Internet access per capita (%)	71,802	121.3	49.4	1.5	250.0
Mobile phones per capita (%)	71,802	23.0	29.5	1.2	129.9
ln(Population)	71,802	7.6	0.8	5.7	9.0

Source: Author's calculations.

Enterprise survey data [5]

The second main data set used in this paper is drawn from the Vietnam Enterprise Survey. The survey has been conducted annually since 2000 by Viet Nam's General Statistics Office. These surveys cover a sample of representative enterprises. The firms can be tracked over time via a unique firm identifier. This means that we can follow each firm over time to observe whether they grow, enter, or exit. The Vietnam Enterprise Survey provides comprehensive information about firms and their activities, including information on firm demographics, ownership, business activities, employment, wages, assets, capital, business performance, revenue, and profit. We examine the relationship between the online public services provided and a firm's performance in 2014–2015.

Table 8.1 shows the characteristics of the firms in the survey. Most firms are private and operate outside industrial zones.

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[5] Information about the Vietnam Enterprise Survey can be found at General Statistics Office (n.d.).

3.2. Empirical model

Our analysis will rely on a examination of the relationship between the online public services provided and several measures of firm-level performance, such as the firm's investment and employment. We regress firms' performance on the online public services according to the following equation:

$$y_{ipt} = \alpha_i + \beta EG_{pt} + \theta X_{ipt} + \rho Z_{pt} + \sigma_t + \varepsilon_{ipt} \tag{1}$$

where y_ipt is outcome variables (which measure ln employment and ln investment for firm i in province p at time t). The key variable EG_{pt} denotes different measures of online public services in province p at time t (which are the openness of the provincial government's webpage score, the percentage of firms that have accessed the provincial government's websites, the percentage of firms that believe that budget documents have enough detail for use, and the timely publication of budget documents). X_{ipt} denotes firm characteristics, including industrial zone dummies, and dummies for firm ownership (which include private firms, firms with state capital, and firms with foreign capital). Z_{pt} denotes provincial characteristics such as the number of citizens, and the number of landlines, mobile numbers, and internet subscribers per capita. α_i and σ_t are firm and time fixed effects. The parameter β is the reduced-form estimate of the effects of the online public services. We expect that β is positive. As firms are nested within provinces, meaning that individual firms within provincial borders cannot be treated as independent draws from the underlying population, their errors may therefore be correlated. To address this problem, we cluster robust standard errors at the provincial level in all regressions.

Two major challenges affect the analysis relationship between the online public services provided and a firm's performance in Equation (1): (i) reversed causality (i.e. while online public services might support firms' performance, it could also be the case that more productive firms may affect the online public services provided); and (ii) omitted variable biases (i.e. other unaccounted unrelated factors might affect the estimated β).

Reversed causality is less of a challenge for our analysis because we focus on the adoption of online public services at the provincial level: it is unlikely that firms' employment and investment performance have a direct impact on the online public services provided in their province. The use of an aggregate measure at the provincial level also reduces the risk of measurement error.

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The underlying and difficult-to-measure historical or socio-cultural features of a province may be associated with both the quality of provincial online public services and firm performances. If this is the case, we may fail to differentiate the potential association between historical or socio-cultural features and the performance of firms, and a causal relationship between the quality of online public services and firm performances. To mitigate this problem, firm (α_i) fixed effects are employed, so that the analysis can isolate the relationship between annual changes in the business perceptions of the performance of both online public services and firms.

Firm fixed effects address time-invariant confounders. However, they do not entirely remove the potential for omitted variable bias. Unobserved time-varying factors at the provincial level could lead to bias if they are correlated with the performance of both online public services and firms. In particular, the quality of infrastructure and the size of the provincial market both change over time in ways that could be correlated with the performance of both public information and firms. To address this possibility, we include some provincial characteristics as control variables. Telecommunications infrastructure is measured by the total number of landlines, mobile numbers, and internet subscribers per capita. Market size is captured simply by the population within the province. Time-variant measures, such as a province's gross domestic product (GDP) per capita, were not included as control variables because of endogeneity concerns. Provincial GDP is mechanically correlated with firm investment because GDP includes investment in its construction. Introducing such variables would bias all variables in the model, including the endogenous covariates. Although we added firm and provincial characteristics and the results are robust, we cannot completely exclude the potential issues of omitted varying variables that may bias our results.

4. Empirical Results

In this section, we present the main results of our empirical estimation. We first document the findings of the relationship between the performance of both online public services and firms, and then explore this relationship through different subsamples.

Table 8.2 and Figure 8.1 report the results of some ordinary least squares regressions. Our dependent variables are ln(Employment) and ln(Investment). Our key explanatory variables are the different measures of the quality of online public services. All models include time dummies. To deal with potential contamination of the models by unobservable firm characteristics that may correlate with both online public variables and firm outcomes, we use fixed effects estimation to control for potential time-invariant firm-specific omitted variables that may bias our results.

Table 8.2. **Online Public Information and Firms' Performance**

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	0.011*				0.002			
	(0.006)				(0.006)			
Firms accessing website		0.005**				0.003**		
		(0.002)				(0.002)		
Budget documents have enough details			0.001				-0.001	
			(0.001)				(0.001)	
Budget documents are published in a timely manner				-0.001				-0.000
				(0.001)				(0.001)
Firms in industrial zones	0.129*	0.133*	0.132*	0.133*	0.013	0.014	0.014	0.014
	(0.069)	(0.069)	(0.070)	(0.070)	(0.038)	(0.038)	(0.038)	(0.039)
Private firms=1	-0.213***	-0.213***	-0.218***	-0.217***	-0.109***	-0.107***	-0.109***	-0.110***
	(0.070)	(0.068)	(0.071)	(0.071)	(0.029)	(0.029)	(0.028)	(0.028)
Foreign firms=1	0.316	0.328	0.312	0.315	-0.022	-0.012	-0.023	-0.022
	(0.438)	(0.439)	(0.439)	(0.438)	(0.393)	(0.388)	(0.391)	(0.392)
Observations	71,802	71,802	71,802	71,802	71,802	71,802	71,802	71,802
R-squared	0.009	0.009	0.009	0.008	0.008	0.007	0.008	0.007
Number of firms	48,845	48,845	48,845	48,845	48,845	48,845	48,845	48,845
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Author's calculations.

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Figure 8.1. **Relationship with Firm Performance**
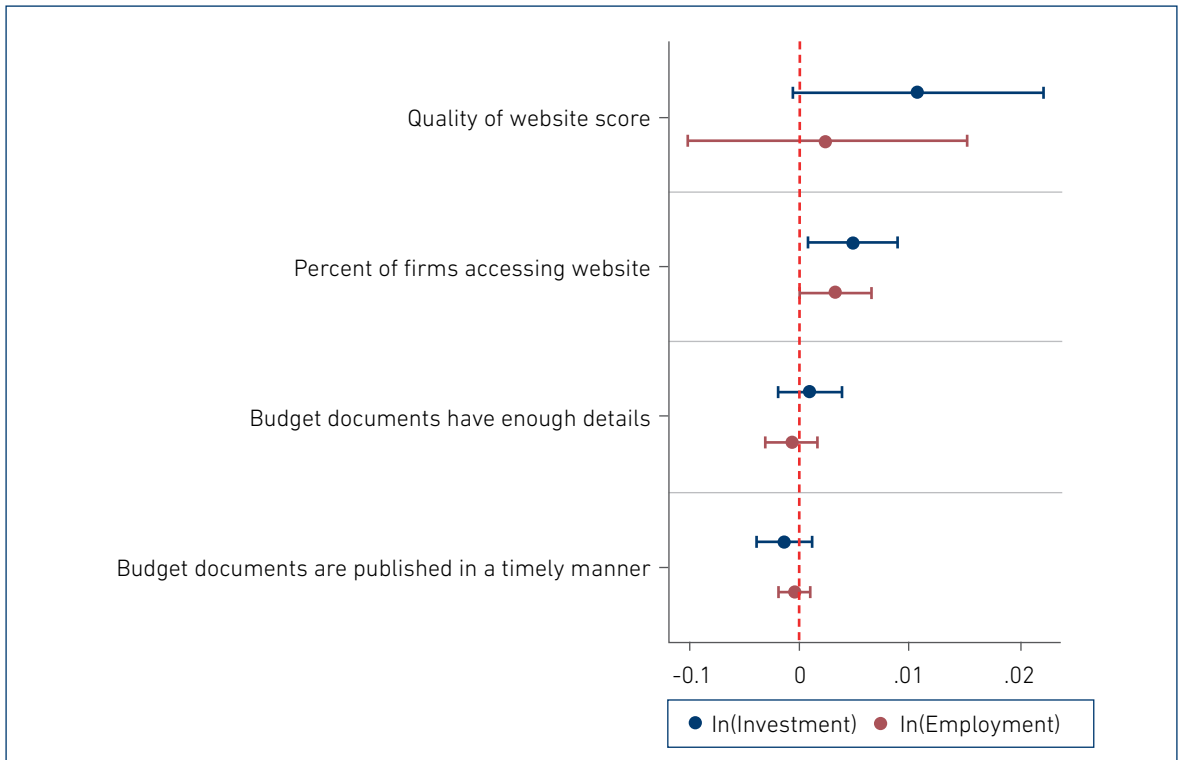
Note: See Tables A1 and A2 for the detailed regression results.

Source: Author's construction.

In columns (1)–(4) of Table 8.2, the dependent variable is ln(Investment). The results in column (1) show that better website quality is associated with a higher level of investment. At the same time, a higher percentage of firms accessing provincial government websites also increases firms' investment, as shown in column (2). For other covariates, we also find firms in industrial zones to be significantly more invested than firms outside industrial zones. In addition, private firms invest less than other firms. Firms with foreign capital tend to invest more, but the coefficients are not statistically significant. The results in columns (3) and (4) show that information on the budget document does not affect firm investment. In columns (5)–(8), we look at the firm performance measured by the number of workers employed and find that a higher percentage of firms accessing provincial government websites is positively correlated with higher employment. The coefficients of the other main explanatory variables are not statistically significant. The findings from this table indicate that online public information may incentivise firms' investment and expand their activities by hiring more workers. This finding confirms the results of previous PCI reports (Malesky, 2009), which have consistently found information transparency to be the most influential sub-index in firm decision-making. Similarly, the PCI (2016)

found that almost 77% of firms responded that contracts, land, and other economic resources are mainly in the hands of firms with close links to local authorities (VCCI and USAID, 2017). Online public information may help firms without linkages to local authorities to procure public projects.

We also check the robustness of our results to the inclusion of other provincial characteristics such as ln(Population), the number of landlines per capita, internet access per capita, and mobile phones per capita, which are likely to influence firms' performance. The results are presented in Table 8.3 and Figure 8.2. Controlling for these variables in the regressions, we still find that our results for the relationship between the quality of a website and firms' performance are almost the same. In the fully specified model in column (1), the magnitude of the coefficient shows that a one-score change in the 50-point index is associated with a 1.3% increase in firm investment. Otherwise, one standard deviation of the provincial government webpage score results in an 8.2% increase in firm investment. The coefficient of accessing the website drops in magnitude to 0.004, but remains statistically significant, as shown in column (2). At the same time, not only is the coefficient statistically significant, but the effect is quite large. The coefficient suggests that if the number of firms accessing provincial government websites increases by 10 percentage points, that results in 4% higher firm investment. As we add other controls, all the main coefficients in columns (4)–(8) are still insignificant although the magnitudes are almost the same.

Table 8.3. Online Public Information and Firms' Performance—Additional Controls

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	0.013**				0.006			
	(0.007)				(0.006)			
Firms accessing website		0.004*				0.002		
		(0.002)				(0.002)		
Budget documents have enough details			0.002				-0.000	
			(0.001)				(0.001)	
Budget documents are published in a timely manner				-0.001				0.000
				(0.001)				(0.001)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	71,802	71,802	71,802	71,802	71,802	71,802	71,802	71,802
R-squared	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009

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Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Number of firms	48,845	48,845	48,845	48,845	48,845	48,845	48,845	48,845
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Other variables include dummies for firms' ownership, industrial zone dummies, ln(Population), the number of landlines per capita, the number of internet subscriptions per capita, and the number of mobile phone subscriptions per capita.

Source: Author's calculations.

Figure 8.2. Relationship with Firm Performance—Adding Provincial Controls
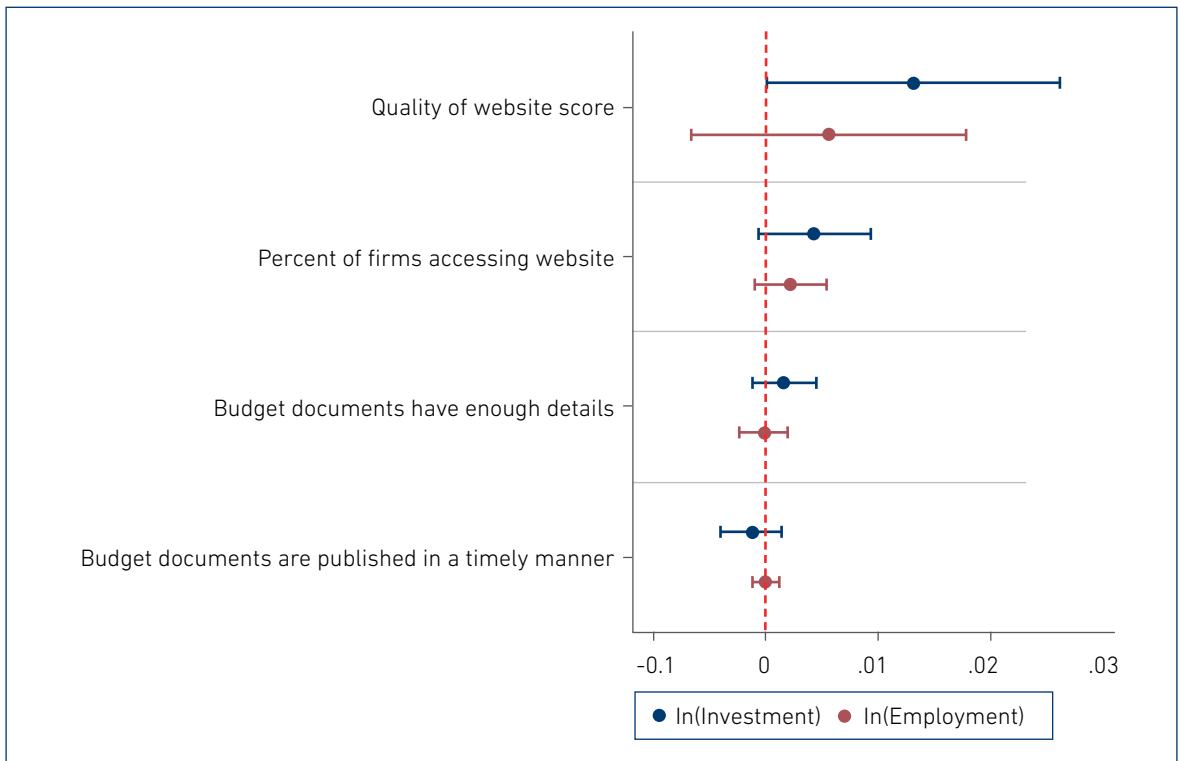
Note: See Tables A1 and A2 for the detailed regression results.

Source: Author's construction.

Heterogeneity

So far, we have pooled all firms into the same regression models. While we have held constant, time-invariant factors at the firm level, the assumption has been that the effect of online public services on investment is homogenous across units. However, the effect of online public services on firms' performance may vary according to the firm's size. Large firms may have privileged access to decision-makers, which is not available to smaller firms. Consequently, general online information may matter much less for their business than their ability to lobby for exceptions to a specific regulation that may be affecting their operations. Regarding the specific question of information, large firms may benefit less from online information, as they may have proprietary information channels of their own (Malesky, McCulloch, and Nguyen, 2015).

To test these possibilities, we ran separate regressions for different firm sizes. The regressions exploring the relationship between online public services and firm performance with firm size, estimated using fixed effects and the same specification as for the regressions presented in Table 8.3, are presented in Tables 8.4–8.6 and Figures 8.3 and 8.4.[6] The results in Table 8.4 confirm that the impacts of online public services differ according to firm size. The magnitude of the coefficients on the quality of a website in columns (1) and (5) is both larger than those in the corresponding columns in Table 8.3. They indicate that the impacts of online public services on firm performance are more profound for small firms and support the hypothesis that larger firms are less reliant on public information than smaller ones. However, the magnitude of the coefficients is not much different. The findings in columns (1) and (2) of Table 8.5 also show that medium-sized firms may find the quality of the website less valuable than other firms. However, the results in Table 8.6 indicate that for large firms, online public services have a bigger impact on investment decisions. Not only is the magnitude of coefficients larger, but the details of provincial budget documents also lead to higher firm investment.

Table 8.4. **Online Public Information and Firms' Performance—Small Firms**

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	0.017**				0.004*			
	(0.008)				(0.002)			
Firms accessing website		0.003				0.001		
		(0.003)				(0.001)		
Budget documents have enough details			0.000				-0.001	
			(0.002)				(0.001)	

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[6] To save space, we do not report all the estimated coefficients.

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Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Budget documents are published in a timely manner				-0.001				0.000
				(0.002)				(0.000)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	71,802	71,802	71,802	71,802	71,802	71,802	71,802	71,802
R-squared	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009
Number of firms	48,845	48,845	48,845	48,845	48,845	48,845	48,845	48,845
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Small firms have up to 50 employees. Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Other variables include dummies for firms' ownership, industrial zone dummies, ln(Population), the number of landlines per capita, the number of internet subscriptions per capita, and the number of mobile phone subscriptions per capita.
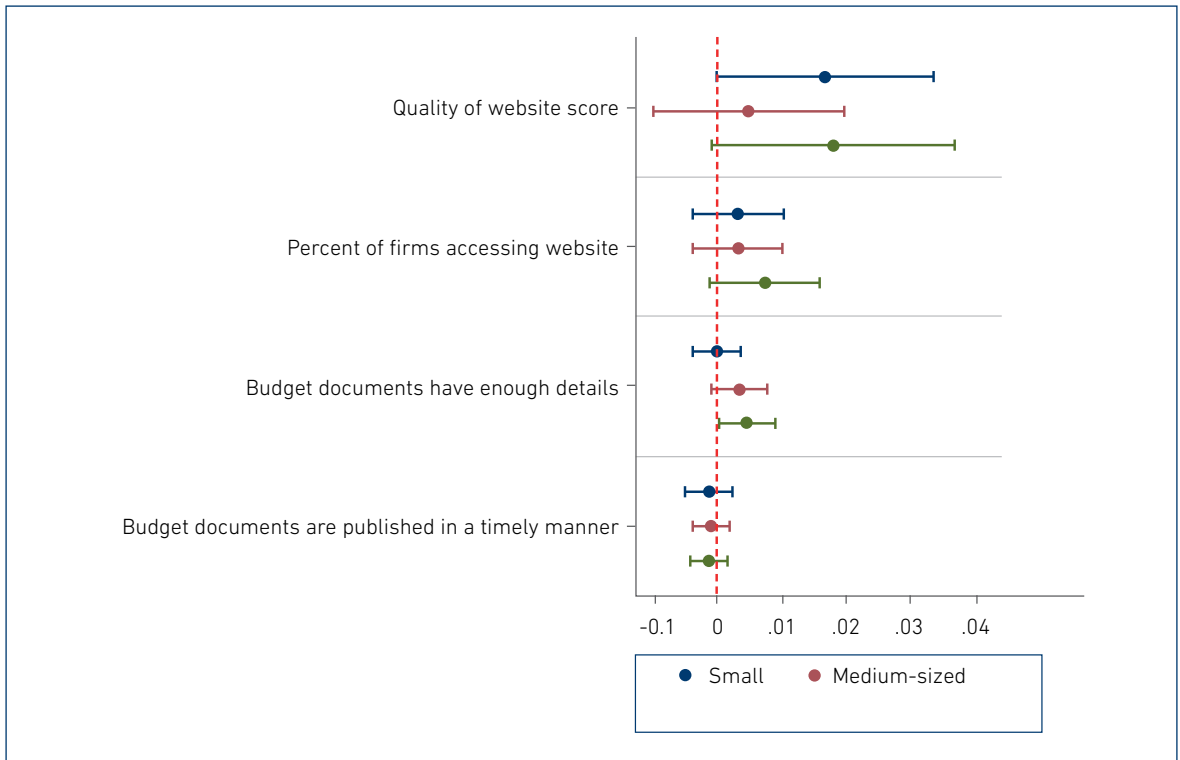
Source: Author's calculations.

Table 8.5. Online Public Information and Firms' Performance—Medium-Sized Firms

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	0.013**				0.006			
	(0.007)				(0.006)			
Firms accessing website		0.004*				0.002		
		(0.002)				(0.002)		
Budget documents have enough details			0.002				-0.000	
			(0.001)				(0.001)	
Budget documents are published in a timely manner				-0.001				0.000
				(0.001)				(0.001)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	71,802	71,802	71,802	71,802	71,802	71,802	71,802	71,802
R-squared	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Number of firms	48,845	48,845	48,845	48,845	48,845	48,845	48,845	48,845
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Medium-sized firms have 50–300 employees. Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Other variables include dummies for firms' ownership, industrial zone dummies, ln(Population), the number of landlines per capita, the number of internet subscriptions per capita, and the number of mobile phone subscriptions per capita.
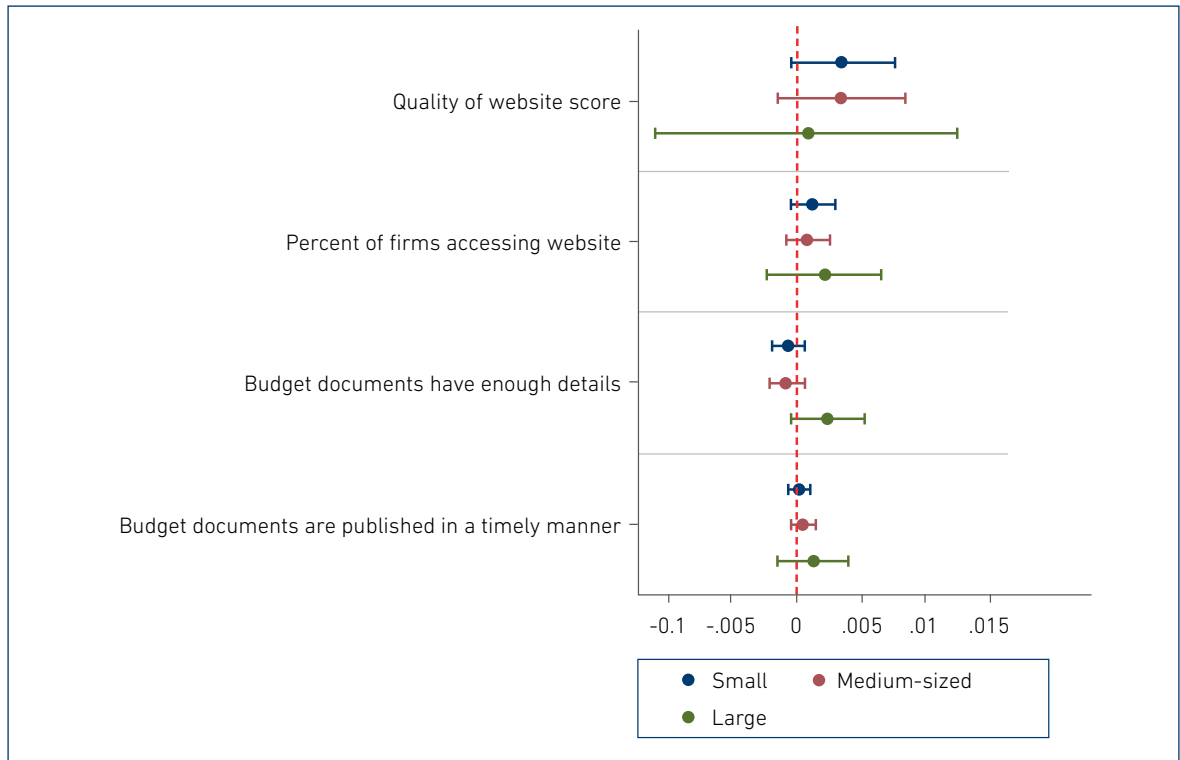
Source: Author's calculations.

Table 8.6. Online Public Information and Firms' Performance—Large Firms

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	0.013**				0.006			
	(0.007)				(0.006)			
Firms accessing website		0.004*				0.002		
		(0.002)				(0.002)		
Budget documents have enough details			0.002				-0.000	
			(0.001)				(0.001)	
Budget documents are published in a timely manner				-0.001				0.000
				(0.001)				(0.001)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	71,802	71,802	71,802	71,802	71,802	71,802	71,802	71,802
R-squared	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009
Number of firms	48,845	48,845	48,845	48,845	48,845	48,845	48,845	48,845
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Medium-sized firms have 50–300 employees. Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Other variables include dummies for firms' ownership, industrial zone dummies, ln(Population), the number of landlines per capita, the number of internet subscriptions per capita, and the number of mobile phone subscriptions per capita.

Source: Author's calculations.

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Figure 8.3. Relationship with Firm Investment by Firm Size

Note: See Tables A1 and A2 for the detailed regression results.

Source: Author's construction.

Figure 8.4. Relationship with Firm Employment by Firm Size

Note: See Tables A1 and A2 for the detailed regression results.

Source: Author's construction.

State-owned enterprises with more inside information may find online public information and services less attractive. We examine whether state-owned firms invest and employ more when there is more public information. The results shown in Tables 8.7 and 8.8 and Figures 8.5 and 8.6 confirm our conjectures. The results in columns (1)–(3) of Table 8.7 indicate that the quality of the website information does not correlate with firm investment and employment. However, the findings in columns (4) and (8) show that firm investment and employment are higher when the budget documents are published right after approval. This demonstrates that state-owned enterprises, which are more likely to benefit from the provincial budget, find budget documents useful. In contrast, the relationships are not statistically different from zero for the domestic private firms, as shown in Table 8.8. They show that online public information has almost no effects on private firms' employment and investment.

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Table 8.7. Online Public Information and Firms' Performance—State-Owned Firms

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	−0.005				−0.005			
	(0.010)				(0.004)			
Firms accessing website		−0.003				0.001		
		(0.003)				(0.001)		
Budget documents have enough details			−0.000				0.001	
			(0.002)				(0.001)	
Budget documents are published in a timely manner				0.003***				0.003***
				(0.001)				(0.001)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,284	4,284	4,284	4,284	4,284	4,284	4,284	4,284
R-squared	0.024	0.024	0.025	0.024	0.026	0.029	0.028	0.028
Number of firms	2,989	2,989	2,989	2,989	2,989	2,989	2,989	2,989
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Other variables include dummies for firms' ownership, industrial zone dummies, ln(Population), the number of landlines per capita, the number of internet subscriptions per capita, and the number of mobile phone subscriptions per capita.

Source: Author's calculations.

**Table 8.8. Online Public Information and Firms' Performance—Private Firms**

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	0.006				−0.006**			
	(0.008)				(0.003)			
Firms accessing website		0.002				0.001		
		(0.003)				(0.001)		
Budget documents have enough details			0.001				0.000	
			(0.002)				(0.001)	
Budget documents are published in a timely manner				−0.001				−0.000
				(0.002)				(0.001)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	52,047	52,047	52,047	52,047	52,047	52,047	52,047	52,047
R-squared	0.009	0.009	0.009	0.009	0.009	0.003	0.003	0.003
Number of firms	38,070	38,070	38,070	38,070	38,070	38,070	38,070	38,070
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Other variables include dummies for firms' ownership, industrial zone dummies, ln(Population), the number of landlines per capita, the number of internet subscriptions per capita, and the number of mobile phone subscriptions per capita.

Source: Author's calculations.

Figure 8.5. Relationship with Firm Investment by Firm Ownership
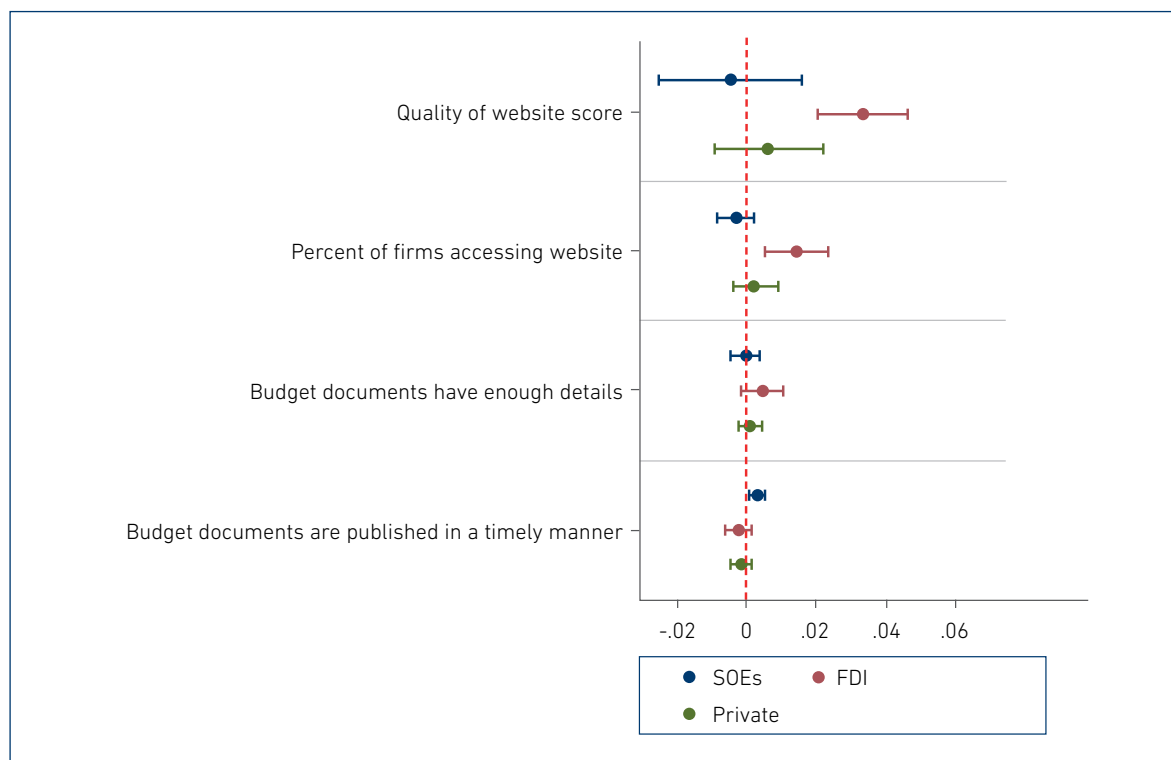
FDI = foreign direct investment, SOE = state-owned enterprise.

Note: See Tables A1 and A2 for the detailed regression results.

Source: Author's construction.

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Figure 8.6. Relationship with Firm Employment by Firm Ownership
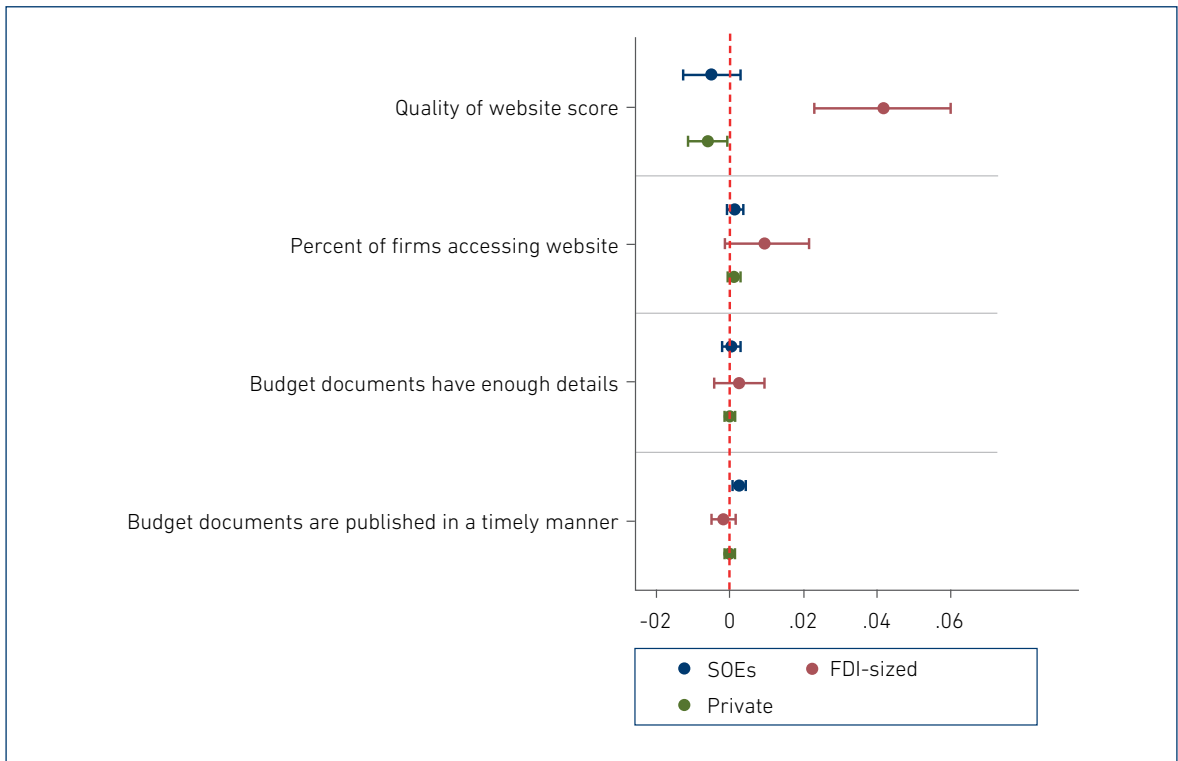
Note: See Tables A1 and A2 for the detailed regression results.

Source: Author's construction.

Foreign firms lack location-specific knowledge and contacts in their competition with domestic actors. In this case, online information may be important for ensuring that foreigners can compete equally in domestic markets. The findings in Table 8.9 demonstrate a fascinating pattern. The first two columns show that when we disaggregate by ownership, we find that the effect of online information is most pronounced amongst foreign firms. The magnitude of the coefficients of the main explanatory variables is much higher compared with those when we run the full sample. A one-unit change in the quality of website scores is associated with a 3.3% increase in investment amongst foreign firms. Additionally, a 10 percentage point increment in the number of foreign firms accessing provincial government websites results in 14% higher firm investment. Similarly, the effects are substantial for employment, as shown in columns (2) and (6). These results appear to confirm the idea that online information helps foreign firms to overcome their lack of connections and local knowledge in an opaque emerging market.

Table 8.9. Online Public Information and Firms' Performance—Foreign Investment Firms

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	0.033***				0.042***			
	(0.006)				(0.009)			
Firms accessing website		0.014***				0.010*		
		(0.004)				(0.006)		
Budget documents have enough details			0.005				0.003	
			(0.003)				(0.003)	
Budget documents are published in a timely manner				-0.003				-0.002
				(0.002)				(0.002)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,284	4,284	4,284	4,284	4,284	4,284	4,284	4,284
R-squared	0.024	0.024	0.025	0.024	0.026	0.029	0.028	0.028
Number of firms	2,989	2,989	2,989	2,989	2,989	2,989	2,989	2,989
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Other variables include dummies for firms' ownership, industrial zone dummies, ln(Population), the number of landlines per capita, the number of internet subscriptions per capita, and the number of mobile phone subscriptions per capita.

Source: Author's calculations.

We also ran a separate regression for firms located in industrial zones and firms outside industrial zones. The results are reported in Table 8.10 and Figures 8.7–8.8. In regressions in columns (1)–(3), we find a positive and significant relationship between the quality of website score and the share of firms accessing the website to firms' performance for firms locating in industrial zones. At the same time, the magnitude of the main coefficients is much higher than the magnitude of the full sample.

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Table 8.10. Online Public Information and Firms' Performance—Firms in Industrial Zones

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	0.024***				0.023***			
	(0.005)				(0.008)			
Firms accessing website		0.008**				0.004		
		(0.003)				(0.004)		
Budget documents have enough details			0.007**				0.000	
			(0.003)				(0.002)	
Budget documents are published in a timely manner				-0.004**				-0.001
				(0.002)				(0.001)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	52,047	52,047	52,047	52,047	52,047	52,047	52,047	52,047
R-squared	0.009	0.009	0.009	0.009	0.009	0.003	0.003	0.003
Number of firms	38,070	38,070	38,070	38,070	38,070	38,070	38,070	38,070
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Other variables include dummies for firms' ownership, industrial zone dummies, ln(Population), the number of landlines per capita, the number of internet subscriptions per capita, and the number of mobile phone subscriptions per capita.

Source: Author's calculations.

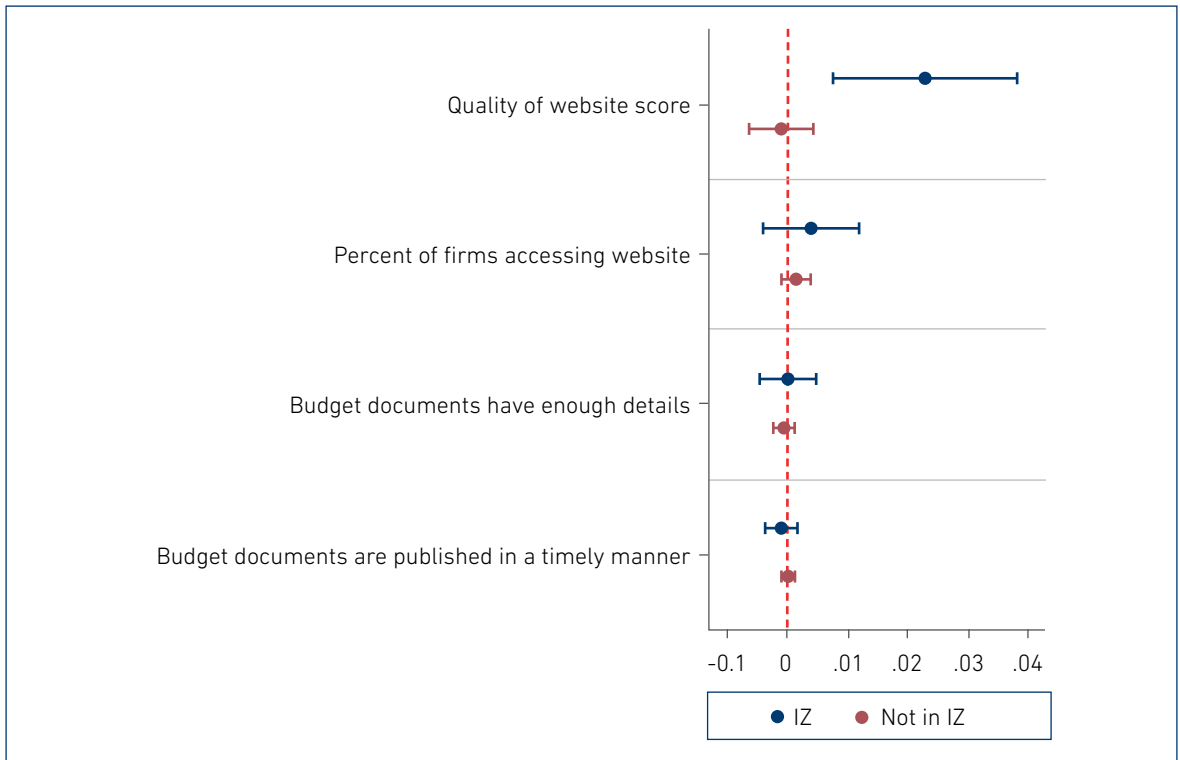**Figure 8.7. Relationship with Firm Investment by Firms Inside and Outside Industrial Zones**
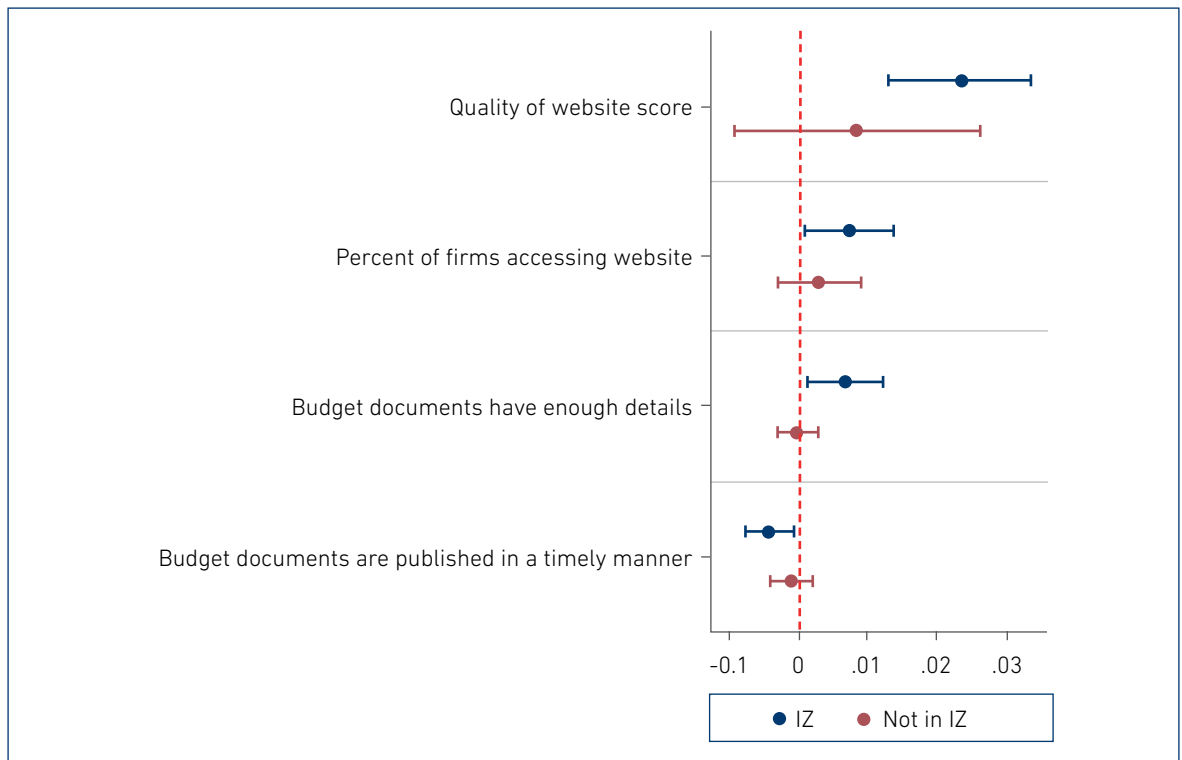
IZ = industrial zone.

Note: See Tables A1 and A2 for the detailed regression results.

Source: Author's construction.

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Figure 8.8. Relationship with Firm Employment by Firms Inside and Outside Industrial Zones

IZ = Industrial Zone

Note: See Tables A1 and A2 for the detailed regression results.

Source: Author's construction.

5. Conclusion

This empirical study has sought to examine the relationship between online public services and firms' performance. While many countries have invested substantially in e-government to better deliver a variety of services to citizens and the business community, empirical studies investigating its effects on firm activities are scarce. Using data from a business perception survey about online public services and the Vietnam Enterprise Survey, we tested whether better online public services at the provincial level are more or less likely to make firms invest and hire more workers. To mitigate the potential biases from omitted variables, we used fixed effects estimation and controlled for provincial characteristics. We find that better website quality is associated with a higher level of investment. At the same time, a higher percentage of firms accessing provincial government websites also increases firms' investment. These relationships are more profound for foreign firms, firms in industrial zones, and large firms. At the same time, state-owned enterprises invest and employ more when budget documents are published in a timely manner.

As more advanced digital government and online public services are an inevitable trend amongst countries worldwide, the impacts of online public services on firms' performance examined in this study also provide insight into understanding the digital transformation process in emerging countries, including the Association of Southeast Asian Nations (ASEAN) Member States. As better e-government enables the public to be informed about what the government is working on and the policies that are enforced, firms can gain a better understanding of the decisions made by local governments, giving them a better chance of predicting the direction and risk of long-term strategies and increasing their ability to make informed investment decisions. This suggests that local governments should increase investment in raising the standard of online public services, enhancing the delivery of government services, making it easier for citizens to comply with legal requirements, and enhancing citizen engagement and public trust, thereby increasing cost-effectiveness for the government and raising citizens' standard of living.

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