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Hope, O.-K., Jiang, S., & Vyas, D. (2021). Government transparency and firm-level operational efficiency. *Journal of Business Finance and Accounting*. <https://onlinelibrary.wiley.com/journal/14685957>

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Government Transparency and Firm-Level Operational Efficiency

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July 17, 2021

Acknowledgements:

We appreciate very helpful comments from Bingxu Fang, Shibin Tang, workshop participants at the Rotman School of Management and Deakin University, and conference participants at the Rotman Sustainable Finance Research Roundtable, the 2020 AAA-International Accounting Section meeting, and the 2020 CAAA meeting. We acknowledge financial support from the Social Sciences and Humanities Research Council and the Rotman Lee Chin Citizenship Institute.

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Abstract

We examine the informational role of governments in the private sector in emerging economies. Using a large sample of private firms, we show that governments' ability and willingness to collect and disseminate economic information (government transparency) is positively associated with firm-level operational efficiency and access to external financing. Several cross-sectional analyses corroborate our main findings. We find that the effect of government transparency is stronger for firms operating in weaker alternative information environments. We also find a reduced effect of government transparency in countries with better-developed capital markets that facilitate capital allocation and production efficiency. Additional analyses using the World Bank-supported Open Government Data initiative as a staggered shock to government transparency provides further support to our primary results. Overall, our paper sheds light on the important role played by governments in emerging markets in aggregating and disseminating economic information.

Keywords: Government Transparency; Private Firms; Emerging Markets; Open Government Data; Operational Efficiency

Government Transparency and Firm-Level Operational Efficiency

1. Introduction

To date, most accounting research has focused on examining the properties and consequences of firm-level accounting information, as well as the informational role played by secondary capital markets and their intermediaries. In this paper, we focus on the role played by an oft-overlooked provider of economic and business information — the government. Governments collect, generate, and disseminate considerable information on local economic conditions and business environment. A lack of such government information creates information voids, an institutional deficiency recently explored by management researchers (Doh, Rodrigues, Saka-Helmhout, and Makhija 2017). In this study, we advance the literature by examining how such government information affects firms' investment and operational decisions in emerging economies.

Our research question requires a contextualized measure of government transparency that reflects governments' ability to aggregate and disseminate information about local economic conditions. Thus, we use the transparency index developed in Hollyer, Rosendorff, and Vreeland (2014), hereafter referred to as the "HRV index." The HRV index covers 125 countries based on an item-response model that treats government transparency as a latent predictor of local governments' reporting of data to the World Bank's World Development Indicators (WDI), and extensively covers local investment climate topics such as macroeconomic conditions, private sector development, public sector spending, etc. Importantly, the HRV index reflects governments' dissemination of *credible* information because data for WDI have survived the World Bank's quality control assessment.

To test firm-level effects of government transparency, we obtain data concerning capacity utilization, total factor productivity (TFP), and financing obstacles from the World Bank Enterprise Survey (WBES). WBES mainly targets small- and medium-sized private firms in emerging markets, which allows our main explanatory variable (government transparency) to be *a priori* important in this setting. In particular, prior research finds that private firms generally have lower financial reporting quality and fewer competing information sources (Chen, Hope, Li, and Wang 2011). Further, unlike developed markets, emerging markets often lack alternative information sources such as developed secondary capital markets and information intermediaries.

We first find that governments' transparency in the provision of local business and economic information is positively associated with firm-level measures of operational efficiency such as *capacity utilization* and *total factor productivity*. The finding is consistent with our prediction that government information facilitates firms' operational decisions. Next, we analyze an underlying mechanism – external financing – through which government transparency can affect firms' investment decisions. We find a negative relation between government transparency and external financing obstacles perceived by private firms, suggesting that government transparency helps external capital providers to better assess their investment opportunity set.

We address the potential endogeneity of government transparency by exploiting the staggered adoption of the World Bank-supported Open Government Data (OGD) initiative by various countries. We observe an increase in private firm operational efficiency and access to financing after a country adopts the OGD initiative. This test provides additional

evidence that better government disclosure of economic fundamentals results in positive externalities for private businesses.

We further take advantage of our *cross-country* empirical setting to conduct several conditioning analyses. First, we predict and find that the effect of government transparency is lower for audited private firms. These firms presumably provide both internal and external decision makers with more reliable firm-level financial information. Second, we argue that the presence of a well-developed secondary capital market is a credible alternative source of business information. We find that the relation between government transparency and firm-level efficiency is muted in countries with better-developed stock markets. Third, we show that the role of government transparency is less important in countries with well-developed credit markets.

Our study contributes to several strands of literature. First, our paper advances the growing management literature on the role of information voids caused by a lack of government transparency in the private sector. Doh et al. (2017) call for more research on new institutional voids such as information voids. Kingsley and Graham (2017) take the first step in examining how information voids affect country-level capital inflows. We extend their study by examining *firm-level* rather than aggregate operational and investment responses to information voids. In other words, we provide micro-level evidence on a question with macro-level importance. Moreover, our paper examines how firm-level and country-level capital market development can mitigate the negative effects of information voids. Our findings further provide evidence on a potential benefit of the World Bank-sponsored global “Open Government Data” initiative.

Second, our research adds to the accounting and finance literature on the informational determinants of firm-level investment and operational efficiency (e.g., Biddle and Hilary 2006; McNichols and Stubben 2008; Biddle, Hilary, and Verdi 2009; Chen et al. 2011; Chen, Xie, and Zhang 2017). However, these studies mainly focus on information provided by the corporate sector (i.e., the firm itself or other firms such as peers in the same industry, and information intermediaries such as financial analysts). We advance this literature in two ways: First, we analyze the important role played by governments in providing relevant business information and thus enabling efficient investments. While prior studies primarily examine firm-level measures of the information environment quality, we provide evidence concerning the importance of reliable aggregate economic information provided by governments. Second, we examine operational variables such as capacity utilization and TFP to infer investment and operational efficiency that are widely used in economics research. Such measures are typically *not* available in databases and thus seldom used in accounting research.

2. Hypotheses Development

The construct behind our primary test variable is “government transparency.” However, our research question requires a rather nuanced conceptualization of transparency — one that reflects the quality of information about local economic and business conditions, rather than tangential information about government accountability, corruption, etc. Therefore, following Hollyer et al. (2014), we define government transparency as governments’ ability and willingness to collect and disseminate aggregate data on local

economic conditions and country fundamentals. Hollyer et al. (2014) develop an index for 125 countries based on an item-response model that treats transparency as a latent predictor of the reporting of data to the World Bank's World Development Indicators, which cover extensive topics on local investment climate such as economic growth, macroeconomic vulnerability, overall debt levels, private sector development, social development, etc. Importantly, data are only included in WDI when they are available in national statistical offices and considered as credible by the World Bank. Therefore, the HRV index reflects governments' dissemination of *credible* economic information. Note that World Development Indicators are provided by local governments and are different from the World Bank firm-level surveys (Section 3.2.1 elaborates the method to construct HRV index). This index is used in studies such as Kingsley and Graham (2017) to examine the relation between government transparency and capital flows in emerging markets.

2.1. Government Transparency and Firm-Level Efficiency

A nascent stream of literature studies how the quality of the information environment affects private firms' investment decisions. To date, most of the research has focused on financial information (firm-level or aggregate) provided externally by the corporate sector. For example, Chen et al. (2011) focus on financial reporting by private firms and find that high quality financial information is associated with higher investment efficiency. More recently, Cheng, Vyas, Wittenberg-Moerman, and Zhao (2019) report that state-industry level aggregate accounting information is associated with future firm-level financial distress.

Governments collect and disseminate important aggregate data that provide insights on local economic conditions and country-level fundamentals. However, there is surprisingly limited research on the role of information provided by governments. Recently, Kingsley and Graham (2017) document that government transparency encourages country-level foreign capital inflows, and that the effect varies with foreign investors' own private information and their flexibility in responding rapidly to change. However, their study does not touch on the firm-level responses to government transparency.

We examine *whether government transparency is positively associated with the operational efficiency of firms* in emerging markets. Prior literature has shown that uncertainty makes firms less responsive to investment opportunities as investment decisions are at least partially irreversible (Bloom, Bond, and Van Reenen 2007; Gulen and Ion 2015). We argue that information released by governments can reduce information uncertainty about local investment opportunities. Such information can be categorized into two types: information directly related to government policy and information not directly related to government policy. For the former type, take for instance, a country's fiscal policy on public expenditures. Government spending can increase firm investment by stimulating aggregate demand or discourage private investment by increasing the wage pressure (Alesina, Ardagna, Perotti, and Schiantarelli, 2002). Another example is governments' policies on tax credits and subsidies. Many governments provide tax support for small businesses. Easy-to-access subsidy policies can help private firms make investment adjustments according to the extent to which they can expect benefits from government support. Understanding the favorability of government policy and making business decisions accordingly can be as important as the

policy itself. Therefore, credible historical and timely current period information provided in government disclosures is important.

Information not related to government policy but provided by governments includes information on local demographics and economic activities. Private firms can access such information directly from government disclosures, or more often, indirectly from third-party platforms that aggregate information disclosed by governments. For example, Tech for Farmers, an e-commerce application in Madagascar, publishes agriculture and geospatial data from Madagascar's Department of Rural Development Policies and Ministry of Agriculture. This information is critical for farmers to adjust to local consumer demand for agriculture products. Similarly, District Metrics, an online service in India, displays information on income and business activity published by the Government of India to help firms understand household consumption at a disaggregated level. We argue that governments' disclosure of local economic data improves managers' understanding of their own operating environment, thereby facilitating local firms' internal decision making and enabling superior investment and operational decisions. Moreover, such information is particularly important for small private firms that lack resources to conduct their own information collection. We refer to this mechanism as the "learning" channel.

In addition to the *learning* mechanism, we also expect that high-quality government information reduces information uncertainty faced by external capital providers, and thus enables capital flows toward more efficient project outcomes — the *financing* channel. This reasoning is similar to the arguments advanced in prior literature on the relation between external information quality and the ability of firms to obtain financing with more favorable

terms (e.g., Hope, Thomas, and Vyas 2011; Van Canegham and Van Campenhout 2012; Vander Bauwhede, de Meyere, and Van Cauwenberge 2015). Compared to public firms, private firms have less alternative information to rely on, and thus, are more likely to benefit from government transparency through either *learning* or *financing* mechanisms. We extend the arguments in these studies to the quality and quantity of aggregate economic information provided by governments.¹

The learning and financing mechanisms are intuitive, but by no means tautological. Whether government information makes a difference in private firms' efficiency and financing is an empirical question. The value of government transparency depends on the quality of government information as well as the alternative information sources a firm has. If governments provide information with significant lags or if firms get access to information from other sources such as professional data providers, we might not find significant effects of government transparency. Accordingly, we state the following hypotheses (in alternate form):

H1a. Government transparency is positively related to firm-level efficiency.

H1b. Government transparency is negatively related to the financing obstacles faced by firms.

¹ The potential substitutability between government transparency and other sources of information is interesting and underexplored in the literature. We include a number of relevant control variables in our empirical analyses. Equally important, our cross-sectional analyses directly examine the roles of several possible alternative sources of information.

2.2. Cross-Sectional Predictions

Next, we explore the conditions under which government transparency is more or less important for firm-level decision making. Specifically, we examine whether the effect in H1 varies with *the availability of alternative information* and with the *development of credit markets*. We expect to find stronger results when firms lack alternative information sources – when public information from peer firms or information intermediaries is limited, and in the absence of credible internal financial information. This prediction is echoed by Chen et al. (2011), who suggest that alternative information sources (e.g., firm-level financial reporting) may be less conducive to the mitigation of investment inefficiencies in countries with less developed institutional frameworks and market mechanisms.

We first argue that the effect of government transparency is lower in settings where credible firm-level or contextual financial information is readily available. This argument is consistent with findings reported in prior literature suggesting that high quality financial information reduces information asymmetry between private firms and outside investors, thereby mitigating financial constraints and increasing investment efficiency (e.g., Chen et al. 2011). High quality financial reporting may also improve internal transparency within firms, thereby enabling managers to learn and focus on new and relevant information and resulting in more efficient investment decisions. Therefore, we predict that the role of government transparency through either the external financing or the managerial learning channels is smaller when firms produce credible internal financial reports. In our empirical tests, we use the presence of audited financial statements to proxy for private firms' financial reporting credibility.

Second, we argue that a well-developed stock market is a richer and potentially timelier source of business information. Accordingly, we expect that the relation between government transparency and firm-level efficiency will be muted in countries with better-developed stock markets. In the presence of a well-developed stock market, private firms and their external capital providers can gauge valuable information about macro-economic and industry prospects from public firms' mandatory periodic reports or voluntary filings, as well as through analyst and media reports.

Finally, we argue that well-developed credit markets mitigate the effect of government transparency on private firms' investment and financing decisions. We argue that creditors with access to sophisticated screening and monitoring tools can incorporate more contextualized borrower-specific information in their decision-making, thereby reducing the importance of more aggregated information sources such as the economic information provided by governments. This argument is broadly echoed in the financial economics literature on the benefits of credit market development (Boyd and Prescott 1986, Beck, Levine, and Loayza, 2000; Wurgler 2000). Furthermore, information sharing between lenders likely increases with the size of the credit market (Pagano and Jappelli 1993). Therefore, we expect government transparency to be less important in reducing private firms' financing obstacles when the credit markets are more developed. In addition, by allowing capital to flow to more productive firms, a well-developed credit market accelerates the non-financial sector's investment and operational efficiency. We thus predict the marginal effect of government transparency in improving private firms' operational efficiency and access to

external finance to be smaller in settings where the credit markets are more developed. Consequently, we state the following cross-sectional hypotheses (in alternate form):

H2a. The relation between government transparency and firm-level investment efficiency (or financing obstacles) is less pronounced for audited firms.

H2b. The relation between government transparency and firm-level investment efficiency (or financing obstacles) is less pronounced in countries with well-developed stock markets.

H2c. The relation between government transparency and firm-level investment efficiency (or financing obstacles) is less pronounced in countries with well-developed credit markets.²

3. Data and Research Design

3.1. Sample Selection

We first obtain firm-level data from the Enterprise Surveys (WBES) conducted by the World Bank since 2006. To ensure the comparability of survey data across years, the World Bank has applied a consistent global survey methodology since 2006 (Hope, Jiang, and Vyas 2021). Next, we obtain the HRV government transparency index from Hollyer et al. (2014).³ This index covers 125 countries from 1980 to 2010. We further restrict our sample to privately-held firms. After merging the HRV index with the WBES data and other

² For completeness, when we use the term “well-developed,” we mean relatively better-developed markets within our sample of emerging markets. Clearly, we expect developed countries to have more developed stock and credit markets than those of developing countries.

³ <http://hrvtransparency.org/>

country-level controls, the resultant sample starts in 2006 and ends in 2010, and includes firms from 55 countries.

3.2. Key Variables

3.2.1 Country-Level Government Transparency HRV Index

We are interested in governments' disclosure of aggregate economic information to the public. Such information is unlikely to be collected and provided by the press because of high fixed costs of collection, and the "public good" nature of such information (Hollyer et al. 2014). Therefore, measures that focus on development of media such as press freedom index are unlikely to reflect our desired construct of government transparency. In addition, measures that reflect general government effectiveness or government accountability do not fully reflect our specific construct either.

Recently, political science scholars have taken important steps to measure government transparency. Williams (2009) constructs a transparency score using the proportion of data coverage on topics that require domestic government assistance in the World Development Indicators and the International Financial Statistics database. Hollyer et al. (2014) further develop a measure to avoid Williams (2009)' subjective calculation choices. Specifically, they include all items that meet data availability criteria (240 items) and apply an Item Response Theory (IRT) model. Usage of the IRT model ensures minimal information loss from collapsing a 240-dimensional observation into a single-dimension representation. They show that the most discriminating variables relate to trade and investment, including measures of the current account balance, goods and services exports

and imports, and changes in reserves. The least discriminating variables are related to population and education measures. The variation in variables confirm that government disclosure is a political decision, not simply a reflection of bureaucratic capacity. Appendix B presents details on the IRT model.

3.2.2. Firm-Level Operational Efficiency

We are interested in examining whether government-provided economic information facilitates firms' operational and investment decisions. WBES provides us with interesting management accounting measures that are not generally available in other settings. Specifically, we use capacity utilization and total factor productivity to measure firm operational efficiency.⁴ *Capacity Utilization* is identified by firms' responses to question F.1 in the survey: "In fiscal year [insert last complete fiscal year], what was this establishment's current output in comparison with the maximum output possible using its facilities at the time?" Possible values range from 0 to 100. Higher value indicates higher capacity utilization.

The second measure we use is total factor productivity (TFP). Higher total factor productivity implies a higher ability to generate greater output with lower input. We obtain firm-level total factor productivity estimates directly from WBES. WBES provides two revenue-based TFP measures: *TFPRYKLM* and *TFPRVAKL*. *TFPRYKLM* uses revenue as output and capital, labor, and materials as inputs, while *TFPRVAKL* uses value added (the

⁴ Questions related to quantitative firm investment level are not included systematically in WBES surveys since 2006, thus we do not use investment efficiency measures that are used in some prior research (e.g., Chen et al. 2011).

difference between revenue and material costs) as output, and capital and labor as inputs. Conceptually, the two measures are similar. Empirically, *TFPRYKLM* considers the interaction effects between material costs and two other inputs while *TFPRVAKL* does not. The correlation between the two TFP measures is 0.74. We report results using *TFPRYKLM* for the main results and cross-sectional analyses and use *TFPRVAKL* in additional analyses.⁵ We provide detailed definitions of *TFPRYKLM* and *TFPRVAKL* in Appendix C.

3.2.3. Firm-Level Financing Constraints

We use *Financing Obstacle* to capture managers' perceived level of financial constraints faced by their firms. *Financing Obstacle* is from firms' responses to question K.30: "To what degree is 'Access to Finance' an obstacle to the current operations of this establishment?" Possible answers are: "0 – no obstacle," "1 – a minor obstacle," "2 – a moderate obstacle," "3 – a major obstacle," "4 – very severe obstacle," "9 – Do not know," and "7 – Does not apply." All answers with "9 – Do not know" and "7 – Does not apply" are treated as missing values.

⁵ Our inferences are similar if we use *TFPRVAKL* for the main and cross-sectional analyses.

3.3. Research Design

H1 predicts that government transparency is positively (negatively) associated with a firm's operational efficiency (financing obstacles). To test H1, we estimate the following regression:

$$\begin{aligned} & \text{Capacity Utilization}_{i,j,t} / \text{TFPRYKLM}_{i,j,t} / \text{Financing Obstacle}_{i,j,t} \\ &= \alpha + \beta_1 \text{Government Transparency}_{j,t} + \beta_2 \text{Size}_{i,j,t} + \beta_3 \text{Audit}_{i,j,t} \\ &+ \beta_4 \text{Tax Inspect}_{i,j,t} + \beta_5 \text{Foreign Ownership}_{i,j,t} + \beta_6 \text{Age}_{i,j,t} + \beta_7 \text{Export}_{i,j,t} \\ &+ \beta_8 \text{GDP}_{j,t} + \beta_9 \text{Inflation}_{j,t} + \beta_{10} \text{Country Import}_{j,t} + \beta_{11} \text{Domestic Credit}_{j,t} \\ &+ \beta_{12} \text{Stock Market}_{j,t} + \beta_{13} \text{Country Governance}_{j,t} + \text{Industry Fixed Effects} \\ &+ \text{Year Fixed Effects} + \varepsilon \end{aligned} \quad (1)$$

where i , j , and t denote firm i , country j , and year t , respectively. *Capacity Utilization* is a firm-level response regarding the current output as a proportion of the maximum output possible. *TFPRYKLM* is a firm-level revenue-based total factor productivity estimate. *Financing Obstacle* is a firm-level response regarding the financing constraints faced by the firm. *Government Transparency* is a time-varying country-level index. We expect to find a significantly positive coefficient β_1 when the dependent variable is *Capacity Utilization* or *TFPRYKLM*, and a negative β_1 when the dependent variable is *Financing Obstacle*. We do not conduct lead-lag analyses due to data limitations.⁶

⁶ Most firms appear in the World Bank survey only once. For a small subset of firms, the World Bank performed multiple rounds of survey. However, the time difference between two rounds is generally more than two years.

We include a number of firm-level and country-level controls. Firm-level factors include firm size (*Size*), external audit (*Audit*), tax inspection (*Tax Inspect*), foreign ownership (*Foreign Ownership*), age (*Age*), and export status (*Export*). *Audit* is used to proxy for the credibility of firm-level financial information in the cross-sectional test. We also control for country-level economic characteristics such as GDP, inflation, and country-level imports. We further use domestic credit provided by the financial sector (*Domestic Credit*) to control for domestic credit market development. We also include the existence of an active stock market (*Stock Market*) to proxy for firms' alternative external information environment and use it in subsequent cross-sectional analyses.

Furthermore, we control for country-level governance quality. Prior studies identify six dimensions of country governance: voice and accountability, regulatory quality, political stability, rule of law, government effectiveness, and control for corruption (Kaufmann, Kraay, and Mastruzzi, 2011). While each variable captures a specific dimension, correlations among the six variables are very high. To mitigate the multicollinearity caused by the high correlations, we perform a factor analysis on the governance proxies and retain one latent factor as a summary measure of country-level governance quality (*Country Governance*).⁷

Finally, we include industry and year fixed effects. We require at least five observations for each country, year, and industry. We cluster standard errors at country-year level. Appendix A provides detailed variable definitions and data sources. All continuous variables are winsorized at the 1% and 99% levels.

⁷ Our conclusions are unaltered if we include all six individual governance variables instead of *Country Governance*.

3.4. Summary Statistics

Table 1 presents the sample distribution and the transparency index level by country. Our sample firms are from emerging markets, where the capital markets and institutional frameworks are less advanced compared to developed countries. Therefore, the WBES sample provides a powerful setting to test the importance of government-provided economic information. Further, government transparency varies significantly across countries. Hungary has the highest government transparency level (8.17) in our sample, while Afghanistan, Madagascar, and Mauritania have the lowest level of transparency (-0.95). The average level of government transparency is 2.69.⁸

Table 2 presents summary statistics for the main variables. The average annual sale for the private firms is 22 million U.S. dollars. On average, firms use 72.56% of the maximum available capacity (*Capacity Utilization*). The average total factor productivity (*TFPRYKLM*) is 2.52.⁹ Approximately half of our sample firms face moderate financing obstacles. For country-level factors, the percentage of domestic credit provided by the financial sector to GDP is 48.34%, while 64% of firms are located in a country with a stock market.

Table 3 shows pairwise correlations among the main variables. Consistent with our primary hypothesis, *Government Transparency* is positively correlated with *Capacity Utilization* and total factor productivity (*TFPRYKLM*), with correlation coefficients of 0.039

⁸ Hungary is treated as an emerging economy by IMF. Note that no inferences are affected by dropping Hungary from our sample.

⁹ Capacity utilization and total factor productivity data are only available for manufacturing firms.

and 0.036, respectively (both significant at the 5% level). Similarly, we find a negative and significant correlation between *Government Transparency* and *Financing Obstacle* (-0.14).

For the control variables, we observe that audit, foreign ownership, GDP, development of domestic credit and stock markets, and country governance are positively (negatively) associated with firm efficiency (extent of financing obstacles). We also note that the correlation between *Government Transparency* and *Country Governance* is positive (0.41) and significant at the 5% level, suggesting that *Government Transparency* is positively associated with overall country-level government quality (Hollyer et al., 2014). However, *Government Transparency* is not subsumed by *Country Governance*, indicating that *Government Transparency* captures an important incremental dimension – governments' ability to collect and disseminate economic information – that is not entirely reflected in country governance.

4. Empirical Results

4.1. Main Results

Table 4 presents the results of our regression analyses to test H1a. If government-provided information facilitates firms' investment and operational decisions, we expect to observe a positive association between *Government Transparency* and *Capacity Utilization* or *TFPRYKLM*. Panel A presents results for *Capacity Utilization*. Column 1 shows that with industry and year fixed effects and without other controls, the estimated coefficient on *Government Transparency* is significantly positive (t-value =2.689). The results hold when we further include firm-level characteristics and country-level economic controls (Column

2). To alleviate the concern that government transparency merely captures country governance, we further include the latent factor of institutional quality (*Country Governance*) and present the main specification for this paper. As shown in Panel A Column 3, the coefficient on *Government Transparency* is 0.746 (t-value =1.758). We find similar results for *TFPRYKLM* in Panel B. In the main specification, the coefficient on *Government Transparency* is 0.03 (t-value =1.753 in Panel B Column 3).

In terms of economic significance, a one standard deviation increase in *Government Transparency* is associated with a 0.078 (0.054) standard deviations increase in *Capacity Utilization (TFPRYKLM)*.¹⁰ For comparison, we note that a one standard deviation increase in firm size is associated with a 0.119 (0.157) standard deviations increase in *Capacity Utilization (TFPRYKLM)*. Overall, the findings in Table 4 are consistent with H1a.¹¹

Table 5 shows the results of regression analyses conducted to test H1b. Government information can improve the information environment for providers of external capital, allowing them to better screen and allocate capital to efficient investment projects. Consequently, H1b predicts a negative relation between *Government Transparency* and *Financing Obstacle*. Consistent with H1b, we find a negative and significant relation

¹⁰ When we only include control variables and fixed effects, the adjusted R-squared is 0.036 and 0.436 for *Capacity Utilization* and *TFPRYKLM* as dependent variables, respectively. As such, adding *Government Transparency* increases adjusted R-squared by 0.001 for both *Capacity Utilization* and *TFPRYKLM* as dependent variables. We acknowledge that this increase in adjusted R-squared is modest.

¹¹ As shown in the correlation table, *Audit* is positively correlated with *Capacity Utilization* and *TFPRYKLM*, and negatively correlated with *Financing Obstacle*, consistent with prior research. When we regress *Capacity Utilization*, *TFPRYKLM*, and *Financing Obstacle* on *Audit* and fixed effects, we find that *Audit* is positively and significantly associated with *Capacity Utilization* and *TFPRYKLM*, and is negatively and significantly associated with *Financing Obstacle*. However, the effect of *Audit* becomes insignificant we include firm size in the regression.

between government transparency and firms' financing obstacles in all specifications.¹² The results in Table 5 provide further evidence regarding the financing mechanism through which government-provided information affects firms' operational and investment efficiency.

4.2. *The Effect of Alternative Information Sources*

H2a predicts that government-provided information is more important when a firm has fewer credible alternative information sources, generated either internally by the firm itself, or externally by the market, peer firms, or financial intermediaries. Among internal information sources, financial statements provide a useful snapshot of firms' underlying economic condition. Following prior studies (e.g., Hope et al. 2011), we use *Audit* to proxy for the credibility of financial statements. As Table 6 shows, *Government Transparency* is significantly positively associated with *Capacity Utilization* and *TFPRYKLM*. This finding (i.e., the main effect) suggests that, in the absence of credible contextual financial information, government transparency is important in improving firms' operational and investment performance. However, the interaction term between *Government Transparency* and *Audit* is negative, suggesting that credible firm-level financial information mitigates the positive effect of government transparency on firms' operational and investment efficiency. Similarly, for *Financing Obstacle*, we find a significantly negative coefficient on

¹² In robustness tests, we alternatively use an ordered Probit regression model when the dependent variable is ordinal (e.g., *Financing Obstacle*), and find that our inferences are unchanged.

Government Transparency and a positive coefficient on the interaction term between *Government Transparency* and *Audit*.

We further find that the sum of coefficients on *Government Transparency* and *Government Transparency* \times *Audit* is statistically insignificant in all three columns, suggesting that government transparency is not associated with operational efficiency or financing obstacles when firms have credible financial information. These findings provide evidence that government information is less useful when firms and their external capital providers can better rely on contextual firm-specific information in their decision-making.

To test the role of alternative external information (H2b), we use the development of the public domestic stock markets to proxy for the richness of information produced by peer firms, financial intermediaries, and investors. *Domestic Stock High* is an indicator equal to one when a country's stock market capitalization of domestic companies is higher than the sample median within the same year, and zero otherwise.¹³ Consistent with H2b, Table 7 shows that the interaction term between *Government Transparency* and *Domestic Stock High* is significantly negative in Column 1-2. This result holds for both *Capacity Utilization* and *TFPRYKLM*. Further, we note that the interaction effect is significantly positive when the outcome variable is *Financing Obstacle*.

Overall, the conclusion from Tables 6 and 7 is that *Government Transparency* is less important when firms have better access to alternative economically-relevant information, generated either internally through audited financial reports, or externally through public capital markets.

¹³ *Domestic Stock High* equals zero for firms in countries without a stock market.

4.3. *The Effect of Domestic Credit Market Development*

In this section, we examine our cross-sectional hypothesis about how the size of domestic credit market affects the relation between government transparency and firms' operational efficiency and financing constraints. We argue that the financial intermediaries in developed credit markets have access to sophisticated screening and monitoring tools, and thus are able to incorporate more contextualized borrower-specific information in their decision-making, thereby reducing the importance of coarser information sources such as the aggregate economic information provided by governments (e.g., Beck et al. 2000). In other words, we expect the effect of government transparency to be weaker in countries with larger domestic credit markets.

In Table 8, we report results of the interaction term between *Government Transparency* and *Domestic Credit High*. As shown in Table 8, *Government Transparency* is positively (negatively) associated with *Capacity Utilization* and *TFPRYKLM* (*Financing Obstacle*), indicating that when the domestic credit market is less developed, government information is more useful in enhancing the efficiency of firms' operational and financing activities. More importantly, we observe a positive (negative) interaction term when the dependent variable is *Financing Obstacle* (*Capacity Utilization* or *TFPRYKLM*). These results are consistent with H2c and imply that a well-developed domestic credit market mitigates the efficiency-enhancing role of government transparency.

5. Additional Analyses

5.1. Open Government Data Movement as a Quasi-Natural Experiment

To further sharpen our empirical identification, we exploit the World Bank-supported Open Government Data initiative as a plausibly exogenous and staggered shock to government transparency. Open Government Data (OGD) is defined as the data that governments collect and release in open format (World Bank 2017). OGD is aimed to create social and economic impact through an increase in government transparency. Since 2012, the World Bank has provided technical assistance and funding to a variety of Open Data projects in developing countries. For example, as many national statistics offices in developing countries did not have modules for metadata to support Open Data platforms, the World Bank launched Data Documentation Initiative to help national statistics offices harvest metadata from microdata catalogs. Consequently, we expect an increase in government transparency in the post OGD period.¹⁴

A key element in OGD is building and launching the Open Data portal. Therefore, we use the year in which the Open Data portal was launched in a country as the OGD identification year. *Post* equals to one for the World Bank surveys conducted during and after the year a country launched its Open Data portal, and zero otherwise. We require a country to have surveys conducted both before and after the Open Data portal launching year. As presented in Panel A of Table 9, six countries are included in the OGD sample. Kenya and Moldova launched Open Data portal in 2011, Ghana launched in 2012, Sierra

¹⁴ We cannot directly test whether government transparency increases after OGD because HRV transparency index is not available after 2010 while OGD took place after 2011.

Leone and Dominican Republic launched in 2015, and Colombia launched in 2016. Panel B of Table 9 provides descriptive statistics for the OGD sample.

Panel C presents regression results. Note that the correlation between *GDP* and *Domestic Credit* is as high as 0.84 in the OGD sample. We perform factor analysis for economic factors (*GDP*, *Country Import*, *Inflation*, *Domestic Credit*, and *Stock Market*) and create a latent factor *Country Economy*. While the Open Data Portal directly targets government transparency, it may indirectly improve government accountability as a result of an increase in public scrutiny. To control for possible government accountability effects, we control for government quality (*Country Governance*) in all regressions. We further include industry fixed effects, *Country Economy*, and all firm-level control variables that are employed in the main regression.¹⁵ We also include *Time Trend* that equals to the number of years between a firm's fiscal year and 2005 to control for the time trend. *Post* is significantly positive in Columns 1-2, suggesting that firms increase their capacity utilization after the government launched OGD. When the dependent variable is *TFPRYKLM*, *Post* is significantly positive without time trend (Column 3) and statistically insignificant with time trend (Column 4). A significantly negative *Post* in Columns 5-6 shows that OGD also mitigates financing obstacles faced by private firms. While these findings address the possibility of correlated omitted variables, we acknowledge that we cannot fully rule out such possibility.

¹⁵ In the OGD sample, *Post* is either 0 for all observations or 1 for all observations. Therefore, we do not include year fixed effects. We do not cluster at the country level because of the limited number of countries (Petersen 2009).

5.2. *Alternative Measures of Operational Performance*

In this section, we provide results using additional measures of operational efficiency. The first alternative measure we use is the value-added-based TFP measure: *TFPRVAKL*. The second alternative measure is labor productivity growth (*Labor Productivity Growth*), where labor productivity is sales divided by the number of full-time permanent workers. We obtain both measures from WBES. We find that government transparency is positively associated with both these measures (untabulated).

6. **Conclusions**

This paper investigates the role of an important but under-explored information source in firms' operational and investment decisions – information supplied by the government in emerging markets. To maintain sustainable growth, firms need a good understanding of the local business environment. Although governments around the world collect and disseminate aggregate data on the country-level fundamentals, the quality of data provision varies across countries. We use a cross-country setting of emerging markets to explore variations in government transparency and provide evidence regarding the broader economic externalities of government transparency. We also strengthen our identification by exploiting the Open Government Data movement as a plausibly exogenous increase in government transparency. Our paper suggests that government transparency reduces financing obstacles faced by private firms, and thus enables more efficient firm-level

investment and operational decisions. However, we caution readers that we cannot fully rule out the possibility of correlated omitted variables.

While the idea that high quality information improves investment efficiency is not new, the insights from prior literature are not obvious in our setting of predominantly small private firms from emerging economies. This is because traditional firm-level and market sources of information may not be readily available for firms in such settings. In other words, in a setting of predominantly small private firms from emerging economies, the government is likely to be an *a priori* important information source. Further, prior literature focuses on indirect measures of investment efficiency such as investment-cash flow sensitivities that are subject to much scholarly criticism. We use more direct operational measures concerning capacity utilization and total factor productivity (TFP) and examine the underlying financing constraints channel.

In addition to contributing to several streams of the academic literature in management, accounting, and corporate finance, we believe that our research should be of interest to policy makers and advocates of the World Bank-supported “Open Government Data” initiative.

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Appendix A: Variable Definitions

Variable	Definition (data items in the World Bank dataset in parentheses, if applicable)	Original Source
<i>Government-Transparency</i>	A country-level government transparency index from Hollyer et al. (2014)	http://hrvtransparency.org/
<i>Post</i>	A country-level indicator that equals to one if the country has launched its Open Government Data Portal	World Bank website
<i>Capacity-Utilization</i>	A firm-level response (f1) regarding the level of current output, compared with the maximum output possible if using all the resources available.	World Bank Enterprises Surveys (WBES)
<i>TFPRVAKL</i>	A firm-level estimate of total factor productivity, based on revenue as output and the VAKL model.	WBES productivity estimates
<i>TFPRYKLM</i>	A firm-level estimate of total factor productivity, based on revenue as output and the YKLM model.	WBES productivity estimates
<i>Financing Obstacles</i>	A firm-level response (k30) regarding the degree of financing obstacles. Possible responses are: 0 – No Obstacle, 1 – a Minor Obstacle, 2 – a Moderate Obstacle, 3 – a Major Obstacle, or 4 – Severe Obstacle.	WBES
<i>Labor Productivity Growth</i>	A firm-level estimate of labor productivity growth (perf3), where labor productivity is sales divided by the number of full-time permanent workers.	WBES
<i>Audit</i>	A firm-level survey indicator (k21) that equals to one if the firm has its annual financial statements checked and certified by an external auditor, zero otherwise.	WBES
<i>Tax Inspect</i>	A firm-level indicator (j3) that equals to one if the firm reports to be visited or inspected by tax officials, zero otherwise.	WBES
<i>Size</i>	Natural log of firm sales (d2) in US dollars.	WBES
<i>Foreign Ownership</i>	A firm-level measure (b2b) that reflects the equity stake by private foreign individuals, companies, or organizations.	WBES
<i>Age</i>	A firm-level measure defined as the natural log of one plus the number of years since the firm began operations in a given country (b5).	WBES
<i>Export</i>	A firm-level indicator (d3) that equals to one if at least 10 percent of a firm's annual sales are derived from direct exports.	WBES

<i>Industry</i>	Business sector classification (stra_sector).	WBES
<i>GDP</i>	Country-level natural log of gross national product per capita.	World Bank website
<i>Inflation</i>	Country-level annual inflation, GDP deflation (%).	World Bank website
<i>Country Import</i>	Country-level imports as a share of GDP (%).	World Bank website
<i>Domestic Credit</i>	Country-level domestic credit provided by financial sector as (% of GDP).	World Bank website
<i>Stock Market</i>	A country-level indicator that equals to one if market capitalization of listed domestic companies (% of GDP) is greater than zero, zero otherwise.	World Bank website
<i>Country Governance</i>	Country-level index of the first latent factor from the factor analysis on <i>Government Effectiveness, Voice and Accountability, Political Stability, Regulatory Quality, Rule of law, and Control of Corruption</i> .	Kaufmann et al. (2011)

Appendix B: Country-Level HRV Government Transparency Index (Hollyer et al. 2014)

The IRT model is as follows:

$$\Pr(y_{j,c,t} = 1 | transparency_{c,t}) = \text{logit}(\delta_j + \beta_j transparency_{c,t})$$

$y_{j,c,t} \in \{0,1\}$ is an indicator equal to 1 if country c reports WDI variable j in year t and equal to 0 otherwise. δ_j is the difficulty parameter and β_j the discrimination parameter for item j . The term $transparency_{c,t}$ is the measure of a given country-year's propensity to disclose data, which is to be estimated. The logit function is a logistic transformation. Thus, changes in δ_j reflect the degree to which countries, on average, report a given variable drawn from the WDI. Changes to β_j reflect the degree to which the outcome of one item predicts the outcome of other items.¹⁶

¹⁶ The list of WDI variables in descending order by the discrimination level are available from the authors upon request. It can also be found in <http://hrvtransparency.org/>

Appendix C: Firm-Level Productivity Estimates from the WBES Methodological Note

Revenue-based total factor productivity (TFPR) is estimated for the WBES survey conducted since 2006. The detailed estimation methodology is as follows (from “World Bank Firm Level TFP Estimates and Factor Ratios Methodological Note_2018_04_09”):

“TFPR is estimated separately for each industry over pooled economies. Two models are used in estimation: VAKL and YKLM. The regression functions are as follows:

$$\begin{aligned} \ln(VA_{sci}) = & c_s^{VAKL} + \alpha_1 \ln(K_{sci}) + \alpha_2 \ln(L_{sci}) + \alpha_3 \ln(K_{sci}) \times I_c + \alpha_4 \ln(L_{sci}) \times I_c + \\ & \frac{1}{2} \alpha_5 [\ln(K_{scti})]^2 + \frac{1}{2} \alpha_6 [\ln(L_{scti})]^2 + \alpha_7 \ln(K_{scti}) \times \ln(L_{scti}) + FE_I + FE_C + FE_t + \\ & u_{sci}^{VAKL} \quad (\text{VAKL}) \end{aligned}$$

$$\begin{aligned} \ln(Y_{sci}) = & c_s^{YKLM} + \beta_1 \ln(K_{sci}) + \beta_2 \ln(L_{sci}) + \beta_3 \ln(M_{sci}) + \beta_4 \ln(K_{sci}) \times I_c \\ & + \beta_5 \ln(L_{sci}) \times I_c + \beta_6 \ln(M_{sci}) \times I_c + \frac{1}{2} \beta_7 [\ln(K_{scti})]^2 + \frac{1}{2} \beta_8 [\ln(L_{scti})]^2 \\ & + \frac{1}{2} \beta_9 [\ln(M_{scti})]^2 + \beta_{10} \ln(K_{scti}) \times \ln(L_{scti}) + \beta_{11} \ln(K_{scti}) \times \ln(M_{scti}) \\ & + \beta_{12} \ln(L_{scti}) \times \ln(M_{scti}) + FE_I + FE_C + FE_t + u_{sci}^{YKLM} \\ & (\text{YKLM}) \end{aligned}$$

Where s, c, i, and t denotes sector, economy, firm, and year respectively. Value-added (VA) is the difference between the total annual sales and total annual cost of inputs. Y is proxied by total annual sales. K is proxied by the replacement value of machinery, vehicles, and equipment. L is proxied by the total annual cost of labor. M is proxied by the total annual cost of inputs. I_c denotes an indicator variable for income group of the economy. C_s^{VAKL} and C_s^{YKLM} are constants. FE_I , FE_C , and FE_t are income level, economy, and year fixed effects.

The TFPR is estimated as:

$$\widehat{TFPR}_{sci}^f = \widehat{u}_{sci}^f + \widehat{c}_s^f + \widehat{FE}_l^f + \widehat{FE}_c^f + \widehat{FE}_y^f$$

Where f is either VAKL or YKLM.”

Table 1: Sample Distribution by Country

Country	Number of observations	<i>Government Transparency</i>
Afghanistan	41	-0.95
Albania	22	1.19
Angola	200	-0.27
Argentina	843	3.85
Bolivia	233	2.55
Botswana	151	1.64
Brazil	643	3.91
Bulgaria	420	8.14
Burkina Faso	22	-0.68
Burundi	101	-0.61
Cameroon	51	0.01
Chile	994	3.58
Colombia	1,056	5.19
Costa Rica	183	2.22
Côte d'Ivoire (Ivory Coast)	80	0.52
Dominican Republic	71	2.07
Ecuador	315	2.85
El Salvador	364	2.93
Eswatini (Swaziland)	60	-0.48
Gambia	29	-0.56
Ghana	277	0.29
Guatemala	444	1.18
Guinea	125	-0.64
Guinea Bissau	44	-0.68
Honduras	257	1.60
Hungary	66	8.17
Indonesia	506	3.12
Iraq	424	-0.63
Jamaica	74	0.18
Kenya	382	1.44
Madagascar	118	-0.95
Mali	307	-0.50
Mauritania	77	-0.95
Mauritius	87	-0.26
Mexico	1,614	4.47
Mongolia	98	0.60
Mozambique	327	1.34
Nepal	108	-0.24

Nicaragua	288	2.10
Panama	140	3.34
Paraguay	196	2.85
Peru	692	3.39
Philippines	303	3.48
Poland	56	6.88
Rwanda	58	-0.54
Senegal	250	1.76
South Africa	669	3.37
Sri Lanka	226	1.09
Tanzania	255	1.30
Turkey	412	4.80
Uganda	293	-0.45
Uruguay	301	3.12
Venezuela	32	1.78
Vietnam	510	-0.70
Zambia	296	1.06
Total	16,191	2.69

Table 2: Descriptive Statistics

Variable	Count	Mean	Min	Std	P25	P50	P75	Max
Capacity Utilization	16,191	72.56	15.00	20.36	60.00	75.00	90.00	100.00
TFPRYKLM	16,191	2.52	-0.90	1.18	2.05	2.46	3.14	6.29
Financing Obstacle	16,191	1.70	0.00	1.39	0.00	2.00	3.00	4.00
Government Transparency	16,191	2.69	-0.95	2.14	1.11	3.05	3.91	8.17
Size	16,191	13.41	8.68	2.44	11.75	13.18	14.90	20.66
Audit	16,191	0.49	0.00	0.50	0.00	0.00	1.00	1.00
Tax Inspect	16,191	0.56	0.00	0.50	0.00	1.00	1.00	1.00
Foreign Ownership	16,191	8.85	0.00	26.96	0.00	0.00	0.00	100.00
Age	16,191	2.78	1.10	0.75	2.30	2.77	3.33	4.43
Export	16,191	0.18	0.00	0.39	0.00	0.00	0.00	1.00
GDP	16,191	7.95	5.72	1.03	7.07	8.33	8.90	9.23
Country Import	16,191	34.56	11.96	16.46	25.26	31.00	40.98	83.98
Inflation	16,191	10.15	-1.74	11.46	4.65	6.45	11.63	80.75
Domestic Credit	16,191	48.34	-1.25	41.38	19.81	37.50	62.36	192.50
Stock Market	16,191	0.64	0.00	0.48	0.00	1.00	1.00	1.00
Country Governance	16,191	59.89	3.72	62.51	23.95	36.42	60.44	261.83

The variables are defined in Appendix A.

Table 3: Pairwise Pearson correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) Capacity Utilization															
(2) TFPYKLM	0.02														
(3) Financing Obstacle	-0.11	-0.05													
(4) Government Transparency	0.04	0.04	-0.14												
(5) Size	0.09	0.11	-0.16	0.12											
(6) Audit	0.03	0.05	-0.11	0.03	0.36										
(7) Tax Inspect	0.01	0.02	0.05	-0.15	0.18	0.17									
(8) Foreign Ownership	0.03	0.04	-0.07	-0.06	0.23	0.18	0.08								
(9) Age	-0.02	-0.01	-0.08	0.17	0.25	0.17	0.02	-0.01							
(10) Export	0.04	-0.01	-0.08	0.09	0.31	0.20	0.09	0.22	0.12						
(11) GDP	0.03	0.06	-0.14	0.65	0.25	0.06	-0.19	-0.05	0.25	0.08					
(12) Country Import	0.00	0.02	-0.08	-0.27	-0.09	-0.02	0.06	0.05	-0.16	0.03	-0.29				
(13) Inflation	0.02	-0.03	0.09	-0.35	0.23	-0.05	0.13	0.00	-0.11	-0.04	-0.31	0.16			
(14) Domestic Credit	0.06	0.01	-0.16	0.21	0.12	0.10	-0.06	-0.01	0.09	0.03	0.34	0.09	-0.17		
(15) Stock Market	0.08	0.01	-0.14	0.55	0.34	0.06	-0.07	-0.02	0.12	0.08	0.56	-0.21	0.08	0.36	
(16) Country Governance	0.03	0.01	-0.13	0.41	0.22	0.05	-0.02	0.00	0.18	0.05	0.53	-0.08	-0.12	0.52	0.44

Variables are defined in Appendix A. Bold number indicates significance at the 5% level.

Table 4: Government Transparency and Firm Operational Efficiency

Panel A: Government transparency and firm capacity utilization

	Dependent Variable = Capacity Utilization		
	(1)	(2)	(3)
Government Transparency	0.581*** (2.689)	0.744* (1.724)	0.746* (1.758)
Size		0.994*** (3.539)	0.999*** (3.572)
Audit		-0.125 (-0.166)	-0.102 (-0.135)
Tax Inspect		0.235 (0.375)	0.176 (0.277)
Foreign Ownership		0.002 (0.247)	0.002 (0.183)
Age		-1.023*** (-3.390)	-1.050*** (-3.421)
Export		0.471 (0.760)	0.496 (0.803)
GDP		-1.186 (-1.329)	-1.441 (-1.620)
Country Import		-0.034 (-0.841)	-0.035 (-0.861)
Inflation		-0.024 (-0.409)	-0.027 (-0.461)
Domestic Credit		0.020 (1.201)	0.016 (0.873)
Stock Market		-0.201 (-0.117)	-0.208 (-0.122)
Country Governance			0.477 (1.077)
Industry FE, Year FE	YES	YES	YES
Observations	16,191	16,191	16,191
Adjusted R-squared	0.025	0.037	0.037

Panel B: Government transparency and firm total factor productivity

	Dependent Variable = TFP _{RYKLM}		
	(1)	(2)	(3)
Government Transparency	0.046***	0.030*	0.030*
	(4.453)	(1.733)	(1.753)
Size		0.076***	0.076***
		(7.301)	(7.238)
Audit		-0.005	-0.006
		(-0.179)	(-0.217)
Tax Inspect		-0.003	-0.000
		(-0.138)	(-0.004)
Foreign Ownership		-0.000	-0.000
		(-0.487)	(-0.410)
Age		-0.059***	-0.058***
		(-4.138)	(-4.006)
Export		-0.147***	-0.148***
		(-4.148)	(-4.199)
GDP		0.033	0.045
		(0.737)	(0.947)
Country Import		0.000	0.001
		(0.385)	(0.433)
Inflation		-0.007***	-0.007***
		(-2.684)	(-2.655)
Domestic Credit		0.000	0.000
		(0.318)	(0.549)
Stock Market		-0.065	-0.065
		(-0.697)	(-0.699)
Country Governance			-0.022
			(-0.685)
Industry FE, Year FE	YES	YES	YES
Observations	16,191	16,191	16,191
Adjusted R-squared	0.420	0.437	0.437

Table 4 presents the results of an OLS estimation of the following model:

$$Capacity\ Utilization\ (TFPRYKL) = \alpha + \beta_1\ Government\ Transparency + \beta_i\ CONTROLS + \varepsilon$$

Capacity Utilization is the level of current output compared to the maximum output possible. *TFPRYKL* is total factor productivity based on the VALK model. *Government Transparency* is the government transparency index from Hollyer et al. (2014). Year and industry fixed effects are included in the regressions. Standard errors are heteroskedasticity robust and clustered at country-year level. t-statistics are reported in parentheses. *, **, *** represent significance levels of 0.10, 0.05 and 0.01, respectively.

Table 5: Government Transparency and Firm Financing Obstacles

	Dependent Variable = Financing Obstacle		
	(1)	(2)	(3)
Government Transparency	-0.113*** (-4.733)	-0.052* (-1.713)	-0.052* (-1.796)
Size		-0.092*** (-7.250)	-0.092*** (-7.371)
Audit		-0.075 (-1.445)	-0.079 (-1.531)
Tax Inspect		0.159*** (4.510)	0.168*** (4.779)
Foreign Ownership		-0.002** (-2.565)	-0.001** (-2.490)
Age		-0.063** (-2.602)	-0.059** (-2.382)
Export		-0.013 (-0.259)	-0.017 (-0.332)
GDP		-0.024 (-0.281)	0.013 (0.144)
Country Import		-0.008*** (-3.189)	-0.008*** (-3.287)
Inflation		0.015*** (3.428)	0.015*** (3.434)
Domestic Credit		-0.002 (-1.310)	-0.001 (-0.850)
Stock Market		-0.110 (-0.869)	-0.109 (-0.879)
Country Governance			-0.069 (-1.566)
Industry FE, Year FE	YES	YES	YES
Observations	16,191	16,191	16,191
Adjusted R-squared	0.058	0.104	0.105

Table 5 presents the results of an OLS estimation of the following model:

$$Financing\ Obstacle = \alpha + \beta_1 Government\ Transparency + \beta_i CONTROLS + \varepsilon$$

Financing Obstacle is the degree of financing obstacle. *Government Transparency* is the government transparency index from Hollyer et al. (2014). Year and industry fixed effects are included in the regressions. Standard errors are heteroskedasticity robust and clustered at country-year level. t-statistics are reported in parentheses. *, **, *** represent significance levels of 0.10, 0.05 and 0.01, respectively.

Table 6: The Role of Alternative Information: Audited Financial Statements

Dependent Variable =	Capacity Utilization	TFPRYKLM	Financing Obstacle
	(1)	(2)	(3)
Government Transparency	0.857* (1.917)	0.040** (2.318)	-0.067** (-2.198)
Government Transparency×Audit	-0.232 (-0.883)	-0.021** (-2.372)	0.032* (1.721)
Size	0.995*** (3.557)	0.076*** (7.197)	-0.092*** (-7.289)
Audit	0.532 (0.582)	0.053 (1.382)	-0.167** (-2.188)
Tax Inspect	0.193 (0.305)	0.001 (0.076)	0.165*** (4.783)
Foreign Ownership	0.001 (0.150)	-0.000 (-0.500)	-0.001** (-2.469)
Age	-1.063*** (-3.503)	-0.059*** (-4.122)	-0.057** (-2.317)
Export	0.509 (0.825)	-0.147*** (-4.172)	-0.018 (-0.375)
GDP	-1.445 (-1.640)	0.045 (0.954)	0.013 (0.152)
Country Import	-0.035 (-0.863)	0.001 (0.458)	-0.008*** (-3.279)
Inflation	-0.026 (-0.434)	-0.006** (-2.608)	0.015*** (3.416)
Domestic Credit	0.017 (0.912)	0.000 (0.656)	-0.001 (-0.913)
Stock Market	-0.252 (-0.147)	-0.069 (-0.744)	-0.102 (-0.833)
Country Governance	0.464 (1.055)	-0.023 (-0.730)	-0.067 (-1.536)
Industry FE, Year FE	YES	YES	YES
F-statistic : Government Transparency +Government Transparency×Audit = 0	2.03	1.13	1.41
P-value for F-test	0.16	0.29	0.24
Observations	16,191	16,191	16,191
Adjusted R-squared	0.037	0.437	0.106

Table 6 presents the results from the OLS estimation of the following model:

$$Capacity\ Utilization/TFPRYKLM/Financing\ Obstacle = \alpha + \beta_1 Government\ Transparency + \beta_2 Government\ Transparency \times Audit + \beta_3 Audit + \beta_i CONTROLS + \varepsilon$$

Capacity Utilization is the level of current output compared to the maximum output possible. *TFPRYKL* is total factor productivity based on the VALK model. *Financing Obstacle* is the degree of financing obstacle. *Government Transparency* is the government transparency index from Hollyer et al. (2014). *Audit* indicates whether a firm has its annual financial statements certified by an external auditor. Year and industry fixed effects are included in the regressions. Standard errors are heteroskedasticity robust and clustered at country-year level. t-statistics are reported in parentheses. *, **, *** represent significance levels of 0.10, 0.05 and 0.01, respectively.

Table 7: The Role of Alternative Information: Stock Market Capitalization

Dependent Variable =	Capacity Utilization	TFPR YKLM	Financing Obstacle
	(1)	(2)	(3)
Government Transparency	0.979*** (2.751)	0.041** (2.359)	-0.091*** (-3.411)
Government Transparency×Domestic Stock High	-1.678** (-2.319)	-0.094*** (-2.797)	0.158*** (2.999)
Size	1.069*** (3.792)	0.078*** (7.068)	-0.101*** (-7.786)
Audit	-0.242 (-0.320)	-0.015 (-0.583)	-0.065 (-1.300)
Tax Inspect	0.182 (0.286)	-0.001 (-0.034)	0.169*** (4.807)
Foreign Ownership	0.000 (0.060)	-0.000 (-0.498)	-0.001** (-2.355)
Age	-1.206*** (-4.038)	-0.065*** (-4.770)	-0.042* (-1.766)
Export	0.362 (0.586)	-0.156*** (-4.519)	0.001 (0.016)
GDP	-1.883** (-2.060)	0.009 (0.196)	0.048 (0.586)
Country Import	-0.027 (-0.658)	0.000 (0.308)	-0.007** (-2.381)
Inflation	-0.026 (-0.549)	-0.007*** (-3.729)	0.014*** (4.077)
Domestic Credit	0.012 (0.676)	0.000 (0.464)	-0.002 (-1.279)
Domestic Stock High	7.291** (2.551)	0.346*** (2.731)	-0.592*** (-2.793)
Country Governance	0.389 (0.829)	-0.023 (-0.740)	-0.066 (-1.494)
Industry FE, Year FE	YES	YES	YES
F-statistic: Government Transparency+Government Transparency×Domestic Stock High = 0	1.28	2.62	1.74
P-value of F-test	0.26	0.11	0.19
Observations	16,191	16,191	16,191
Adjusted R-squared	0.040	0.439	0.109

Table 7 presents the results of an OLS estimation of the following model:

$$Capacity\ Utilization/TFPRYKLM/Financing\ Obstacle = \alpha + \beta_1 Government\ Transparency + \beta_2 Government\ Transparency \times Domestic\ Stock\ High + \beta_3 Domestic\ Stock\ High + \beta_i CONTROLS + \varepsilon$$

Capacity Utilization is the level of current output compared to the maximum output possible. *TFPRYKLM* is total factor productivity based on the VALK model. *Financing Obstacle* is the degree of financing obstacle. *Government Transparency* is the government transparency index from Hollyer et al. (2014). *Domestic Stock High* indicates whether a country has a domestic stock market size that is above the sample median. Year and industry fixed effects are included in the regressions. Standard errors are heteroskedasticity robust and clustered at country-year level. t-statistics are reported in parentheses. *, **, *** represent significance levels of 0.10, 0.05 and 0.01, respectively.

Table 8: Credit Market Development: Size of the Domestic Credit Market

Dependent Variable =	TFPR		
	Capacity Utilization	YKLM	Financing Obstacle
	(1)	(2)	(3)
Government Transparency	1.302*** (2.892)	0.053** (2.096)	-0.097** (-2.503)
Government Transparency×Domestic Credit High	-0.874** (-2.377)	-0.031 (-1.419)	0.077** (2.254)
Size	1.009*** (3.556)	0.076*** (7.044)	-0.095*** (-7.387)
Audit	-0.097 (-0.131)	-0.003 (-0.114)	-0.072 (-1.384)
Tax Inspect	0.199 (0.317)	-0.001 (-0.037)	0.162*** (4.528)
Foreign Ownership	0.001 (0.155)	-0.000 (-0.481)	-0.002** (-2.529)
Age	-1.155*** (-3.823)	-0.061*** (-4.391)	-0.048* (-1.903)
Export	0.429 (0.695)	-0.150*** (-4.314)	-0.010 (-0.204)
GDP	-1.474 (-1.589)	0.037 (0.789)	0.007 (0.082)
Country Import	-0.035 (-0.816)	0.001 (0.555)	-0.007*** (-3.053)
Inflation	-0.036 (-0.639)	-0.007*** (-3.017)	0.016*** (3.917)
Domestic Credit High	2.406 (1.364)	0.054 (0.812)	-0.273* (-1.976)
Stock Market	-0.608 (-0.341)	-0.073 (-0.798)	-0.049 (-0.391)
Country Governance	0.788* (1.782)	-0.008 (-0.255)	-0.084** (-2.175)
Industry FE, Year FE	YES	YES	YES
F-statistic: Government Transparency+Government Transparency×Domestic Credit High = 0	1.15	2.00	0.52
P-value of F-test	0.29	0.16	0.47
Observations	16,191	16,191	16,191
Adjusted R-squared	0.038	0.437	0.107

Table 8 presents the results of an OLS estimation of the following model:

$$\begin{aligned}
 \text{Capacity Utilization} / \text{TFPRYKLM} / \text{Financing Obstacle} = & \alpha + \beta_1 \text{Government Transparency} \\
 & + \beta_2 \text{Government Transparency} \times \text{Domestic Credit High} + \beta_3 \text{Domestic Credit High} + \beta_i \text{CONTROLS} \\
 & + \varepsilon
 \end{aligned}$$

Capacity Utilization is the level of current output compared to the maximum output possible. *TFPRYKLM* is total factor productivity based on the VALK model. *Financing Obstacle* is the degree of financing obstacle. *Government Transparency* is the government transparency index from Hollyer et al. (2014). *Domestic Credit High* indicates whether a country has a domestic credit market size that is above the

sample median. Year and industry fixed effects are included in the regressions. Standard errors are heteroskedasticity robust and clustered at country-year level. t-statistics are reported in parentheses.

Table 9: Adoption of the Open Government Data Initiative as a Staggered Shock

Panel A: Sample distribution for the Open Government Data sample

Country	Open Data Portal Year Launched	Fiscal year surveyed	Pos t	Coun t
Colombia		2016	2016	1 925
Colombia		2016	2009	0 868
Colombia		2016	2005	0 925
Dominican Republic		2015	2015	1 255
Dominican Republic		2015	2009	0 312
Ghana		2012	2012	1 537
Ghana		2012	2006	0 490
Kenya		2011	2012	1 608
Kenya		2011	2006	0 649
Moldova		2011	2011	1 289
Moldova		2011	2007	0 245
Sierra Leone		2015	2016	1 149
Sierra Leone		2015	2007	0 145

Panel B: Descriptive statistics for the Open Government Data sample

Variable	Count	Mean	Min	Std	P25	P50	P75	Max
Capacity Utilization	3,497	70.70	10.00	19.88	60.00	70.00	85.00	100.00
TFPRYKLM	2,341	2.54	-0.27	1.00	2.09	2.48	3.05	6.02
Financing Obstacle	6,397	1.79	0.00	1.35	1.00	2.00	3.00	4.00
Post	6,397	0.43	0.00	0.50	0.00	0.00	1.00	1.00
Size	6,397	13.66	8.15	2.77	11.84	13.27	15.04	21.97
Audit	6,397	0.58	0.00	0.49	0.00	1.00	1.00	1.00
Tax Inspect	6,397	0.57	0.00	0.50	0.00	1.00	1.00	1.00
Foreign Ownership	6,397	7.12	0.00	23.90	0.00	0.00	0.00	100.00
Age	6,397	2.72	1.10	0.74	2.20	2.77	3.26	4.33
Export	6,397	0.13	0.00	0.34	0.00	0.00	0.00	1.00
Country Economy	6,397	-0.10	-2.07	0.90	-0.82	0.33	0.78	1.03
Country Governance	6,397	0.19	-1.08	0.62	-0.32	0.23	0.72	1.18
Time Trend	6,397	4.81	0.00	3.87	1.00	4.00	7.00	11.00

Panel C: Open Government Data Movement and firms' operational efficiency and financing obstacles

Dependent Variable =	Capacity Utilization		TFPRVAKL		Financing Obstacle	
	(1)	(2)	(3)	(4)	(5)	(6)
Post	3.949***	8.674***	0.724***	-0.038	-0.432***	-1.494***
	(4.921)	(4.451)	(9.807)	(-0.242)	(-11.493)	(-16.105)
Size	1.555***	1.602***	0.068***	0.062***	-0.085***	-0.097***
	(9.965)	(10.211)	(5.669)	(5.172)	(-11.557)	(-13.248)
Audit	-2.248***	-2.432***	0.039	0.071	0.021	0.041
	(-2.952)	(-3.183)	(0.676)	(1.237)	(0.594)	(1.176)
Tax Inspect	-0.123	-0.091	-0.096	-0.123**	0.086**	0.101***
	(-0.155)	(-0.115)	(-1.594)	(-2.045)	(2.313)	(2.748)
Foreign Ownership	0.002	0.002	-0.002	-0.001	-0.002***	-0.002***
	(0.161)	(0.168)	(-1.630)	(-1.400)	(-3.024)	(-3.266)
Age	-1.118**	-1.076**	-0.055	-0.061*	-0.078***	-0.080***
	(-2.281)	(-2.195)	(-1.508)	(-1.668)	(-3.270)	(-3.394)
Export	0.125	-0.110	-0.088	-0.060	-0.093*	-0.044
	(0.132)	(-0.116)	(-1.265)	(-0.870)	(-1.825)	(-0.878)
Country Economy	1.102**	2.013***	0.268***	0.179***	-0.336***	-0.585***
	(2.087)	(3.201)	(6.181)	(3.861)	(-13.779)	(-18.707)
Country Governance	-5.389***	-5.629***	-0.215***	-0.163***	0.695***	0.749***
	(-6.516)	(-6.772)	(-3.609)	(-2.727)	(19.396)	(20.995)
Time Trend		-0.749***		0.139***		0.173***
		(-2.660)		(5.415)		(12.493)
Industry FE	YES	YES	YES	YES	YES	YES
Observations	3,497	3,497	2,341	2,341	6,397	6,397
Adjusted R-squared	0.040	0.042	0.171	0.181	0.117	0.138

Table 9 Panel A (B) presents sample distribution (descriptive statistics) for the Open Government Data sample. Panel C presents the results from the OLS estimation of the following model:

$$Capacity\ Utilization/TFPRYKLM / Financing\ Obstacle = \alpha + \beta_1 Post + \beta_i CONTROLS + \varepsilon$$

Capacity Utilization is the level of current output compared to the maximum output possible. *TFPRYKL* is total factor productivity based on the VALK model. *Financing Obstacle* is the degree of financing obstacle. *Post* equals one if a country has launched its Open Government Data Portal. Industry fixed effects are included in the regressions. t-statistics are reported in parentheses. *, **, *** represent significance levels of 0.10, 0.05 and 0.01, respectively.