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Firm Growth around the World: Financial Constraints, Corruption, and Privatization

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FIRM GROWTH AROUND THE WORLD: FINANCIAL CONSTRAINTS,
CORRUPTION, AND PRIVATIZATION

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Dedication

To my wife, *Ummeh Habiba Lorna*, and sons, *Sheikh Wafid Ullah* and *Wahib Ullah*. Thank you
for your love, sacrifice, and support.

To my parents, *S. M. Jamal Uddin* and *Sahida Jamal*, and parents-in-law, *Md. Akhtaruzzaman*
and *Gazi Akhter Jahan*. Thank you for your continuous support and motivation.

To *Dr. Zuobao “Eddie” Wei*. I could not have reached this stage without all your support,
supervision, and guidance.

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CORRUPTION, AND PRIVATIZATION

BY

SK. MD. BARKAT ULLAH, MBA

DISSERTATION

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The University of Texas at El Paso

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for the Degree of

DOCTOR OF PHILOSOPHY

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Abstract

This dissertation consists of three separate essays that are broadly related to firm-level financial constraints, corruption, and privatization and their relation to firm performance and growth across the globe. I employ World Bank Enterprise Survey data collected from 2006-2011 for over one hundred countries. In my first dissertation essay, I study the effects of accounting information disclosure through auditing on firm level financial constraints and corruption obstacles. I find that audited firms exhibit significantly lower level of financial constraints than unaudited firms. Audited firms also encounter higher level of corruption obstacles than unaudited firms. The second essay examines three firm-level constraints to firm growth (financing, corruption and legal) of privatized firms in comparison to those of the originally private (*de novo*) firms. I find that the *de novo* firms experience significantly higher financial, corruption, and legal obstacles than the privatized firms. I further find that the privatized firms significantly underperform the *de novo* firms. In addition, I find ownership concentration and foreign ownership have an overall moderating effect on firm-level growth constraints. My final essay examines the effect of International Organization for Standardization (ISO) certification on firm performance measured by sales growth and labor productivity. I find that ISO-certified firms exhibit higher sales growth and higher labor productivity than non-certified firms. I also find that the positive link between ISO certification and labor productivity remains highly significant regardless the corruption levels. However, when firms operate in a highly corrupt business environment, the positive effect of ISO certification on sales growth becomes insignificant.

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Chapter 1

Introduction - Firm growth around the world: financial constraints, corruption, and privatization

1.1 Introduction

This dissertation consists of three separate essays that are broadly related to firm-level financial constraints, corruption, and privatization and their relation to firm performance and growth across the globe.

In my first dissertation essay, I study the effects of accounting information disclosure through auditing on firm level financial constraints and corruption obstacles. I analyze a large-scale WBES data collected from 2006-2011 for over 50,000 firms in 119 mostly developing countries. I find that disclosure can be a double-edge sword. On the one hand, audited firms exhibit significantly lower level of financial constraints than unaudited firms. To gain access to credit, firms are generally required to have their financial statements audited and verified by external auditors. Auditing reduces information asymmetries between insiders and external stakeholders (suppliers, customers, and creditors, etc.), resulting in lower costs of market exchanges (including lower cost of capital) (Williamsons, 1985). On the other hand, audited firms encounter higher level of corruption obstacles than unaudited firms. Corrupt officials can gain access to the disclosed financial information to extract bribes from the firm. I further investigate the effect of disclosure on firm growth and find that audit has a negative and significant effect on firm's sales growth and an insignificant effect on employment growth. However, the negative effect is only significant for firms in non-OECD countries. OECD countries in general have more efficient institutions and less corrupt governments than non-OECD countries. Disclosure of accounting information is harmful for growth if firms operate in

a business environment with less efficient institutions and more corrupt governance. The results remain robust after a battery of robustness checks. This essay was presented at the 2013 FMA annual meeting in Chicago. It was nominated by track chairs and reviewers as a semifinalist for the best paper award in Corporate Finance category at the 2013 FMA.

The second essay also employs the WBES data collected in 2002, 2005 and 2009 for 17,893 firms from 27 Eastern European and Central Asian countries to examine three firm-level constraints to firm growth (financing, corruption and legal) of privatized firms in comparison to those of the originally private (*de novo*) firms. I find that the *de novo* firms experience significantly higher financial, corruption, and legal obstacles than the privatized firms. I further compare firm growth and labor productivity between the privatized firms and the *de novo* firms and find that the privatized firms significantly underperform the *de novo* firms. In addition, I find ownership concentration and foreign ownership have an overall moderating effect on firm-level growth constraints. This essay is the first in the privatization literature that examines firm-level growth obstacles experienced by privatized firms in comparison with those experienced by *de novo* firms. This essay was presented at the 2013 Privatization Conference at Wake Forest University, North Carolina and is currently a Revise & Resubmit (1st round) at *Journal of Corporate Finance* Special Issue - “*Contracting Issues at the Intersection of the Public & Private Sectors*”.

My final essay examines the effect of International Organization for Standardization (ISO) certification on firm performance measured by sales growth and labor productivity. I employ the WBES data collected from 2006-2011 for over 40,000 firms in 119 countries. The results from both the univariate tests and multivariate regressions show that ISO-certified firms exhibit higher sales growth and higher labor productivity than non-certified firms. I further

investigate whether the effects of ISO certification on firm performance vary when firms operate in different levels of corrupt business environment. I find that the positive link between ISO certification and labor productivity remains highly significant regardless the corruption levels. This is consistent with the internal improvement theory of international quality standards since labor productivity is mostly a function of internal control. However, when firms operate in a highly corrupt business environment, the positive effect of ISO certification on sales growth becomes insignificant, consistent with the market signaling theory. In a highly corrupt business environment, information asymmetry between insiders and external stakeholders (i.e. customers) is severe, diminishing the signaling effect of ISO certification on sales. This essay provides the first large scale cross-section and cross-country evidence on the effect of ISO certification on firm performance. This essay was presented at the 2013 European Center for Corporate Engagement (ECCE)-University of Stellenbosch (USB) Conference on "*Financial Globalisation and Sustainable Finance: Implications for Policy and Practice*", Cape Town. It has also been accepted for presentation at 2014 FMA annual meeting in Nashville, Tennessee (October 15 - 18, 2014).

Chapter 2

Essay 1 - Disclosure as a double-edged sword: financial constraints, corruption, and auditing

2.1 Introduction

A firm has three incentives to hire an outside accounting firm to audit its financial statements, as hypothesized by Chow, Kramer, and Wallace (1988). The first incentive, known as the information-signaling hypothesis (Dye, 1993), posits that through auditing, a firm can transmit private information to external stakeholders concerning its future prospects. The second is known as the insurance hypothesis (Kellogg, 1984; Wallace, 1987), where through audit opinions, a firm provides a means for investors to recover investment losses. The third incentive is to reduce agency costs through auditing and provide assurance that the reported financial statements are accurate (DeFond, 1992; Beatty, 1989). The overall empirical evidence tends to support these hypotheses. However, most of the studies in the extant audit and disclosure literature mainly focus on firms in the U.S. where institutions and governance are much more efficient than those of developing countries. For example, Khurana, Pereira and Martin (2006) find that expanded and credible disclosure helps U.S. firms lower their external financing costs and improve their ability to pursue positive NPV projects, therefore beneficial to firm growth. Can disclosure lower financial constraint when firms operate in countries with less developed institutions and governance? Is disclosure still beneficial to growth when firms operate in corrupt business environment? We investigate these related questions in this study.

Information asymmetry and agency costs constrain a firm's access to external financing and as a result, limit its investment opportunity set (Demirguc-Kunt and Maksimovic, 1998). Myers and Majluf (1984) also suggest that information asymmetry increases the cost of external financing and hence, forces firms to forgo potentially positive NPV projects. They argue that in

the presence of information asymmetry, a firm's performance and especially growth will be constrained to its internal resources. Agency conflicts are also detrimental firm growth (Myers, 1977). Thus, reducing information asymmetry and agency costs should improve access to lower cost external financing. Verrecchia (2001) conducts an extensive survey on disclosure related empirical evidence and finds that a firm's disclosure policy is directly related the access and cost of external financing. Higher level of disclosure is generally related to better access and lower cost of external funds. Bushman and Smith (2001) and Stein (2003) also document similar findings.

The above findings are largely based on publicly traded firms in the U.S. where corporate governance and institutions are more efficient than developing countries. In a corrupt business environment with weak institutions, disclosure of accounting information can be a double-edged sword. In most circumstances, financial statements audited by external auditors are required to gain access to credit. Disclosure also helps mitigate information asymmetry between the firm and other external stakeholders (e.g. suppliers and customers), leading to lower costs of market exchanges (Williamson, 1985). In this regard, disclosure is beneficial to the firm. On the other hand, too much disclosure can be harmful to the firm. In a corruption business environment with underdeveloped institutions, the audited financial information can easily fall in the hands of corrupt bureaucrats. Corrupt officials then utilize the firm-level accounting data to assess the bribe paying ability of a firm and optimize their bribe extraction activities (Svensson, 2005; Fisman and Svensson, 2007). Therefore, we argue that disclosure in less developed countries may be related to higher level of corruption and therefore, harmful to firm growth.

In this paper, we study the effect of accounting disclosure through auditing on firm level financial constraints and corruption obstacles. We analyze a large-scale World Bank Enterprise

Survey (WBES) data collected from 2006-2011 for over 50,000 firms in 119 mostly developing countries. We find that auditing indeed can be a double-edge sword. On the one hand, audited firms exhibit significantly lower level of financial constraints than unaudited firms. On the other hand, audited firms face higher level of corruption obstacles. The results are robust after controlling for relevant firm characteristics, industry effects, country fixed effects, year effects, and various relevant country level variables. We conduct additional robustness checks, including controlling for potential endogeneity of a firm's auditing decision, and the results remain robust. We divide the 119 countries into those with and without public credit registries and those with and without private credit bureaus. We document one interesting finding. Audited firms in countries with public credit registry exhibit significantly higher corruption obstacles than unaudited firms. However, in countries with no public credit registry, audited and unaudited firms exhibit similar level of corruption obstacles.

We further examine the effect of auditing on firm growth. We find that after controlling for relevant firm characteristics, industry and year effects, auditing has an overall negative and significant effect on sales growth and negative but insignificant effect on employment growth. However, the negative effect is significant only for firms in non-OECD countries but not for firms in OECD countries. OECD countries in general have more efficient institutions and better governance than non-OECD countries. Disclosure of accounting information is harmful to firm growth if firms operate in countries with underdeveloped institutions.

Our paper is the first cross-country study to examine the opposite effects of financial disclosure on firm level financial constraints and corruption obstacles. Ours is also the first to compare the effect of disclosure on firm growth in OECD versus non-OECD countries. This

paper contributes to the existing literature by documenting that information disclosure is not always beneficial to firm growth.

The paper is organized as follows. Section 2.2 reviews relevant literature and develops the hypotheses of our study, while Section 2.3 describes data and summary statistics. Section 2.4 discusses the methodologies and presents the empirical results, while Section 2.5 conducts various robustness checks. Section 2.6 concludes the study.

2.2 Literature review and hypotheses

2.2.1 Disclosure and financial constraints

Arthur Levitt, the former chairman of the Securities and Exchange Commission (SEC), claims that "high quality accounting standards... reduce capital costs" (Levitt [1998, p. 81]). Similarly, Neel Foster, a former member of the Financial Accounting Standards Board (FASB), suggests that "More information always equates to less uncertainty, and... people pay more for certainty. In the context of financial information, the end result is that better disclosure results in a lower cost of capital." (Foster [2003, p. 1]). Consistent with these claims, extant research suggests that disclosure of firm-specific information reduces information asymmetry between the firm and its outside investors and lenders, resulting in lower cost of capital (Verrecchia 2001; Easley and O'Hara 2004). Botosan (1997), Botosan and Plumlee (2002) and Sengupta (1998) have also documented a negative relation between a firm's level of disclosure and its cost of capital.

The existing theories of corporate disclosure mainly focus on direct capital market outcomes of firm's disclosure activities. Such outcomes encompass liquidity, cost of capital and

firm valuation.¹ Through corporate disclosure, firms are able to mitigate adverse selection problem resulted from information asymmetries among investors and increase market liquidity by leveling the playing field among investors (Verrecchia, 2001). This increase in market liquidity positively affects cost of capital and firm value as illiquidity and bid-ask spreads impose trading costs on investors, for which they need to be compensated in equilibrium; therefore, the required rate of return of a security increases by its per-period transaction costs (e.g., Constantinides, 1986; Amihud and Mendelson, 1986). Accounting information is also used in the credit granting process to reduce adverse selection problems (Wittenberg-Moerman 2008). Information asymmetry and adverse selection in the primary market often reduce the offering price leading to underpricing. Myers and Majluf (1984) provide evidence that a firm may opt to pass up a profitable investment opportunity if it has to issue new securities in order to finance that investment and information is asymmetrically distributed between managers and outside investors. Rock's (1986) model shows that uninformed investors experience a winner's curse and a firm has to underprice its securities to ensure the active participation of uninformed group of investors in the offering.

The theories of corporate disclosure also provide a more direct link between disclosing firm-level accounting information and the cost of capital or firm value. Consistent with the finding of Merton (1987), disclosing information by lesser known firms make investors aware of their existence and enhance the investor base improving the risk sharing and lowering the cost of capital. Such investor-base effect is susceptible to arbitrage if some investors are aware of the stocks which are not known by all investors (Merton, 1987; Easley and O'Hara, 2004).

¹ Other potential observable outcomes of firm's disclosure related activities may include changes in analyst following and institutional holdings, which are often viewed as indirect measures of access to low cost sources of capital of firms.

Information disclosure aids decision makers to better assess the real prospects of a firm (Elliott and Jacobson, 1994). A firm is benefitted from information disclosure when disclosure leads to a lower cost of capital. When accounting information is disclosed, investors and creditors realize the economic risk of their investment. Thus, the informativeness of the disclosure is the route for both the investors and creditors to arrive at the economic risk of the transfer of capital. If sufficient accounting information is not disclosed to assess economic risk, the capital supplier will charge a high price for the capital. As a firm discloses more accounting information, the demanded rates for capital decline as the capital supplier can better assess and understand the economic risk associated with the firm. Inadequacy and incompleteness of accounting information are reflected as a premium above the risk-free rate plus the economic risk premium (Elliott and Jacobson, 1994). A direct association between disclosure and the cost of capital can also arise from estimation risk (e.g., Brown, 1979; Barry and Brown, 1984 and 1985). Hughes, Liu, and Liu (2007) and Lambert, Leuz and Verrecchia (2007) provide evidence that with the increase of firm-specific disclosure quality, a firm's cost of capital gets closer to the risk-free rate.

Khurana, Pereira, and Martin (2006) study the effect of firm disclosure policy on its access to external finance and find a positive relation between a firm's disclosure policy and its externally financed growth rate. Bushman and Smith (2003) also show how disclosure can affect the investments, productivity, and value-added to firms by reducing both the cost of external financing and agency costs significantly. They posit that disclosure of business information not only reduces adverse selection, but plays a crucial governance role in improving investors' ability to better evaluate managerial performance and to monitor firm performance. As a result,

managers are more likely to efficiently manage firms' assets in place and invest in positive NPV projects in the presence of a sound and fair disclosure policy.

Both information asymmetry and agency costs are instrumental factors for firm performance (Stein, 2003); both of these constraints limit a firm's access to external financing and as a result, limit its investment opportunity set and its ability to pursue positive NPV projects (Demirguc-Kunt and Maksimovic, 1998). Myers and Majluf (1984) empirically show that information asymmetry substantially increases the cost of external financing and hence, force firms to forgo potentially positive NPV projects constraining firms' growth. Agency conflicts also influence a firm's realized growth rate (Myers, 1977). Thus, reducing information asymmetry and agency costs help a firm to improve its access to lower cost external financing and attain higher growth. Verrecchia (2001) also suggests that disclosure policy assists a firm to lower its cost of external financing and improve its ability to pursue growth opportunities.

2.2.2 Auditing as a signal

Financial statements are important sources of information for external stakeholders. According to the SEC, "The annual report to security holders has long been recognized as the most effective means of communication between management and security holders." (SEC Handbook, Section 102, para. 38,025) Beginning with Ball and Brown (1968), researchers have mainly focused on the value relevance of financial statement information. In addition, they also emphasize the central importance of "high quality" financial accounting information to robust and effective capital markets (Sutton, 1997; Beresford, 1997). Despite this consensus regarding the importance of financial statements, few researchers have examined the impact of the disclosure of such accounting information on firm level obstacles and growth. Through auditing, firms disclose accounting information and such public disclosure reduces information asymmetry

between insiders and external stakeholders (e.g. creditors). Therefore, consistent with the extant literature, by disclosing accounting information, audited firms should exhibit lower financial constraints and higher growth than unaudited firms.

The transaction costs of market exchanges increase as a result of the existence of information asymmetries between suppliers and customers (Williamson, 1985). Suppliers are better aware of their own characteristics than customers. Hence, customers incur costs related to searching and monitoring to identify those characteristics of suppliers that are desirable but costly to observe. Such transaction costs are usually reduced when suppliers provide signal that they possess these desirable but unobservable characteristics (Spence, 1973). Akerlof (1970) relates uncertainty with price and quality and shows that “guarantee” by the suppliers can reduce the quality uncertainty by ensuring the customers an expected quality level. The auditing of financial statements can play the role of this “guarantee” and serve as a signal to external stakeholders that audited firms possess certain characteristics.

In seeking capital from financial markets, firms face problem of credibly informing potential creditors about their projects’ quality due to moral hazard. Auditing of financial statements can convey the risk characteristics of the firm to the potential lenders. Creditors may use firms’ auditing as a “guarantee” and are more likely to provide more or easier financing to audited firms in comparison with unaudited firms. In this paper, we concentrate on the role of auditing signal on the financial constraints of firms and hypothesize that auditing transmits an organizational and financial quality signal to the creditors making financing easier for audited firms. More specifically, we expect that audited firms experience less financial constraints compared to similar unaudited firms.

2.2.3 Institutional development and disclosure

The expected growth benefits from information disclosure may depend on how efficient the market is and how developed a country is in terms of its institutional development. Ball, Kothari, and Robin (2000), Hung (2001), and Leuz, Nanda and Wysocki (2003) claim that a country's institutional environment can affect firms' financial reporting incentives and therefore influence the quality of financial information reported to outside investors; the results of these studies show that institutional factors can substantially limit the effectiveness of the accounting standards, leading to lower quality financial reporting.² In investigating the impact of a developed private-sector auditing profession on reporting outcomes, Francis, Khurana and Pereira (2003) find higher average financial reporting and disclosure quality in countries with more developed auditing infrastructures and greater auditing enforcement. Therefore, we hypothesize that in institutionally developed countries (e.g. OECD countries), the value of disclosing information should be beneficial (e.g. in terms of firm growth) than developing countries (e.g. non-OECD countries).

2.2.4 Liquidity and disclosure

The finance literature emphasizes the importance of a firm's liquidity in assessing its financial constraints. Line of credit is a significant source of liquidity not only for US firms (Sufi, 2009; Yun, 2009), it is also the dominant source of liquidity for most companies around the world (Lins, Servaes, and Tufano, 2010). Lins et al. (2010) also find that in countries with less developed credit markets where it is hard to obtain bank funds on the spot, firms find it particularly valuable to have credit lines (such as overdraft protection). Chevalier and Scharfstein (1995) suggest that financially constrained firms are more likely to cut capital expenditure.

² Such institutional factors may include investor protection laws and enforcement, firm's ownership structure, legal and economic factors etc.

Therefore, firms having higher line of credit, overdraft facility and substantial capital expenditure are positive indicators of firm's financial strength. Thus, based on our previous hypotheses, audited firms should have significantly higher line of credit, overdraft facility, and capital expenditure i.e. more liquidity comparing to unaudited firms confirming the information disclosure benefits in terms of lower financial constraints.

2.2.5 Corruption costs of disclosure

The disclosure costs may encompass costs of gathering, processing, auditing, and disseminating the accounting information. Various indirect costs are also resulted in from information disclosure such as revealing proprietary information to competitors which may adversely affect firm's competitive position and hence its future profitability (Yosha, 1995; Bhattacharya and Chiesa, 1995; Dye, 1985; Darrough and Stoughton, 1990). Some disclosure costs are unaffected by the overlap between costs incurred for managerial purposes and costs incurred for external disclosure purposes. In this paper, we focus on corruption related costs of accounting information disclosure.

Svensson (2005) find that with few exceptions, countries with low income levels are more likely to be most corrupt. Shleifer and Vishny (1993) claim that weakness of central government, more prevalent in less developed countries, allows government agencies and bureaucrats to impose independent bribes on private agents seeking permits from these agencies. Since the WBES sample countries are mostly developing with weak governments, higher level of corruption may be a crucial factor for growth in those business environments. The extant macro literature, beginning with Mauro (1995) has established a negative correlation between corruption and growth. However, the existing macro literature tells us little about the dynamics of corruption as a firm-level obstacle.

Bribery may allow firms to get things done in an economy plagued by bureaucratic hold-ups (Leff, 1964; Huntington and Fukuyama, 2006). In a system built on bribery for allocating licenses and government contracts, firms that can afford to pay higher amount of bribes may have a competitive advantage (Lui, 1985). Bliss and Di Tella (1997) and Svensson (2003) provide evidence that if the bureaucrats can tailor the nature and amount of harassment on firms to extract bribes, the “required bribe” will depend on the ability of the firm to pay. Access to firm information is thus crucial for such corrupt bureaucrats to know the ability of the firms to pay the “required bribe”. Consistent with the empirical set up used by Fisman and Svensson (2007), two firms in the same sector may thus require paying different amounts in bribes and the difference may be correlated with accounting information disclosed by the firms. Rational and profit maximizing bureaucrats would try to maximize their demand for bribes extracting as much bribe as possible utilizing the available firm-level accounting information to assess the bribe paying ability of a firm, subject to the constraints that the firm might exit, and/or the corrupt official may get caught. Besides, corrupt officials may make attempt to obtain bribe from firms by deliberately questioning the authenticity of their disclosed information. Finally, managers also may perceive that their firms become more susceptible to corrupt officials by disclosing accounting information through auditing. Therefore, we hypothesize that in extracting bribes, corrupt bureaucrats are more likely to target firms whose accounting information is disclosed through auditing and hence, available in the market and thus, such information disclosure increases the corruption related obstacles for audited firms.

Consistent with our hypothesis that audited firms are subject to higher level of corruption obstacles, audited firms should experience other firm-level obstacles related to corruption. Such firms are subject to face higher level of legal obstacles as firm-level corruption and the

functioning of the judiciary for the operation and growth of business are closely related and may affect each other substantially. Such firms are also more likely to experience greater extent of problems in getting business licenses and permits, dealing with labor regulations, customs and trade regulations. Thus, we hypothesize that audited firms are subject to higher levels of legal obstacles and obstacles related to license, permits, labor regulation, customs and trade regulations.

2.3 Data and variables

To test the above hypotheses, we employ the World Bank Enterprise Survey (WBES) data for 53,924 firms in 119 countries around the world for the period between 2006 and 2011. Most of the countries in the sample have one survey, whereas few countries have two surveys. In Table A1 in the Appendix, we present the list of our sample countries, the survey year(s) and the number of audited and unaudited firms by country. In the World Bank enterprise surveys, standardized survey instruments are used in collecting firm-level data on the business environment. The survey respondents are mainly business owners and firms' top managers. Country data are matched to a standard set of questions allowing cross-country comparisons and analysis. The survey focuses on assessing the critical obstacles in the business environment that hinder firm growth around the world. Major topics of the surveys encompass access to finance, corruption, political, infrastructure, crime, competition, labor market and legal obstacles. The survey also contains information on firms' ownership (government and foreign ownership) and top managers' experience, whether the firms export, and firms' background related information. The survey also asks firms to provide sales for year (t-1) and year (t-3), where t is the survey year; this allows us to construct firm growth measures, i.e. sales growth.

We start with all observations in the WBES database and proceed to delete firms that do not have either “Yes (1)” or “No (2)” answer to the audit question: “*In last complete fiscal year, did this establishment have its annual financial statement checked and certified by an external auditor?*” (original data item: ‘k21’). We also delete firms with no sales values (original data items: ‘d2’ and ‘n3’, respectively) or no number of permanent, full time employees (original data items: ‘l1’ and ‘l3’, respectively) for (t-1) to (t-3) t being the survey year. The survey does not have sales or employee data for year (t-2). We do not delete observations for lack of any other variables. Our final sample consists of 53,924 unique firms in 119 countries over the period between 2006 and 2011.³ Among these, 26,344 (more than 50% of the total sample) sample firms’ annual financial statements were checked and certified by external auditors for the year (t-1). The dataset includes firms from more than 33 industries classified by two-digit *International Standard of Industrial Classification (ISIC)* codes. While examining the effect of auditing on financial constraint, we control for country level financial development and information sharing via credit bureaus/registries using data from *International Financial Statistics (IFS)* and Djankov, McLiesh, and Shleifer (2007), respectively. In investigating the impact of auditing on corruption, we control for country-level corruption using data from *Worldwide Governance Indicators (WGI)* database of the World Bank and *Transparency International*. For all our multivariate regressions, we control for a country’s GDP, GDP per capita, GDP growth rate, and inflation. We obtain these macro variables from the *World Development Indicators (WDI)* database of the World Bank. Country level variables are the averages over the period from year (t-3) to (t-1), t being the survey year. The relevant variables are described below.⁴

³ Every firm has a unique identifier code, the “idstd” code.

⁴ The details of the variables, their sources and the survey data items are mentioned in Table A2 in the Appendix.

2.3.1 Dependent variables

2.3.1.1 Obstacles to firm growth

We mainly examine two obstacles to firm growth: financial (Financial) and corruption (Corruption). For additional analysis, we also use four other firm-level obstacles including legal obstacles (Legal), obstacles related to business licensing and permits (License), labor regulations obstacles (Labor) and obstacles associated with customs and trade regulations (Customs) for exporting firms. All these firm-level obstacles take on a value based on the self-reported answers to the following WBES question:

“How problematic is _____ for the current operations of a business?”

The blank space represents one of the aforementioned growth obstacles. The WBES scores the obstacles on the following scale: No obstacle=0, Minor obstacle =1, Moderate obstacle=2, Major obstacle =3, and Very severe obstacle=4.

2.3.1.2 Firm growth

To measure the growth of a firm, we employ Sales Growth and Employment Growth. Following Fisman and Svensson (2007), we compute these growth measures as follows:

$$\text{Sales Growth} = [\log (\text{Sales}_{t-1}) - \log(\text{Sales}_{t-3})] / 2 \quad (1)$$

$$\text{Employment Growth} = [\log (\text{employees}_{t-1}) - \log(\text{employees}_{t-3})] / 2 \quad (2)$$

A better measure for firm growth would be the average of the two growth rates over the three-year period from (t-3) to (t-1). However, the WBES database does not have data for year (t-2). A common criticism of using survey data to conduct research related to firm performance and growth is that survey data are self-reported and therefore the findings may suffer from self-

reporting bias. However, Beck DemirgüçKunt and Maksimovic (2005) argue that accounting data are more likely to be biased than survey data as the incentives to distort data are likely to be higher in financial statements because many firm level decisions, such as tax, financing, and managerial compensations, are in part based on financial statement variables. Beck et al. (2005) also posit that the self-reporting nature of the WBES data is not likely to be a significant source of bias. With intimate working knowledge of the WBES, they point out that the survey aims to evaluate the business environment instead of firm performance and growth. Even though some firm performance and growth related questions were asked, the survey was specifically designed to ask those questions at the end of the interview. This reduces the respondents' need to justify their own performance when answering the earlier business environment related questions.

2.3.1.3 Additional measures of financial constraints

We employ three additional measures of a firm's financial constraints: Overdraft, Line of Credit, and Capital Expenditure. Overdraft is a dummy variable equal to 1 if firm has an overdraft facility at year t (original data item: 'k7'), and 0 otherwise. Line of Credit is a dummy variable equal to 1 if firm has a line of credit or loan from a financial institution at year t (original data item: 'k8'), and 0 otherwise. Capital Expenditure is a dummy variable equal to 1 if firm purchased fixed assets, such as machinery, vehicles, equipment, land or buildings at year $(t-1)$, (WBES data item 'k4') and 0 otherwise. Lins, et al. (2010) document that firms with overdraft facility and line of credit are less financially constrained. And less financially constrained firms are more likely to undertake capital investment projects. As shown in Table 2.4 (Panel A), univariate tests show that audited firms are significantly more likely than unaudited firms to have overdraft facility and line of credit, and to undertake capital investment projects.

2.3.2 Explanatory variables

2.3.2.1 Audit

Our main explanatory variable, Audit, is an indicator variable that takes on the value 1 if firm's annual financial statement was checked and certified by an external auditor (original data item: 'k21'), and zero otherwise. As shown in the Table 2.1, Audit has a mean of 0.512, indicating about 51% percent of the surveyed firms are audited.

2.3.2.2 Firm size

Large firms are likely to be less constrained by various firm-level obstacles than smaller firms (Schiffer and Weder, 2001; Beck et al., 2005). Beck, et al. (2005) also show that small firms benefit more than large firms when growth obstacles are reduced. By disclosing accounting information, auditing reduces information asymmetry and may affect certain growth obstacles; firm size may be important in this association between auditing and various growth obstacles. Therefore, in our analysis, we control for firm size. In our multivariate regressions, we use the logarithm of firm's sales at the end of year (t-1) (original data item 'd2') as Firm Size variable. In Table 2.1 and Table 2.2, we present the size variable as firm's number of permanent, full time employees in the year (t-1). The mean and median numbers of employees in our sample are around 106 and 21, respectively; this indicates that firm size distribution is right skewed with extreme large firms. In fact, the largest firm in our sample has a total number of 64,000 permanent, full time employees.⁵ The average audited firm in our sample is larger than the average unaudited firm with the mean sizes 170.03 and 42.49 for audited and unaudited firms, respectively (Table 2.1 Panel A).

⁵ The largest firm in our sample is a garment-manufacturing firm in Lesotho.

2.3.2.3 Firm age

Dunne, Roberts and Samuelson (1988) find that younger firms grow faster than older firms. Fisman and Svensson (2007) argue that firm age is correlated with its growth. They also claim that firm age may be correlated with bribes because longer established firms have better access to bureaucrats and bank officers who in turn may demand more bribes. Anderson and Eshima (2011) further argue that younger firms can make up their lack of established routines and processes with being more flexible and reactive in the market places than older firms. Thus, in our analysis, we control for firm age. We measure Firm Age by subtracting the firm's founding year (original data item: 'b5') from the survey year (t) and take the logarithm of firm's actual age. In our sample, the average firm has been in business for about 19 years and the oldest firm is 340 year (Table 2.1).⁶ The average audited firm in our sample has been in business longer than the average unaudited firm with the mean ages 22.32 and 16.29 for audited and unaudited firms, respectively (Table 2.1 Panel A).

2.3.2.4 Top managerial experience

Ceteris paribus, more experience working in the same sector means better understanding of the rules and regulations and better access to finance and government officials. Therefore, we control for top manager experience in our analysis. Prior industry experience is positively related to firm performance measured by survival rate, profitability and growth (Bosma, van Praag, Thurik and de Wit, 2004). However, Robb and Watson (2012) find mixed effects of owner experience on firm performance. We use the number of years the top manager has been working in the same sector as managerial experience, denoted as Experience (original data item: b7). In our sample, the average top manager has 18.06 years of working in the same sector

⁶ For curiosity reason, we look it up and the oldest firm in our sample is a food-manufacturing firm in Jamaica.

(Table 2.1). The average top manager in audited firms has 18.97 years of experience, compared to 17.18 years for the average top manager in unaudited firms.

We must point out that the related WBES question asks for the work experience of the top manager in the firm, not the owner. As shown in Table 2.1, the median size of our sample firm is 21 employees. Therefore, we can reasonably assume that the top manager is also the owner in many firms. In cases where the owners are not the top managers, the owners still do the hiring, and by extension the top managers carry out the visions of the owners. Therefore, top manager's work experience is a logical proxy for owner's work experience.

2.3.2.5 Exporter

Fisman and Svensson (2007) show that exporting firms may be more vulnerable to rent extraction by corrupt officials and subject to greater bureaucratic scrutiny than firms with only domestic sales. Beck et al. (2005) find that exporters grow faster and face lower financial and corruption obstacles than non-exporters. In our study, we use a dummy variable, *Exporter*, equal to 1 if firm exports (using WBES data items 'd3a', 'd3b' and 'd3c'), 0 otherwise. In our sample, 18.7% of all firms export their products abroad (Table 2.1). As reported in Table 2.2 Panel A, exporting firms are more likely to be audited firms.

2.3.2.6 Government ownership

Beck et al. (2005) show that government-owned firms have lower growth rates and are subject to higher financial obstacles and lower corruption related obstacles. In our analysis, we control for government ownership using a dummy variable, *Government*, that takes on the value 1 if firm is owned by government/state (WBES data item 'b2c'), 0 otherwise. As presented in Table 2.1, in our sample, about 1.6% of all firms have government ownership stakes. Government firms are more likely to be audited firms as indicated in Table 2.2 Panel A.

2.3.2.7 Foreign ownership

Fishman and Svensson (2007) claim that firms with foreign ownership may provide better access to markets and technical expertise leading to better financial performance than pure domestic firms. Beck et al. (2005) show that foreign ownership has largely positive effect on firm performance and such firms experience less firm-level obstacles than domestically operated firms. Therefore, we control for foreign ownership in our regression analysis. We use a dummy variable, *Foreign*, to indicate if any foreign company or individual has a financial stake in the ownership of the firm (original data item: 'b2b'). As presented in Table 2.1, in our sample, 12.5 % of all firms have foreign ownership stakes. In our sample foreign firms are more likely to be audited firms as presented in Table 2.2 Panel A.

2.3.2.8 Apply for loan

It could be that firms have their financial statements audited because they apply for loans. Therefore, we control for *Apply for Loan*, a dummy variable equal to 1 if the firm applied for loans or lines of credit in the year (t-1) (WBES data item 'k16'), and 0 otherwise. As presented in Table 2.1, in our sample, 35.8 % of all firms applied for loans or lines of credit in the year (t-1). As shown in table 2.2 (Panel A) audited firms are more likely to apply for loans than unaudited firms.

2.3.2.9 Industry, year, and country effects

Like all cross-section and cross-country studies, we control for industry, year, and country effects in our multivariate regressions. We use the two-digit ISIC codes assigned to each firm in the WBES database to create industry dummies to control for industry effects. As macro factors also influence firm level performance (Beck et al. 2005), in our regressions, we control for country level GDP, GDP growth rate, GDP per capita, and inflation. In our sample, as shown

in Table 2.1, the mean log GDP is 22.89 million, the mean GDP per Capita is US\$ 2675.44.89, and the mean GDP Growth is 5%; all vary widely across the countries surveyed. The mean Inflation is 7% and also varies widely across countries, from the low of 0.2% to the high of 191%. Because sales values are reported in local currencies, inflation must be controlled for.

As a control for country-level financial development, we use Priv, which is given by the ratio of domestic banking credit to the private sector divided by GDP. We also control for country level information sharing via credit bureaus/registries in investigating the role of disclosure through auditing on firm's financial constraints. We control for Private Bureau, a dummy variable, which takes the value 1 if a private credit bureau operates in the country by the end of year (t-1), and 0 otherwise and Public Credit Registry, a dummy variable, which takes the value 1 if a public credit registry operates in the country by the end of year (t-1), and 0 otherwise.

To control for country level corruption, we use two alternative measures: Corruption Control from World Bank's WGI database and Corruption Perception Index (CPI Score) from Transparency International. The World Bank estimates country level corruption control worldwide and ranks countries on the scales of -2.5 (weak control) to +2.5 (strong control) governance performance. CPI Score is country-level corruption score based on how corrupt a country's public sector is perceived and takes the values between 10 (highly clean) and 0 (highly corrupt). In examining the impact of disclosure on corruption related obstacles, we control for country level rule of society, contract enforcement, property rights, the police, the courts, crime and violence by using Rule of Law. By using Government Effectiveness, we also control for country-level quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and

the credibility of the government's commitment to such policies. Like CPI Score, both Rule of Law and Government Effectiveness rank countries on the scales of -2.5 (weak control) to +2.5 (strong control) governance performance.

2.4 Methodologies and results

In this section we present the methodologies and empirical results of our study. We first conduct univariate tests for the differences of the relevant variables between audited and unaudited firms. We then employ multivariate regressions to examine separately the effect of financial constraint and corruption obstacles on audited firms in comparison to unaudited firms. Additional evidences are presented confirming our main finding that by disclosing accounting information through auditing, firms experience lower level of financial constraint and higher level of corruption obstacles. We next employ multivariate regressions to examine the association between audited firms' growth and their accounting information disclosure for the full sample. We further partition the full sample into two subsamples, OECD and non-OECD countries, and employ univariate tests for the differences of the relevant variables between OECD and non-OECD sample countries and multivariate regressions to investigate separately the relationship between firm growth and information disclosure for developed and developing countries in our sample. Finally, as robustness checks, we test for potential endogeneity of auditing to financial and corruption obstacles and both our growth measures by following the propensity score matching method.

2.4.1 Univariate tests and correlation matrix

Panel A of Table 2.2 presents univariate test results for the key variables between audited and unaudited firms. T-test and non-parametric tests are used to test the mean differences. The

Table 2.1: Summary statistics

Audit is a dummy variable equal to 1 if firm's annual financial statement was checked and certified by an external auditor, and 0 otherwise. *Financial* and *Corruption* are survey responses for firm-level obstacles as specified in the survey questionnaire. They take values between 0 and 4, where 0 indicates no obstacle and 4 a very severe obstacle. *Sales Growth* is the average of the difference of log [sales (t-1)] and log [sales (t-3)]. *t* is the survey year. *Employment Growth* is average of the difference of log [employees (t-1)] and log [employees (t-3)]. *Firm Size* is the number of permanent, full-time employees at the end of year (t-1). *Firm Age* is the firm's actual age. *Experience* is firm's top manager's years of working experience in the sector. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm, and 0 otherwise. *Apply for Loan* is a dummy variable equal to 1 if the firm applied for loans or lines of credit at the year (t-1), and 0 otherwise. *Priv*, the measure of country-level financial development, is the ratio of domestic banking credit to the private sector divided by GDP. *CPI Score* is country-level *Corruption Perceptions Index (CPI)* and ranges between 10 (highly clean) and 0 (highly corrupt). *Corruption Control* is country-level corruption estimate of *Worldwide Governance Indicators (WGI)* and ranges from approximately -2.5 (weak) to 2.5 (strong). *Rule of Law* is country-level estimate of rule of society, contract enforcement, property rights, the police, the courts, crime and violence and it ranges from approximately -2.5 (weak) to 2.5 (strong). *Government Effectiveness* is country-level governance estimate of *WGI* and ranges from approximately -2.5 (weak) to 2.5 (strong). *Private Bureau* is a dummy variable, which takes the value 1 if a private credit bureau operates in the country by the end of year (t-1), and 0 otherwise. *Public Credit Registry* is a dummy variable, which takes the value 1 if a public credit registry operates in the country by the end of year (t-1), and 0 otherwise. *GDP* is the log of GDP in current millions of U.S. dollars. *GDP per capita* is the real GDP per capita in U.S. dollars. *GDP Growth* is the real growth rate of GDP. *Inflation* is log difference of consumer price indices. Detailed variable definitions and sources are given in Table A2 in the Appendix.

	<i>N</i>	Mean	Median	<i>SD</i>	Min	Max
Audit	53,924	0.500	1	0.500	0	1
Financial	51,804	1.659	2	1.369	0	4
Corruption	52,975	1.859	2	1.502	0	4
Sales Growth	47,129	0.158	0.112	0.375	-1.040	1.579
Employment Growth	49,817	0.078	0.053	0.207	-0.549	0.805
Firm Size	54,448	105.865	21	548.114	5	64000
Firm Age	54,056	19.278	14	17.105	3	340
Experience	52,924	18.056	15	11.196	0	70
Exporter	54,579	0.187	0	0.390	0	1
Government	53,570	0.016	0	0.124	0	1
Foreign	54,579	0.125	0	0.330	0	1
Apply for Loan	52,100	0.358	0	0.479	0	1
<i>Priv</i>	138	31.472	23.872	24.188	0.923	109.480
Corruption Control	141	-0.356	-0.486	0.699	-1.496	1.377
CPI Score	135	3.319	2.9	1.383	1.5	7.4
Rule of Law	141	-0.427	-0.563	0.738	-1.870	1.276
Government Effectiveness	141	-0.341	-0.438	0.683	-1.718	1.477
Private Bureau	137	0.577	1	0.496	0	1
Public Credit Registry	139	0.568	1	0.497	0	1
GDP (log)	141	22.889	22.809	1.850	19.137	27.425
GDP per Capita (US\$)	141	2675.444	1489.206	3111.058	88.638	20750.780
GDP Growth (Real)	141	0.050	0.053	0.036	-0.061	0.234
Inflation	141	0.094	0.070	0.166	0.002	1.910

results of Panel A show that audited firms face significantly lower level of financial obstacles across the board than unaudited firms providing initial support to the finding that information disclosure benefits firms in lowering their financial constraints. However, audited firms experience significantly higher level of corruption obstacles than unaudited firms indicating the possible accounting information disclosure costs. Audited firms exhibit significantly lower level of employment growth than unaudited firms indicating the information disclosure costs. The results further show that audited firms are larger, have been in business longer, and have more experienced top managers than unaudited firms. Audited firms are also more likely to export, have more foreign or government ownership and to apply for loans than the unaudited counterparts.

Panel B of Table 2.2 reports the correlation matrix for the major variables in our study. Our primary interests are the correlations of the indicator variable for audited firms, Audit. As expected and consistent with the univariate test results in Panel A, Audit is significantly and negatively correlated with financial obstacles (Financial) and significantly and positively correlated with Corruption obstacles. The correlation between Audit and Sales Growth is positive but insignificant. Employment growth is significantly and negatively related to the Audit variable. The results further show that the two obstacles are positively and significantly correlated with each other indicating that one obstacle affects the other positively.

2.4.2 Auditing and financial constraints: multivariate analysis

The univariate test results in Table 2.2 (Panel A) show that audited firms exhibit significantly lower level of financial obstacles than their unaudited counterpart in the sample.

Table 2.2: Univariate tests and correlation matrix

Panel A presents univariate tests for the differences of relevant variables between audited and unaudited firms and Panel B presents the correlation matrix of the key variables. *N* is the number of firms. *Audit* is a dummy variable equal to 1 if firm's annual financial statement was checked and certified by an external auditor, and 0 otherwise. *Financial* and *Corruption* are survey responses for firm-level obstacles as specified in the survey questionnaire. They take values between 0 and 4, where 0 indicates no obstacle and 4 a very severe obstacle. *Sales Growth* is the average of the difference of log [sales (t-1)] and log [sales (t-3)]. *t* is the survey year. *Employment Growth* is average of the difference of log [employees (t-1)] and log [employees (t-3)]. *Firm Size* is the number of permanent, full-time employees at the end of year (t-1). *Firm Age* is the firm's actual age. *Experience* is firm's top manager's years of working experience in the sector. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm, and 0 otherwise. *Apply for Loan* is a dummy variable equal to 1 if the firm applied for loans or lines of credit at the year (t-1), and 0 otherwise. Detailed variable definitions and sources are given in Table A2 in the Appendix.

Panel A: Univariate Tests for Audited versus Unaudited Firms							
	Audited			Unaudited			Mean Difference
	<i>N</i>	Mean	Median	<i>N</i>	Mean	Median	
Financial	26,344	1.529	1	24,886	1.794	2	-0.264***
Corruption	26,296	1.881	2	26,085	1.833	2	0.048***
Sales Growth	23,375	0.156	0.112	23,268	0.161	0.117	-0.005
Employment Growth	24,864	0.070	0.048	24,406	0.086	0.059	-0.016***
Firm Size	26,920	170.032	40	26,892	42.448	13	127.584***
Firm Age	26,706	22.315	16	26,725	16.291	12	6.024***
Experience	26,048	18.968	17	26,285	17.184	15	1.784***
Exporter	26,970	0.265	0	26,954	0.109	0	0.156***
Government	26,507	0.024	0	26,434	0.008	0	0.016***
Foreign	26,970	0.187	0	26,954	0.062	0	0.125***
Apply for Loan	25,740	0.423	0	25,836	0.294	0	0.129***

T-tests and non-parametric tests are used to test mean differences. *, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

However, these results have not taken into account other factors that might also affect these obstacles. To investigate the impact of auditing on financial obstacles, we employ multivariate regressions to control for relevant firm characteristics, industry effects, year effects, country effects, and country level financial development index. The observed firm-level financial obstacles are polychotomous variables with a natural order, i.e. firms rank the financial obstacles by five levels, from 0 (no obstacle) to 4 (severe obstacle). We follow Beck, et al. (2006) and

Panel B: Correlation Matrix of Variables											
	Audit	Financial	Corruption	Sales Growth	Employment Growth	Firm Size	Firm Age	Experience	Exporter	Government	Foreign
Financial	-0.0965***										
Corruption	0.0159***	0.225***									
Sales Growth	-0.007	0.0031	-0.0091**								
Employment Growth	-0.0389***	0.0052	0.0022	0.2561***							
Firm Size	0.1158***	-0.0382***	0.0011	0.003	0.0056						
Firm Age	0.1759***	-0.0497***	0.0372***	-0.059***	-0.1692***	0.128***					
Experience	0.0796***	-0.0477***	0.0737***	-0.0446***	-0.11***	0.0365***	0.3718***				
Exporter	0.1994***	-0.0581***	0.004	0.0025	-0.018***	0.1442***	0.1525***	0.0984***			
Government	0.0645***	-0.007	-0.0265***	0.0062	-0.0508***	0.0533***	0.0843***	-0.0065	0.04***		
Foreign	0.1892***	-0.0778***	-0.021***	0.0018	-0.02***	0.0943***	0.0322***	-0.0354***	0.1873***	0.0541***	
Apply for Loan	0.1348***	0.0712***	0.0683***	0.0319***	0.0464***	0.0822***	0.0918***	0.0931***	0.149***	0.0277***	-0.015***

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Barth, Lin, Lin, and Song (2009) and employ the ordered probit model, estimated by the standard maximum likelihood estimation with heteroskedasticity robust standard errors. The estimated multivariate regression model takes the form:

$$\begin{aligned} Financial_{ij} = & \alpha + \beta_1 Audit_{i,i} + \beta_2 Firm\ Size_{i,j} + \beta_3 Firm\ Age_{i,j} + \beta_4 Experience_{i,j} + \beta_5 Exporter_{i,j} \\ & + \beta_6 Government_{i,j} + \beta_7 Foreign_{i,j} + \beta_8 Priv_{i,j} + \beta_9 Apply\ for\ Loan_{i,j} + \theta' Macro\ Controls_i + \varepsilon_{i,j} \quad (3) \end{aligned}$$

The subscripts i and j represent firm and country. The dependent variable is the financial obstacles (Financial) and our main explanatory variable is Audit, the indicator variable that takes on the value 1 if firm's annual financial statement was checked and certified by an external auditor, 0 otherwise. Our main hypothesis is that audited firms face lower financial obstacles than unaudited firms. Therefore, we expect the coefficient of Audit, β_1 , to be negative and significant.

The ordered probit regression results are reported in Table 2.3. As hypothesized, the results show that the coefficients of Audit, β_1 , are significantly negative for Financial at the 1% level in all the four models. When we look at the control variables, both firm size and age have significantly negative coefficients indicating that larger and older firms face lower level of financial constraint. Top manager work experience has a negative effect on financial obstacles, indicating that top manager's experience is helpful in overcoming the financial constraints. Foreign firms face significantly less financial obstacles. Firms who applied for loans are more likely to experience more financial constraints. In Column (4), the country-level financial development measure, Priv, is significantly negatively related to financial obstacles indicating that more financially developed countries are subject to significantly lower level of financial constraints.

2.4.3 Auditing and financial constraints: additional evidence

To confirm our finding from Table 2.3 that by disclosing accounting information, firms are able to significantly lower their financial constraints, we present some additional evidences in Table 2.4. In Panel A of Table 2.4, we present univariate tests for the differences of three liquidity variables (i.e. Overdraft, Line of Credit, and Capital Expenditure) between audited and unaudited firms. The univariate results show that audited firms have significantly higher Overdraft, Line of Credit, and Capital Expenditure indicating that such firms have higher level of liquidity i.e. lower level of financial constraints than unaudited firms.

To further investigate the liquidity status difference between audited and unaudited firms, we regress the liquidity variables on Audit controlling for other firm-specific variables. We employ logit model with heteroskedasticity-robust standard errors to examine the effect of Overdraft, Line of Credit, and Capital Expenditure on audited firms. As reported in Panel B of Table 2.4 (Column 1, 2, and 3), the coefficients of Audit, are significantly positive at the 1% level for Overdraft, Line of Credit, and Capital Expenditure. This provide strong evidence that audited firms have significantly higher line of credit, overdraft facility and capital expenditure than similar unaudited firms. These results support our hypotheses related to liquidity and disclosure mentioned in Section 2 and provide strong evidence that audited firms are more likely to have high degree of liquidity than their unaudited counterpart confirming our main finding that through auditing, firms are able for reduce their financial constraints.

2.4.4 Auditing and corruption: multivariate analysis

The univariate test results in Table 2.2 (Panel A) show that audited firms exhibit significantly higher level of corruption obstacles than their unaudited counterpart in the sample.

Table 2.3: Ordered probit analysis: auditing and financial constraints

The dependent variable is financial obstacles (*Financial*) which are survey responses for firm-level financial obstacles as specified in the survey questionnaire. It takes values between 0 and 4, where 0 indicates no financial obstacle and 4 a very severe financial obstacle. *Audit* is a dummy variable equal to 1 if firm's annual financial statement was checked and certified by an external auditor, and 0 otherwise. *Firm Size* is the log of firm's sales at year (t-1). *t* is the survey year. *Firm Age* is the log of firm's age. *Experience* is firm's top manager's years of working experience in the sector. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm, and 0 otherwise. *Priv*, the measure of country-level financial development, is the ratio of domestic banking credit to the private sector divided by GDP. *Apply for Loan* is a dummy variable equal to 1 if the firm applied for loans or lines of credit at the year (t-1), and 0 otherwise. Macro-controls (GDP, GDP per capita, GDP growth and inflation) and dummies for industry, year, and country are also included. For brevity, the coefficients are not presented but are available upon request. The regressions are run with ordered probit, which is based on standard maximum likelihood estimation with heteroskedasticity-robust standard errors.

Dependent variable: <i>Financial Obstacles</i>				
	(1)	(2)	(3)	(4)
Audit	-0.0333*** (0.012)	-0.0344*** (0.012)	-0.0554*** (0.012)	-0.0561*** (0.012)
Firm Size	-0.0540*** (0.003)	-0.0543*** (0.003)	-0.0663*** (0.003)	-0.0664*** (0.003)
Firm Age	-0.0299*** (0.008)	-0.0309*** (0.008)	-0.0302*** (0.008)	-0.0306*** (0.008)
Experience	-0.0017*** (0.001)	-0.0017*** (0.001)	-0.0018*** (0.001)	-0.0018*** (0.001)
Exporter	0.0150 (0.014)	0.0172 (0.014)	0.0052 (0.014)	0.0056 (0.014)
Government	0.0618 (0.041)	0.0590 (0.043)	0.0615 (0.043)	0.0632 (0.043)
Foreign	-0.1990*** (0.016)	-0.2037*** (0.016)	-0.1751*** (0.017)	-0.1752*** (0.017)
<i>Priv</i>		0.0590 (0.058)	0.0729 (0.058)	-0.2004*** (0.085)
Apply for Loan			0.3000*** (0.011)	0.3002*** (0.011)
Macro Controls	No	No	No	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes
Log Pseudo Likelihood	-72180.09	-71515.01	-68355.33	-68341.56
Pseudo R ²	0.05	0.0499	0.055	0.0552
No. of Firms	48,466	47,986	46,142	46,142
No. of Countries	119	119	119	119

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

To further investigate the impact of auditing on corruption obstacles, we employ multivariate regressions to control for relevant firm characteristics, industry effects, year effects, country effects, and country level corruption index.

Similar to our analysis for financial obstacles, we employ the ordered probit model, estimated by the standard maximum likelihood estimation with heteroskedasticity robust standard errors to examine the impact of auditing on corruption obstacles. The estimated multivariate regression model takes the form:

$$\begin{aligned} \text{Corruption}_{ij} = & \alpha + \beta_1 \text{Audit}_{ij} + \beta_2 \text{Firm Size}_{ij} + \beta_3 \text{Firm Age}_{ij} + \beta_4 \text{Experience}_{ij} + \beta_5 \text{Exporter}_{ij} \\ & + \beta_6 \text{Government}_{ij} + \beta_7 \text{Foreign}_{ij} + \beta_8 \text{Corruption Index}_{ij} + \theta' \text{Macro Controls}_j + \varepsilon \end{aligned} \quad (4)$$

The dependent variable is the corruption obstacles (Corruption) and our main explanatory variable is Audit, the indicator variable that takes on the value 1 if firm's annual financial statement was checked and certified by an external auditor, 0 otherwise. Our main hypothesis is that audited firms face higher level of corruption related obstacles than unaudited firms. Therefore, we expect the coefficient of Audit, β_1 , to be positive and significant.

The ordered probit regression results are reported in Table 2.5. Country level corruption is not controlled for in Column (1). In column (2) and (3), we control for country level corruption by using two indexes: Control of Corruption and CPI Score. In column (4), we also control for country level macro variables including GDP, GDP per capita, GDP growth, and inflation. As hypothesized, the results show that the coefficients of Audit, β_1 , are significantly positive for Corruption in all the four models. When we look at the control variables, both firm size and experience have significantly positive coefficients indicating that larger firms with more

Table 2.4: Auditing and financial constraints: additional evidence

Panel A presents univariate tests for the differences of relevant liquidity variables between audited and unaudited firms and Panel B presents logit results for related liquidity variables for audited firms. *Overdraft* is a dummy variable equal to 1 if firm has an overdraft facility at year t , and 0 otherwise. t is the survey year. *Line of Credit* is a dummy variable equal to 1 if firm has a line of credit or loan from a financial institution at year t , and 0 otherwise. *Capital Expenditure* is a dummy variable equal to 1 if firm purchased fixed assets, such as machinery, vehicles, equipment, land or buildings at year $(t-1)$, and 0 otherwise. *Audit* is a dummy variable equal to 1 if firm's annual financial statement was checked and certified by an external auditor, and 0 otherwise. *Firm Size* is the log of firm's sales at year $(t-1)$. *Firm Age* is the log of firm's age. *Experience* is firm's top manager's years of working experience in the sector. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm, and 0 otherwise. *Priv*, the measure of country-level financial development, is the ratio of domestic banking credit to the private sector divided by GDP. *Apply for Loan* is a dummy variable equal to 1 if the firm applied for loans or lines of credit at the year $(t-1)$, and 0 otherwise. Macro-controls (GDP, GDP per capita, GDP growth and inflation) and dummies for industry, year, and country are also included. For brevity, the coefficients are not presented but are available upon request. The regressions are run with logit with heteroskedasticity-robust standard errors. Detailed variable definitions and sources are given in Table A2 in the Appendix.

Panel A: Univariate Tests for Audited versus Unaudited Firms							
	Audited			Unaudited			Mean Difference
	<i>N</i>	Mean	Median	<i>N</i>	Mean	Median	
Overdraft	24,928	0.585	1	24,260	0.362	0	0.222***
Line of Credit	25,367	0.526	1	24,820	0.344	0	0.181***
Capital Expenditure	26,156	0.610	1	25,748	0.467	0	0.143***

T-tests and non-parametric tests are used to test mean differences. *, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

experienced managers face higher level of corruption obstacles. Firms having government or foreign ownership are less subject to corruption obstacles.

2.4.5 Auditing and corruption obstacles: additional evidence

To confirm our finding from Table 2.5 that audited firms are subject to significantly higher level of corruption obstacles, we present some additional evidences in Table 2.6. In Panel A of Table 2.6, we present univariate tests for the differences of four obstacle variables related to corruption (i.e. Legal, License, Labor, and Customs) between audited and unaudited firms. The univariate results show that audited firms have significantly higher levels of Legal, License, Labor, and Customs indicating that such firms face higher levels of legal obstacles and obstacles

Panel B: Auditing and Financial Constraints: Logit Analysis			
	(1) Overdraft	(2) Line of Credit	(3) Capital Expenditure
Audit	0.3905*** (0.027)	0.2577*** (0.029)	0.2264*** (0.024)
Firm Size	0.2573*** (0.007)	0.2166*** (0.008)	0.2413*** (0.006)
Firm Age	0.1005*** (0.018)	0.0151 (0.019)	-0.0886*** (0.016)
Experience	0.0024** (0.001)	0.0034*** (0.001)	-0.0002 (0.001)
Exporter	0.2088*** (0.033)	0.1781*** (0.035)	0.2293*** (0.031)
Government	-0.1963** (0.101)	-0.2512** (0.104)	-0.2133** (0.093)
Foreign	-0.0381 (0.038)	-0.4711*** (0.040)	0.0299 (0.034)
<i>Priv</i>	-0.1755 (0.222)	0.6099*** (0.248)	0.4307** (0.183)
Apply for Loan	0.8721*** (0.025)	2.5098*** (0.028)	0.7258*** (0.023)
Macro Controls	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes
Log Pseudo Likelihood	-23410.85	-20964.11	-28863.37
Pseudo R ²	0.2908	0.3687	0.1378
No. of Firms	47,737	48,479	48556
No. of Countries	119	119	119

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

related to business licensing and permits, labor regulations, customs and trade regulations.

To further investigate the corruption related obstacles difference between audited and unaudited firms, using ordered probit regressions, we regress those obstacles on Audit controlling for other firm-specific variables. As reported in Panel B of Table 2.6 (Column 1-4), the coefficients of Audit, are significantly positive across all the four specifications. These

Table 2.5: Ordered probit analysis: auditing and corruption obstacles

The dependent variable is corruption obstacles (*Corruption*) which are survey responses for firm-level corruption obstacles as specified in the survey questionnaire. It takes values between 0 and 4, where 0 indicates no corruption obstacle and 4 a very severe corruption obstacle. *Audit* is a dummy variable equal to 1 if firm's annual financial statement was checked and certified by an external auditor, and 0 otherwise. *Firm Size* is the log of firm's sales at year (t-1). *t* is the survey year. *Firm Age* is the log of firm's age. *Experience* is firm's top manager's years of working experience in the sector. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm, and 0 otherwise. *Corruption Control* is country-level corruption estimate of *Worldwide Governance Indicators (WGI)* and ranges from approximately -2.5 (weak) to 2.5 (strong). *CPI Score* is country-level *Corruption Perceptions Index (CPI)* and ranges between 10 (highly clean) and 0 (highly corrupt). Macro-controls (GDP, GDP per capita, GDP growth and inflation) and dummies for industry, year, and country are also included. For brevity, the coefficients are not presented but are available upon request. The regressions are run with ordered probit, which is based on standard maximum likelihood estimation with heteroskedasticity-robust standard errors. Detailed variable definitions and sources are given in Table A2 in the Appendix.

Dependent variable: <i>Corruption Obstacles</i>				
	(1)	(2)	(3)	(4)
Audit	0.0509*** (0.012)	0.0510*** (0.012)	0.0537*** (0.012)	0.0555*** (0.012)
Firm Size	0.0068** (0.003)	0.0068** (0.003)	0.0068** (0.003)	0.0041 (0.003)
Firm Age	0.0068 (0.008)	0.0068 (0.008)	0.0068 (0.008)	0.0059 (0.008)
Experience	0.0018*** (0.001)	0.0018*** (0.001)	0.0019*** (0.001)	0.0019*** (0.001)
Exporter	-0.0061 (0.014)	-0.0062 (0.014)	-0.0071 (0.014)	-0.0002 (0.014)
Government	-0.0878** (0.045)	-0.0877** (0.045)	-0.0888** (0.046)	-0.1013** (0.045)
Foreign	-0.0364** (0.016)	-0.0365** (0.016)	-0.0363** (0.016)	-0.0358** (0.016)
Corruption Control		-0.0609 (0.122)		0.2900** (0.135)
CPI Score			-0.0527 (0.043)	
Macro Controls	No	No	No	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes
Log Pseudo Likelihood	-73024.33	-73024.205	-72061.783	-72863.867
Pseudo R ²	0.0717	0.0717	0.0723	0.0737
No. of Firms	49,659	49,659	49,042	49,659
No. of Countries	119	119	119	119

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

results strongly support our hypothesis that audited firms are subject to higher levels of legal obstacles and obstacles related to licensing and permits, labor regulations, customs and trade regulations. The overall results confirm our main finding that audited firms are subject to higher levels of corruption related obstacles.

2.4.6 The role of public and private information exchanges

Information sharing via private bureaus and public credit registries has become ever more important as part of recent developments in modern business. Barth et al. (2009) find that such information sharing reduces lending corruption for banks, and that information sharing also helps enhancing the positive effect of competition in curtailing lending corruption. Therefore, we hypothesize that information sharing via private bureaus and public credit registries may affect the relationship between information disclosure through auditing and firm's financial and corruption obstacles.

For information sharing via private bureaus, we use Private Bureau, a dummy variable, which takes the value 1 if a private credit bureau operates in the country by the end of year (t-1), and 0 otherwise. A private bureau is defined as a private commercial firm that maintains a database on the standing of borrowers in the financial system, and its primary role is to facilitate exchange of information amongst banks and financial institutions. For information sharing via public credit registries, we use Public Credit Registry, a dummy variable, which takes the value 1 if a public credit registry operates in the country by the end of year (t-1), and 0 otherwise. A public registry is defined as a database owned by public authorities (usually the central bank or banking supervisory authority) that collects information on the standing of borrowers in the financial system and makes it available to financial institutions.

Table 2.6: Auditing and corruption: additional evidence

Panel A presents univariate tests for the differences of relevant obstacles between audited and unaudited firms and Panel B presents ordered probit regression results for the obstacles for audited firms. *Legal*, *License*, *Labor* and *Customs* variables are survey responses as specified in the survey questionnaire. They take values between 0 and 4, where 0 indicates no obstacle and 4 indicates a very severe obstacle. *Audit* is a dummy variable equal to 1 if firm's annual financial statement was checked and certified by an external auditor, and 0 otherwise. *Firm Size* is the log of firm's sales at year (t-1). *t* is the survey year. *Firm Age* is the log of firm's age. *Experience* is firm's top manager's years of working experience in the sector. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm, and 0 otherwise. *Rule of Law* is country-level estimate of rule of society, contract enforcement, property rights, the police, the courts, crime and violence and it ranges from approximately -2.5 (weak) to 2.5 (strong). *Government Effectiveness* is country-level governance estimate of *WGI* and ranges from approximately -2.5 (weak) to 2.5 (strong). Macro-controls (GDP, GDP per capita, GDP growth and inflation) and dummies for industry, year, and country are also included. For brevity, the coefficients are not presented but are available upon request. The regressions are run with ordered probit, which is based on standard maximum likelihood estimation with heteroskedasticity-robust standard errors. Detailed variable definitions and sources are given in Table A2 in the Appendix.

Panel A: Univariate tests for audited versus unaudited firms							
	Audited			Unaudited			Mean Difference
	<i>N</i>	Mean	Median	<i>N</i>	Mean	Median	
Legal	24694	1.214	1	22703	1.114	1	0.100***
License	25577	1.195	1	24823	1.179	1	0.016
Labor	26108	1.196	1	25458	1.043	1	0.153***
Customs	7,059	1.456	1	2,907	1.719	1	0.137***

T-tests and non-parametric tests are used to test mean differences. *, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

To investigate the possible role of information sharing via private bureaus and public credit registries on the relationship between information disclosure through auditing and firm's financial and corruption obstacles, using ordered probit regressions, we regress both financial and corruption obstacles on *Audit* controlling for other firm-specific variables. As reported in Table 2.7 for financial obstacles, the coefficients of *Audit* are significantly negative across all the four specifications. These results suggest that audited firms are subject to lower levels of financial obstacles in all the countries regardless of their information sharing via private bureaus and public credit registries. The results for corruption obstacles are presented in Table 2.8 which suggests that when financial information is shared through public credit registries, firms located

Panel B: Auditing and corruption: ordered probit analysis				
	(1) Legal	(2) License	(3) Labor	(4) Customs
Audit	0.0548*** (0.013)	0.0329*** (0.012)	0.0392*** (0.012)	0.0608** (0.029)
Firm Size	0.0331*** (0.003)	0.0162*** (0.003)	0.0385*** (0.003)	0.0172** (0.007)
Firm Age	0.0465*** (0.008)	-0.0115 (0.008)	0.0417*** (0.008)	-0.0237 (0.017)
Experience	0.0002 (0.001)	-0.0026*** (0.001)	-0.0018*** (0.001)	-0.0005 (0.001)
Exporter	0.0607*** (0.015)	0.0311** (0.014)	0.1002*** (0.014)	
Government	-0.0585 (0.047)	-0.0584 (0.045)	-0.0325 (0.042)	-0.0379 (0.072)
Foreign	0.0183 (0.017)	-0.0024 (0.016)	-0.0269* (0.016)	0.0739*** (0.028)
Rule of Law	-0.5306*** (0.108)			
Govt. Effectiveness		-0.1469 (0.227)	-0.0158 (0.131)	-0.9034* (0.529)
Macro Controls	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes
Log Pseudo Likelihood	-59984.94	-66759.87	-63628.18	-13624.48
Pseudo R ²	0.0806	0.0495	0.0907	0.0521
No. of Firms	46,366	49,446	50,580	9,547
No. of Countries	119	119	119	119

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

in those countries experience higher corruption obstacles. However, interestingly, when such information is not disclosed through public credit registries, firms face no significant corruption obstacles. These results strongly support our main hypothesis that audited firms are subject to higher levels of corruption related obstacles.

2.4.7 Firm growth and information disclosure through auditing: multivariate analysis

The univariate test results in Table 2.2 (Panel A) show that audited firms exhibit insignificantly lower sales growth and significantly lower employment growth than unaudited firms. To get more concrete evidence on whether accounting information disclosure through auditing substantially contributes to firm growth, we perform multivariate analysis. We measure firm growth in terms of sales growth and employment growth as defined in equation (1) and (2). Following Beck, et al. (2005), we employ regressions with random-effects GLS with heteroskedasticity-robust standard errors to examine the association between audited firms' information disclosure and growth for the full sample.⁷ Our GLS estimated regression equation takes the form:

$$\begin{aligned} \text{Firm Growth}_{ij} = & \alpha + \beta_1 \text{Audit}_{ij} + \beta_2 \text{Firm Size}_{ij} + \beta_3 \text{Firm Age}_{ij} + \beta_4 \text{Experience}_{ij} \\ & + \beta_5 \text{Exporter}_{ij} + \beta_6 \text{Government}_{ij} + \beta_7 \text{Foreign}_{ij} + \theta' \text{Macro Controls}_j + \varepsilon_{ij} \end{aligned} \quad (5)$$

The dependent variables are Sales Growth and Employment Growth and our main explanatory variable is Audit. We report the GLS results in Table 2.9. The coefficient of the Audit is negative and significant in specification (1) and negative but insignificant in specification (2). For firm-level control variables, large firms tend to grow faster as the coefficients of Firm Size are significantly positive across both columns in Table 2.9. Across both the specifications, the coefficients of the Firm Age are negative and significant indicating that younger firms grow faster than large firms; this result is consistent with the findings of Evans (1987) and Dunne, Roberts and Samuelson (1988). The results also suggest that exporting, government and foreign firms are subject to lower level of growth.

⁷ We run country fixed effect regressions and find similar results but do not report the results.

Table 2.7: Auditing and financial constraints: the role of public and private information exchanges

The dependent variable is financial obstacles (*Financial*) which are survey responses for firm-level financial obstacles as specified in the survey questionnaire. It takes values between 0 and 4, where 0 indicates no financial obstacle and 4 a very severe financial obstacle. *Private Bureau* is a dummy variable, which takes the value 1 if a private credit bureau operates in the country by the end of year (t-1), and 0 otherwise. *t* is the survey year. *Public Credit Registry* is a dummy variable, which takes the value 1 if a public credit registry operates in the country by the end of year (t-1), and 0 otherwise. *Audit* is a dummy variable equal to 1 if firm's annual financial statement was checked and certified by an external auditor, and 0 otherwise. *Firm Size* is the log of firm's sales at year (t-1). *Firm Age* is the log of firm's age. *Experience* is firm's top manager's years of working experience in the sector. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm, and 0 otherwise. *Priv*, the measure of country-level financial development, is the ratio of domestic banking credit to the private sector divided by GDP. Macro-controls (GDP, GDP per capita, GDP growth and inflation) and dummies for industry and year are also included. For brevity, the coefficients are not presented but are available upon request. The regressions are run with ordered probit, which is based on standard maximum likelihood estimation with heteroskedasticity-robust standard errors. Detailed variable definitions and sources are given in Table A2 in the Appendix.

Dependent variable: <i>Financial Obstacles</i>				
	(1) Private Bureau =0	(2) Private Bureau =1	(3) Public Credit Registry =0	(4) Public Credit Registry =1
Audit	-0.0426** (0.021)	-0.1167*** (0.012)	-0.1935*** (0.017)	-0.0540*** (0.014)
Firm Size	-0.0105*** (0.004)	-0.0217*** (0.002)	-0.0040 (0.003)	-0.0236*** (0.002)
Firm Age	-0.0412*** (0.015)	-0.0400*** (0.009)	-0.0524*** (0.012)	-0.0419*** (0.010)
Experience	-0.0022* (0.001)	-0.0018*** (0.001)	-0.0034*** (0.001)	-0.0013** (0.001)
Exporter	-0.1527*** (0.030)	-0.0143 (0.015)	-0.0180 (0.023)	-0.0582*** (0.017)
Government	-0.0279 (0.069)	0.1321*** (0.053)	0.0740 (0.069)	0.0672 (0.054)
Foreign	-0.2397*** (0.030)	-0.2487*** (0.019)	-0.2973*** (0.024)	-0.2016*** (0.021)
<i>Priv</i>	-0.0530*** (0.017)	-0.1943*** (0.010)	-0.0668*** (0.018)	-0.2046*** (0.010)
Macro Controls	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Log Pseudo Likelihood	-19576.51	-52937.52	29901.35	-43010.08
Pseudo R ²	0.0188	0.0204	0.0347	0.0181
No. of Firms	12,432	35,085	19,685	28,036
No. of Countries	61	58	63	56

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 2.8: Auditing and corruption: the role of public and private information exchange

The dependent variable is corruption obstacles (*Corruption*) which are survey responses for firm-level corruption obstacles as specified in the survey questionnaire. It takes values between 0 and 4, where 0 indicates no corruption obstacle and 4 a very severe corruption obstacle. *Private Bureau* is a dummy variable, which takes the value 1 if a private credit bureau operates in the country by the end of year (t-1), and 0 otherwise. *t* is the survey year. *Public Credit Registry* is a dummy variable, which takes the value 1 if a public credit registry operates in the country by the end of year (t-1), and 0 otherwise. *Audit* is a dummy variable equal to 1 if firm's annual financial statement was checked and certified by an external auditor, and 0 otherwise. *Firm Size* is the log of firm's sales at year (t-1). *Firm Age* is the log of firm's age. *Experience* is firm's top manager's years of working experience in the sector. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm, and 0 otherwise. *Corruption Control* is country-level corruption estimate of *Worldwide Governance Indicators (WGI)* and ranges from approximately -2.5 (weak) to 2.5 (strong). Macro-controls (GDP, GDP per capita, GDP growth and inflation) and dummies for industry and year are also included. For brevity, the coefficients are not presented but are available upon request. The regressions are run with ordered probit, which is based on standard maximum likelihood estimation with heteroskedasticity-robust standard errors. Detailed variable definitions and sources are given in Table A2 in the Appendix.

Dependent variable: <i>Corruption Obstacles (ordered probit analysis)</i>				
	Private Bureau =0	Private Bureau =1	Public Credit Registry =0	Public Credit Registry =1
Audit	0.1347*** (0.022)	0.0318*** (0.012)	0.0136 (0.017)	0.1051*** (0.014)
Firm Size	0.0061 (0.004)	-0.0449*** (0.002)	0.0202*** (0.003)	-0.0510*** (0.002)
Firm Age	0.0088 (0.016)	0.0619*** (0.009)	0.0080 (0.012)	0.0556*** (0.010)
Experience	0.0021* (0.001)	0.0041*** (0.001)	0.0013 (0.001)	0.0029*** (0.001)
Exporter	-0.0280 (0.031)	0.0659*** (0.015)	0.0079 (0.023)	-0.0100 (0.017)
Government	-0.1760** (0.078)	-0.2041*** (0.050)	-0.0388 (0.069)	-0.2685*** (0.054)
Foreign	-0.0558* (0.031)	-0.0070 (0.018)	-0.0774*** (0.023)	0.0618*** (0.021)
Corruption Control	-0.5266*** (0.024)	-0.4476*** (0.014)	-0.4713*** (0.021)	-0.5223*** (0.014)
Macro Controls	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Log Pseudo Likelihood	-18323.77	-56295.55	-29735.33	-45401.36
Pseudo R ²	0.0561	0.0361	0.0318	0.0407
No. of Firms	12,260	36,862	19,547	29,848
No. of Countries	61	58	63	56

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

2.4.8 Firm growth and information disclosure: OECD versus non-OECD countries

We next partition the full sample into two subsamples, OECD and non-OECD countries, to investigate whether the effect of disclosure on firm growth varies across countries of different degree of economic and institutional development. As we hypothesize, in countries with more efficient institutions and better governance, the value of disclosing accounting information should be more pronounced and therefore, firms located in OECD countries should be harmed less or insignificantly from disclosing information through auditing.

Panel A of Table 2.10 presents univariate test results for the key variables between OECD and non-OECD countries. T-test and non-parametric tests are used to test the mean differences. The results of Panel A of Table 2.2 show that firms in OECD countries experience significantly lower level of financial and corruption obstacles. Such firms also experience lower level of sales and employment growth than firms in non-OECD countries. The results further show that firms in OECD countries are larger in size and have been in business longer than firms in non-OECD countries. As expected, firms in OECD countries are more likely to be exporters and less likely to have government and foreign ownership. Not surprisingly, OECD countries are in better condition in terms of corruption control, financial development, rules of law, and government effectiveness. OECD countries have larger economies with higher per capita income and lower rates for GDP growth and inflation.

For the sub-samples of OECD and non-OECD countries, we employ regressions with random-effects GLS with heteroskedasticity-robust standard errors to examine the association between audited firms' information disclosure and growth using the equation (5) and report the results in Panel B of Table 2.10. As we hypothesize, for OECD countries the coefficients of

Table 2.9: Auditing and firm growth

The dependent variable in the first specification is *Sales Growth* which is the average of the difference of log [sales (t-1)] and log [sales (t-3)]. *t* is the survey year. The dependent variable in the second specification is *Employment Growth* which is the average of the difference of log [employees (t-1)] and log [employees (t-3)]. *Audit* is a dummy variable equal to 1 if firm's annual financial statement was checked and certified by an external auditor, and 0 otherwise. *Firm Size* is the log of firm's sales at year (t-1). *Firm Age* is the log of firm's age. *Experience* is firm's top manager's years of working experience in the sector. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm, and 0 otherwise. Macro-controls (GDP, GDP per capita, GDP growth and inflation) and dummies for industry and year are also included. For brevity, the coefficients are not presented but are available upon request. The regressions are run with random-effects GLS with heteroskedasticity-robust standard errors. Detailed variable definitions and sources are given in Table A2 in the Appendix.

	(1) Sales Growth	(2) Employment Growth
Audit	-0.0266*** (0.005)	-0.0036 (0.003)
Firm Size	0.0281*** (0.003)	0.0070*** (0.001)
Firm Age	-0.0570*** (0.005)	-0.0544*** (0.003)
Experience	-0.0002 (0.000)	-0.0004*** (0.000)
Exporter	-0.0203*** (0.006)	0.0048 (0.003)
Government	-0.0225 (0.017)	-0.0556*** (0.008)
Foreign	-0.0383*** (0.006)	-0.0185*** (0.004)
Macro Controls	Yes	Yes
Industry Dummies	Yes	Yes
Year Dummies	Yes	Yes
R ² within	0.0371	0.0518
R ² between	0.0554	0.3958
R ² overall	0.0172	0.0642
No. of Firms	44,377	46,806
No. of Countries	119	119

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Audit, β_1 , are not significant and for non-OECD countries, the coefficients of Audit are negative and significant. This provides strong evidence that audited firms located in the OECD countries are not negatively affected by disclosing information through auditing. However,

information disclosure is harmful in terms of significantly negative sales growth and employment growth if firms operate in non-OECD countries i.e. in business environment with less efficient institutions and less effective governance. These conclusions hold after controlling for after controlling for relevant firm characteristics, country level macro variables, industry effects, and year effects.

2.5 Robustness tests

2.5.1 Unbalanced responses: a probit analysis

The main dependent variables in our study are firms' responses to questionnaires concerning their financial constraint and corruption related obstacles. The responses are unbalanced across the five levels of answers (0-4) and the unbalanced nature of the responses might invalidate the estimates obtained from the ordered probit regressions. A few outliers in one of the levels with a small number of responses could bias the overall results (see Beck et al. 2006; Barth et al. 2009). To address these potential issues and obtain a somewhat balanced responses, we follow Beck et al. (2006) and Barth et al. (2009) and construct two binary variables, the financial constraint dummy (*Fin_dum*) and the corruption obstacle dummy (*Corr_dum*). *Fin_dum* and *Corr_dum* take the value of zero if the response is "no obstacle" in assessing financial and corruption obstacles a firm faces, respectively, and one if the response is "minor", "moderate", "major", or "very severe". This technique creates a binary variable for firms' responses, "no obstacle" or "obstacle". We then use the *Fin_dum* and *Corr_dum* as dependent variables and repeat the regressions in Table 2.3 (column 4) and Table 2.5 (column 4) with probit regressions.

The results are presented in Table 2.11 and are largely consistent with those obtained through ordered probit analysis. The coefficient of Audit in column (1) is negative and

significantly at the one percent level, indicating that disclosure is significantly related to lower financial constraints. The coefficient of Audit in column (2) is positive and significant at the five percent level, indicating disclosure is significantly positively related to higher corruption obstacles.

2.5.2 Endogeneity tests

The regression models in Tables 2.3-2.11 assume a firm's decision to have its financial statements audited by an outside auditor to be exogenous to firm-level financial and corruption obstacles. However, a firm's audit decision may also be endogenous, i.e. there may be a reverse causality between the growth obstacles and a firm's audit decision. Since the decision is mostly voluntary (as opposed to regulatory requirement), a firm takes into account many factors when deciding whether to have its financial statement audited. For example, a firm is financially constrained and wants to apply for external financing. But the firm decides not to because it doesn't believe the application would be approved due to high level of existing debt or other observed factors. On the other hand, it could be that a firm will only have its books audited if it is in relatively good financial health and believes the application for credit is likely to be approved. The potential self-selection bias needs to be accounted for.

The endogeneity between a firm's audit decision and the corruption obstacles it faces is less of a concern. Our overall results show that auditing is linked to high level of corruption obstacles. It is unlikely that highly corrupt business environment encourages a firm to have its books audited. The more likely scenario is that highly corrupt business environment discourages voluntary auditing while less corrupt business environment encourages voluntary auditing. Therefore, the potential endogeneity problem should strengthen our results. Nevertheless, we

Table 2.10: Auditing and firm growth: OECD versus Non-OECD countries

Panel A presents univariate tests for the differences of relevant variables between OECD and non-OECD firms and Panel B presents random-effects GLS regression results for OECD and non-OECD firms. *N* is the number of firms, except for country level macro variables which is the number of countries studied. *Audit* is a dummy variable equal to 1 if firm's annual financial statement was checked and certified by an external auditor, and 0 otherwise. *Financial* and *Corruption* are survey responses for firm-level obstacles as specified in the survey questionnaire. They take values between 0 and 4, where 0 indicates no obstacle and 4 a very severe obstacle. *Sales Growth* is the average of the difference of log [sales (t-1)] and log [sales (t-3)]. *t* is the survey year. *Employment Growth* is average of the difference of log [employees (t-1)] and log [employees (t-3)]. *Firm Size* is the number of permanent, full-time employees at the end of year (t-1). *Firm Age* is the firm's actual age. *Experience* is firm's top manager's years of working experience in the sector. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm, and 0 otherwise. *Apply for Loan* is a dummy variable equal to 1 if the firm applied for loans or lines of credit at the year (t-1), and 0 otherwise. *Corruption Control* is country-level corruption estimate of *Worldwide Governance Indicators (WGI)* and ranges from approximately -2.5 (weak) to 2.5 (strong). *Rule of Law* is country-level estimate of rule of society, contract enforcement, property rights, the police, the courts, crime and violence and it ranges from approximately -2.5 (weak) to 2.5 (strong). *Priv*, the measure of country-level financial development, is the ratio of domestic banking credit to the private sector divided by GDP. *GDP* is the log of GDP in current millions of U.S. dollars. *GDP per capita* is the real GDP per capita in U.S. dollars. *GDP Growth* is the real growth rate of GDP. *Inflation* is log difference of consumer price indices. All country level variables are the average over year (t-3), (t-2) and (t-1). In Panel B, macro-controls (GDP, GDP per capita, GDP growth and inflation) and dummies for industry and year are also included. For brevity, the coefficients are not presented but are available upon request.

Panel A: Univariate Tests: OECD vs Non-OECD Firms							
	OECD			Non-OECD			Mean Difference
	<i>N</i>	Mean	Median	<i>N</i>	Mean	Median	
Audit	6,662	0.510	1	50,629	0.489	0	0.021***
Financial	6,648	1.333	1	48,374	1.718	2	-0.384***
Corruption	6,599	1.769	2	49,666	1.869	2	-0.100***
Sales Growth	5,667	0.135	0.100	42,565	0.160	0.1168074	-0.025***
Employment Growth	6,201	0.048	0.006	45,015	0.079	0.0526803	-0.031***
Firm Size	6,720	163.967	30	51,134	92.591	19	71.376***
Firm Age	6,629	22.506	17	50,843	17.978	13	4.528***
Experience	6,103	70.496	70	41,702	75.538	90	-5.041***
Exporter	6,735	0.262	0	51,266	0.168	0	0.094***
Government	6,713	0.007	0	50,140	0.016	0	-0.009***
Foreign	6,735	0.097	0	51,266	0.126	0	-0.029***
Apply for Loan	6,655	0.422	0	48,690	0.341	0	0.081***
<i>Priv</i>	11	52.335	48.094	127	29.665	23.253	22.670***
Corruption Control	11	0.499	0.334	130	-0.428	-0.541	0.927***
CPI Score	11	5.282	5.1	124	3.145	2.8	2.137***
Rule of Law	11	0.570	0.850	130	-0.512	-0.612	1.082***
Govt. Effectiveness	11	0.746	0.844	130	-0.433	-0.500	1.179***
Private Bureau	11	0.909	1	126	0.548	1	0.361***
Public Credit Registry	11	0.545	1	128	0.570	1	-0.025***
GDP (log)	11	25.367	25.191	130	22.680	22.664	2.687***
GDP per Capita (US\$)	11	6944.198	6152.458	130	2314.242	1332.360	4629.956***
GDP Growth (Real)	11	0.043	0.047	130	0.051	0.053	-0.008
Inflation	11	0.048	0.044	130	0.098	0.075	-0.049

T-tests and non-parametric tests are used to test mean differences. *, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Panel B: Firm Growth : OECD vs Non-OECD Firms				
	OECD		Non-OECD	
	(1) Sales Growth	(2) Employment Growth	(3) Sales Growth	(4) Employment Growth
Audit	-0.0055 (0.006)	0.0104 (0.011)	-0.0312*** (0.005)	-0.0066** (0.003)
Firm Size	0.0278*** (0.007)	0.0099*** (0.004)	0.0286*** (0.003)	0.0068*** (0.002)
Firm Age	-0.0490*** (0.007)	-0.0504*** (0.011)	-0.0581*** (0.006)	-0.0550*** (0.003)
Experience	-0.0003 (0.000)	-0.0003 (0.000)	-0.0002 (0.000)	-0.0004*** (0.000)
Exporter	-0.0239*** (0.010)	0.0020 (0.010)	-0.0204*** (0.007)	0.0044 (0.003)
Government	0.0301 (0.088)	-0.0292 (0.036)	-0.0245 (0.017)	-0.0560*** (0.009)
Foreign	-0.0756*** (0.014)	-0.0242** (0.010)	-0.0341*** (0.007)	-0.0178*** (0.004)
Macro Controls	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
R ² within	0.0623	0.0607	0.0366	0.0525
R ² between	0.8359	0.9775	0.0494	0.4223
R ² overall	0.1006	0.0788	0.0153	0.0668
No. of Firms	5,316	5,800	39,061	41,006
No. of Countries	9	9	110	110

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

conduct endogeneity tests using two methods, the propensity score matching (PSM) and the Heckman two-stage procedure.

2.5.2.1 Propensity score matching (PSM)

A firm's audit decision may be systematically related to certain firm level characteristics. To control for the non-random nature of a firm's audit decision, we use the propensity score matching (PSM) technique to select matching firms for each audited firm. The

Table 2.11: Robustness check: a probit analysis

The dependent variables in the column (1) and (2) are dummies, *Fin_dum* and *Corr_dm*, respectively. They take the value of 0 if the response is “no obstacle” and 1 if the response is “minor,” “moderate,” “major,” or “very severe” obstacles regarding firm-level financial corruption obstacles, respectively. *Audit* is a dummy variable equal to 1 if firm’s annual financial statement was checked and certified by an external auditor, and 0 otherwise. *Firm Size* is the log of firm’s sales at year (t-1). *t* is the survey year. *Firm Age* is the log of firm’s age. *Experience* is firm’s top manager’s years of working experience in the sector. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm, and 0 otherwise. *Priv*, the measure of country-level financial development, is the ratio of domestic banking credit to the private sector divided by GDP. *Apply for Loan* is a dummy variable equal to 1 if the firm applied for loans or lines of credit at the year (t-1), and 0 otherwise. *Corruption Control* is country-level corruption estimate of *Worldwide Governance Indicators (WGI)* and ranges from approximately -2.5 (weak) to 2.5 (strong). Macro-controls (GDP, GDP per capita, GDP growth and inflation) and dummies for industry, year, and country are also included. For brevity, the coefficients are not presented but are available upon request. The regressions are run with probit, which is based on standard maximum likelihood estimation with heteroskedasticity-robust standard errors. Detailed variable definitions and sources are given in Table A2 in the Appendix.

	(1) <i>Fin_dum</i>	(2) <i>Corr_dm</i>
Audit	-0.0446*** (0.015)	0.0334** (0.015)
Firm Size	-0.0597*** (0.004)	0.0284*** (0.004)
Firm Age	-0.0324*** (0.010)	0.0224** (0.010)
Experience	-0.0049*** (0.001)	-0.0012* (0.001)
Exporter	0.0201 (0.018)	0.0169 (0.019)
Government	0.0514 (0.055)	-0.1262** (0.055)
Foreign	-0.1975*** (0.020)	-0.0119 (0.021)
<i>Priv</i>	0.4128*** (0.092)	
Apply for Loan	0.3922*** (0.015)	
Corruption Control		-0.2246 (0.188)
Macro Controls	Yes	Yes
Industry Dummies	Yes	Yes
Year Dummies	Yes	Yes
Country Dummies	Yes	Yes
Log Pseudo Likelihood	-25340.199	-25377.071
No. of Firms	46,142	49,659
No. of Countries	119	119

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

PSM technique estimates the propensity scores (likelihood to participate, or receive the treatment) of all observations and matches each treated observation with one or more untreated observations (the control) according to their propensity scores. As proposed by Heckman and Navarro-Lozano (2004) and Smith and Todd (2005), the logit model that estimates the propensity score should include only the variables that influence both the participation decision and the outcome variable. Based on finance theory and existing empirical evidence as discussed in Section 3, we employ the following logit model to estimate the propensity score for a firm to have its financial statements audited by an outside auditor:

$$\begin{aligned} \text{Audit}_{i,j} = & \alpha + \beta_1 \text{Firm Size}_{i,j} + \beta_2 \text{Firm Age}_{i,j} + \beta_3 \text{Experience}_{i,j} + \beta_4 \text{Exporter}_{i,j} \\ & + \beta_5 \text{Government}_{i,j} + \beta_6 \text{Foreign}_{i,j} + \beta_7 \text{Apply for Loan}_{i,j} + \varepsilon_{i,j} \end{aligned} \quad (6)$$

The variables are defined as before and are in Appendix Table A2. We drop observations that have missing values in any variables in equation (4) or in any of the outcome variables (financial constraints, corruption obstacles, sales growth, or employment growth). We then apply the “psmatch2” module in STATA with common support constraint that drops any treated observation whose propensity score is higher than the maximum or lower than the minimum score of the controls. We also trim at the bottom 1% those treated observations with the lowest propensity score density. We then apply the k-nearest neighbors matching method to construct a matching sample of the controls (unaudited) with the treated sample (audited).

The PSM results are presented in Table 2.12. Panel A presents the logit regression results (equation (6)), while Panel B presents the average treatment effect on the treated (ATT). As shown in Panel B, the final number of treated observations is 18,412 and the number of

controls is 19,855, indicating one treated observation has one or more matching controls. Panel A shows that all the right-hand side variables in equation (6) are highly significantly related to the propensity score of a firm's decision to participate. Panel B further shows that the average treatment effect on the treated (ATT) is significantly lower than the controls when the outcome is financial constraints (Financial). ATT for the treated is significantly higher than the controls when the outcome is corruption obstacles (corruption). We then re-estimate the ordered probit model using only the propensity score matched sample. The results are reported in Table 2.13. As shown in column (1), the coefficient of the treated dummy (Treated, or Audit) is negative and significant at the 1% level, indicating that disclosure is related to lower firm level financial constraint. In column (2), the coefficient of Treated is positive and significant at the 1% level, indicating that disclosure is related to higher firm level corruption obstacles.

We further re-examine the effects of disclosure on firm growth using only the propensity score matched sample of the treated and the controls. We re-estimate equation (5) using GLS country random effects. The results are reported in Tables 2.14 and 2.15. The results are consistent with those in Table 2.9 and Table 2.10. Audit has a negative and significant effect on sales growth but a negative and insignificant effect on employment growth. However, the negative effect of disclosure on sales growth and employment growth is significant only for firms in non-OECD countries, but not for firms in OECD countries.

The above results suggest that after controlling for potential endogeneity caused by selection bias, our overall findings remain robust.

Table 2.12: Propensity scores matching

Panel A presents the logit regression estimates and Panel B presents the average treatment effects (ATT) for obstacles and growth variables. *Firm Size* is the log of firm's sales at year (t-1). *t* is the survey year. *Firm Age* is the log of firm's age. *Experience* is firm's top manager's years of working experience in the sector. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm, and 0 otherwise. *Apply for Loan* is a dummy variable equal to 1 if the firm applied for loans or lines of credit at the year (t-1), and 0 otherwise. *Financial* and *Corruption* are survey responses for firm-level obstacles as specified in the survey questionnaire. They take values between 0 and 4, where 0 indicates no obstacle and 4 a very severe obstacle. *Sales Growth* is the average of the difference of log [sales (t-1)] and log [sales (t-3)]. *Employment Growth* is average of the difference of log [employees (t-1)] and log [employees (t-3)].

Panel A: Propensity scores: logit estimation			
Variable	Coef.	Std. Err.	z
Firm Size	0.0700***	0.004	19.74
Firm Age	0.4116***	0.017	24.25
Experience	-0.0024**	0.001	-2.25
Exporter	0.6459***	0.029	22.04
Government	0.7624***	0.105	7.25
Foreign	1.0512***	0.037	28.45
Apply for Loan	0.3409***	0.023	15.01
Constant	-2.5464***	0.071	-36.07
Log likelihood	-24609.649		
Pseudo R ²	0.0758		
No. of Firms	38,467		
No. of Countries	119		

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Panel B: Average Treatment Effects on the treated (ATT)

Matching Algorithm	Mean outcome	Sample	Treated (N=18,412)	Controls (N=19855)	Difference Treated - Controls
K-nearest neighbors matching	(1) Financial	Unmatched	1.5231	1.776	-0.2530***
		ATT	1.5278	1.7223	-0.1945***
	(2) Corruption	Unmatched	1.867	1.7865	0.0805***
		ATT	1.8703	1.7726	0.0977***
	(3) Sales growth	Unmatched	0.1559	0.1566	-0.0007
		ATT	0.1561	0.1534	0.0026
	(4) Employment growth	Unmatched	0.0692	0.0794	-0.0102***
		ATT	0.0697	0.0705	-0.0007

T-tests for ATT differences. *, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 2.13: Propensity score matching: ordered probit analysis

The dependent variables in column (1) and (2) are financial obstacles (*Financial*) and corruption obstacles (*Corruption*), respectively. They take values between 0 and 4, where 0 indicates no obstacle and 4 a very severe obstacle. *Audit* is a dummy variable equal to 1 if firm's annual financial statement was checked and certified by an external auditor, and 0 otherwise. *Firm Size* is the log of firm's sales at year (t-1). t is the survey year. *Firm Age* is the log of firm's age. *Ownership* is the percent of the firm owned by the largest owner. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm, and 0 otherwise. *Priv*, the measure of country-level financial development, is the ratio of domestic banking credit to the private sector divided by GDP. *Apply for Loan* is a dummy variable equal to 1 if the firm applied for loans or lines of credit at the year (t-1), and 0 otherwise. *Corruption Control* is country-level corruption estimate of *Worldwide Governance Indicators (WGI)* and ranges from approximately -2.5 (weak) to 2.5 (strong). Macro-controls (GDP, GDP per capita, GDP growth and inflation) and dummies for industry, year, and country are also included. For brevity, the coefficients are not presented but are available upon request. The regressions are run with ordered probit, which is based on standard maximum likelihood estimation with heteroskedasticity-robust standard errors. Detailed variable definitions and sources are given in Table A2 in the Appendix.

	(1) Financial	(2) Corruption
Treated (Audit)	-0.0437*** (0.013)	0.0601*** (0.013)
Firm Size	-0.0727*** (0.003)	0.0065** (0.003)
Firm Age	-0.0356*** (0.009)	0.0035 (0.009)
Experience	-0.0016*** (0.001)	0.0022*** (0.001)
Exporter	0.0124 (0.016)	0.0020 (0.016)
Government	0.0773 (0.048)	-0.1090** (0.050)
Foreign	-0.1765*** (0.019)	-0.0500*** (0.018)
<i>Priv</i>	-0.2792*** (0.094)	
Apply for Loan	0.3054*** (0.012)	
Corruption Control		0.3082** (0.148)
Macro Controls	Yes	Yes
Industry Dummies	Yes	Yes
Year Dummies	Yes	Yes
Country Dummies	Yes	Yes
Log Pseudo Likelihood	-56249.412	-55941.911
Pseudo R ²	0.0557	0.0782
No. of Firms	38,029	38,417
No. of Countries	119	119

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 2.14: Propensity score matching: auditing and growth

The dependent variable in the first specification is *Sales Growth* which is the average of the difference of log [sales (t-1)] and log [sales (t-3)]. *t* is the survey year. The dependent variable in the second specification is *Employment Growth* which is the average of the difference of log [employees (t-1)] and log [employees (t-3)]. *Audit* is a dummy variable equal to 1 if firm's annual financial statement was checked and certified by an external auditor, and 0 otherwise. *Firm Size* is the log of firm's sales at year (t-1). *Firm Age* is the log of firm's age. *Ownership* is the percent of the firm owned by the largest owner. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm, and 0 otherwise. Macro-controls (GDP, GDP per capita, GDP growth and inflation) and dummies for industry and year are also included. For brevity, the coefficients are not presented but are available upon request. The regressions are run with random-effects GLS with heteroskedasticity-robust standard errors. Detailed variable definitions and sources are given in Table A2 in the Appendix.

	(1) Sales Growth	(2) Employment Growth
Treated (Audit)	-0.0244*** (0.005)	-0.0033 (0.004)
Firm Size	0.0302*** (0.002)	0.0078*** (0.001)
Firm Age	-0.0610*** (0.005)	-0.0544*** (0.003)
Experience	-0.0002 (0.000)	-0.0004*** (0.000)
Exporter	-0.0216*** (0.006)	0.0040 (0.003)
Government	-0.0181 (0.018)	-0.0573*** (0.010)
Foreign	-0.0390*** (0.007)	-0.0194*** (0.004)
Macro Controls	Yes	Yes
Industry Dummies	Yes	Yes
Year Dummies	Yes	Yes
R ² within	0.0403	0.0529
R ² between	0.0849	0.3446
R ² overall	0.0206	0.0554
No. of Firms	38,417	38,417
No. of Countries	119	119

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 2.15: Propensity score matching: growth in OECD vs non-OECD countries

The dependent variable in the first and third specifications is *Sales Growth* which is the average of the difference of log [sales (t-1)] and log [sales (t-3)]. *t* is the survey year. The dependent variable in the second and fourth specifications is *Employment Growth* which is the average of the difference of log [employees (t-1)] and log [employees (t-3)]. *Audit* is a dummy variable equal to 1 if firm's annual financial statement was checked and certified by an external auditor, and 0 otherwise. *Firm Size* is the log of firm's sales at year (t-1). *Firm Age* is the log of firm's age. *Ownership* is the percent of the firm owned by the largest owner. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm, and 0 otherwise. Macro-controls (GDP, GDP per capita, GDP growth and inflation) and dummies for industry and year are also included. For brevity, the coefficients are not presented but are available upon request. The regressions are run with random-effects GLS with heteroskedasticity-robust standard errors. Detailed variable definitions and sources are given in Table A2 in the Appendix.

	OECD		Non-OECD	
	(1) Sales Growth	(2) Employment Growth	(3) Sales Growth	(4) Employment Growth
Treated (Audit)	0.0010 (0.005)	0.0116 (0.012)	-0.0296*** (0.006)	-0.0066** (0.003)
Firm Size	0.0265*** (0.007)	0.0099*** (0.004)	0.0312*** (0.003)	0.0076*** (0.002)
Firm Age	-0.0457*** (0.007)	-0.0464*** (0.011)	-0.0632*** (0.006)	-0.0556*** (0.003)
Experience	-0.0004** (0.000)	-0.0002 (0.000)	-0.0002 (0.000)	-0.0004*** (0.000)
Exporter	-0.0247*** (0.009)	0.0028 (0.008)	-0.0214*** (0.007)	0.0032 (0.003)
Government	0.0147 (0.088)	-0.0236 (0.038)	-0.0186 (0.018)	-0.0578*** (0.010)
Foreign	-0.0769*** (0.015)	-0.0252*** (0.009)	-0.0349*** (0.007)	-0.0186*** (0.004)
Macro Controls	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
R ² within	0.0641	0.0567	0.0401	0.0545
R ² between	0.8052	0.9875	0.0783	0.3792
R ² overall	0.0985	0.0731	0.0189	0.0581
No. of Firms	4,989	4,989	33,428	33,428
No. of Countries	9	9	119	119

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

2.5.2.2 Heckman two-stage selection model

Heckman (1979) argues that self-selection biases are akin to omitted variable biases that could cause potential endogeneity. He proposes a two-step procedure to correct for the biases. In the first stage, a selection model (probit) is employed to estimate a firm's choice between having its financials audited and not audited. The second stage is the outcome model that corrects for the selection bias. For identification reasons, we need to exclude one (or more) variables that are in the first stage selection equation from the second stage outcome equation. We choose the country and industry average value the audit dummy, *Audit_m*, as the excluded variable. We argue that in a specific country and a specific industry, the average fraction of firms that choose to have their financial statements audited should have a significant influence on a firm's choice to have its financials audited, given this firm operates in that country and in that industry. Furthermore, we also argue that ex ante, there is no reason to believe that the country and industry average affects firm level financial constraints or corruption obstacles.

We employ two Heckman procedures, the conventional Heckman procedure (*heckman* in STATA) and the Heckman probit procedure (*heckprob* in STATA). In the conventional Heckman, the outcome variables are the five levels of responses on financial constraints and corruption obstacles (i.e. 0-4). The results are presented in Table 2.16. For financial constraints (Financial), columns (1) reports the first stage regression results for the selection equation while column (2) reports the second stage regression results for outcome equation. For the corruption obstacles (Corruption), columns (3) reports the first stage regression results for the selection equation while column (4) reports the second stage regression results for outcome equation. As shown Table 16, the coefficients for the Mills lambda are all significant, indicating selection effect is substantial and important. The coefficient for *Audit* is negative and significant in

column (2) and positive and significant in column (4), all at the 1% level. These findings are consistent with our previous results.

As further robustness check, we employ a Heckman probit procedure where the dependent variables in the outcome equations are dummy variables `Fin_dum` and `Corr_dum`. `Fin_dum` and `Corr_dum` take the value of zero if the response to financial constraints or corruption obstacle is “no obstacles”, and one if the response is “minor”, “moderate”, “major”, or “very severe.” The Heckman probit results are presented in Table 2.17 and are very consistent with the overall findings reported earlier in the paper.

2.6 Conclusions

When firms operate in business environment with efficient institutions and strong governance, such as the U.S., high level of accounting disclosure can help firms gain access to low cost of external financing, and therefore beneficial to firm growth. However, when firms operate in corrupt business environment with underdeveloped institutions, financial information disclosure may not always be beneficial. In this paper, we study the effect of accounting disclosure through auditing on firm level financial constraint and corruption obstacles. We analyze a large-scale World Bank Enterprise Survey (WBES) data collected from 2006-2011 for over 50,000 firms in 119 mostly developing countries. We find that auditing indeed can be a double-edge sword. On the one hand, audited firms exhibit significantly lower level of financial constraints than unaudited firms. On the other hand, audited firms face higher level of corruption obstacles. The results are robust after controlling for relevant firm characteristics, industry effects, country fixed effects, year effects, and various relevant country level variables. We conduct additional robustness checks, including controlling for potential endogeneity of a firm's

Table 2.16: Endogeneity test: two-stage Heckman model

Column (1) presents the Heckman first-stage selection equation and column (2) the outcome equation for financial constraints (*Financial*). Column (3) presents the Heckman first-stage selection equation and column (4) the outcome equation for corruption obstacles (*Corruption*). The outcome variables, *Financial* and *Corruption*, take values between 0 and 4, where 0 indicates no obstacle and 4 a very severe obstacle. *Audit* is a dummy variable equal to 1 if firm's annual financial statement was checked and certified by an external auditor, and 0 otherwise. *Audit_m* is country and industry mean value of *Audit*. *Firm Size* is the log of firm's sales at year (t-1). *t* is the survey year. *Firm Age* is the log of firm's age. *Experience* is firm's top manager's years of working experience in the sector. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm, and 0 otherwise. *Priv*, the measure of country-level financial development, is the ratio of domestic banking credit to the private sector divided by GDP. *Apply for Loan* is a dummy variable equal to 1 if the firm applied for loans or lines of credit at the year (t-1), and 0 otherwise. *Corruption Control* is country-level corruption estimate of *Worldwide Governance Indicators (WGI)* and ranges from approximately -2.5 (weak) to 2.5 (strong). The regressions are run with probit, which is based on standard maximum likelihood estimation with heteroskedasticity-robust standard errors. Detailed variable definitions and sources are given in Table A2 in the Appendix.

	(1) Selection	(2) Financial	(3) Selection	(4) Corruption
Audit_m	2.1976*** (0.055)		0.3619*** (0.048)	
Audit		-0.1315*** (0.014)		0.0851*** (0.033)
Firm Size	0.0515*** (0.004)	-0.0271*** (0.002)	-0.0032 (0.004)	-0.0417*** (0.005)
Firm Age	0.0616*** (0.018)	-0.0339*** (0.009)	0.0037 (0.017)	0.0937*** (0.022)
Experience	0.0099*** (0.001)	-0.0025*** (0.001)	-0.0007 (0.001)	0.0109*** (0.001)
Exporter	0.2104*** (0.043)	-0.0569*** (0.017)	0.0612** (0.032)	0.0792* (0.041)
Government	-0.2461*** (0.098)	0.0669 (0.053)	-0.3200*** (0.075)	-0.2172 (0.144)
Foreign	0.1777*** (0.044)	-0.2153*** (0.020)	-0.0681** (0.035)	-0.0013 (0.047)
Priv	0.1435*** (0.014)	-0.2606*** (0.008)		
Apply for Loan	0.6235*** (0.032)	0.3667*** (0.014)		
Corruption Control			0.0163 (0.018)	-0.4360 (0.023)
Constant	-0.9709*** (0.084)	2.9886*** (0.055)	1.7972*** (0.074)	2.0991 (0.128)
Mills <i>lambda</i>		0.6336*** (0.073)		-3.2929** (1.448)
No. of Firms		48,701		51,122
No. of Countries		119		119

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 2.17: Endogeneity test: two-stage Heckman probit model

Column (1) presents the Heckman first-stage selection equation and column (2) the outcome equation for financial constraints (*Fin_dm*). Column (3) presents the Heckman first-stage selection equation and column (4) the outcome equation for corruption obstacles (*Corr_dm*). The dependent variables in the column (2) and (4) are dummies, *Fin_dm* and *Corr_dm*, respectively. They take the value of 0 if the response is “no obstacle” and 1 if the response is “minor,” “moderate,” “major,” or “very severe” obstacles regarding firm-level financial and corruption obstacles, respectively. *Audit* is a dummy variable equal to 1 if firm’s annual financial statement was checked and certified by an external auditor, and 0 otherwise. *Audit_m* is country and industry mean value of *Audit*. *Firm Size* is the log of firm’s sales at year (t-1). *t* is the survey year. *Firm Age* is the log of firm’s age. *Experience* is firm’s top manager’s years of working experience in the sector. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm, and 0 otherwise. *Priv*, the measure of country-level financial development, is the ratio of domestic banking credit to the private sector divided by GDP. *Apply for Loan* is a dummy variable equal to 1 if the firm applied for loans or lines of credit at the year (t-1), and 0 otherwise. *Corruption Control* is country-level corruption estimate of *Worldwide Governance Indicators (WGI)* and ranges from approximately -2.5 (weak) to 2.5 (strong). The regressions are run with Heckman-probit procedure (*heckprob* in STATA), which is based on standard maximum likelihood estimation with heteroskedasticity-robust standard errors. Detailed variable definitions and sources are given in Table A2 in the Appendix.

	(1) <i>Selection</i>	(2) <i>Fin_dm</i>	(3) <i>Selection</i>	(4) <i>Corr_dm</i>
<i>Audit_m</i>	2.2049*** (0.065)		0.407*** (0.052)	
<i>Audit</i>		-0.0953*** (0.014)		0.123*** (0.013)
<i>Firm Size</i>	0.0511*** (0.004)	-0.0218*** (0.002)	-0.004 (0.004)	-0.035*** (.002)
<i>Firm Age</i>	0.0601*** (0.017)	-0.0021 (0.009)	0.002 (0.017)	0.119*** (.009)
<i>Experience</i>	0.0099*** (0.001)	-0.0037*** (0.001)	-0.001 (0.001)	0.005*** (.001)
<i>Exporter</i>	0.2103*** (0.045)	-0.0167 (0.016)	0.056* (0.031)	0.130*** (0.016)
<i>Government</i>	-0.2374** (0.107)	0.0283 (0.052)	-0.318*** (0.076)	-0.316*** (0.048)
<i>Foreign</i>	0.1734*** (0.048)	-0.2168*** (0.019)	-0.067* (0.035)	0.031* (0.019)
<i>Priv</i>	0.1380*** (0.014)	-0.2138*** (0.009)		
<i>Apply for Loan</i>	0.6279*** (0.031)	0.3803*** (0.014)		
<i>Corruption Control</i>			0.020 (0.017)	-0.323*** (0.009)
<i>Constant</i>	-0.9476*** (0.084)	1.6003*** (0.054)	1.794*** (0.073)	0.573*** (0.038)
<i>Arc-hyperbolic tangent (athrho)</i>		0.2091* (0.060)		-0.9028*** (.100)
No. of Firms	48,701		51,122	
No. of Countries	119		119	

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

auditing decision, and the results remain robust. We divide the 119 countries into those with and without public credit registries and those with and without private credit bureaus. We document one interesting finding. Audited firms in countries with public credit registry exhibit significantly higher corruption obstacles than unaudited firms. However, in countries with no public credit registry, audited and unaudited firms exhibit similar level of corruption obstacles.

Next, we ask whether or not information disclosure through auditing is beneficial to our sample firms most of which operate in developing countries. We find that after controlling for relevant firm characteristics, industry and year effects, auditing has an overall negative and significant effect on sales growth and negative but insignificant effect on employment growth. However, the negative effect is significant only for firms in non-OECD countries but not for firms in OECD countries. OECD countries in general have more efficient institutions and better governance than non-OECD countries. Disclosure of accounting information is harmful to firm growth if firms operate in countries with underdeveloped institutions.

Chapter 3

Essay 2 - Growth and growth obstacles in transition economies: privatized versus *de novo* private firms

3.1 Introduction

The last few decades have witnessed a significant global shift away from state socialism towards entrepreneurial capitalism that has led to a major change in the structure of corporate ownership around the world. One of the most noticeable aspects of this trend has been the enthusiasm with which governments of all political persuasions have sold their state-owned enterprises (SOEs) to private investors (Megginson and Netter, 2001). An important reason for this trend is that governments have bought into the belief that private ownership and market forces can significantly improve the poor performance of the SOEs. Eastern European and Central Asian (ECA hereafter) governments were among the most enthusiastic in privatizing their SOEs in the 1990's and early 2000's (Estrin, Hanousek, Kocenda and Svejnar, 2009). More than a decade has passed since the conclusions of the major privatization programs in those transition economies. How do the privatized firms stack up against the originally private (*de novo*) firms? We study this question in our paper.

Transition economies are commonly referred to the economies in Central and Eastern Europe (CEE) and in the Commonwealth of Independent States (CIS) that formed most of the former Soviet Union. Privatization programs in transition economies are quite different than those in non-transition economies. The most important difference may be that transition economies did not merely privatize their SOEs in order to improve efficiency. Like reforms in the political, financial, and legal systems, privatization was an important and integral component of the reforms that helped transform the economic system and society at large. Therefore,

privatization in transition economies provides a unique and useful laboratory to compare and contrast firm-level growth constraints in the business environment between privatized firms and the *de novo* firms. Specifically, we examine the financial, corruption, and legal obstacles faced by privatized firms in comparison to those faced by the *de novo* firms. To better understand the relative performance, scholars and policy makers may find it useful to examine the growth constraints in the business and institutional environment. To the best of our knowledge, this paper is the first in the privatization literature that examines the relative firm-level business constraints between privatized and the *de novo* firms.

We also examine the relative performance between the privatized firms and the *de novo* firms, motivated by the current state of the literature on privatization in transition economies. Estrin, et al (2009) survey a large number of studies related to the effects of privatization and ownership in transition economies. They find a large variation of privatization outcomes, ranging from no systemically significant effect of privatization on performance (Bevan, Estrin, and Shaffer, 1999), to mostly positive performance improvement (Megginson and Netter, 2001), to strong evidence of positive effect of privatization on performance (Shirley and Walsh, 2000; Djankov and Murrell, 2002). Estrin, et al (2009) attribute this variation in the interpretations of privatization outcomes to several reasons. First, early studies had access only to limited firm-level performance and ownership data. Many of the early studies relied on performance data immediately before and after privatization. Estrin, et al. (2009) argue that the effects of privatization should take longer to manifest themselves. Second, early studies used small and often unrepresentative samples of firms and ownership structure was difficult to identify because privatization was still ongoing. In addition, the cross-countries studies combined different accounting standards and employed accounting ratios as performance measures. Third, many of

the early studies did not control for the selection/endogeneity problem associated with government's non-random choice of firms to privatize.

The current study is able to overcome some of the aforementioned limitations in the literature. First, we employ a large-scale, unique dataset, the *World Bank Enterprise Survey (WBES)* data collected in 2002, 2005 and 2009 for all 27 countries in CEE and CIS. The WBES refers to this group of countries Eastern Europe and Central Asia (ECA). Second, the WBES-ECA database allows us to clearly identify the origins of ownership types of the surveyed firms. Specifically, the dataset contains 13,732 originally private (*de novo*) firms, 3,694 fully privatized firms (0% residual state ownership), and 476 partially privatized firm (residual state ownership>0%).⁸ Third, we employ sales growth, employment growth, and labor productivity as performance measures. These measures are calculated with only two inputs, sales revenues and the numbers of full time employees, and therefore are less likely to be distorted by different accounting standards across countries. Furthermore, few studies in the extant privatization literature examine sales growth and employment growth of the privatized firms relative to those of the *de novo* private firms. Sales growth and employment growth are indicators of a firm's long term viability and should receive more attention from scholars and policymakers. Finally, it has been more than a decade since the conclusions of the major privatization programs in the ECA countries. This fact indicates that if privatization has an effect on performance, enough time may have passed for that effect to manifest itself. This fact also suggests that the selection/endogeneity problems associated with government's non-random choice of firms to privatize is less of a concern in the current study. The ECA governments have completed their major privatization programs more than a decade ago. There is little evidence that the privatized

⁸ The WBES-ECA database also contains 96 not-yet privatized state-owned enterprises (SOEs). Due to the relatively small number of SOE observations and the focus of this paper, we do not include SOEs in our analysis.

firms are re-nationalized at all, much less based on good or poor performance.

In our empirical analysis of the firm-level growth constraints, we find that privatized firms experience significantly lower financial, corruption, and legal obstacles than the *de novo* private firms. In our subsample analysis, we divide the privatized firms into fully privatized (0% state ownership) and partially privatized (state ownership > 0%) subsamples. The fully privatized firms exhibit significantly higher level of corruption and legal obstacles than the partially privatized firms. After controlling for industry effects, year effects, country-level financial market development, fully privatized and partially privatized firms exhibit similar level of financial constraint. In addition, we find that foreign ownership has a significant moderating effect on firm-level financial constraint in the full sample. Foreign ownership also has a moderating effect on financial, corruption, and legal constraints in the subsample of privatized firms. Ownership concentration has an overall moderating effect on all of the three firm-level growth constraints.

Our empirical results further show that privatized firms experience significantly lower sales growth, employment growth, and labor productivity than those of the *de novo* private firms. The results are robust after controlling for relevant firm characteristics, country-level macro variables, industry effects, year effects and country fixed effects. In our subsample analyses, we find that fully privatized firms exhibit significantly higher employment growth but significantly lower labor productivity than the partially privatized. The difference of sales growth between these two subsamples is insignificant.

The paper is organized as follows. Section 3.2 reviews relevant literature and develops the hypotheses, while Section 3.3 describes data and summary statistics. Section 3.4 discusses the methodologies and presents the empirical results, while Section 3.5 concludes the study.

3.2 Literature review and hypothesis development

In this section, we first review relevant studies concerning the relation between ownership structure and firm-level growth constraints. We then review the extant literature on the effects of privatization and ownership on firm performance.

3.2.1 Ownership structure and firm-level financial, corruption, and legal constraints

The existing literature on ownership and privatization offers some guidance on firm-level financial constraints faced by privatized firms in comparison with those by *de novo* private firms. The soft-budget constraint (SBC) theory posits that state-owned firms are more likely than the *de novo* firms to have soft-budget constraint (Kornai, 1979, 1980), i.e. state-owned firms will be less financially constrained. By extension, residual state ownership in privatized firms is expected to be negatively related to firm-level financial constraint. Boubakri, Cosset, and Saffar (2008) study political connections in newly privatized firms and find that the likelihood of observing political connection in a privatized firm is positively related to the government residual ownership. Boubakri, Guedhami, Mishra, and Saffar (2012) further document that political connections lead to lower cost of equity capital, indicating they are less financially constrained.

Borisova and Megginson (2011) find a negative relationship between the residual government ownership in privatized firms and credit spreads, a proxy for financial constraint. Boubakri, Cosset, and Saffar (2013) study the relation between ownership structure of privatized firms and corporate risk-taking behavior. They document a negative relation between state ownership and corporate risk-taking, evidenced by lower earnings volatility. Capital structure theory suggests that lower risk-taking leads to lower cost of capital, as investors' required return is positively related the risk of the projects. The above studies in sum suggest that privatized

firms with residual government ownership are less financially constrained than fully privatized firms, and by extension, less constrained than the *de novo* private firms.

As noted in Beck et al. (2005), state-owned firms have advantages in dealing with the government agencies and legal/regulatory system compared to the *de novo* private firms. Even after being privatized, these former SOEs maintain the important connections to the state institutions (Fan et al. 2007; Boubakri, et al. 2008). Barth, et al (2009) study firm-level perception of bank corruption in 56 countries and find that government ownership in the firm to be significantly negatively related to the level of bank corruption. In summary, we hypothesize that privatized firms exhibit lower levels of financial, corruption and legal obstacles in comparison with the *de novo* private firms.

Hypothesis **H1**: Privatized firms face lower levels of financing, corruption and legal obstacles, relative to the *de novo* firms.

Hypothesis **H1a**: Partially privatized firms face lower levels of financing, corruption and legal obstacles, relative to the fully privatized firms.

3.2.2 Privatization and firm performance in transition economies

Over the past two decades or so, a large number of studies have examined the effects of privatization and ownership on firm performance in transition economies (Megginson and Netter, 2001). Barberis, Boycko, Shleifer and Tsukanova (1996) investigate the divestment of 452 Russian retail businesses in the early 1990s. Claessens, Djankov and Pohl (1997) study ownership and governance issues for a sample of 706 Czech firms that were privatized during 1991 and 1992. Aggarwal and Harper (2000) examine the auction process and equity valuation issues of the Czech voucher privatization. Wei, Varela, D'Souza and Hassan (2003) study the

pre- and post-privatization financial and operating performance of 208 Chinese firms that were privatized in 1990-1997. Overall, these single-country studies exhibit significant performance improvements for firms following privatization.

In multi-country studies that contain firms from both developed and developing countries, Megginson et al. (1994), Boubakri and Cosset (1998), D'Souza and Megginson (1999), Galal, Jones, Tandon and Vogelsang (1994), and Dewenter and Malatesta (2001) find strong evidence of positive effect of privatization on profitability, efficiency, output and capital spending. Several studies have examined privatization in developing countries and find positive effect of privatization on operating performance of newly privatized firms (Eckel et al., 1997; LaPorta and Lopez-de-Silanes, 1999; Ramamurti, 1997; Dewenter and Malatesta, 1997, 2001; Boubakri, Cosset and Guedhami, 2005b; Sun and Tong, 2002).

Several notable survey papers find a large variation of privatization outcomes, ranging from no systemically significant effect of privatization on performance (Bevan, Estrin, and Shaffer, 1999), to mostly positive performance improvement (Megginson and Netter, 2001), to strong evidence of positive effect of privatization (Shirley and Walsh, 2000; Djankov and Murrell, 2002). Estrin, et al (2009) survey a large number of studies related to the effectiveness of privatization in transition economies. Overall, they find that the effect of privatization on total factor productivity (TFP) is mostly positive in CEE and mostly insignificant to outright negative in CIS. Two papers that are particularly relevant to the current study compare the performance of privatized firms with that of the newly created private (*de novo*) firms. Sabirianova, Svejnar and Terrel (2005) study almost all industrial firms in the Czech Republic and Russia from 1992-2000 and find new *de novo* firms tend to be more efficient than the SOEs privatized to domestic owners. Commandar and Svejnar (2005) study firm-level data from 26 CEE and CIS countries in

2002 and 2005 and find that domestic start-up firms are not significantly different in performance from domestic privatized or state-owned firms. These two studies conclude that the *de novo* firms are more efficient than, or least as efficient as the privatized former SOEs in transition economies.

Estrin, et al. (2009) examine the effects of privatization and ownership on revenues and employment. They find that in most of CEE studies there is an overall strong and positive effect of private ownership on the level of revenues (scale of operation, not growth rate). Very few studies examine the effect of privatization on revenue growth. In the few CEE studies surveyed by Estrin, et al. (2009), the effect of privatizing to domestic owners is insignificant but positive and significant when the SOE is sold to a foreign owner. The effect of privatization on revenue growth is insignificant in CIS. Concerning the effects of privatization and ownership on employment, Estrin, et al. (2009) find that privatized firms, especially those with foreign ownership, have a tendency to increase or not reduce employment, relative to firms with state ownership. However, La Porta and Lopez-de-Silanes (1999) find a negative effect of privatization on employment in Mexican privatized firms.

Hypothesis **H2**: Privatized firms perform poorly relative to *de novo* private firms.

Hypothesis **H2a**: Partially privatized firms perform poorly relative to fully privatized firms.

3.3 Data and variables

In this study, we employ the *World Bank Enterprise Survey (WBES)* data for 17,893 firms in 27 Eastern European and Central Asian Countries. Most of the countries in the sample have three surveys in 2002, 2005 and 2009. In the enterprise surveys, the World Bank uses standardized survey instruments in collecting firm-level data on the business environment from

business owners and top managers. These standardized instruments allow for cross-country comparisons and analysis. The surveys ask respondents to provide information related to sales and number of employees for year $(t-1)$ and year $(t-3)$, where t is the survey year. This allows us to construct firm performance measures, i.e. sales growth, employment growth and labor productivity. The surveys also aim to assess the critical obstacles in the business environment that hinder firm's growth rate. Such obstacles of the surveys encompass access to finance, corruption, political, infrastructure, crime, competition, labor market and legal obstacles. The surveys also contain information on form of enterprises (originally private, fully privatized or partially privatized), age, size, ownership concentration, export status, government and foreign ownership.

The final sample consists of 17,893 firms in 27 countries for the year of 2002, 2005 and 2009. Among these, 4,170 are fully privatized firms and 13,723 are private firms. The dataset includes firms from more than 33 industries classified by two-digit *International Standard of Industrial Classification (ISIC)* codes. For our multivariate regressions in examining the privatized firm performance in comparison with those of other enterprises, we control for a country's GDP, GDP per capita, GDP growth rate and inflation. We obtain these macro variables from the *World Development Indicators (WDI)* database of the World Bank. Country level variables are the averages over the period from year $(t-3)$ to $(t-1)$, t being the survey year. The relevant variables are described below.

3.3.1 Dependent variables

3.3.1.1 Firm performance

We employ three firm performance measures in our analysis: sales growth (*Sales Growth*), employment growth (*Employment Growth*) and labor productivity (*Productivity*). We

compute these three performance measures as follows:⁹

$$\text{Sales Growth} = [\log (\text{sales}_{t-1}) - \log(\text{sales}_{t-3})] / 2 \quad (1)$$

$$\text{Employment Growth} = [\log (\text{employees}_{t-1}) - \log(\text{employees}_{t-3})] / 2 \quad (2)$$

$$\text{Productivity} = \log [(\text{sales}_{t-1}) / (\text{employees}_{t-1})] \quad (3)$$

The log values are natural logarithms. As reported in Table 3.1 (Panel A), the mean values of *Sales Growth*, *Employment Growth* and *Productivity* are 0.18, 0.08 and 10.22 respectively. A common criticism of using survey data to conduct research related to firm performance is that survey data are self-reported and therefore the findings may suffer from self-reporting bias. However, Beck et al. (2005) argue that accounting data are more likely to be biased than survey data as the incentives to distort data are likely to be higher in financial statements because many firm level decisions, such as tax, financing, and managerial compensations, are in part based on financial statement variables. Beck et al. (2005) also posit that the self-reporting nature of the WBES data is not likely to be a significant source of bias. With intimate working knowledge of the WBES, they point out that the survey aims to evaluate the business environment instead of firm performance. Even though some firm performance related questions were asked, the survey was specifically designed to ask those questions at the end of the interview. This reduces the respondents' need to justify their own performance when answering the earlier business environment related questions.

3.3.1.2 Obstacles to firm growth

We examine three obstacles to firm growth: financial (*Financing*), corruption (*Corruption*) and legal (*Legal*). These firm-level obstacles take on a value based on the self-reported answers to

⁹ Fisman and Svensson (2007) employs the same sales growth measure for Ugandan firms.

the following WBES question:

“How problematic is _____ for the current operations of a business?”

The blank space represents one of the aforementioned growth obstacles. The WBES scores the obstacles on the following scale: No obstacle=0, Minor obstacle =1, Moderate obstacle=2, Major obstacle =3, and Very severe obstacle=4. As reported in Table 3.1 (Panel A), the mean values of *Financing*, *Corruption* and *Legal* are 1.44, 1.48 and 1.18 respectively. The definitions of financing and corruption obstacles are self-explanatory. The level of legal obstacles a firm faces reflects its assessment of and confidence in the legal and regulatory institutions related to its business operations.

3.3.2 Explanatory variables

3.3.2.1 Privatized firms

Our main explanatory variable, *Privatized*, is an indicator variable that equals one if a firm is privatized former SOE, and zero otherwise. About 23 percent of the surveyed firms in ECA countries are privatized former SOEs.

3.3.2.2 Firm size

Harper (2002) shows that smaller firms are more likely to exhibit performance improvement following privatization. Larger firms may show more resistance to changes and therefore, exhibit less substantial post-privatization performance improvements (Aussenegg and Jelic, 2002; Villalonga, 2000). Large firms are likely to be less constrained by various firm-level obstacles than smaller firms (Schiffer and Weder, 2001; Beck et al., 2005). Beck et al. (2005) also show that small firms benefit more than large firms when growth obstacles are reduced. Beck et al. (2008) show that firm size is an important determinant of firm-level financing

patterns. Therefore, in our analysis, we control for firm size. We use the logarithm of number of permanent, full-time employees at the end of year (t-1) (original data item 'l1') as *Firm Size* variable. As reported in Table 3.1 (Panel A), the mean and median numbers of employees in our sample are 109 and 25, respectively. This indicates that firm size distribution in our sample is right skewed with extreme large firms. In fact, the largest firm in our sample has a total number of 37,772 full time employees.

3.3.2.3 Firm age

Older firms may have more entrenched stakeholders who are more resistant to the changes and restructuring brought about by privatization. Evans (1987) and Dunne, Roberts, and Samuelson (1988) find that younger firms grow faster than older firms. Beck et al. (2006) find that older firms experience less growth constraints. Therefore, we control for firm age (*Firm Age*), and measure firm age by subtracting the firm's founding year from the survey year. In our sample, the average firm has been in business for about 15 years and the oldest firm is 202 years of age (Table 3.1 Panel A).

3.3.2.4 Ownership concentration

Hingorani, Lehn and Makhija (1997) and Claessens et al. (1997) examine the effect of ownership concentration on post-privatization firm performance. The overall findings of these studies indicate that a more concentrated ownership structure has a positive relationship on profitability for newly privatized firms. Extant empirical evidence on the relation between ownership concentration and firm performance has been mixed. Demsetz and Lehn (1985) and McConnell and Servaes (1990) find a nonlinear, U-shaped relation between ownership concentration and firm performance. On the contrary, Morck, Shleifer and Vishny (1988) and Wruck (1989) find positive a relation between ownership concentration and firm performance.

Following Harper (2002), we use the fraction of the shares owned by the largest shareholder as ownership concentration (*Ownership*). As reported in Table 3.1 (Panel A), for the average firm in our sample, the largest owner owns 75 percent of the firm.

3.3.2.5 *Exporter*

Exporting firms are more exposed to foreign markets, technology and managerial expertise compared to purely domestic firms. Therefore, following privatization, newly privatized firms that export should perform better than other privatized non-exporting firms. Beck et al. (2005) find that exporters grow faster and perform better than non-exporters. Beck et al. (2006) find that exporters face less firm-level obstacles than non-exporter. Thus, we control for exporting firms. We use a dummy variable, *Exporter*, to indicate if a firm exports. In our sample, about 27% of all firms export (Table 3.1).

3.3.2.6 *Government ownership*

Perotti (1995) show that the continued presence of government ownership sends a positive signal. However, Boycko, Shleifer and Vishny (1996) find that government control or influence may prohibit restructuring of privatized firms. Harper (2002) argues that government commitment to privatization increases with the greater percentage of shares privatized. Beck et al. (2005) show that government ownership is related to lower sales growth rate and lower corruption obstacles. As shown in Table 3.1 (Panel B), we divide our full sample into three subsamples, the *de novo* private firms, the fully privatized firms with zero residual government ownership, and the partially privatized firms with residual government ownership. In the partially privatized subsample, the government maintains a 31.6% ownership in the average firm.

3.3.2.7 Foreign ownership

Foreign ownership exposes firms to foreign markets, technology and managerial expertise. Boubakri et al. (2005) argue that any involvement of foreign investors brings monitoring and expertise to the firm which may lead to improved operating performance. Fishman and Svensson (2007) suggest that firms with foreign ownership possess better access to markets and technical expertise, resulting in better financial performance than pure domestic firms. Beck et al. (2005) find that foreign ownership has large positive effect on firm performance. Beck et al. (2006) show that firms with foreign ownership face less firm-level obstacles. Therefore, we control for foreign ownership in our regression analysis. We use a dummy variable, *Foreign*, to indicate if any foreign company or individual has a financial stake in the ownership of the firm. As presented in Table 3.1 (Panel A), in our sample, about 12% of all firms have foreign ownership stakes.

3.3.2.8 Industry effects, year effects, and country fixed effects

Like all cross-section and cross-country studies, we control for industry effects, year effects and country fixed effects. We use the two-digit ISIC codes assigned to each firm in the WBES database to create industry dummies to control for industry effects. We use year dummy variables to control for year effects. In the GLM regressions, we control for country fixed effects to address other unobservable country-specific factors that might affect firm performance and obstacles. Macroeconomic factors also influence firm level performance (Beck et al., 2005). Therefore, to control for macroeconomic factors, we use GDP, GDP growth rate, GDP per capita and inflation. As shown in Table 3.1 (Panel A), the mean log of *GDP* is 23.82; the mean *GDP per Capita* is US\$ 2,932.87; the mean *GDP Growth* is 1%. These macro variables vary widely across Eastern European and Central Asian countries. The mean *Inflation* is 7%, but this varies

widely across countries, from 1% to 43%. The source and proxies for country-level controls are presented in Appendix Table A4.

3.4 Methodologies and results

In this section we present the methodologies and empirical results of our study. To begin, we compute the correlation coefficients for the relevant variables. We then employ multivariate regressions to examine the performance of privatized firms as compared to the *de novo* private firms. We then perform various subsample analyses to get a better understanding of the overall results. We next investigate the firm-level growth obstacles (financial, corruption and legal) faced by privatized firms in comparison to the *de novo* private firms. We finally examine the performance between privatized firms and the *de novo* private firms after controlling for the three growth obstacles.

In Table 3.1, Panel A presents the summary statistics for all variables, Panel B defines and clarifies the firm types according to firm origins and current state ownership, and Panel D presents summary statistics for all variables by firm types.

3.4.1 Correlation matrix and other statistics

Panel C of Table 3.1 presents the correlation matrix for the main variables of our study. Our primary interest is the correlation of *Privatized* (privatized firms) with the performance measures and the growth constraints. As expected, *Privatized* is significantly negatively correlated with all three of the performance measures i.e. *Sales Growth*, *Employment Growth* and *Productivity*. On the other hand, *Private* (*de novo* private firms) is positively correlated to the these performance measures. The matrix also shows that only the correlation coefficient between *Privatized* (*Private*) and corruption is significantly positive (negative).

Table 3.1: Summary statistics and correlations

Panel A presents summary statistics for the full sample. Panel B presents the definitions of firm types. Panel C presents the correlation matrix. Panel D presents summary statistics of relevant variables for different types of firms. *N* is the number of firms, except for country level macro variables which is the number of countries studied. *Sales Growth* is the average of the difference of log [sales (t-1)] and log [sales (t-3)], where t is the year the survey was conducted. *Employment Growth* is average of the difference of log [employees (t-1)] and log [employees (t-3)]. *Productivity* is log [sales (t-1) / employees (t-1)]. *Financing*, *Corruption*, and *Legal* are survey responses for firm-level obstacles as specified in the survey questionnaire. They take values between 0 and 4, where 0 indicates no obstacle and 4 a very severe obstacle. *Firm Size* is the log of the number of permanent, full-time employees at year (t-1). *Firm Age* is the log of a firm's age. *Ownership* is the percent of the firm owned by the largest owner. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if a firm has foreign ownership stakes, and 0 otherwise. *Priv*, the measure of country-level financial development, is the ratio of domestic banking credit to the private sector divided by GDP. *Control of Corruption* is country-level corruption estimate of *Worldwide Governance Indicators (WGI)* and ranges from approximately -2.5 (weak) to 2.5 (strong). *CPI Score* is country-level *Corruption Perceptions Index (CPI)* and ranges between 10 (highly clean) and 0 (highly corrupt). *Rule of Law* is country-level estimate of rule of society, contract enforcement, property rights, the police, the courts, crime and violence and it ranges from approximately -2.5 (weak) to 2.5 (strong). *GDP* is the log of GDP in current millions of U.S. dollars. *GDP per Capita* is the real GDP per capita in U.S. dollars. *GDP Growth* is the growth rate of GDP. *Inflation* is log difference of consumer price indices. All country level variables are the average over year (t-3), (t-2) and (t-1).

Panel A: Summary statistics

	<i>N</i>	Mean	<i>SD</i>	Min	Max
Sales Growth	12,509	0.181	0.329	-0.799	1.803
Employment Growth	16,682	0.08	0.217	-0.582	0.916
Productivity	13,683	10.22	1.678	6.904	17.486
Financing	17,290	1.435	1.257	0	4
Corruption	16,803	1.478	1.323	0	4
Legal	16,438	1.184	1.218	0	4
Firm Size	17,978	108.6	450.194	5	37,772
Firm Age	17,978	15.197	16.159	3	202
Ownership	16,844	0.754	0.289	0.01	1
Exporter	17,978	0.266	0.442	0	1
Foreign	17,978	0.119	0.324	0	1
<i>Priv</i>	27	36.396	22.863	3.917	109.149
Control of Corruption	27	-0.402	0.626	-1.250	1.052
CPI Score	27	3.312	1.18	1.7	6.6
Rule of Law	27	-0.289	0.709	-1.442	1.121
GDP	27	23.82	1.549	20.737	26.71
GDP per Capita	27	2,932.87	2,506.37	164.60	12,613.68
GDP Growth	27	0.011	0.082	-0.18	0.264
Inflation	27	0.067	0.062	-0.007	0.425

Panel B: Firm types by origin and current state ownership

Firm Type Definitions	Mean state ownership	<i>N</i>
Originally (<i>de novo</i>) private firms	0%	13,723
Fully privatized former SOEs	0%	3,694
Partially privatized former SOEs	31.64%	476

Panel C: Correlation matrix of variables												
	Private	Privatized	Sales Growth	Employ. Growth	Productivity	Financing	Corruption	Legal	Firm Size	Firm Age	Ownership	Exporter
Privatized	-1.0000***											
Sales Growth	0.0395***	-0.0395***										
Employ. Growth	0.2298***	-0.2298***	0.2673***									
Productivity	0.0494***	-0.0494***	0.1754***	-0.0206**								
Financing	-0.0013	0.0013	0.0213	-0.0100	0.0091							
Corruption	0.0275***	-0.0275***	0.0631***	0.0122	0.0048	0.2938***						
Legal	-0.0005	0.0005	-0.0042	-0.0253***	0.0456***	0.2714***	0.6070***					
Firm Size	-0.1566***	0.1566***	0.0263***	-0.0206***	0.0219***	-0.0113	-0.0031	0.0187**				
Firm Age	-0.4718***	0.4718***	-0.0290***	-0.2049***	0.0721***	0.0179**	-0.0117	0.0360***	0.1557***			
Ownership	0.1992***	-0.1992***	0.0425***	0.0769***	-0.0126	-0.0087	0.0068	-0.0207***	-0.0603***	-0.1646***		
Exporter	-0.0874***	0.0874***	0.0128	-0.0087	0.1070***	-0.0242***	-0.0348***	0.0383***	0.1167***	0.1602***	-0.0894***	
Foreign	-0.0124*	0.0124*	0.0073	0.0130*	0.0581***	-0.0935***	-0.0322***	-0.0001	0.1193***	0.0128*	-0.0086	0.2336***

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Panel D: Summary statistics for firms by type						
	<i>De Novo</i> Private		Fully Privatized		Partially Privatized	
	<i>N</i>	Mean	<i>N</i>	Mean	<i>N</i>	Mean
Sales Growth	9,331	0.188	2,770	0.159	352	0.151
Employment Growth	12,699	0.108	3,466	-0.005	440	-0.042
Productivity	10,273	10.265	2,985	9.99	369	10.746
Financing	13,189	1.431	3,553	1.419	465	1.559
Corruption	12,849	1.497	3,440	1.427	435	1.285
Legal	12,504	1.182	3,413	1.19	442	1.14
Firm Size	13,723	68.971	3,694	210.125	476	433.664
Firm Age	13,723	10.945	3,694	28.038	476	34.685
Ownership	12,895	0.786	3,412	0.661	459	0.56
Exporter	13,723	0.244	3,694	0.323	476	0.429
Foreign	13,723	0.117	3,694	0.123	476	0.151

As a rudimentary check for potential multicollinearity, we examine the correlation coefficients among the independent variables. A correlation of 0.7 or higher in absolute value is usually considered a multicollinearity concern. No correlation coefficient in the matrix has an absolute value greater than 0.7.

3.4.2 Growth obstacles of privatized versus de novo private firms

To test hypotheses **H1** and **H1a** concerning firm-level growth obstacles faced by privatized and *de novo* private firms, we assume a firm's latent response can be expressed in equation (4) below:

$$\begin{aligned}
 \text{Growth Obstacles}_{ij} = & \alpha + \beta_1 \text{Privatized}_{ij} + \beta_2 \text{Firm Size}_{ij} + \beta_3 \text{Firm Age}_{ij} + \beta_4 \text{Ownership}_{ij} \\
 & + \beta_5 \text{Exporter}_{ij} + \beta_6 \text{Foreign}_{ij} + \theta' \text{Macro Controls}_j + \varepsilon_{ij}
 \end{aligned} \tag{4}$$

Where subscripts *i* and *j* represent firm and country, respectively. The left-hand side represents the three firm-level growth obstacles as dependent variables, i.e. *Financing*, *Corruption* and *Legal*. These observed firm-level obstacles are polychotomous variables with a

natural order, i.e. firms rank the obstacles by five levels, from 0 (no obstacle) to 4 (severe obstacle). We follow Beck, et al. (2006) and Barth, et al. (2009) and employ the ordered probit model, estimated by the standard maximum likelihood estimation with heteroskedasticity robust standard errors. Table 3.2 presents the results for fully privatized versus *de novo* private firms, Table 3.3 for all privatized (fully and partially) versus *de novo* private firms, and Table 3.4 for fully privatized versus partially privatized firms.

All the regression models in Tables 3.2, 3.3 and 3.4 include industry dummies, year dummies, and country dummies. As shown in columns (1) in Table 3.2, fully privatized firms experience lower but insignificant level of financial obstacles (*Financing*) than the *de novo* private firms. However, after controlling for a country's financial market development proxied by domestic banking credit to the private sector scaled by GDP (*Priv*), fully privatized firms exhibit significantly lower financial obstacles (*Financing*) than those faced by *de novo* private firms (column (2)), consistent with the prediction in hypothesis **H1**. In addition, we also observe several interesting findings in columns (1) and (2). Firm size and firm-level financial constraint are negatively related, consistent with the established literature on financial constraint that small firms are more financially constrained than large firms (Almeida, Campello and Weisbach, 2004). Ownership concentration and foreign ownership also show a significant negative effect on a firm's financial/financing constraint.

The results in column (3) of Table 3.2 show that the fully privatized firms exhibit significantly lower corruption obstacles than the *de novo* private firms. The results are robust after controlling for country-level corruption proxied by World Bank's Control of Corruption index (Column (4)) and corruption perception index (CPI score, column (5)) by Transparency

International. These results indicate that the owners of the *de novo* private firms face (or perceive to face) higher demands for bribes than the fully privatized firms. In addition, we observe that older firms and firms with lower ownership concentration face higher level of corruption (columns (4) and (5)).

The result in column (6) of Table 3.2 shows that fully privatized firms perceive the legal and regulatory environment is less of an obstacle than the *de novo* private firms. The result holds after controlling for country-level rule of law quality index (column (7)), as predicted by hypothesis **H1**. One explanation is that the privatized firms are former state-owned enterprises and their owners have relatively better connections to the government legal and regulatory institutions. They can “get things done” more easily than the *de novo* private firms. Another related explanation is that due to better connections to the government institutions, the privatized former SOEs are less likely to get into legal troubles. When they do get into legal hot waters, they can get out more easily than the private firms. In addition to the main results, we also observe several interesting findings in columns (6) and (7). Larger firms, older firms, and exporters face relatively higher legal obstacles, *ceteris paribus*.

In our subsample analysis, we first compare the three growth obstacles between all privatized firms (fully and partially) and the *de novo* private firms. The results are presented in Table 3.3. The results in Table 3.3 are consistent with those in Table 3.2 in terms of the signs and magnitudes of the coefficients of the explanatory variables. In particular, the results show that privatized firms (fully and partially) exhibit significantly lower growth obstacles than the *de novo* private firms, consistent with hypothesis **H1**.

Table 3.2: Firm-level growth obstacles: fully privatized versus *de novo* private

Financing [the dependent variable of specification (1) and (2)], *Corruption* [the dependent variable of specification (3) and (4)], and *Legal* [the dependent variable of specification (5) and (6)] are survey responses for firm-level obstacles as specified in the survey questionnaire. They take values between 0 and 4, where 0 indicates no obstacle and 4 a very severe obstacle. *De Novo* private firms are originally private firms with zero state ownership. *Fully Privatized* is a dummy variable equal to 1 if the firm is a privatized former SOE with zero state ownership, and 0 otherwise. *Firm Size* is the log of the number of permanent, full-time employees at year (t-1). *Firm Age* is the log of a firm's age. *Ownership* is the percent of the firm owned by the largest owner. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if a firm has foreign ownership stakes, and 0 otherwise. *Priv*, the measure of country-level financial development, is the ratio of domestic banking credit to the private sector divided by GDP. *Control of Corruption* is country-level corruption estimate of *Worldwide Governance Indicators (WGI)* and ranges from approximately -2.5 (weak) to 2.5 (strong). *CPI Score* is country-level *Corruption Perceptions Index (CPI)* and ranges between 10 (highly clean) and 0 (highly corrupt). *Rule of Law* is country-level estimate of rule of society, contract enforcement, property rights, the police, the courts, crime and violence and it ranges from approximately -2.5 (weak) to 2.5 (strong). The regressions are run with ordered probit, which is based on standard maximum likelihood estimation with heteroskedasticity-robust standard errors. Furthermore, clustering within countries is allowed for possible correlation of errors in models. White's heteroscedasticity consistent standard errors are presented in the parentheses.

	Financing		Corruption			Legal	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fully Privatized	-0.0342 (0.028)	-0.0807*** (0.029)	-0.1062*** (0.030)	-0.2012*** (0.030)	-0.2014*** (0.030)	-0.1506*** (0.028)	-0.1609*** (0.028)
Firm Size	-0.0421*** (0.008)	-0.0440*** (0.009)	0.0195** (0.009)	0.0085 (0.009)	0.0079 (0.009)	0.0406*** (0.008)	0.0398*** (0.008)
Firm Age	0.0010 (0.017)	0.0206 (0.017)	-0.0124 (0.018)	0.0557*** (0.018)	0.0515*** (0.018)	0.1043*** (0.017)	0.1108*** (0.017)
Ownership	-0.0957*** (0.035)	-0.1030*** (0.036)	-0.0776** (0.037)	-0.0883** (0.037)	-0.0891** (0.037)	-0.0642* (0.035)	-0.0660* (0.035)
Exporter	-0.0435* (0.025)	0.0015 (0.025)	-0.1024*** (0.026)	0.0080 (0.027)	0.0230 (0.027)	0.0628*** (0.025)	0.0729*** (0.025)
Foreign	-0.2799*** (0.032)	-0.2862*** (0.032)	-0.0739** (0.034)	-0.0466 (0.033)	-0.0477 (0.033)	-0.0291 (0.032)	-0.0263 (0.032)
<i>Priv</i>		-0.0070*** (0.001)					
Control of Corruption				-0.3201*** (0.018)			
CPI Score					-0.2004*** (0.009)		
Rule of Law							-0.0302** (0.015)
Intercept	1.3019*** (0.124)	1.3154*** (0.126)	1.1831*** (0.131)	1.0274*** (0.130)	1.8433*** (0.133)	0.5102*** (0.123)	0.5000*** (0.123)
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Firms	15,693	15,134	15,262	15,262	15,262	14,935	14,935
No. of Countries	27	27	27	27	27	27	27

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 3.3: Firm-level growth obstacles: privatized versus *de novo* private

Financing [the dependent variable of specification (1) and (2)], *Corruption* [the dependent variable of specification (3) and (4)], and *Legal* [the dependent variable of specification (5) and (6)] are survey responses for firm-level obstacles as specified in the survey questionnaire. They take values between 0 and 4, where 0 indicates no obstacle and 4 a very severe obstacle. *De Novo* private firms are originally private firms with zero state ownership. *Privatized* is a dummy variable equal to 1 if the firm is a privatized former SOE (fully privatized or partially privatized firms), and 0 otherwise. Fully privatized firms are former SOEs with zero state ownership. Partially privatized firms are former SOEs with greater than 0% state ownership. *Firm Size* is the log of the number of permanent, full-time employees at year (t-1). *Firm Age* is the log of a firm's age. *Ownership* is the percent of the firm owned by the largest owner. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if a firm has foreign ownership stakes, and 0 otherwise. *Priv*, the measure of country-level financial development, is the ratio of domestic banking credit to the private sector divided by GDP. *Control of Corruption* is country-level corruption estimate of *Worldwide Governance Indicators* (WGI) and ranges from approximately -2.5 (weak) to 2.5 (strong). *CPI Score* is country-level *Corruption Perceptions Index* (CPI) and ranges between 10 (highly clean) and 0 (highly corrupt). *Rule of Law* is country-level estimate of rule of society, contract enforcement, property rights, the police, the courts, crime and violence and it ranges from approximately -2.5 (weak) to 2.5 (strong).

	Financing		Corruption			Legal	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Privatized	-0.0222 (0.027)	-0.0737*** (0.028)	-0.1220*** (0.029)	-0.2157*** (0.029)	-0.2180*** (0.029)	-0.1574*** (0.027)	-0.1670*** (0.028)
Firm Size	-0.0405*** (0.008)	-0.0421*** (0.008)	0.0146* (0.009)	0.0045 (0.009)	0.0040 (0.009)	0.0378*** (0.008)	0.0372*** (0.008)
Firm Age	0.0101 (0.016)	0.0255 (0.017)	-0.0130 (0.017)	0.0498*** (0.017)	0.0446*** (0.017)	0.1015*** (0.016)	0.1069*** (0.016)
Ownership	-0.1002*** (0.035)	-0.1066*** (0.035)	-0.0673* (0.037)	-0.0749** (0.037)	-0.0751** (0.036)	-0.0547 (0.035)	-0.0559 (0.035)
Exporter	-0.0417* (0.024)	0.0048 (0.025)	-0.1029*** (0.026)	0.0040 (0.026)	0.0177 (0.026)	0.0656*** (0.024)	0.0745*** (0.025)
Foreign	-0.2760*** (0.031)	-0.2871*** (0.031)	-0.0678** (0.033)	-0.0399 (0.033)	-0.0410 (0.033)	-0.0294 (0.031)	-0.0268 (0.031)
<i>Priv</i>		-0.0070*** (0.001)					
Control of Corruption				-0.3117*** (0.018)			
CPI Score					-0.1944*** (0.009)		
Rule of Law							-0.0269* (0.014)
Intercept	1.2940*** (0.123)	1.3242*** (0.125)	1.1827*** (0.130)	1.0282*** (0.129)	1.8206*** (0.131)	0.4875*** (0.121)	0.4783*** (0.121)
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Firms	16,141	15,478	15,682	15,682	15,682	15,361	15,361
No. of Countries	27	27	27	27	27	27	27

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Next, we examine firm-level growth obstacles between fully privatized and partially privatized firms (hypothesis **H1a**). The results are presented in Table 3.4. After controlling for country-level financial market development (*Priv*), fully- and partially-privatized firms exhibit similar level of financial constraints (column (2)), inconsistent with hypothesis **H1a**. As shown in Panel D of Table 3.1, partially privatized firms are twice the size of fully privatized firms in terms of mean number of employees. Large firms tend to obtain their financing through formal channels (capital markets and banks), while small firm are more likely to obtain financing through informal sources (Allen, Qian and Qian, 2005; Ayyagari, Demirguc-Kunt and Maksimovic, 2010). Therefore, it is possible that these two groups of firms experience similar level of financial constraints. Another possible explanation is that fully privatized firms continue to benefit from their SOE era connections to government-owned financial institutions.

The results in Table 3.4 further show that fully privatized firms exhibit significantly higher level of corruption obstacles (columns (3), (4), and (5)) and higher level of legal obstacles (columns (6) and (7)) than the partially privatized firms, consistent with **H1a**.

3.4.2.1 Growth obstacles of privatized versus de novo private firms: the size effects

Beck et al. (2005) find that firm size has a significant effect of firm-level financial, corruption, and legal constraints. They further document that small firms face higher level of growth obstacles than medium or large firms. When these growth obstacles are moderated, small firms also benefit the most compared to medium or large firms. Based on their findings, we extend our main hypothesis **H1** and argue that the differences in firm-level growth obstacles between fully privatized and the de novo private firms are more pronounced in small firms than in medium or large firms. We follow the WBES classificaitons of firm size by the number of full

time employees: small firms have 5 – 50 employees, medium firms 50 – 500, and large firms 500 and more. We re-estimate equation (4) separately for the three size subsamples, excluding firm size as a control variable. The results are presented in Table 3.5.

As shown in columns (1) – (3), fully privatized firms exhibit lower financing, corruption, and legal obstacles respectively, than *de novo* private firms in the small-firm subsample (all significant at the 1% level). For the medium-firm subsample analysis, as shown in columns (4) – (6) respectively, fully privatized firms exhibit similar level of financial constraint, but significantly lower level of corruption (significant at the 1% level), and significantly lower level of legal constraints (significant at the 5% level), than *de novo* private firms. For the large-firm subsample analysis in columns (7) – (9), fully privatized and *de novo* private firms exhibit similar levels of financial, corruption, and legal constraints. These overall findings in Table 3.4 are consistent with Beck, et al. (2005) in that firm size also matters in firm-level growth obstacles in privatized and *de novo* private firms.

3.4.3 Performance of privatized firms versus *de novo* private firms

We first employ an OLS multivariate regression model to compare the performance of privatized firms with the *de novo* private firms. The OLS model is specified in equation (5):

$$\begin{aligned} \text{Firm Performance}_{ij} = & \alpha + \beta_1 \text{Privatized}_{ij} + \beta_2 \text{Firm Size}_{ij} + \beta_3 \text{Firm Age}_{ij} + \beta_4 \text{Ownership}_{ij} \\ & + \beta_5 \text{Exporter}_{ij} + \beta_6 \text{Foreign}_{ij} + \theta' \text{Macro Controls}_j + \varepsilon_{ij} \end{aligned} \quad (5)$$

where subscripts *i* and *j* represent firm and country, respectively. The dependent variables are the three performance measures, namely *Sales Growth*, *Employment Growth*, and *Productivity*,

Table 3.4: Firm-level growth obstacles: fully privatized versus partially privatized

Financing [the dependent variable of specification (1) and (2)], *Corruption* [the dependent variable of specification (3) and (4)], and *Legal* [the dependent variable of specification (5) and (6)] are survey responses for firm-level obstacles as specified in the survey questionnaire. They take values between 0 and 4, where 0 indicates no obstacle and 4 a very severe obstacle. *Fully Privatized* is a dummy variable equal to 1 if the firm is a privatized former SOE with zero state ownership, and 0 otherwise. Partially privatized firms are former SOEs with greater than 0% state ownership. *Firm Size* is the log of the number of permanent, full-time employees at year (t-1). *Firm Age* is the log of a firm's age. *Ownership* is the percent of the firm owned by the largest owner. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if a firm has foreign ownership stakes, and 0 otherwise. *Priv*, the measure of country-level financial development, is the ratio of domestic banking credit to the private sector divided by GDP. *Control of Corruption* is country-level corruption estimate of *Worldwide Governance Indicators (WGI)* and ranges from approximately -2.5 (weak) to 2.5 (strong). *CPI Score* is country-level *Corruption Perceptions Index (CPI)* and ranges between 10 (highly clean) and 0 (highly corrupt). *Rule of Law* is country-level estimate of rule of society, contract enforcement, property rights, the police, the courts, crime and violence and it ranges from approximately -2.5 (weak) to 2.5 (strong). The regressions are run with ordered probit, which is based on standard maximum likelihood estimation with heteroskedasticity-robust standard errors. Furthermore, clustering within countries is allowed for possible correlation of errors in models. White's heteroscedasticity consistent standard errors are presented in the parentheses (White, 1980). Detailed variable definitions and sources are given in Table A4 in the Appendix.

	Financing		Corruption			Legal	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fully Privatized	-0.1420** (0.064)	-0.0858 (0.072)	0.1915*** (0.069)	0.2195*** (0.068)	0.2379*** (0.068)	0.1208* (0.063)	0.1222** (0.063)
Firm Size	-0.0288* (0.017)	-0.0235 (0.017)	0.0058 (0.018)	0.0083 (0.017)	0.0064 (0.017)	0.0552*** (0.016)	0.0553*** (0.016)
Firm Age	0.0632*** (0.025)	0.0568** (0.026)	0.0140 (0.027)	0.0145 (0.027)	0.0030 (0.027)	0.0501** (0.025)	0.0500** (0.025)
Ownership	-0.1212* (0.069)	-0.1221* (0.072)	-0.1136 (0.073)	-0.1055 (0.073)	-0.1008 (0.073)	-0.1806*** (0.067)	-0.1803*** (0.067)
Exporter	-0.0994* (0.052)	-0.0410 (0.055)	-0.0911* (0.056)	0.0331 (0.057)	0.0395 (0.057)	0.0775 (0.051)	0.0801 (0.052)
Foreign	-0.2084*** (0.063)	-0.2144*** (0.066)	-0.1515** (0.068)	-0.1171* (0.068)	-0.1174* (0.067)	-0.1143* (0.062)	-0.1136* (0.062)
<i>Priv</i>		-0.0056*** (0.001)					
Control of Corruption				-0.2968*** (0.038)			
CPI Score					-0.1738*** (0.020)		
Rule of Law							-0.0061 (0.031)
Intercept	1.4646*** (0.359)	1.4612*** (0.387)	0.8162** (0.378)	0.6841* (0.375)	1.3912*** (0.380)	0.0873 (0.347)	0.0844 (0.347)
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Firms	3,730	3,410	3,604	3,604	3,604	3,583	3,583
No. of Countries	27	27	27	27	27	27	27

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 3.5: Firm-level growth obstacles: the size effect

Financing [the dependent variable of specification (1)-(3)], *Corruption* [the dependent variable of specification (4)-(6)], and *Legal* [the dependent variable of specification (7)-(9)] are survey responses for firm-level obstacles as specified in the survey questionnaire. They take values between 0 and 4, where 0 indicates no obstacle and 4 a very severe obstacle. A firm is defined as small if it has between 5 and 50 employees, medium-sized if it has between 51 and 500 employees, and large if it has more than 500 employees. *De Novo* private firms are originally private firms with zero state ownership. *Fully Privatized* is a dummy variable equal to 1 if the firm is a privatized former SOE with zero state ownership, and 0 otherwise. The regressions are run with ordered probit, which is based on standard maximum likelihood estimation with heteroskedasticity-robust standard errors. Furthermore, clustering within countries is allowed for possible correlation of errors in models. White's heteroscedasticity consistent standard errors are presented in the parentheses (White, 1980). Detailed variable definitions and sources are given in Table A4 in the Appendix.

	Small			Medium			Large		
	Financing	Corruption	Legal	Financing	Corruption	Legal	Financing	Corruption	Legal
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Fully Privatized	-0.1213*** (0.041)	-0.2524*** (0.042)	-0.2090*** (0.040)	-0.0517 (0.044)	-0.1528*** (0.045)	-0.0956** (0.043)	-0.2038 (0.139)	-0.0712 (0.142)	-0.0873 (0.128)
Firm Age	0.0175 (0.023)	0.0582** (0.024)	0.1490*** (0.023)	0.0024 (0.027)	0.0605** (0.028)	0.0645*** (0.026)	0.1498** (0.071)	-0.0334 (0.073)	0.1038 (0.066)
Ownership	-0.0662 (0.045)	-0.1050** (0.047)	-0.0279 (0.045)	-0.1484** (0.062)	-0.0385 (0.064)	-0.1257** (0.060)	-0.3296* (0.187)	-0.2731 (0.193)	-0.2041 (0.174)
Exporter	0.0053 (0.033)	0.0093 (0.035)	0.1053*** (0.033)	-0.0181 (0.041)	0.0187 (0.043)	0.0670* (0.041)	-0.0669 (0.133)	-0.0114 (0.138)	0.0466 (0.125)
Foreign	-0.3705*** (0.047)	-0.0527 (0.049)	-0.0162 (0.047)	-0.2141*** (0.047)	-0.0319 (0.048)	-0.0019 (0.046)	-0.2795** (0.121)	-0.0132 (0.122)	-0.0035 (0.112)
<i>Priv</i>	-0.0069*** (0.001)			-0.0080*** (0.001)			-0.0023 (0.004)		
Cont. of Corruption		-0.2798*** (0.022)			-0.4078*** (0.032)			-0.2812*** (0.097)	
Rule of Law			-0.0093 (0.018)			-0.0868*** (0.026)			-0.0107 (0.077)
Intercept	1.3104*** (0.156)	1.2279*** (0.161)	0.5866*** (0.152)	1.0044*** (0.220)	0.7347*** (0.227)	0.6233*** (0.215)	-0.3889 (0.724)	0.2479 (0.747)	0.2792 (0.677)
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Firms	9,990	10,094	9,778	4,680	4,699	4,687	464	469	470
No. of Countries	27	27	27	27	27	27	27	27	27

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

as defined in equation (1), (2), and (3) respectively. We also follow Beck, et al. (2005) and control for country level macroeconomic variables (*Macro Controls*), including GDP, GDP per capita, GDP growth and inflation.

To account for the omitted and/or unobservable country-specific factors that might also affect firm performance, we control for country fixed-effects using a generalized linear model (GLM-FE). A GLM model allows for more flexible assumptions concerning the dependent variable distribution properties. Our GLM-FE model is specified in equation (5) below:

$$\begin{aligned} \text{Firm Performance}_{ij} = & \alpha + \beta_1 \text{Privatized}_{ij} + \beta_2 \text{Firm Size}_{ij} + \beta_3 \text{Firm Age}_{ij} + \beta_4 \text{Ownership}_{ij} \\ & + \beta_5 \text{Exporter}_{ij} + \beta_6 \text{Foreign}_{ij} + \varepsilon_{ij} + \delta_j \end{aligned} \quad (6)$$

We exclude from the GLM-FE model all country-level macro control variables, since the effects of these country specific variables are already accounted for in the country fixed-effect model. All regressions include industry dummies and year dummies.

We first compare the performance of fully privatized firms (0% state ownership) with that of the *de novo* private firms. The results are presented in Table 3.6. For each performance measure, we present the regression results for both the OLS and GLM-FE models. The results for sales growth are presented in columns (1) and (2), employment growth in columns (3) and (4), and labor productivity in columns (5) and (6). As hypothesized (**H2**), β_1 , the coefficients of the indicator variable, *Fully Privatized*, are negative across all regressions in Table 3.6 and are significant at the 1% level. These results provide strong evidence that the fully privatized firms in ECA countries perform significantly worse than that of the *de novo* private firms. These findings are robust after controlling for firm size, firm age, ownership concentration, exporter, foreign ownership and industry and year effects. The results also hold after controlling for

country-fixed effects.

Further analysis of the effects of the control variables shows that larger firms exhibit better performance across all three performance measures than the *de novo* private firms. Younger firms grow faster but older firms have higher labor productivity. Exporters exhibit higher sales growth and higher labor productivity. Firms with foreign ownership exhibit lower employment growth but higher labor productivity.

We conduct two subsample performance comparisons: (1) between all privatized firms (fully and partially) and the *de novo* private firms and (2) between fully privatized and partially privatized. The results are presented in Table 3.7 and Table 3.8, respectively. The results in Table 3.7 are consistent with those in Table 3.6, suggesting privatized (fully and partially) firms underperform the *de novo* private firms in the ECA countries in our sample. The results in Table 3.6 and 3.7 are consistent with our hypotheses **H2**.

In Table 3.8, we present the results of the performance comparisons between fully privatized (0% state ownership) versus partially privatized firms (state ownership > 0%). We observe some interesting results. The difference in sales growth rate is insignificant between fully and partially privatized firms. However, fully privatized firms exhibit higher employment growth and lower labor productivity than partially privatized firms. One explanation is that fully privatized firms have better business prospects than the partially privatized firms. As presented at Table 3.1 (Panel D), on average, both fully privatized firms and partially privatized firms laid off workers during our sampling periods, but the fully privatized laid off significantly fewer workers (-0.5% versus -4.2% employment growth). The lower productivity by fully privatized

Table 3.6: Firm performance: fully privatized versus *de novo* private

Sales Growth, the dependent variable of specification (1) and (2), is the average of the difference of log [sales (t-1)] and log [sales (t-3)], where t is the year the survey was conducted. *Employment Growth*, the dependent variable of specification (3) and (4), is average of the difference of log [employees (t-1)] and log [employees (t-3)]. *Productivity*, the dependent variable of specification (5) and (6), is log [sales (t-1) / employees (t-1)]. *De Novo* private firms are originally private firms with zero state ownership. *Fully Privatized* is a dummy variable equal to 1 if the firm is a privatized former SOE with zero state ownership, and 0 otherwise. *Firm Size* is the log of the number of permanent, full-time employees at year (t-1). *Firm Age* is the log of a firm's age. *Ownership* is the percent of the firm owned by the largest owner. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if a firm has foreign ownership stakes, and 0 otherwise. *GDP* is the log of GDP in current millions of U.S. dollars. *GDP per Capita* is the real GDP per capita in U.S. dollars. *GDP Growth* is the growth rate of GDP. *Inflation* is log difference of consumer price indices. All country level variables are the average over year (t-3), (t-2) and (t-1).

	Sales Growth		Employment Growth		Productivity	
	(1) OLS	(2) GLM-FE	(3) OLS	(4) GLM-FE	(5) OLS	(6) GLM-FE
Fully Privatized	-0.0241*** (0.008)	-0.0278*** (0.008)	-0.0880*** (0.005)	-0.0860*** (0.005)	-0.1583*** (0.032)	-0.1306*** (0.030)
Firm Size	0.0228*** (0.002)	0.0221*** (0.002)	0.0252*** (0.001)	0.0250*** (0.001)	0.0106 (0.010)	0.0320*** (0.009)
Firm Age	-0.0544*** (0.005)	-0.0489*** (0.005)	-0.0676*** (0.003)	-0.0675*** (0.003)	0.0893*** (0.019)	-0.0013 (0.018)
Ownership	0.0068 (0.010)	0.0027 (0.010)	0.0205*** (0.006)	0.0178*** (0.006)	-0.2229*** (0.040)	-0.1599*** (0.037)
Exporter	0.0237*** (0.007)	0.0314*** (0.007)	0.0056 (0.004)	0.0056 (0.004)	0.2826*** (0.029)	0.1549*** (0.027)
Foreign	0.0005 (0.009)	0.0025 (0.009)	-0.0167*** (0.005)	-0.0146*** (0.005)	0.2889*** (0.037)	0.2849*** (0.034)
GDP	0.0025 (0.003)		-0.0105*** (0.002)		-0.0448*** (0.010)	
GDP per Capita	-0.0098** (0.004)		0.0002 (0.003)		0.7368*** (0.018)	
GDP Growth	-0.1269** (0.058)		0.0048 (0.032)		1.3372*** (0.227)	
Inflation	0.1431*** (0.053)		0.0084 (0.033)		2.2971*** (0.219)	
Intercept	0.1923*** (0.059)		0.4360*** (0.035)		4.1223*** (0.232)	
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	Yes	No	Yes
R-Square	0.1642	0.1746	0.0990	0.1122	0.3704	0.4753
Adj. R-Square	0.1621		0.0973		0.3689	
F-Value	77.57	47.42	57.4	37.5	254.04	222.04
No. of Firms	11,482	11,482	15,178	15,178	12,553	12,553
No. of Countries	27	27	27	27	27	27

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 3.7: Firm performance: privatized versus *de novo* private

Sales Growth, the dependent variable of specification (1) and (2), is the average of the difference of log [sales (t-1)] and log [sales (t-3)], where t is the year the survey was conducted. *Employment Growth*, the dependent variable of specification (3) and (4), is average of the difference of log [employees (t-1)] and log [employees (t-3)]. *Productivity*, the dependent variable of specification (5) and (6), is log [sales (t-1) / employees (t-1)]. *De Novo* private firms are originally private firms with zero state ownership. *Privatized* is a dummy variable equal to 1 if the firm is a privatized former SOE (fully privatized or partially privatized firms), and 0 otherwise. Fully privatized firms are former SOEs with zero state ownership. Partially privatized firms are former SOEs with greater than 0% state ownership. *Firm Size* is the log of the number of permanent, full-time employees at year (t-1). *Firm Age* is the log of a firm's age. *Ownership* is the percent of the firm owned by the largest owner. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if a firm has foreign ownership stakes, and 0 otherwise. *GDP* is the log of GDP in current millions of U.S. dollars. *GDP per Capita* is the real GDP per capita in U.S. dollars. *GDP Growth* is the growth rate of GDP. *Inflation* is log difference of consumer price indices.

	Sales Growth		Employment Growth		Productivity	
	(1) OLS	(2) GLM-FE	(3) OLS	(4) GLM-FE	(5) OLS	(6) GLM-FE
Privatized	-0.0256*** (0.008)	-0.0319*** (0.008)	-0.0942*** (0.005)	-0.0917*** (0.005)	-0.0724** (0.032)	-0.0877*** (0.030)
Firm Size	0.0214*** (0.002)	0.0219*** (0.002)	0.0240*** (0.001)	0.0243*** (0.001)	0.0134 (0.010)	0.0333*** (0.009)
Firm Age	-0.0533*** (0.005)	-0.0472*** (0.005)	-0.0640*** (0.003)	-0.0644*** (0.003)	0.0730*** (0.019)	0.0020 (0.018)
Ownership	0.0089 (0.010)	0.0054 (0.010)	0.0212*** (0.006)	0.0176*** (0.006)	-0.2445*** (0.041)	-0.1423*** (0.037)
Exporter	0.0263*** (0.007)	0.0337*** (0.007)	0.0052 (0.004)	0.0062 (0.004)	0.2773*** (0.029)	0.1470*** (0.027)
Foreign	0.0004 (0.009)	0.0016 (0.009)	-0.0154*** (0.005)	-0.0142*** (0.005)	0.2862*** (0.037)	0.2745*** (0.034)
GDP	0.0024 (0.003)		-0.0103*** (0.002)		0.0453*** (0.011)	
GDP per Capita	-0.0104** (0.004)		0.0004 (0.003)		0.7533*** (0.018)	
GDP Growth	-0.1537*** (0.057)		-0.0074 (0.031)		2.3244*** (0.229)	
Inflation	0.1571*** (0.052)		0.0018 (0.032)		3.0718*** (0.223)	
Intercept	0.1938*** (0.058)		0.4224*** (0.034)		3.8874*** (0.237)	
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	Yes	No	Yes
R-Square	0.1614	0.1725	0.1043	0.1176	0.3588	0.4734
Adj. R-Square	0.1594		0.1026		0.3574	
No. of Firms	11,999	11,824	15,835	15,603	13,096	12,913
No. of Countries	27	27	27	27	27	27

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 3.8: Firm performance: fully privatized versus partially privatized

Sales Growth, the dependent variable of specification (1) and (2), is the average of the difference of log [sales (t-1)] and log [sales (t-3)], where t is the year the survey was conducted. *Employment Growth*, the dependent variable of specification (3) and (4), is average of the difference of log [employees (t-1)] and log [employees (t-3)]. *Productivity*, the dependent variable of specification (5) and (6), is log [sales (t-1) / employees (t-1)]. *Fully Privatized* is a dummy variable equal to 1 if the firm is a privatized former SOE with zero state ownership, and 0 otherwise. Partially privatized firms are former SOEs with greater than 0% state ownership. *Firm Size* is the log of the number of permanent, full-time employees at year (t-1). *Firm Age* is the log of a firm's age. *Ownership* is the percent of the firm owned by the largest owner. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if a firm has foreign ownership stakes, and 0 otherwise. *GDP* is the log of GDP in current millions of U.S. dollars. *GDP per Capita* is the real GDP per capita in U.S. dollars. *GDP Growth* is the growth rate of GDP. *Inflation* is log difference of consumer price indices.

	Sales Growth		Employment Growth		Productivity	
	(1) OLS	(2) GLM-FE	(3) OLS	(4) GLM-FE	(5) OLS	(6) GLM-FE
Fully Privatized	0.0057 (0.015)	0.0194 (0.019)	0.0246*** (0.008)	0.0333*** (0.010)	-0.3566*** (0.073)	-0.2699*** (0.077)
Firm Size	0.0050 (0.005)	0.0117*** (0.005)	0.0154*** (0.002)	0.0200*** (0.002)	0.0582*** (0.021)	0.0468** (0.019)
Firm Age	-0.0211*** (0.007)	-0.0189*** (0.008)	-0.0330*** (0.004)	-0.0313*** (0.004)	0.0597** (0.032)	0.0748*** (0.030)
Ownership	0.0197 (0.019)	0.0097 (0.019)	0.0280*** (0.010)	0.0213** (0.010)	-0.1334 (0.088)	0.0283 (0.079)
Exporter	0.0386*** (0.015)	0.0488*** (0.015)	0.0079 (0.008)	0.0168** (0.008)	0.3073*** (0.069)	0.1504** (0.062)
Foreign	0.0192 (0.017)	0.0208 (0.018)	-0.0062 (0.009)	-0.0071 (0.009)	0.3357*** (0.078)	0.3043*** (0.073)
GDP	-0.0001 (0.006)		-0.0097*** (0.003)		-0.1004*** (0.027)	
GDP per Capita	-0.0104 (0.009)		-0.0003 (0.005)		0.9058*** (0.043)	
GDP Growth	-0.2214** (0.104)		0.1514*** (0.054)		7.7682*** (0.484)	
Inflation	0.2476** (0.121)		-0.1116* (0.065)		8.9134*** (0.581)	
Intercept	0.2683** (0.132)		0.2415*** (0.069)		3.2952*** (0.593)	
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	Yes	No	Yes
R-Square	0.1216	0.1405	0.0510	0.0912	0.3958	0.5506
Adj. R-Square	0.1133		0.0438		0.3905	
No. of Firms	3,124	2,949	3,868	3,636	3,344	3,161
No. of Countries	27	27	27	27	27	27

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

firms is inconsistent with our hypothesis. One explanation is that fully privatized firms believe their future prospects in that they temporarily keep more workers in staff than needed, leading to lower productivity during our sampling periods. Another plausible explanation is that the governments fully divest relatively poor performing firms first, while retaining shares in the relatively better firms. The results in Table 3.8 provide mixed findings concerning hypothesis H2a.

3.4.3.1 Performance of privatized versus de novo private firms: controlling for the obstacles

Empirical results in Table 3.2 and Table 3.3 show that privatized firms face significantly lower levels of financing, corruption and legal obstacles than the de novo private firms. They also significantly underperform the *de novo* private firms, as shown in Table 3.6 and Table 3.7. However, the results in Tables 3.6 – 3.8 above have not controlled for the growth obstacles. To further investigate the relative performance between privatized firms and *de novo* private firms, we control for the three firm-level growth obstacles in our regression analysis. Specifically, we add the financing, corruption and legal obstacles as control variables in equation (5) and (6) and re-estimate them. Respectively, Tables 3.9, 3.10 and 3.11 present performance comparison results between fully privatized and de novo private firms, between all privatized firms and *de novo* private firms, and between fully privatized and partially privatized firms.

The results in Table 3.9 and Table 3.10 are consistent with those in Table 3.6 and Table 3.7. These findings confirm our main hypothesis (**H2**) in that privatized firms underperform the *de novo* private firms after controlling for firm-level growth obstacles.

Further analysis of the effects of the control variables in Table 3.9 and Table 3.10 shows that financial constraint (*Financing*) has a significantly negative effect on *Sales Growth*. Legal constraint (*Legal*) has a negative and significant effect on both *Sales Growth* and *Employment*

Growth, but a positive effect on labor productivity (*Productivity*). The results further show that corruption obstacle (*Corruption*) has marginal significant and positive effect on *Sales Growth* and *Employment Growth* (Table 3.9, columns (2) and (4)). The positive effects of corruption on firm growth and legal constraint on productivity may be due to the potential endogeneity issues between the growth obstacles and firm growth (Fishman and Svensson, 2007).¹⁰

3.5 Conclusions

In this study, we examine firm-level growth constraints and performance of 4,170 privatized firms with those of 13,723 *de novo* private firms in 27 Eastern European and Central Asian countries. Specifically, we analyze the *World Bank Enterprise Survey (WBES)* data collected in 2002, 2005 and 2009, with performance data spanning an 8-year period. We employ the ordered probit model to examine firm-level financial, corruption and legal obstacles between the privatized and the *de novo* private firms in the ECA countries. We further use OLS and country fixed-effect (GLM-FE) models to investigate firm performance measured by sales growth, employment growth and labor productivity between these two groups of firms.

Our overall empirical evidence shows that privatized firms experience significantly lower financial, corruption, and legal obstacles than the *de novo* private firms. The results are robust after controlling for industry effects, year effects, and relevant country-level governance variables (financial development, corruption, and rule of laws). The results are also robust after controlling for country fixed effects. We further document that that privatized firms experience significantly lower sales growth, employment growth and labor productivity than the *de novo*

¹⁰ Fishman and Svensson (2007) find that corruption has a significant and negative effect on firm growth after controlling for the endogeneity between corruption and firm growth. The focus of this study is the comparisons firm-level growth obstacles and performance between privatized firms and *de novo* private firms, not the relations between firm growth and growth obstacles. Therefore, in this study we do not address the potential endogeneity issues between firm growth and the growth obstacles.

Table 3.9: Firm performance and growth obstacles: fully privatized versus *de novo* private

Sales Growth, the dependent variable of specification (1) and (2), is the average of the difference of log [sales (t-1)] and log [sales (t-3)], where t is the year the survey was conducted. *Employment Growth*, the dependent variable of specification (3) and (4), is average of the difference of log [employees (t-1)] and log [employees (t-3)]. *Productivity*, the dependent variable of specification (5) and (6), is log [sales (t-1) / employees (t-1)]. *De Novo* private firms are originally private firms with zero state ownership. *Fully Privatized* is a dummy variable equal to 1 if the firm is a privatized former SOE with zero state ownership, and 0 otherwise. *Financing*, *Corruption* and *Legal* are survey responses for firm-level obstacles as specified in the survey questionnaire. They take values between 0 and 4, where 0 indicates no obstacle and 4 a very severe obstacle. *Firm Size* is the log of the number of permanent, full-time employees at year (t-1). *Firm Age* is the log of a firm's age. *Ownership* is the percent of the firm owned by the largest owner. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if a firm has foreign ownership stakes, and 0 otherwise. *Macro-Controls* include country-level indexes for financial development, corruption and rule of law and country-level GDP, GDP per capita, GDP growth and inflation. For brevity, the coefficients are not presented but are available upon request. White's heteroscedasticity consistent standard errors are presented in the parentheses (White, 1980). Detailed variable definitions and sources are given in Table A4 in the Appendix.

	Sales Growth		Employment Growth		Productivity	
	(1) OLS	(2) GLM-FE	(3) OLS	(4) GLM-FE	(5) OLS	(6) GLM-FE
Fully Privatized	-0.0195** (0.009)	-0.0240*** (0.009)	-0.0869*** (0.005)	-0.0867*** (0.005)	-0.2084*** (0.031)	-0.1373*** (0.031)
Financing	-0.0052** (0.003)	-0.0052** (0.003)	0.0033** (0.002)	0.0023 (0.002)	-0.0073 (0.009)	-0.0033 (0.009)
Corruption	0.0042 (0.003)	0.0052* (0.003)	0.0020 (0.002)	0.0031* (0.002)	0.0096 (0.011)	0.0013 (0.011)
Legal	-0.0105*** (0.003)	-0.0083*** (0.003)	-0.0056*** (0.002)	-0.0075*** (0.002)	0.0416*** (0.011)	0.0297*** (0.012)
Firm Size	0.0211*** (0.003)	0.0198*** (0.003)	0.0248*** (0.002)	0.0244*** (0.002)	0.0303*** (0.009)	0.0358*** (0.009)
Firm Age	-0.0566*** (0.005)	-0.0500*** (0.005)	-0.0689*** (0.003)	-0.0684*** (0.003)	0.0317* (0.018)	0.0072 (0.019)
Ownership	0.0107 (0.011)	0.0070 (0.011)	0.0164*** (0.007)	0.0171*** (0.007)	-0.0521 (0.038)	-0.1340*** (0.039)
Exporter	0.0294*** (0.008)	0.0352*** (0.008)	0.0079* (0.005)	0.0082* (0.005)	0.2486*** (0.027)	0.1570*** (0.028)
Foreign	0.0003 (0.010)	0.0026 (0.010)	-0.0144** (0.006)	-0.0130** (0.006)	0.2259*** (0.034)	0.2678*** (0.035)
Intercept	0.1739*** (0.066)		0.4280*** (0.040)		4.5715*** (0.230)	
Macro-Controls	Yes	No	Yes	No	Yes	No
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	Yes	No	Yes
R-Square	0.1694	0.1737	0.104	0.1166	0.4497	0.4898
Adj. R-Square	0.1664		0.1015		0.4479	
F-Value	56.11	38.93	41.95	32.05	245.38	193.59
Pr > F	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
No. of Firms	9,664	10,052	12,691	13,162	10,546	10,944
No. of Countries	27	27	27	27	27	27

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 3.10: Firm performance and growth obstacles: privatized versus *de novo* private

Sales Growth, the dependent variable of specification (1) and (2), is the average of the difference of log [sales (t-1)] and log [sales (t-3)], where t is the year the survey was conducted. *Employment Growth*, the dependent variable of specification (3) and (4), is average of the difference of log [employees (t-1)] and log [employees (t-3)]. *Productivity*, the dependent variable of specification (5) and (6), is log [sales (t-1) / employees (t-1)]. *De Novo* private firms are originally private firms with zero state ownership. *Privatized* is a dummy variable equal to 1 if the firm is a privatized former SOE (fully privatized or partially privatized firms), and 0 otherwise. Fully privatized firms are former SOEs with zero state ownership. Partially privatized firms are former SOEs with greater than 0% state ownership. *Financing*, *Corruption* and *Legal* are survey responses for firm-level obstacles as specified in the survey questionnaire. They take values between 0 and 4, where 0 indicates no obstacle and 4 a very severe obstacle. *Firm Size* is the log of the number of permanent, full-time employees at year (t-1). *Firm Age* is the log of a firm's age. *Ownership* is the percent of the firm owned by the largest owner. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if a firm has foreign ownership stakes, and 0 otherwise. *Macro-Controls* include country-level indexes for financial development, corruption and rule of law and country-level GDP, GDP per capita, GDP growth and inflation. For brevity, the coefficients are not presented but are available upon request. White's heteroscedasticity consistent standard errors are presented in the parentheses (White, 1980). Detailed variable definitions and sources are given in Table A4 in the Appendix.

	Sales Growth		Employment Growth		Productivity	
	(1) OLS	(2) GLM-FE	(3) OLS	(4) GLM-FE	(5) OLS	(6) GLM-FE
Privatized	-0.0238*** (0.008)	-0.0281*** (0.008)	-0.0926*** (0.005)	-0.0932*** (0.005)	-0.1641*** (0.031)	-0.0930*** (0.031)
Financing	-0.0055** (0.003)	-0.0051** (0.002)	0.0031** (0.002)	0.0019 (0.002)	-0.0081 (0.009)	-0.0051 (0.009)
Corruption	0.0035 (0.003)	0.0047 (0.003)	0.0019 (0.002)	0.0029* (0.002)	0.0092 (0.011)	-0.0004 (0.011)
Legal	-0.0104*** (0.003)	-0.0080*** (0.003)	-0.0059*** (0.002)	-0.0077*** (0.002)	0.0434*** (0.011)	0.0397*** (0.012)
Firm Size	0.0211*** (0.003)	0.0200*** (0.003)	0.0241*** (0.002)	0.0238*** (0.002)	0.0356*** (0.009)	0.0351*** (0.010)
Firm Age	-0.0553*** (0.005)	-0.0482*** (0.005)	-0.0658*** (0.003)	-0.0646*** (0.003)	0.0206 (0.018)	0.0115 (0.019)
Ownership	0.0139 (0.011)	0.0098 (0.010)	0.0165*** (0.006)	0.0165*** (0.006)	-0.0450 (0.038)	-0.1112*** (0.039)
Exporter	0.0303*** (0.008)	0.0369*** (0.008)	0.0085* (0.005)	0.0089** (0.005)	0.2365*** (0.027)	0.1499*** (0.028)
Foreign	-0.0006 (0.010)	0.0022 (0.010)	-0.0144*** (0.006)	-0.0132** (0.006)	0.2259*** (0.035)	0.2604*** (0.036)
Intercept	0.1713*** (0.065)		0.4208*** (0.039)		4.3994*** (0.233)	
Macro-Controls	Yes	No	Yes	No	Yes	No
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	Yes	No	Yes
R-Square	0.168	0.1718	0.1077	0.1220	0.4424	0.4880
Adj. R-Square	0.165		0.1053		0.4406	
No. of Firms	9,890	10,352	12,977	13,537	10,783	11,263
No. of Countries	27	27	27	27	27	27

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 3.11: Firm performance and growth obstacles: fully privatized versus partially privatized

Sales Growth, the dependent variable of specification (1) and (2), is the average of the difference of log [sales (t-1)] and log [sales (t-3)], where t is the year the survey was conducted. *Employment Growth*, the dependent variable of specification (3) and (4), is average of the difference of log [employees (t-1)] and log [employees (t-3)]. *Productivity*, the dependent variable of specification (5) and (6), is log [sales (t-1) / employees (t-1)]. *Fully Privatized* is a dummy variable equal to 1 if the firm is a privatized former SOE with zero state ownership, and 0 otherwise. Partially privatized firms are former SOEs with greater than 0% state ownership. *Financing*, *Corruption* and *Legal* are survey responses for firm-level obstacles as specified in the survey questionnaire. They take values between 0 and 4, where 0 indicates no obstacle and 4 a very severe obstacle. *Firm Size* is the log of the number of permanent, full-time employees at year (t-1). *Firm Age* is the log of a firm's age. *Ownership* is the percent of the firm owned by the largest owner. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if a firm has foreign ownership stakes, and 0 otherwise. *Macro-Controls* include country-level indexes for financial development, corruption and rule of law and country-level GDP, GDP per capita, GDP growth and inflation. For brevity, the coefficients are not presented but are available upon request. White's heteroscedasticity consistent standard errors are presented in the parentheses (White, 1980). Detailed variable definitions and sources are given in Table A4 in the Appendix.

	Sales Growth		Employment Growth		Productivity	
	(1) OLS	(2) GLM-FE	(3) OLS	(4) GLM-FE	(5) OLS	(6) GLM-FE
Fully Privatized	0.0355* (0.022)	0.0174 (0.020)	0.0405*** (0.011)	0.0330*** (0.010)	-0.3829*** (0.080)	-0.2638*** (0.081)
Financing	-0.0019 (0.005)	-0.0001 (0.005)	0.0023 (0.003)	0.0018 (0.003)	-0.0002 (0.019)	-0.0222 (0.021)
Corruption	0.0107* (0.006)	0.0114* (0.006)	-0.0013 (0.003)	0.0001 (0.003)	0.0271 (0.023)	0.0213 (0.024)
Legal	-0.0167*** (0.007)	-0.0113* (0.006)	-0.0077** (0.003)	-0.0072** (0.003)	0.0272 (0.024)	0.0663*** (0.026)
Firm Size	0.0102** (0.005)	0.0107** (0.005)	0.0175*** (0.003)	0.0200*** (0.003)	0.0710*** (0.019)	0.0470** (0.020)
Firm Age	-0.0205*** (0.008)	-0.0168** (0.008)	-0.0332*** (0.004)	-0.0322*** (0.004)	0.0029 (0.029)	0.0968*** (0.032)
Ownership	0.0293 (0.021)	0.0189 (0.020)	0.0138 (0.011)	0.0139 (0.011)	0.1649** (0.077)	0.0491 (0.083)
Exporter	0.0371** (0.016)	0.0536*** (0.016)	0.0148* (0.009)	0.0194** (0.008)	0.2200*** (0.060)	0.1417** (0.066)
Foreign	0.0195 (0.019)	0.0287 (0.019)	-0.0147 (0.010)	-0.0071 (0.010)	0.2412*** (0.071)	0.2910*** (0.077)
Intercept	0.1245 (0.154)		0.2879*** (0.083)		4.5446*** (0.563)	
Macro-Controls	Yes	No	Yes	No	Yes	No
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	Yes	No	Yes
R-Square	0.1399	0.1430	0.0719	0.0967	0.4611	0.5659
Adj. R-Square	0.1269		0.0605		0.4535	
F-Value	10.73	7.82	6.3	6.15	60.59	65.49
Pr > F	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
No. of Firms	2,344	2,584	2,882	3,154	2,514	2768
No. of Countries	27	27	27	27	27	27

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

private firms. The results are robust after controlling for relevant firm characteristics, country-level macro variables, industry effects, year effects and country fixed effects. These results are also robust after controlling for firm-level growth obstacles. For the relatively poor performance of the privatized firms in ECA transition economies, we consider three alternative explanations. First, these transition economies generally have poor property rights, under-developed capital markets, and shortage of skilled labor forces. These weak institutions may impede the privatized firms to restructure effectively and quickly after privatization to take advantage of the market forces. Second, though the privatized firms may have become privately-owned after privatization, the ways of doing business from the SOE era may carry over to the current business operation. Third, the unstable political and economic environment commonly found in transition economies may further impede the performance of the privatized firms.

Our paper contributes to the privatization literature from three new angles. First, more than a decade has passed since the major privatization programs in ECA countries have taken place. How do these privatized firms stack up against the *de novo* private firms? We provide empirical evidence that answers this question. Second, few studies in the extant privatization literature examine sales growth and employment growth of the privatized firms in comparison with those of the *de novo* private firms. Sales growth and employment growth are important measures of a firm's long term viability and should receive more attention from scholars and policymakers. Our paper employs both growth measures and contributes to the literature in this regard. Third, no study in the privatization literature has examined the firm-level constraints to growth in the business environment experienced by privatized firms relative to those experienced by the *de novo* private firms. The WEBS dataset allows us to examine three important firm-level obstacles to growth, i.e. the corruption, financing, and legal obstacles.

Chapter 4

Essay 3 - ISO certification, corruption, and firm performance: a cross-country study

4.1 Introduction

Obtaining management quality certifications from the International Organization for Standardization (ISO) has emerged as a managerial and strategic tool for businesses across the globe. The popularity of ISO certificates has grown exponentially over the last decade with 164 current ISO member countries worldwide. The ISO official website explicitly lists the following five benefits from an ISO certification for businesses: “ (1) *Cost savings - International Standards help optimise operations and therefore improve the bottom line;* (2) *Enhanced customer satisfaction - International Standards help improve quality, enhance customer satisfaction and increase sales;* (3) *Access to new markets - International Standards help prevent trade barriers and open up global markets;* (4) *Increased market share - International Standards help increase productivity and competitive advantage;* (5) *Environmental benefits - International Standards help reduce negative impacts on the environment.*”¹¹ Do these benefits actually materialize at the firm level? We investigate this question in the paper.

While a number of studies have examined the above question, the overall evidence is inconclusive. Furthermore, to our surprise, there is no cross-country study in the existing literature that examines firm-level benefits of ISO certification around the world.¹² The effectiveness of the ISO quality certifications may be a function of a country’s institutional environment and macroeconomic variables. This study aims to address these two limitations in

¹¹ The official ISO website is: www.iso.org.

¹² Several cross-country studies have examined the relations between ISO diffusion and foreign trade and foreign direct investment at the macro level (e.g. Clougherty and Grajek, 2008).

the ISO literature by providing concrete firm level evidence on the benefits of ISO certification from the first large scale cross-section, cross-country study.

We employ the World Bank Enterprise Survey (WBES) data collected from 2006-2011 for over 40,000 mostly small and medium-size enterprises (SME) in 119 countries to study the effect of ISO certification on sales growth and labor productivity. Approximately 20 percent of the surveyed firms have at least one type of the ISO certifications (ISO 9000, ISO 9002 or ISO 14000).¹³ Our results from both the univariate tests and multivariate regressions show that ISO-certified firms exhibit higher sales growth and higher labor productivity than non-certified firms. The results are robust after controlling for relevant firm characteristics, industry effects, year effects and country level macro-economic variables and corruption indexes. We further control for the potential endogeneity of ISO adoption to firm performance, and the results are robust.

Our paper addresses several important limitations in the existing literature on ISO certification and firm performance. In a comprehensive study, Corbett, Montes-Sancho, and Kirsch (2005, referred to as CMK hereafter) examine the effect of ISO 9000 certification on firm financial performance in publicly traded U.S. manufacturing firms over the period 1987-1997. They find that ISO 9000 certification leads to significant overall financial improvements. However, the authors indicate that their study has several limitations. The first limitation is that their study is a single country study. The authors ask “what do our results imply for firms outside the United States?” (pp. 1057). Other single country studies also have this limitation.¹⁴ Different countries have different sets of governance and institutional variables within which

¹³ The WBES does not distinguish the types of ISO certifications.

¹⁴ Sharma (2005) investigates firms listed in Singapore; Heras, Dick, and Casadesus (2002) and Lafuente, Bayo-Moriones and Garcia-Cestona (2009) focus on Spanish firms; Beirao and Cabral (2002) study Portuguese firms; Terziovski, Samson, and Dow (1997) examine Australian firms; Singels, Ruel and Water (2001) study Dutch firms, and Corbett, Montes, Kirsch and Alvarez-Gil (2002) and Simmons and White (1999) investigate US firms.

their businesses operate. Therefore, the benefits from ISO certification may be significant in some but not in other countries. Our paper addresses this limitation by being the first to provide comprehensive cross-country evidence on the benefits of ISO certification from 119 countries.

The second and more pronounced limitation of CMK (2005) is that it matches ISO certification with overall firm performance using Compustat data. This can be problematic because ISO certifications are site-specific while Compustat contains the consolidated financial statements of a firm. Judging from the mean asset size (US\$1.63 billion) and mean sales (US\$1.65 billion), it is reasonable to assume that some of the ISO certified firms in the CMK (2005) sample may in fact be multinationals that have multiple manufacturing sites, some of which could be abroad and not ISO-certified. This situation makes it difficult to estimate the direct effect of ISO certification on financial performance of the certified site. Our sample contains mostly small and medium size enterprises (SME) with a median size of only 21 employees (Table 4.1). We can reasonably assume that majority of the firms in our sample do not have multiple operation sites nor overseas sites. This situation provides a more ideal setting to examine the direct link between ISO certification and firm financial performance. As a robustness check for this issue, we divide the sample into small (<50 employees), medium (50 – 500 employees) and large firms (>500 employees) and re-examine the relation between ISO certification and firm performance. We find that the benefits from ISO certification are the most pronounced in small firms.

In a recent article, Montiel, Husted and Christmann (2012) study how corruption influences firm decision to obtain ISO 14001 certifications in 463 automotive plants in Mexico. They argue that corrupt business environment creates information asymmetry between insiders and external stakeholders. External stakeholders do not trust compliance with government

regulations or other official seals of approval as accurate proxies for unobservable and desirable firm characteristics. Third-party quality standards, such as the family of ISO certifications, can signal external stakeholders that certified firms possess quality products and management. However, Montiel et al. (2012) do not explicitly study the relation between ISO certification and firm performance in corrupt business environment. In this study, we test the signaling hypothesis of ISO certification by linking ISO certification to firm performance in different levels of corrupt business environments. We find that the positive and significant impact of ISO certification on labor productivity remains intact regardless the levels of corruption. However, when a firm operates in a highly corrupt business environment, the positive effect of ISO certification on sales growth becomes insignificant. This is not surprising in that labor productivity is more of a function of internal control, whereas information asymmetry plays a bigger role in sales growth. When the business environment is “severely corrupt”, external stakeholders discount third party quality certifications. This analysis and finding add additional new contributions to the literature.

The paper is organized as follows. Section 4.2 reviews relevant literature and develops the hypotheses of our study, while Section 4.3 describes data and summary statistics. Section 4.4 discusses the methodologies and presents the empirical results, while Section 4.5 concludes the study.

4.2 Theories, relevant literature, and hypotheses

Three theories emerge in the ISO literature in explaining the possible sources of financial benefits following ISO certification: the internal improvement theory, the external improvement theory and the market signaling theory. According to the internal improvement theory, firms should benefit from ISO certifications through greater quality awareness among employees

(Brooks, 1995; Brown & Van der Wiele, 1995; BSI, 2000; Dale, 1994; Peach, 1997), improvement of product and service quality (Quazi, Hong and Meng, 2002), and improved productivity and efficiency (Arnold, 1994; Brooks, 1995; BSI, 2000; Buttle, 1997; RAB, 2000; Reed, Lemak, & Montgomery, 1996).

The external improvement theory suggests that ISO certification helps a firm maintain and increase profits by ensuring its ability to satisfy customers and sustain competitive advantage (Carr, Mak and Needham, 1997). This theory predicts that certified firms are more likely to increase their customer base and market share and therefore, sales.

The market signaling theory suggests that information asymmetries exist between insiders and external stakeholders, and that ISO certifications can serve as a signal that certified firms possess certain desirable firm characteristics. Akerlof (1970) explicitly relates uncertainty with price and quality and suggests that “guarantee” by the suppliers can reduce the quality uncertainty by ensuring the customers an expected quality level. Quality certification can be used as a signal to provide that quality guarantee. The transaction costs of market exchanges increase as the information asymmetries between suppliers and customers increase (Williamson, 1985). Such transaction costs are reduced when suppliers signal the market that they possess certain desirable firm characteristics (Spence, 1973). King, Lenox, and Terlaak, (2005) argue that an ISO certification can serve as an effective signal of quality management.

Consistent with the predictions of the aforementioned theories, a good number of papers have documented strong positive effect of ISO certification on organizational and financial performance of a firm. Elmuti and Kathawala (1997) examine two manufacturing plants in a large U.S. organization and provide evidence that the plant with ISO 9000 certification experiences higher worker productivity than the non-ISO certified plant. Heras, Casadesus and

Dick (2002) find that ISO certified Spanish firms outperform non-certified firms. As mentioned in the introduction, CMK (2005) investigate financial performance from 1987 to 1997 of all publicly traded ISO 9000 certified manufacturing firms in the United States. They find that, three years after their first certification, ISO 9000-certified firms experience positive and significant abnormal financial performance. Sharma (2005) studies Singaporean firms and finds that ISO 9000 certification is strongly associated with improved operating efficiency, sales growth and overall financial performance. Lafuente, Bayo-Moriones and Garcia-Cestona (2009) also establish statistically significant positive relationship between ISO certification and firm performance in terms of ROA and labor productivity among Spanish manufacturing firms. Similar findings are also found by Naveh and Marcus (2005), Terlaak and King (2006a,b), King and Lenox (2001).

By contrary, quite a few papers provide empirical evidence that shows an insignificant relation between ISO certification and firm performance. Beattie and Sohal (1999) survey 50 Australian companies and a majority of those companies could not identify any strategic benefits or any substantial improvement in their profitability following certification. Shams-ur (2001) finds no performance difference among small- and medium-sized enterprises (SMEs) with or without ISO 9000 certification in Australia. Yamada (2001) surveys certified Japanese companies who could not identify the effects of ISO 9000 certification on estimated expenses and profits of large companies listed on the Tokyo Stock Exchange. Quazi, Hong and Meng (2002) reveal that ISO 9000 certification could not bring about significant positive improvements on quality management practices and quality related measures of companies in Singapore. Surveys among Australian and Dutch firms by Terziovski, Samson and Dow (1997) and Singels, Ruel and Water (2001), respectively, provide no significant link between ISO 9000 and

organizational performance. Wayhan, Kirche and Khumawala (2002) and Lima, Resende and Hasenclever (2000) also document no financial benefits from ISO certification in among U.S. and Brazilian firms, respectively.

Overall, the empirical evidence on the relation between ISO certification and firm performance is inconclusive. This inconclusiveness may be due to the aforementioned limitations of the existing literature. One such limitation is that most of the existing studies are single country or single-industry studies. Our study examines over 40,000 mostly small or medium sized enterprises (SMEs) from 33 industries in 119 countries. We control for various firm characteristics and country-level variables. The comprehensiveness of our study overcomes some of the limitations and provides concrete evidence on the relation between ISO certification and firm performance.

We hypothesize a positive effect of ISO certification on firm performance. An ISO certification may be a requirement for winning a contract or may enhance the chances of winning. Such certification may help a firm gain acceptability and credibility among external stakeholders, such as customers and creditors. ISO certifications related to environmental policy and corporate social responsibility (CSR), i.e. the ISO 14000, may help enhance a firm's customer base among those who are conscious about the environments and CSR. As a result of these, sales of ISO certified firms are expected to grow faster than non-certified firms. Similarly, ISO certification may help boost the labor productivity of a firm resulting from continuous quality monitoring and measurement. Certified firms follow well-defined and documented procedures to ensure appropriate corrective action is taken whenever defects occur, leading to relatively lower defect rates. Better training programs in ISO certified firms also make it more efficient and effective to transfer knowledge, procedures and technology to new employees.

HYPOTHESIS 1: *ISO-certified firms exhibit higher sales growth than non-certified firms*

HYPOTHESIS 2: *ISO-certified firms exhibit higher labor productivity than non-certified firms*

Svensson (2005) show that with few exceptions, countries with low income levels are more likely to be the most corrupt. The level of corruption faced by a firm is a key impediment to firm growth (Beck, Demirguc-Kunt and Maksimovic, 2005). The level of information asymmetry between business insiders and the external stakeholders increases as the level corruption increases (Monteil et al., 2012). The effectiveness of an ISO certification as a signal of quality management diminishes as corruption level increases. In a highly corrupt business environment, outside stakeholders, especially customers, may choose to believe that even a third-party quality standard certificate can be bought with bribes, therefore discounting its value. To obtain an ISO certification, a firm is required to pass a third-party audit conducted by an audit organization or accredited certification agency who verifies whether the firm meets the requirements specified by the standard.¹⁵ In a corrupt business environment, these audit agencies can be bribed. Montiel, et al. (2012) show that corruption weakens the institutional context in which certification signals are transmitted.

HYPOTHESIS 3: *As the level of corruption increases, the signaling effect of ISO certification on firm growth decreases.*

Beck et al. (2005) show that improvements in institutional factors disproportionately benefit small firms. As discussed earlier, ISO certification is site-specific. A certified small firm is more likely to have only one operation site, whereas a certified large firm may have multiple

¹⁵ e.g. IRAM for Argentina, IANORQ for Angola, BSTI for Bangladesh, IBNORCA for Bolivia, BOBS for Botswana etc.

sites, some of which may not be certified. Hence, the link between ISO certification and firm performance is more direct in small firms than in large firms. Any positive effect of ISO certification on firm performance will be more pronounced in small firms than in large firms.

HYPOTHESIS 4: The effect of ISO certification on firm performance is more pronounced in small firms than in large firms.

4.3 Data

To test the above hypotheses, we employ the World Bank Enterprise Survey (WBES) data for the period between 2006 and 2011. The WBES was conducted in most of the countries of the world using standardized survey instruments in collecting firm-level data on the business environment from business owners and top managers. Country data are matched to a standard set of questions so that cross-country comparisons and analysis are possible. The main focus of the survey is to assess obstacles to business growth around the world. The growth obstacles examined in the survey include issues related to finance, corruption, infrastructure and labor, among others. Even though the survey lacks sufficient general information at firm level, it includes data on sales, number of employees, growth, and industry (two-digit ISIC codes). The survey also contains information on ownership, whether the firm exports, and firm background related information.

We start with all observations in the WBES database and proceed to delete firms that do not have either “Yes (1)” or “No (2)” answer to the ISO certification question (original WBES data item: *b8*). We also delete firms with no sales values for (t-1) or (t-3) (data items: *d2* and *n3*) or employee data for year (t-1) (data item: *l1*), with t being the survey year. However, we do not delete observations for lack of any other variables. Our final sample consists of 44,614 unique

firms in 119 countries over the period between 2006 and 2011.¹⁶ Among these, 8,853 sample firms (about 20% of the total) have at least one type of ISO certification (ISO 9000, 9002 or 14000). The dataset includes firms from 33 industries classified by two-digit ISIC codes. For our multivariate regressions, we control for a country's GDP, GDP per capita, GDP growth rate, and inflation. We obtain these macro variables from the *World Development Indicators (WDI)* database of the World Bank. Country level variables are the averages over the period from year (t-3) to (t-1). We also control for country-level corruption using two alternative measures: Control of Corruption from *Worldwide Governance Indicators (WGI)* database from the World Bank and *Corruption Perceptions Index (CPI)* from Transparency International.

The WBES database allows us to construct two financial performance measures, sales growth rate and labor productivity. As shown in the introduction section, sales growth and labor productivity directly measure the ISO-claimed benefit No. 2 and No. 4, respectively.¹⁷ We measure sales growth and labor productivity as follows:

$$Sales\ Growth = [\log (sales_{t-1}) - \log (sales_{t-3})] / 2 \quad (1)$$

$$Productivity = \log (sales_{t-1} / employees_{t-1}) \quad (2)$$

where t is the year the survey was conducted. Fishman and Svensson (2007) employ the same sales growth measure for Ugandan firms.¹⁸

¹⁶ Every firm has a unique identifier code, the "idstd" code.

¹⁷ Benefit (2): Enhanced customer satisfaction - International Standards help improve quality, enhance customer satisfaction and increase sales; and Benefit (4): Increased market share - International Standards help increase productivity and competitive advantage.

¹⁸ A better measure for sales growth rate would be the average of the sales growth rate from (t-3) to (t-2) and the sales growth rate from (t-2) to (t-1). However, sales figure for year (t-2) is not available in the survey data.

Table A5 in the Appendix presents the number of ISO-certified and non-ISO certified sample firms by country and by survey year. As shown in Table A5, the World Bank conducted more than one surveys in only a handful of countries over 2006-2011.¹⁹

Summary statistics of the relevant firm level and country level variables for the full sample are presented in Table 4.1. Our performance measures are *Sales Growth* and *Labor Productivity* (dependent variables), as defined in equations (1) and (2), respectively. To account for outliers of the dependent variables, we truncate the full sample from top and bottom one percent. Our main explanatory variable, *ISO*, is an indicator variable of ISO certification that equals one if the firm is ISO-certified, and zero otherwise. As shown in Table 4.1, about 20 percent of the surveyed firms are ISO-certified.

For firm level control variables, we include *Firm Size*, *Firm Age*, *Corruption*, *Exporter*, *Government* and *Foreign*. Small firms are likely to be more constrained by various obstacles than large firms (Schiffer and Weder, 2001; Beck et al., 2005). As shown in Table 4.1, the mean and median of the number of full time employees are 103 and 21, respectively. This indicates that the sample size distribution is right skewed with extreme large firms. In fact, the largest firm in our sample has a total number of 21,955 full time employees. Evans (1987) and Dunne, Roberts and Samuelson (1988) find that younger firms grow faster than older firms. The average firm in the sample has been in business for 20 years, with the oldest being in business for 340 years.²⁰ Beck et al. (2005) show that government-owned firms have lower growth rates and therefore, we control for government ownership. In our sample, around 1.5% sample firms have government ownership. Beck et al. (2005) also find that exporters grow faster than non-

¹⁹ Angola, Argentina, Bolivia, Botswana, Bulgaria, Chile, Columbia, Democratic Republic of Congo, Ecuador, El Salvador, Guatemala, Honduras, Mali, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela.

²⁰ For curiosity reason, we look it up and it is a food company in Jamaica.

exporter and that foreign ownership has a positive effect on sales growth. Therefore, we control for both. In our sample, about 24% of the firms in the sample are exporters and 12% have foreign ownership. Macro factors also influence firm level performance (Beck et al., 2005). Therefore, we also control for country level GDP, GDP per capita, GDP growth rate and inflation. GDP per capita has a mean value of US\$ 2,792 and varies widely across the countries surveyed, ranging from the low of US\$ 89 in Democratic Republic of Congo to the high of US\$ 20,751 in Bahamas. The mean inflation is 8% and also varies widely across countries, from the low of 0% to the high of 55%. Because sales values are reported in local currencies, inflation must be controlled for.

We obtain the level of corruption a firm faces from a WBES question asking business owners to rate how much corruption affects the current business operations (WBES data item: *j30f*). WBES employs the following scale: No Obstacle=0, Minor Obstacle=1, Moderate Obstacle=2, Major Obstacle=3, Very Severe Obstacle=4.²¹ As shown in Table 4.1, the average firm in our sample faces a 1.85 corruption level, close to a moderate level.

To control for country level corruption, we use two alternative measures: *Control of Corruption* from World Bank's WGI database and *Corruption Perception Index (CPI Score)* from Transparency International. The World Bank estimates country level corruption control worldwide and ranks countries on the scales of -2.5 (weak control) to +2.5 (strong control) governance performance. *CPI Score* is country-level corruption score based on how corrupt a country's public sector is perceived and takes the values between 10 (highly clean) and 0 (highly corrupt). In our sample of 119 countries, the mean values of *control of corruption* and *CPI Score* are -0.40 and 3.3, respectively.

²¹ In surveys prior to 2002, the WBES uses a 1-5 scale on firm growth obstacles (Beck et al., 2005).

Table 4.1: Summary statistics and univariate tests

Panel A presents summary statistics for the full sample. Panel B presents univariate tests for the differences of relevant variables between ISO and Non-ISO firms. Panel C presents the correlation matrix. *N* is the number of firms, except for country level macro variables which is the number of countries studied. *ISO* is a dummy variable equal to 1 if a firm is ISO-certified, and 0 otherwise. *Sales Growth* is the average of the difference of log [sales (t-1)] and log [sales (t-3)], where t is the year the survey was conducted. *Productivity* is log [sales (t-1) / employees (t-1)]. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Corruption* is survey response as specified in the survey questionnaire. It takes values between 0 and 4, where 0 indicates no corruption obstacle and 4 a very severe corruption obstacle. *Firm Size* is the log of the number of permanent, full-time employees at the end of year (t-1). *Firm Age* is the log of firm's actual age. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if a firm has foreign ownership stakes, and 0 otherwise. *Control of Corruption* is country-level corruption estimate of *Worldwide Governance Indicators (WGI)* and ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance. *CPI Score* is country-level corruption score of *Corruption Perceptions Index (CPI)* and ranges between 10 (highly clean) and 0 (highly corrupt). *GDP* is the log of GDP in current millions of U.S. dollars. *GDP per capita* is the real GDP per capita in U.S. dollars. *GDP Growth* is the growth rate of GDP. *Inflation* is log difference of consumer price indices. All country level variables are the average over year (t-3), (t-2) and (t-1). Detailed variable definitions and sources are given in Table A6 in the Appendix.

Panel A: Summary statistics						
	<i>N</i>	Mean	Median	<i>SD</i>	Min	Max
ISO	44,067	0.2022	0	0.4017	0	1
Sales Growth	44,067	0.1525	0.1116	0.317	-0.989	1.4492
Productivity	44,067	13.687	13.2559	2.6692	8.0064	20.4992
Exporter	44,067	0.2388	0	0.4264	0	1
Corruption	42,894	1.8459	2	1.4989	0	4
Firm Size	44,067	103.2053	21	445.2873	5	21,955
Firm Age	43,638	19.5377	14	16.9972	3	340
Government	43,338	0.0148	0	0.1206	0	1
Foreign	44,067	0.1197	0	0.3246	0	1
Control of Corruption	119	-0.3982	-0.4694	0.6833	-1.6215	1.377
CPI Score	119	3.3027	2.9	1.265	1.65	7.15
GDP (log)	119	24.0286	23.8959	1.8648	19.1365	27.4254
GDP per Capita (US\$)	119	2,791.5369	1,748.8569	2,790.713	88.6378	20,750.7797
GDP Growth (Real)	119	0.0529	0.0539	0.0307	-0.0615	0.2345
Inflation	119	0.0771	0.0696	0.0524	0.0024	0.5491

Panel B: ISO versus non-ISO firms: univariate tests								
	ISO Firms			Non-ISO Firms			Difference	
	N	Mean	Median	N	Mean	Median	Mean	Median
Sales Growth	8,911	0.1654	0.1192	35,156	0.1492	0.1116	0.0162***	0.0076***
Productivity	8,911	13.9057	13.41	35,156	13.6316	13.2046	0.2741***	0.2054***
Exporter	8,911	0.4892	0	35,156	0.1754	0	0.3138***	0***
Corruption	8,694	1.8427	2	34,200	1.8467	2	-0.004	0
Firm Size	8,911	261.6468	80	35,156	63.0451	17	198.6017***	63***
Firm Age	8,814	24.6803	17	34,824	18.236	14	6.4443***	3***
Government	8,753	0.0328	0	34,585	0.0102	0	0.0226***	0***
Foreign	8,911	0.2611	0	35,156	0.0839	0	0.1772***	0***

T-tests and non-parametric tests are used to test mean and median differences, respectively. *, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Panel C: Correlation matrix of variables														
	ISO	Sales Growth	Productivity	Exporter	Corruption	Firm Size	Firm Age	Govt.	Foreign	Con. Corr.	CPI Score	GDP	GDP per Capita	GDP Growth
Sales Growth	0.0205***													
Productivity	0.0413***	-0.0069												
Exporter	0.2956***	0.0010	-0.0022											
Corruption	-0.0011	-0.0176***	-0.1146***	0.0237***										
Firm Size	0.3783***	0.0207***	0.0280***	0.3972***	0.0252***									
Firm Age	0.1494***	-0.0900***	-0.0152***	0.1616***	0.0616***	0.3089***								
Government	0.0752***	0.0047	0.0376***	0.0375***	-0.0289***	0.1213***	0.0720***							
Foreign	0.2193***	0.0078*	0.0608***	0.1921***	-0.0257***	0.2310***	0.0155***	0.0504***						
Cont. of Corr.	0.1084***	0.0082*	-0.0513***	0.1275***	-0.1624***	0.0858***	0.1595***	-0.0272***	0.0534***					
CPI Score	0.0939***	-0.0116**	-0.0198***	0.1267***	-0.1528***	0.0903***	0.1505***	-0.0363***	0.0416***	0.9585***				
GDP	0.0908***	-0.0027	-0.0047	0.0917***	0.1059***	0.1912***	0.1455***	-0.0336***	-0.0944***	0.0443***	0.0361***			
GDP/Capita	0.1324***	-0.0004	-0.1754***	0.1633***	-0.0050	0.1430***	0.2038***	-0.0294***	0.0195***	0.6205***	0.6178***	0.3504***		
GDP Growth	-0.0276***	0.1383***	0.0113**	-0.0513***	-0.0328***	-0.0361***	-0.1473***	0.0526***	-0.0428***	-0.3349***	-0.3209***	0.0191***	-0.2749	
Inflation	-0.0678***	0.0858***	0.0990***	-0.0978***	-0.0551***	-0.0654***	-0.1098***	0.0163***	-0.0145***	-0.3500***	-0.3235***	-0.0692***	-0.2295	0.3407***

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

4.4 Methodologies and results

This section presents the methodologies and empirical results of our study. We first conduct univariate tests for the differences of the relevant variables between ISO-certified firms and non-certified firms. We then employ multivariate regressions to examine the effect of ISO certification on sales growth and labor productivity for the full sample. We further partition the full sample into various subsamples to investigate ISO certification as it relates to corruption and firm size. Finally we present some robustness tests at the end of this section. The first partition is to divide the full sample into five subsamples according the five levels of corruption from the WBES data: no corruption (0), minor corruption (1), moderate corruption (2), major corruption (3), and severe corruption (4). This partition allows us to examine the signaling effects of ISO certification when firms operate in different levels of corrupt business environments. The second partition is to divide the full sample into three subsamples according to the number of full-time, permanent employees a firm has at the end of year (t-1): small (<50), medium (50-500), and large (>500). This partition allows us to investigate the relation between ISO certification and firm performance across different firm sizes. Lastly, as a robustness check, we conduct endogeneity tests for the effect of ISO certification on firm sales growth and labor productivity.

4.4.1 Univariate tests and correlation matrix

Panel B of Table 4.1 presents univariate test results for the relevant variables between ISO-certified and non-certified firms. T-test and non-parametric test are used to test the mean and median differences, respectively. The results show that ISO-certified firms exhibit significantly higher sales growth and higher labor productivity than non-certified firms. These results provide preliminary evidence that firms benefit from ISO certification. The results

further show that ISO-certified firms are bigger in size and have been in business longer than non-certified firms. ISO firms are also more likely to be exporters and have foreign and government ownership.

Panel C of Table 4.1 reports the correlation matrix for the relevant variables in our study. Our primary interests are the correlation coefficients of the performance measures and the *ISO* dummy. *ISO* is significantly positively correlated with both sales growth and productivity, consistent with the univariate test results in Panel B. ISO firms are also positively linked to firm size, firm age, government dummy, exporter dummy and foreign ownership dummy. Firm-level corruption is significantly negatively correlated with both of our performance measures, as expected. Firm size has significantly positive correlation and firm age has significant negative correlation with both performance measures. Foreign ownership is positively correlated with sales growth and productivity whereas government ownership is positively correlated with productivity only. At the macro level, sales growth and productivity are positively correlated with a country's GDP growth and inflation rate.

4.4.2 ISO certification and firm performance: full sample analyses

The univariate test results in Table 4.2 (Panel B) show that ISO-certified firms exhibit significantly higher sales growth and higher labor productivity than the non-certified firms. However, these results have not taken into account other factors that might also affect sales growth and productivity. We employ multivariate regressions to control for firm characteristics, industry effects, year effects and country level macro variables. The regression equations take the forms:

$$\begin{aligned}
\text{Sales Growth} = & \alpha + \beta_1 \text{ISO} + \beta_2 \text{Corruption} + \beta_3 \text{Firm Size} + \beta_4 \text{Firm Age} + \beta_5 \text{Government} \\
& + \beta_6 \text{Foreign} + \beta_7 \text{Control of Corruption} + \beta_8 \text{GDP} + \beta_9 \text{GDP/Capita} \\
& + \beta_{10} \text{GDP Growth} + \beta_{11} \text{Inflation} + \varepsilon
\end{aligned} \tag{3}$$

$$\begin{aligned}
\text{Productivity} = & \alpha + \beta_1 \text{ISO} + \beta_2 \text{Corruption} + \beta_3 \text{Firm Size} + \beta_4 \text{Firm Age} + \beta_5 \text{Government} \\
& + \beta_6 \text{Foreign} + \beta_7 \text{Control of Corruption} + \beta_8 \text{GDP} + \beta_9 \text{GDP/Capita} \\
& + \beta_{10} \text{GDP Growth} + \beta_{11} \text{Inflation} + \varepsilon
\end{aligned} \tag{4}$$

The dependent variables are *Sales Growth* and *Productivity* as defined in equations (1) and (2), respectively. Our main explanatory variable is *ISO*, an indicator variable that takes the value of 1 if a firm is ISO-certified and zero otherwise. Our main hypothesis is that ISO certification has positive effect on firm performance. Therefore, we expect the coefficient of *ISO*, β_1 , to be positive and significant.

The main multivariate regression results are presented in Table 4.2. Columns (1), (2) and (3) use *Sales Growth* as dependent variable while columns (4), (5) and (6) use *Productivity* as dependent variable. As hypothesized, the coefficients of *ISO*, β_1 , the main focus of our study, are positive and significant at the 1% level across all specifications in Table 4.2. This provides strong evidence that firms around the world benefit from ISO certifications in terms of higher sales growth and higher labor productivity. This conclusion holds after controlling for firm size, firm age, and whether or not a firm has foreign and government ownership. Industry effects and year effects are also controlled for, as well as country level macroeconomic variables, namely GDP, GDP growth, GDP per capita, and inflation. We also control for country level corruption by using two different measures, the World Bank's *Control of Corruption* and Transparency International's *CPI Score*.

In addition to the main result, we observe that firm-level corruption (*Corruption*) has significant negative effect on labor productivity. *Firm size* measured by number of employees is positively related to both sales growth and productivity. *Firm age* is negatively related to *Sales Growth*, indicating younger firms grow faster. Having government and foreign ownership in the firm has significant positive effect on labor productivity, but neither affects sales growth in a significant way. The coefficients for *Control of Corruption* and *CPI Score* are both significant and positive in columns (2), (3), (5) and (6). This indicates that firms benefit from effective country-level corruption controls.

4.4.3 The benefits of ISO certification in a corrupt environment

We next investigate whether the benefits from ISO certification documented in Table 4.2 vary across different levels of corruption business environment a firm faces. Information asymmetry between managers and external stakeholders (e.g. customers) is high when firms operate in high corrupt business environment (Beck et al., 2005; Montiel et al., 2012). Montiel et al. (2012) argue that ISO certification can serve as a signal of quality product and management to external stakeholders in corrupt business environment. They further argue that the signaling effect on firm certification decision (i.e. the value of certification) depends on the types (policy-specific vs systematic) and levels of corruption. The WBES uses five ratings to gauge corruption obstacles faced by a firm. This provides an excellent setting to test the signaling hypothesis that the effectiveness of ISO certification as a signal is a function of the level of corruption obstacles in the business environment. We re-estimate the multivariate regression equations (3) and (4) across five levels of corruption obstacles. The results for firm growth (*Sales Growth*) as dependent variable are presented in Table 4.3 and the labor productivity results (*Productivity*) are presented in Table 4.4.

Table 4.2: ISO certification and firm performance: multivariate regressions

Sales Growth, the dependent variable in specification (1) and (2), is the average of the difference of log [sales (t-1)] and log [sales (t-3)], where t is the year the survey was conducted. *Productivity*, the dependent variable in specification (3) and (4), is log [sales (t-1) / employees (t-1)]. *ISO* is a dummy variable equal to 1 if a firm is ISO-certified, and 0 otherwise. *Corruption* is survey response as specified in the survey questionnaire. It takes values between 0 and 4, where 0 indicates no corruption obstacle and 4 a very severe corruption obstacle. *Firm Size* is the log of the number of permanent, full-time employees at the end of year (t-1). *Firm Age* is the log of firm's actual age. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if a firm has foreign ownership stakes, and 0 otherwise. *Control of Corruption* is country-level corruption estimate of *Worldwide Governance Indicators (WGI)* and ranges from approximately -2.5 (weak) to 2.5 (strong). *CPI Score* is country-level *Corruption Perceptions Index (CPI)* and ranges between 10 (highly clean) and 0 (highly corrupt). *GDP* is the log of GDP in current millions of U.S. dollars. *GDP per capita* is the real GDP per capita in U.S. dollars. *GDP Growth* is the growth rate of GDP. *Inflation* is log difference of consumer price indices. All country level variables are the average over year (t-3), (t-2) and (t-1). White's heteroscedasticity consistent standard errors are presented in the parentheses (White, 1980). Detailed variable definitions and sources are given in Table A6 in the Appendix.

	Dependent variable: Sales Growth			Dependent variable: Productivity		
	(1)	(2)	(3)	(4)	(5)	(6)
ISO	0.0143*** (0.004)	0.0131*** (0.004)	0.0142*** (0.004)	0.3493*** (0.033)	0.3065*** (0.032)	0.3337*** (0.032)
Corruption		0.0010 (0.001)	-0.0007 (0.001)		-0.1548*** (0.008)	-0.1462*** (0.008)
Firm Size	0.0108*** (0.001)	0.0112*** (0.001)	0.0108*** (0.001)	0.0586*** (0.010)	0.0720*** (0.010)	0.0589*** (0.010)
Firm Age	-0.0388*** (0.002)	-0.0400*** (0.002)	-0.0391*** (0.002)	-0.0020 (0.018)	-0.0232 (0.017)	-0.0167 (0.017)
Government	-0.0052 (0.013)	-0.0030 (0.013)	-0.0055 (0.013)	0.7692*** (0.103)	0.7657*** (0.099)	0.8385*** (0.098)
Foreign	-0.0060 (0.005)	-0.0073 (0.005)	-0.0060 (0.005)	0.3327*** (0.039)	0.2775*** (0.037)	0.3132*** (0.037)
Control of Corruption		0.0378*** (0.003)			1.1223*** (0.026)	
CPI Score			0.0083*** (0.002)			0.7049*** (0.013)
GDP	-0.0032*** (0.001)	0.0011 (0.001)	-0.0011 (0.001)	0.2717*** (0.008)	0.4162*** (0.008)	0.4385*** (0.008)
GDP/Capita	0.0127*** (0.002)	-0.0043* (0.002)	0.0057*** (0.002)	-0.9750*** (0.014)	-1.5053*** (0.018)	-1.5800*** (0.017)
GDP Growth	0.0098*** (0.001)	0.0113*** (0.001)	0.0103*** (0.001)	-0.0308*** (0.005)	0.0140*** (0.005)	0.0154*** (0.005)
Inflation	0.0031*** (0.000)	0.0036*** (0.000)	0.0033*** (0.000)	0.0086*** (0.003)	0.0210*** (0.002)	0.0197*** (0.002)

(continued)

Table 4.2-Continued

	Dependent variable: Sales Growth			Dependent variable: Productivity		
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-0.2274*** (0.044)	-0.1744*** (0.044)	-0.1374*** (0.026)	13.1362*** (0.351)	14.8730*** (0.342)	13.8433*** (0.198)
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-Square	0.0638	0.0668	0.0641	0.1573	0.2119	0.2274
No of Firms	41,553	41,553	41,544	41,553	41,553	41,544
No of Countries	119	119	119	119	119	119

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

The results in Table 4.3 show that in low to moderate corrupt business environment (columns (1)-(3)), certified firms exhibit significant higher sales growth than non-certified firms. However, when firms operate in “Major” or “Very Severe” corrupt business environment (columns (4) and (5)), the effect of ISO certification on sales growth becomes insignificant. The results in Table 4.4 show that ISO-certified firms exhibit significantly higher labor productivity than non-certified firms, regardless of the level of corruption obstacles.

The above seemingly contradictory results concerning firm sales growth and labor productivity are not inconsistent with the signaling hypothesis of ISO certification. Information asymmetry between insiders and external stakeholders affects sales more than it does labor productivity. Labor productivity is more of a function of internal control. ISO certification brings good management practices and internal control that benefit labor productivity. On the other hand, sales growth depends more heavily on the confidence of external stakeholders (i.e. customers) concerning the firm’s desirable but unobservable characteristic. When the business environment is highly corrupt, ISO certification as a signal becomes ineffective as external stakeholders discount the validity of the ISO certification itself.

Table 4.3: Firm sales benefits from ISO certification at different levels of corruption

The dependent variable is firm growth (*Sales Growth*) and is the average of the difference of log [sales (t-1)] and log [sales (t-3)], where t is the year the survey was conducted. *Corruption* is survey response as specified in the survey questionnaire. It takes values between 0 and 4, where 0 indicates no corruption obstacle and 4 a very severe corruption obstacle. *ISO* is a dummy variable equal to 1 if a firm is ISO-certified, and 0 otherwise. *Firm Size* is the log of the number of permanent, full-time employees at the end of year (t-1). *Firm Age* is the log of firm's actual age. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if a firm has foreign ownership stakes, and 0 otherwise. *Control of Corruption* is country-level corruption estimate of *Worldwide Governance Indicators (WGI)* and ranges from approximately -2.5 (weak) to 2.5 (strong). *GDP* is the log of GDP in current millions of U.S. dollars. *GDP per capita* is the real GDP per capita in U.S. dollars. *GDP Growth* is the growth rate of GDP. *Inflation* is log difference of consumer price indices. All country level variables are the average over year (t-3), (t-2) and (t-1). White's heteroscedasticity consistent standard errors are presented in the parentheses (White, 1980). Detailed variable definitions and sources are given in Table A6 in the Appendix.

Corruption as a Growth Obstacle	0 None (1)	1 Minor (2)	2 Moderate (3)	3 Major (4)	4 Very Severe (5)
ISO	0.0126* (0.008)	0.0200** (0.010)	0.0268*** (0.010)	0.0054 (0.009)	0.0052 (0.010)
Firm Size	0.0066*** (0.002)	0.0061** (0.003)	0.0116*** (0.003)	0.0133*** (0.003)	0.0192*** (0.003)
Firm Age	-0.0342*** (0.004)	-0.0261*** (0.005)	-0.0532*** (0.005)	-0.0458*** (0.005)	-0.0527*** (0.005)
Government	-0.0133 (0.020)	-0.0086 (0.031)	-0.0279 (0.032)	0.0734** (0.032)	-0.0101 (0.039)
Foreign	-0.0194** (0.009)	-0.0137 (0.011)	-0.0119 (0.011)	0.0125 (0.011)	-0.0007 (0.012)
Control of Corruption	0.0219*** (0.006)	0.0308*** (0.007)	0.0434*** (0.008)	0.0497*** (0.008)	0.0335*** (0.009)
GDP	-0.0040** (0.002)	-0.0016 (0.003)	0.0012 (0.003)	0.0034 (0.003)	0.0086*** (0.003)
GDP per Capita	0.0003 (0.004)	0.0017 (0.005)	0.0010 (0.006)	-0.0098* (0.005)	-0.0159*** (0.006)
GDP Growth	0.0106*** (0.001)	0.0076*** (0.001)	0.0113*** (0.001)	0.0127*** (0.001)	0.0121*** (0.002)
Inflation	0.0016*** (0.000)	0.0062*** (0.001)	0.0062*** (0.001)	0.0062*** (0.001)	0.0028*** (0.001)
Intercept	0.1776* (0.099)	-0.1089 (0.108)	-0.1675* (0.091)	-0.3481*** (0.090)	-0.4217*** (0.127)
Industry Dummies	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes
Adj. R-Square	0.0378	0.0495	0.0743	0.0938	0.1404
No of Firms	12,035	6,600	6,816	8,342	7,760
No of Countries	119	119	119	119	119

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 4.4: Labor productivity and ISO certification at different levels of corruption

The dependent variable is labor productivity (*Productivity*) and is $\log[\text{sales}(t-1) / \text{employees}(t-1)]$, where t is the year the survey was conducted. *Corruption* is survey response as specified in the survey questionnaire. It takes values between 0 and 4, where 0 indicates no corruption obstacle and 4 a very severe corruption obstacle. *ISO* is a dummy variable equal to 1 if a firm is ISO-certified, and 0 otherwise. *Firm Size* is the log of the number of permanent, full-time employees at the end of year ($t-1$). *Firm Age* is the log of firm's actual age. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if a firm has foreign ownership stakes, and 0 otherwise. *Control of Corruption* is country-level corruption estimate of *Worldwide Governance Indicators (WGI)* and ranges from approximately -2.5 (weak) to 2.5 (strong). *GDP* is the log of GDP in current millions of U.S. dollars. *GDP per capita* is the real GDP per capita in U.S. dollars. *GDP Growth* is the growth rate of GDP. *Inflation* is log difference of consumer price indices. All country level variables are the average over year ($t-3$), ($t-2$) and ($t-1$). White's heteroscedasticity consistent standard errors are presented in the parentheses (White, 1980). Detailed variable definitions and sources are given in Table A6 in the Appendix.

Corruption as a Growth Obstacle	0 None (1)	1 Minor (2)	2 Moderate (3)	3 Major (4)	4 Very Severe (5)
ISO	0.2600*** (0.060)	0.3941*** (0.077)	0.4129*** (0.077)	0.2226*** (0.072)	0.2854*** (0.072)
Firm Size	0.1219*** (0.019)	0.0708*** (0.025)	0.0691*** (0.024)	0.0485** (0.022)	0.0343 (0.023)
Firm Age	-0.0451 (0.032)	0.0010 (0.042)	-0.0180 (0.042)	0.0255 (0.039)	-0.0301 (0.040)
Government	1.0952*** (0.158)	0.9274*** (0.243)	0.5159** (0.251)	0.2356 (0.243)	0.4417 (0.280)
Foreign	0.1524** (0.068)	0.3274*** (0.086)	0.1020 (0.089)	0.5244*** (0.087)	0.3620*** (0.089)
Control of Corruption	1.5533*** (0.046)	1.3613*** (0.059)	0.9895*** (0.065)	0.8321*** (0.059)	0.7835*** (0.063)
GDP	0.5998*** (0.015)	0.4601*** (0.020)	0.3384*** (0.021)	0.2867*** (0.020)	0.2530*** (0.020)
GDP per Capita	-1.8751*** (0.032)	-1.6208*** (0.043)	-1.3321*** (0.045)	-1.2125*** (0.041)	-1.2274*** (0.045)
GDP Growth	0.0531*** (0.010)	0.0006 (0.011)	-0.0445*** (0.010)	0.0175* (0.010)	0.0353*** (0.011)
Inflation	0.0202*** (0.004)	0.0402*** (0.007)	0.0248*** (0.007)	0.0220*** (0.006)	0.0198*** (0.006)
Intercept	11.0460*** (0.778)	14.4975*** (0.855)	15.5417*** (0.713)	16.1641*** (0.692)	17.4191*** (0.921)
Industry Dummies	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes
Adj. R-Square	0.2915	0.2343	0.1713	0.1627	0.1968
No of Firms	12,035	6,600	6,816	8,342	7,760
No of Countries	119	119	119	119	119

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

4.4.4 A closer look at the size effect: a robustness check

The WBES Survey classifies a firm as small if it has 5-50 employees, medium 51-500 employees, and large more than 500 employees. Following Beck et al. (2005), we use these firm size classifications. Beck et al. (2005) show that small firms face higher level of growth obstacles than large firms. They also show that small firms benefit more than large firms when growth obstacles are lowered. ISO certification reduces information asymmetry and institutes quality management practices at the firm level. Therefore, we argue that small firms benefit more from ISO certification than large firms, *ceteris paribus*.

Another potentially important size-related issue is that ISO certification is site-specific, rather than an umbrella seal of approval for the whole company. In empirical research concerning the effect of ISO certification on firm financial performance, it is only appropriate to directly link ISO certification to the performance of the certified site. Small firms with 50 or less employees are more likely to have only one operation site. Large firms with 500 or more employees are more likely to have multiple operation sites, some of which may be located abroad or not ISO-certified. As discussed in the introduction section, CMK (2005) has this limitation in that their sample contains some very large firms that may indeed be multinationals with multiple operation sites.

As a robustness check for the two issues mentioned above, we divide the full sample into three subsamples by size: 29,600 small firms, 11,614 medium firms and 1,470 large firms. We then re-estimate the multivariate regression equations (3) and (4) and report the results in Table 4.5. The dependent variables for columns (1)-(3) and (4)-(6) are firm growth (*Sales Growth*) and labor productivity (*Productivity*), respectively. Results in columns (1)-(3) show that ISO-certified firms exhibit higher firm growth than non-certified firms. However, only small firms

benefits significantly from ISO certification. ISO reduces information asymmetry between insiders and external stakeholders and signals quality management practice. Small firms benefit most from the resulted mitigation of information asymmetry. Another explanation is that small firms with 50 or less employees are less likely to have multiple operation sites. The effect of ISO certification on firm growth is more direct in small firms as large firms may have multiple operation sites some of which may not be certified.

Columns (4)-(6) of Table 4.5 show that labor productivity benefits significantly from ISO certification, regardless firm size. As discussed earlier, labor productivity is more of a function of internal quality control and is less affected by information asymmetry between insiders and external stakeholders.

4.4.5 Endogeneity test: a robustness check

The multivariate OLS regression models in Tables 4.2-4.5 assume ISO certification to be exogenous to firm performance, i.e. ISO certification affects firm performance, not the other way around. However, ISO certification may also be endogenous to firm performance, i.e. there is a reverse causality between firm performance and the decision to adopt ISO certification. Since the adoption of ISO certification is mostly voluntary (as opposed to regulatory requirement), a firm takes into account many factors when deciding whether or not to pursue an ISO certification. One such factor could be its relative performance and organizational quality. It is possible that poor performing firms do not pursue ISO certification because they do not believe they will pass the required third-party audit. On the other hand, it could be possible that only relatively good performing firms with sound organizations and procedures pursue ISO certifications. For already good performing firms, an ISO certification may be regarded as another “feather on the hat”. Therefore, a situation may arise that poor performing firms are

Table 4.5: ISO certification and firm performance: the size effects

Sales Growth, the dependent variable in specification (1), (2), and (3), is the average of the difference of log [sales (t-1)] and log [sales (t-3)], where t is the year the survey was conducted. *Productivity*, the dependent variable in specification (4), (5), and (6), is log [sales (t-1) / employees (t-1)]. A firm is defined as *Small* if it has between 5 and 50 employees, *Medium* if it has between 51 and 500 employees, and *Large* if it has more than 500 employees. White's heteroscedasticity consistent standard errors are presented in the parentheses (White, 1980). Detailed variable definitions and sources are given in Table A6 in the Appendix.

	Dependent variable: Sales Growth			Dependent variable: Productivity		
	Large	Medium	Small	Large	Medium	Small
	(1)	(2)	(3)	(4)	(5)	(6)
ISO	0.0075 (0.017)	0.0034 (0.006)	0.0288*** (0.006)	0.4349*** (0.150)	0.4111*** (0.050)	0.2854*** (0.046)
Firm Age	-0.0156 (0.010)	-0.0407*** (0.004)	-0.0386*** (0.003)	0.4336*** (0.088)	0.0631** (0.032)	-0.0464** (0.021)
Government	-0.0554* (0.032)	-0.0076 (0.016)	0.0121 (0.022)	0.9128*** (0.284)	0.8591*** (0.139)	0.3159* (0.174)
Foreign	0.0177 (0.017)	0.0028 (0.007)	-0.0102 (0.007)	0.4973** (0.147)	0.3319*** (0.058)	0.3465*** (0.054)
GDP	-0.0018 (0.006)	-0.0050*** (0.002)	-0.0022* (0.001)	0.3260*** (0.055)	0.2654*** (0.016)	0.2824*** (0.009)
GDP per Capita	0.0020 (0.012)	0.0253*** (0.003)	0.0097*** (0.002)	-0.9671*** (0.103)	-1.0141*** (0.029)	-0.9683*** (0.016)
GDP Growth	0.0090*** (0.004)	0.0104*** (0.001)	0.0097*** (0.001)	-0.1410*** (0.032)	-0.0874*** (0.010)	-0.0166*** (0.005)
Inflation	0.0109*** (0.003)	0.0065*** (0.001)	0.0024*** (0.000)	0.1033*** (0.023)	0.0540*** (0.007)	-0.0019 (0.003)
Intercept	0.1523 (0.168)	0.0179 (0.092)	-0.2423** (0.051)	10.6587*** (1.466)	12.3056*** (0.780)	13.2588*** (0.396)
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-Square	0.0604	0.0610	0.0700	0.1899	0.1758	0.1597
No of Firms	1,470	11,614	29,600	1,470	11,614	29,600
No of Countries	119	119	119	119	119	119

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

clustered in the non-ISO group, while good performing firms are clustered in the ISO-certified group.

To address the above potential endogeneity problem, we employ the 2-stage least square (2SLS) method. A challenge for the 2SLS method is to identify an observable instrumental variable (IV) that influences the endogenous variable but not the dependent variable, as many of the observable variables affect both. We follow a common practice to identify potential IV's from the Pearson correlation coefficient matrix. As shown in Table 4.1 (Panel C), indeed, most of the other variables are correlated with both the endogenous (*ISO*) and dependent (*Sales growth* and *Labor productivity*) variables. An indicator variable, *Exporter*, is the exception. *Exporter*, equal to one if the firm exports and zero otherwise, is highly correlated with a firm's decision to adopt ISO certification with a correlation coefficient of 0.296 ($p\text{-value} < 0.000$), but not significantly correlated with neither *Sales Growth* nor *Labor Productivity* with the correlation coefficients of 0.001 and -0.002, respectively. Consistent with the signaling hypothesis, exporting firms are more likely to adopt ISO certifications to signal overseas customers that their products and processes are of certain quality. However, among the more than 44,000 surveyed firms from 119 countries in our sample, firm performance, measured by sales growth and labor productivity, is not correlated with a firm's exporting status. Therefore, we employ *Exporter* as our IV to test the potential endogeneity problem of *ISO*. Our two-equation 2SLS system is as follows:

First stage:

$$\begin{aligned} ISO = & \alpha + \beta_1 \mathbf{Exporter} + \beta_2 \mathbf{Firm Size} + \beta_3 \mathbf{Firm Age} \\ & + \beta_4 \mathbf{Government} + \beta_5 \mathbf{Foreign} + \mathbf{Controls} + \varepsilon \end{aligned} \quad (5)$$

Second stage:

$$\begin{aligned} \text{Firm performance} = & \alpha + \beta_1 \widehat{ISO} + \beta_2 \text{Firm Size} + \beta_3 \text{Firm Age} \\ & + \beta_4 \text{Government} + \beta_5 \text{Foreign} + \text{Controls} + \varepsilon \end{aligned} \quad (6)$$

Controls in equations (5) and (6) is a vector of control variables, including country level GDP, GDP per capita, GDP growth, inflation, industry effects and year effects. In the first stage, equation (5) is estimated using IV, *Exporter*, to predict the value of *ISO*. The predicted ISO value from the first stage, i.e. \widehat{ISO} , is then used to estimate firm performance in equation (6), the second stage. The results are presented in Table 4.6 for sales growth as dependent variable and Table 4.7 for labor productivity as dependent variable.

As shown in the second stage results in Table 4.6 and Table 4.7, the coefficients of the predicted value of ISO from the first stage, \widehat{ISO} , are both positive and significant at the 1% level. This indicates that after controlling for the potential endogenous choice of ISO certification by firms, ISO certification has a positive and significant effect on firm performance measured by sales growth and labor productivity.

4.5 Conclusions

Using a unique survey dataset, we investigate the firm level benefits of ISO certification for 44,614 sample firms in 119 countries over the period 2006 – 2011. We then examine whether or not the benefits from ISO certification vary when firms operate in different levels of corrupt business environment.

Table 4.6: Effect of ISO certification on firm sales growth: endogeneity test

This table presents our 2SLS test results of the potential endogeneity of ISO, instrumented by *Exporter*, an indicator variable equal to 1 if a firm exports and zero otherwise. The 1st stage and 2nd stage results are presented in columns (1) and (2), respectively. *ISO*, the dependent variable in the 1st stage, is a dummy variable equal to 1 if a firm is ISO-certified, and 0 otherwise. *ISO* in the 2nd stage is the predicted value of ISO from the 1st stage. *Sales Growth*, the dependent variable in the 2nd stage, is the average of the difference of log [sales (t-1)] and log [sales (t-3)], where t is the year the survey was conducted. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Firm Size* is the log of the number of permanent, full-time employees at the end of year (t-1). *Firm Age* is the log of firm's actual age. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if a firm has foreign ownership stakes, and 0 otherwise. *GDP* is the log of GDP in current millions of U.S. dollars. *GDP per capita* is the real GDP per capita in U.S. dollars. *GDP Growth* is the growth rate of GDP. *Inflation* is log difference of consumer price indices. All country level variables are the average over year (t-3), (t-2) and (t-1). White's heteroscedasticity consistent standard errors are presented in the parentheses (White, 1980). Detailed variable definitions and sources are given in Table A6 in the Appendix.

	(1) Dependent variable: ISO		(2) Dependent variable: Sales Growth
First stage		Second stage	
Exporter	0.1962*** (0.005)	<i>ISO</i>	0.0898*** (0.020)
Firm Size	0.0182*** (0.001)	Firm Size	-0.0002 (0.001)
Firm Age	0.0347*** (0.003)	Firm Age	-0.0384*** (0.002)
Government	0.1305*** (0.015)	Government	-0.0061 (0.013)
Foreign	0.1764*** (0.006)	Foreign	-0.0087 (0.006)
GDP	0.0031*** (0.001)	GDP	-0.0026*** (0.001)
GDP per Capita	0.0313*** (0.002)	GDP per Capita	0.0105*** (0.002)
GDP Growth	0.0050*** (0.001)	GDP Growth	0.0134*** (0.001)
Inflation	-0.0019*** (0.000)	Inflation	0.0027*** (0.000)
Intercept	-0.5484*** (0.052)	Intercept	0.0680 (0.046)
Industry dummies	Yes	Industry dummies	Yes
Year dummies	Yes	Year dummies	Yes
Adj. R-Square	0.1783	Adj. R-Square	0.0348
No of Firms	41,553	No of Firms	41,553
No of Countries	119	No of Countries	119

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 4.7: Effect of ISO certification on firm labor productivity: endogeneity test

This table presents our 2SLS test results of the potential endogeneity of ISO, instrumented by *Exporter*, an indicator variable equal to 1 if a firm exports and zero otherwise. The 1st stage and 2nd stage results are presented in columns (1) and (2), respectively. *ISO*, the dependent variable in the 1st stage, is a dummy variable equal to 1 if a firm is ISO-certified, and 0 otherwise. *ISO* in the 2nd stage is the predicted value of ISO from the 1st stage. *Productivity*, the dependent variable in the 2nd stage, is $\log [\text{sales (t-1)} / \text{employees (t-1)}]$, where t is the year the survey was conducted. *Exporter* is a dummy variable equal to 1 if firm exports, and 0 otherwise. *Firm Size* is the log of the number of permanent, full-time employees at the end of year (t-1). *Firm Age* is the log of firm's actual age. *Government* is a dummy variable equal to 1 if firm is owned by government/state, and 0 otherwise. *Foreign* is a dummy variable equal to 1 if a firm has foreign ownership stakes, and 0 otherwise. *GDP* is the log of GDP in current millions of U.S. dollars. *GDP per capita* is the real GDP per capita in U.S. dollars. *GDP Growth* is the growth rate of GDP. *Inflation* is log difference of consumer price indices. All country level variables are the average over year (t-3), (t-2) and (t-1). White's heteroscedasticity consistent standard errors are presented in the parentheses (White, 1980). Detailed variable definitions and sources are given in Table A6 in the Appendix.

	(1) Dependent variable: ISO	Second stage	(2) Dependent variable: Productivity
First stage			
Exporter	0.1443*** (0.005)	<i>ISO</i>	1.3273*** (0.228)
Firm Size	0.0770*** (0.001)	Firm Size	-0.0351 (0.023)
Firm Age	0.0119*** (0.003)	Firm Age	0.0339* (0.018)
Government	0.0868*** (0.015)	Government	0.5034*** (0.106)
Foreign	0.1415*** (0.006)	Foreign	0.2516*** (0.054)
GDP	0.0011 (0.001)	GDP	0.2165*** (0.008)
GDP per Capita	0.0158*** (0.002)	GDP per Capita	-0.7916*** (0.014)
GDP Growth	0.0030*** (0.001)	GDP Growth	-0.0844*** (0.005)
Inflation	-0.0016*** (0.000)	Inflation	0.0196*** (0.003)
Intercept	-0.3054*** (0.050)	Intercept	11.5902*** (0.364)
Industry dummies	Yes	Industry dummies	Yes
Year dummies	Yes	Year dummies	Yes
Adj. R-Square	0.2114	Adj. R-Square	0.1049
No of Firms	41,553	No of Firms	41,553
No of Countries	119	No of Countries	119

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

We find that ISO-certified firms exhibit significantly higher firm growth than non-certified firms. We also document that ISO certification leads to higher labor productivity. The results are robust after controlling for relevant firm characteristics, industry effects, year effects and country level macro-economic variables and corruption indexes. Our results are also robust after controlling for potential endogeneity of a firm's decision to adopt ISO certification.

We also find that the positive link between ISO certification and labor productivity remains highly significant regardless the corruption levels, consistent with internal improvement theory. However, the positive link between sales growth and ISO certification becomes insignificant when a firm operates in a highly corrupt business environment. In corrupt business environments, information asymmetries between business insiders and external stakeholders are high. External stakeholders (i.e. customers) discount the credibility of the ISO certifications, hence reducing the signaling value of such certifications.

Our results also provide evidence that smaller firms benefit more in sales growth from ISO certification relative to medium and large firms. Overall, the findings in this study are consistent with the predictions by the established theories in the academic literature concerning the possible sources of gains following ISO certification: the internal improvement theory, the external improvement theory and the market signaling theory.

Chapter 5

Conclusions and Summary

5.1 Conclusions and Summary

The three essays of this dissertation broadly discuss the firm-level financial constraints, corruption, and privatization and their relation to firm performance and growth across the globe.

In my first dissertation essay, I find that disclosure can be a double-edge sword. On the one hand, audited firms exhibit significantly lower level of financial constraints than unaudited firms. To gain access to credit, firms are generally required to have their financial statements audited and verified by external auditors. Auditing reduces information asymmetries between insiders and external stakeholders (suppliers, customers, and creditors, etc.), resulting in lower costs of market exchanges (including lower cost of capital) (Williamsons, 1985). On the other hand, audited firms encounter higher level of corruption obstacles than unaudited firms. Corrupt officials can gain access to the disclosed financial information to extract bribes from the firm.

In the second essay, I find that the *de novo* private firms experience significantly higher financial, corruption, and legal obstacles than the privatized firms. I also find that the privatized firms significantly underperform the *de novo* firms. In addition, I find ownership concentration and foreign ownership have an overall moderating effect on firm-level growth constraints.

In my final essay, I find that ISO-certified firms exhibit higher sales growth and higher labor productivity than non-certified firms. I also find that the positive link between ISO certification and labor productivity remains highly significant regardless the corruption levels. This is consistent with the internal improvement theory of international quality standards since labor productivity is mostly a function of internal control. However, when firms operate in a

highly corrupt business environment, the positive effect of ISO certification on sales growth becomes insignificant, consistent with the market signaling theory. In a highly corrupt business environment, information asymmetry between insiders and external stakeholders (i.e. customers) is severe, diminishing the signaling effect of ISO certification on sales.

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Appendix

Table A1: Audited and unaudited firms by country

Country	Year	Total	Audited	Unaudited
Afghanistan	2008	178	86	92
Albania	2007	108	39	69
Angola	2006, 2010	435	58	377
Antigua & Barbuda	2010	127	64	63
Argentina	2006, 2010	1,517	1,130	387
Armenia	2009	175	39	136
Azerbaijan	2009	285	114	171
Bahamas	2010	117	72	45
Bangladesh	2007	1,431	575	856
Barbados	2010	111	89	22
Belarus	2008	169	77	92
Belize	2010	145	99	46
Benin	2009	72	45	27
Bhutan	2009	221	120	101
Bolivia	2006, 2010	526	418	108
Bosnia & Herzegovina	2009	225	127	98
Botswana	2006, 2010	440	308	132
Brazil	2009	1,397	308	1,089
Bulgaria	2007, 2009	1,050	452	598
Burkina Faso	2009	284	159	125
Burundi	2006	214	33	181
Cameroon	2009	304	209	95
Cape Verde	2009	73	31	42
Central African Rep.	2011	106	62	44
Chad	2009	110	65	45
Chile*	2006, 2010	1,583	798	785
Colombia	2006, 2010	1,555	924	631
Congo	2009	37	27	10
Costa Rica	2010	321	196	125

Country	Year	Total	Audited	Unaudited
Croatia	2007	457	217	240
Czech Rep. *	2009	161	88	73
Dem. Rep. of Congo	2006, 2010	421	84	337
Dominica	2010	138	67	71
Dominican Rep.	2010	275	253	22
Ecuador	2006, 2010	722	404	318
El Salvador	2006, 2010	747	690	57
Eritrea	2009	83	65	18
Estonia*	2009	226	180	46
Fiji	2009	62	51	11
Gabon	2009	79	21	58
Gambia	2006	116	38	78
Georgia	2008	195	87	108
Ghana	2007	435	175	260
Grenada	2010	133	81	52
Guatemala	2006, 2010	792	496	296
Guinea	2006	178	13	165
Guinea Bissau	2006	123	8	115
Guyana	2010	122	115	7
Honduras	2006, 2010	520	320	200
Hungary*	2009	250	195	55
Indonesia	2009	1,078	161	917
Iraq	2011	618	239	379
Ivory Coast	2009	236	73	163
Jamaica	2010	233	175	58
Kazakhstan	2009	338	96	242
Kenya	2007	574	432	142
Kosovo	2009	206	35	171
Kyrgyz Rep.	2009	154	65	89

Table A1-Continued

Country	Year	Total	Audited	Unaudited
Lao PDR	2009	343	25	318
Latvia	2009	200	150	50
Lesotho	2009	106	77	29
Liberia	2009	109	24	85
Lithuania	2009	188	67	121
Macedonia	2009	237	157	80
Madagascar	2009	284	156	128
Malawi	2009	100	76	24
Mali	2007, 2010	493	142	351
Mauritania	2006	194	31	163
Mauritius	2009	275	187	88
Mexico*	2006, 2010	2,222	1,030	1,192
Micronesia	2009	49	10	39
Moldova	2009	304	73	231
Mongolia	2009	334	275	59
Montenegro	2009	64	38	26
Mozambique	2007	426	167	259
Namibia	2006	234	202	32
Nepal	2009	305	265	40
Nicaragua	2006, 2010	589	282	307
Niger	2009	78	49	29
Nigeria	2007	1,640	270	1,370
Pakistan	2007	789	235	554
Panama	2006, 2010	458	365	93
Paraguay	2006, 2010	581	191	390
Peru	2006, 2010	1,329	488	841
Philippines	2009	984	914	70
Poland*	2009	219	96	123
Romania	2009	253	94	159
Russia	2009	580	298	282
Rwanda	2006	156	66	90

Country	Year	Total	Audited	Unaudited
Samoa	2009	58	38	20
Senegal	2007	410	112	298
Serbia	2009	292	191	101
Sierra Leon	2009	143	41	102
Slovak Rep. *	2009	151	85	66
Slovenia*	2009	222	112	110
South Africa	2007	812	638	174
Sri Lanka	2011	486	328	158
St. Kitts & Nevis	2010	109	74	35
St. Lucia	2010	139	65	74
St. Vincent	2010	126	100	26
Suriname	2010	152	79	73
Swaziland	2006	199	160	39
Tajikistan	2008	207	55	152
Tanzania	2006	358	202	156
Timor Leste	2009	70	16	54
Togo	2009	79	45	34
Tonga	2009	110	60	50
Trinidad & Tobago	2010	290	235	55
Turkey*	2008	604	395	209
Uganda	2006	500	243	257
Ukraine	2008	431	147	284
Uruguay	2006, 2010	741	304	437
Uzbekistan	2008	317	148	169
Vanuatu	2009	68	35	33
Venezuela	2006, 2010	411	315	96
Vietnam	2009	835	315	520
Yemen	2010	242	73	169
Zambia	2007	404	294	110
Zimbabwe	2011	123	79	44

* OECD country; ** Sources of Data: WBES = World Bank Enterprise

Table A2: Variables and sources

Variable	Definition - t is the survey year	Original Source
<i>Audit</i>	Dummy variable that takes on the value 1 if firm's annual financial statement was checked and certified by an external auditor (WBES data item 'k21'), 0 otherwise.	WBES
<i>Financial</i>	"How problematic is access to finance for the current operations of a business?" No Obstacle =0, Minor Obstacle =1, Moderate Obstacle=2, Major Obstacle =3, and Very Severe Obstacle=4 (WBES data item 'k30').	WBES
<i>Corruption</i>	"How problematic is corruption for the current operations of a business?" No Obstacle =0, Minor Obstacle =1, Moderate Obstacle=2, Major Obstacle =3, and Very Severe Obstacle=4 (WBES data item 'j30f').	WBES
<i>Sales Growth</i>	The average of the difference of log sales in year (t-1) (WBES data item 'd2') and log sales in year (t-3) (WBES data item 'n3').	WBES
<i>Employment Growth</i>	The average of the difference of log employees in year (t-1) (WBES data item 'l1') and log employees in year (t-3) (WBES data item 'l3').	WBES
<i>Firm Size</i>	Logarithm of firm's sales at the end of year (t-1) (WBES data item 'd2').	WBES
<i>Firm Age</i>	Logarithm of a firm's actual age, age=survey year – firm founding year (WBES data item 'b5').	WBES
<i>Experience</i>	"How many years of experience working in this sector does the top manager have?" (WBES data item 'b7')	WBES
<i>Exporter</i>	Dummy variable equal to 1 if firm exports (using WBES data item s'd3a', 'd3b' and 'd3c'), 0 otherwise.	WBES
<i>Government</i>	Dummy variable that takes on the value 1 if firm is owned by government/state (WBES data item 'b2c'), 0 otherwise.	WBES
<i>Foreign</i>	Dummy variable equal to 1 if foreign company or individual has a financial stake in the ownership of the firm (WBES data item 'b2b'), 0 otherwise.	WBES
<i>Apply for Loan</i>	Dummy variable equal to 1 if the firm applied for loans or lines of credit in the year (t-1) (WBES data item 'k16'), and 0 otherwise.	WBES
<i>Priv</i>	Private credit by deposit money banks to GDP, calculated using the following deflation method: $\{(0.5) \cdot [F_t/P_{et} + F_{t-1}/P_{et-1}]\} / [GDP_t/P_{at}]$ where F is credit to the private sector, P_e is end-of period CPI, and P_a is average annual CPI.	IFS

(continued)

Table A2-Continued

Variable	Definition - t is the survey year	Original Source
<i>Corruption Control</i>	Country-level corruption estimate of <i>WGI</i> and ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance	WGI
<i>CPI Score</i>	Country-level corruption score based on how corrupt a country's public sector is perceived to be according to <i>Corruption Perceptions Index (CPI)</i> and ranges between 10 (highly clean) and 0 (highly corrupt).	TI
<i>Rule of Law</i>	Country-level estimate of <i>WGI</i> for rule of society, contract enforcement, property rights, the police, the courts, crime and violence. It ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance	WGI
<i>Government Effectiveness</i>	Country-level estimate of <i>WGI</i> for the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. It ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance	WGI
<i>Private Bureau</i>	Dummy variable, which takes the value 1 if a private credit bureau operates in the country by the end of year (t-1), and 0 otherwise. A private bureau is defined as a private commercial firm that maintains a database on the standing of borrowers in the financial system, and its primary role is to facilitate exchange of information amongst banks and financial institutions.	Djankov, McLiesh, and Shleifer (2007)
<i>Public Credit Registry</i>	Dummy variable, which takes the value 1 if a public credit registry operates in the country by the end of year (t-1), and 0 otherwise. A public registry is defined as a database owned by public authorities (the central bank or banking supervisory authority) that collects information on the standing of borrowers in financial system and makes available to financial institutions.	Djankov, McLiesh, and Shleifer (2007)
<i>GDP</i>	Logarithm of GDP in current US\$, the average over year (t-3), (t-2) and (t-1).	WDI
<i>GDP per capita</i>	Real per capita in US\$, the average real GDP per capita over year (t-3), (t-2) and (t-1).	WDI
<i>GDP Growth</i>	Real growth rate of GDP, the average over year (t-3), (t-2) and (t-1).	WDI
<i>Inflation</i>	Log difference of consumer prices, the average over year (t-3), (t-2) and (t-1).	WDI
<i>Overdraft</i>	Dummy variable equal to 1 if firm has an overdraft facility at year t (WBES data item 'k7'), and 0 otherwise.	WBES
<i>Line of Credit</i>	Dummy variable equal to 1 if firm has a line of credit or loan from a financial institution at year t (WBES data item 'k8'), and 0 otherwise.	WBES

(continued)

Table A2-Continued

Variable	Definition - t is the survey year	Original Source
<i>Capital Expenditure</i>	Dummy variable equal to 1 if firm purchased fixed assets, such as machinery, vehicles, equipment, land or buildings at year (t-1), (WBES data item 'k4') and 0 otherwise.	WBES
<i>Legal</i>	"How problematic are courts for the current operations of a business?" No Obstacle =0, Minor Obstacle =1, Moderate Obstacle=2, Major Obstacle =3, and Very Severe Obstacle=4 (WBES data item 'h30').	WBES
<i>License</i>	"How problematic are business licensing and permits for the current operations of a business?" No Obstacle =0, Minor Obstacle =1, Moderate Obstacle=2, Major Obstacle =3, and Very Severe Obstacle=4 (WBES data item 'j30c').	WBES
<i>Labor</i>	"How problematic are labor regulations for the current operations of a business?" No Obstacle =0, Minor Obstacle =1, Moderate Obstacle=2, Major Obstacle =3, and Very Severe Obstacle=4 (WBES data item 'l30a').	WBES
<i>Customs</i>	"How problematic are customs and trade regulations for the current operations of a business?" No Obstacle =0, Minor Obstacle =1, Moderate Obstacle=2, Major Obstacle =3, and Very Severe Obstacle=4 (WBES data item 'd30b').	WBES

* *Sources of Data:* **WBES** = World Bank Enterprise Survey (WBES); **WDI** = World Development Indicators, World Bank; **WGI** = Worldwide Governance Indicators, World Bank; **TI** = Transparency International; **IFS** = International Financial Statistics.

Table A3: No. of *de novo* private firms and privatized former SOEs by country

Country	<i>de novo</i> Private Firms	Privatized Former SOEs
Albania	311	29
Armenia	501	208
Azerbaijan	611	127
Belarus	449	94
Bosnia	403	157
Bulgaria	432	99
Croatia	227	98
Czech Republic	501	69
Estonia	437	63
Macedonia	410	110
Georgia	351	200
Hungary	682	144
Kazakhstan	861	257
Kyrgyz	250	191
Latvia	348	69
Lithuania	376	100
Moldova	505	187
Montenegro	109	14
Poland	985	154
Romania	888	164
Russia	1,259	428
Serbia	461	148
Slovakia	366	72
Slovenia	355	133
Tajikistan	328	232
Ukraine	1,025	335
Uzbekistan	292	288
Total = 17,893	13,723	4,170

Table A4: Variable definitions and data sources

Variable	Definition - t is the survey year	Original Source
<i>Sales Growth</i>	The average of the difference of log sales in year (t-1) (WBES data item 'd2') and log sales in year (t-3) (WBES data item 'n3').	WBES
<i>Employment Growth</i>	The average of the difference of log [employees (t-1)] (WBES data item 'l1') and log [employees (t-3)] (WBES data item 'l2').	WBES
<i>Productivity</i>	Log of the ratio of a firm's sales in year (t-1) (WBES data item 'd2') over its number of permanent, full-time employees at (t-1) (WBES data item 'l1').	WBES
<i>Financing</i>	"How problematic is access to finance for the current operations of a business?" No Obstacle =0, Minor Obstacle =1, Moderate Obstacle=2, Major Obstacle =3, and Very Severe Obstacle=4 (WBES data item 'k30').	WBES
<i>Corruption</i>	"How problematic is corruption for the current operations of a business?" No Obstacle =0, Minor Obstacle =1, Moderate Obstacle=2, Major Obstacle =3, and Very Severe Obstacle=4 (WBES data item 'j30f').	WBES
<i>Legal</i>	"How problematic are courts for the current operations of a business?" No Obstacle =0, Minor Obstacle =1, Moderate Obstacle=2, Major Obstacle =3, and Very Severe Obstacle=4 (WBES data item 'h30').	WBES
<i>Firm Size</i>	Logarithm of number of permanent, full-time employees at the end of year (t-1) (WBES data item 'l1').	WBES
<i>Firm Age</i>	Logarithm of a firm's actual age, age=survey year – firm founding year (WBES data item 'b5').	WBES
<i>Ownership</i>	Percentage of firm owned by the largest owner (WBES data item 'b3').	WBES
<i>Exporter</i>	Dummy variable equal to 1 if firm exports (using WBES data items 'd3a', 'd3b' and 'd3c'), 0 otherwise.	WBES
<i>Foreign</i>	Dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm (WBES data item 'b2b'), 0 otherwise.	WBES
<i>Control of Corruption</i>	Country-level corruption estimate of <i>WGI</i> and ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance.	WGI
<i>CPI Score</i>	Country-level corruption score based on how corrupt a country's public sector is perceived to be according to <i>Corruption Perceptions Index (CPI)</i> and ranges between 10 (highly clean) and 0 (highly corrupt).	TI

Table A4-Continued

Variable	Definition - t is the survey year	Original Source
<i>Priv</i>	Private credit by deposit money banks to GDP, calculated using the following deflation method: $\{(0.5) * [F_t/P_{et} + F_{t-1}/P_{et-1}]\} / [GDP_t/P_{at}]$ where F is credit to the private sector, P_e is end-of period CPI, and P_a is average annual CPI.	IFS
<i>Rule of Law</i>	Country-level estimate of <i>Worldwide Governance Indicators (WGI)</i> for rule of society, contract enforcement, property rights, the police, the courts, crime and violence. It ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance	WGI
<i>GDP</i>	GDP in current US\$, the average over year (t-3), (t-2) and (t-1).	WDI
<i>GDP per Capita</i>	Real per capita in US\$, the average real GDP per capita over year (t-3), (t-2) and (t-1).	WDI
<i>GDP Growth</i>	GDP growth rate, the average over year (t-3), (t-2) and (t-1).	WDI
<i>Inflation</i>	Log difference of consumer prices, the average over year (t-3), (t-2) and (t-1).	WDI

* *Sources of Data:* **WBES** = World Bank Enterprise Survey (WBES); **WDI** = World Development Indicators, World Bank; **WGI** = Worldwide Governance Indicators, World Bank; **TI** = Transparency International; **IFS** = International Financial Statistics.

Table A5: Number of ISO-certified and non-ISO firms by country

Country	Survey Year(s)	Total	ISO		Non-ISO	
			N	%	N	%
Afghanistan	2008	219	17	8%	202	92%
Albania	2007	105	28	27%	77	73%
Angola	2006, 2010	376	38	10%	338	90%
Antigua & Barbuda	2010	129	5	4%	124	96%
Argentina	2006, 2010	1515	501	33%	1014	67%
Armenia	2009	176	42	24%	134	76%
Azerbaijan	2009	265	61	23%	204	77%
Bahamas	2010	107	37	35%	70	65%
Bangladesh	2007	1408	199	14%	1209	86%
Barbados	2010	112	27	24%	85	76%
Belarus	2008	160	19	12%	141	88%
Belize	2010	145	4	3%	141	97%
Benin	2009	84	12	14%	72	86%
Bhutan	2009	214	18	8%	196	92%
Bolivia	2006, 2010	514	108	21%	406	79%
Bosnia & Herzegovina	2009	227	79	35%	148	65%
Botswana	2006, 2010	430	72	17%	358	83%
Brazil	2009	1147	221	19%	926	81%
Bulgaria	2007, 2009	1072	335	31%	737	69%
Burkina Faso	2009	279	53	19%	226	81%
Burundi	2006	214	14	7%	200	93%
Cameroon	2009	304	65	21%	239	79%
Cape Verde	2009	57	9	16%	48	84%
Central African Rep.	2011	100	36	36%	64	64%
Chad	2009	100	44	44%	56	56%
Chile	2006, 2010	1462	424	29%	1038	71%
Colombia	2006, 2010	1466	302	21%	1164	79%
Rep. of Congo	2009	35	9	26%	26	74%
Costa Rica	2010	304	54	18%	250	82%
Croatia	2007	461	138	30%	323	70%
Czech Rep.	2009	163	81	50%	82	50%
Dem. Rep. of Congo	2006, 2010	399	27	7%	372	93%
Dominica	2010	138	2	1%	136	99%
Dominican Rep.	2010	274	54	20%	220	80%
Ecuador	2006, 2010	699	160	23%	539	77%
El Salvador	2006, 2010	692	115	17%	577	83%
Eritrea	2009	95	11	12%	84	88%
Estonia	2009	225	63	28%	162	72%
Fiji	2009	60	7	12%	53	88%
Macedonia	2009	229	64	28%	165	72%
Gabon	2009	60	15	25%	45	75%

(continued)

Table A5-Continued

Country	Survey Year(s)	Total	ISO		Non-ISO	
			N	%	N	%
Gambia	2006	117	27	23%	90	77%
Georgia	2008	161	26	16%	135	84%
Ghana	2007	404	14	3%	390	97%
Grenada	2010	120	43	36%	77	64%
Guatemala	2006, 2010	775	112	14%	663	86%
Guinea	2006	172	9	5%	163	95%
Guinea-Bissau	2006	119	9	8%	110	92%
Guyana	2010	112	30	27%	82	73%
Honduras	2006, 2010	512	94	18%	418	82%
Hungary	2009	253	131	52%	122	48%
Indonesia	2009	945	68	7%	877	93%
Iraq	2011	670	16	2%	654	98%
Ivory Coast	2009	281	14	5%	267	95%
Jamaica	2010	241	62	26%	179	74%
Kazakhstan	2009	328	51	16%	277	84%
Kenya	2007	566	81	14%	485	86%
Kosovo	2009	205	25	12%	180	88%
Kyrgyz Rep.	2009	147	27	18%	120	82%
Lao PDR	2009	276	37	13%	239	87%
Latvia	2009	198	53	27%	145	73%
Lesotho	2009	98	32	33%	66	67%
Liberia	2009	102	3	3%	99	97%
Lithuania	2009	188	39	21%	149	79%
Madagascar	2009	271	27	10%	244	90%
Malawi	2009	96	30	31%	66	69%
Mali	2007, 2010	482	50	10%	432	90%
Mauritania	2006	196	11	6%	185	94%
Mauritius	2009	278	36	13%	242	87%
Mexico	2006, 2010	2261	579	26%	1682	74%
Micronesia	2009	39	1	3%	38	97%
Moldova	2009	302	33	11%	269	89%
Mongolia	2009	323	53	16%	270	84%
Montenegro	2009	60	12	20%	48	80%
Mozambique	2007	404	88	22%	316	78%
Namibia	2006	231	61	26%	170	74%
Nepal	2009	311	27	9%	284	91%
Nicaragua	2006, 2010	592	110	19%	482	81%
Niger	2009	89	9	10%	80	90%
Nigeria	2007	1637	124	8%	1513	92%
Pakistan	2007	796	134	17%	662	83%
Panama	2006, 2010	423	76	18%	347	82%

(continued)

Table A5-Continued

Country	Survey Year(s)	Total	ISO		Non-ISO	
			N	%	N	%
Paraguay	2006, 2010	475	40	8%	435	92%
Peru	2006, 2010	1298	290	22%	1008	78%
Philippines	2009	977	291	30%	686	70%
Poland	2009	238	59	25%	179	75%
Romania	2009	246	109	44%	137	56%
Russia	2009	573	117	20%	456	80%
Rwanda	2006	156	17	11%	139	89%
Samoa	2009	56	13	23%	43	77%
Senegal	2007	405	30	7%	375	93%
Serbia	2009	290	86	30%	204	70%
Sierra Leon	2009	132	20	15%	112	85%
Slovak Rep.	2009	154	62	40%	92	60%
Slovenia	2009	218	98	45%	120	55%
South Africa	2007	806	279	35%	527	65%
Sri Lanka	2011	500	77	15%	423	85%
St. Kitts & Nevis	2010	109	23	21%	86	79%
St. Lucia	2010	139	2	1%	137	99%
St. Vincent	2010	127	29	23%	98	77%
Suriname	2010	152	28	18%	124	82%
Swaziland	2006	205	51	25%	154	75%
Tajikistan	2008	163	23	14%	140	86%
Tanzania	2006	360	60	17%	300	83%
Timor Leste	2009	124	61	49%	63	51%
Togo	2009	76	15	20%	61	80%
Tonga	2009	96	18	19%	78	81%
Trinidad & Tobago	2010	283	50	18%	233	82%
Turkey	2008	572	283	49%	289	51%
Uganda	2006	499	70	14%	429	86%
Ukraine	2008	429	54	13%	375	87%
Uruguay	2006, 2010	747	135	18%	612	82%
Uzbekistan	2008	316	25	8%	291	92%
Vanuatu	2009	69	18	26%	51	74%
Venezuela	2006, 2010	414	67	16%	347	84%
Vietnam	2009	494	100	20%	394	80%
Yemen	2010	231	28	12%	203	88%
Zambia	2007	366	60	16%	306	84%
Zimbabwe	2011	117	31	26%	86	74%
Total		44,614	8,853	20%	35,761	80%

* Sources of Data: World Bank Enterprise Survey (WBES).

Table A6: Variables and sources

Variable	Definition - <i>t</i> is the survey year	Original Source
<i>ISO</i>	Dummy variable equal 1 if a firm is ISO certified, and 0 otherwise (WBES original data item 'b8')	WBES
<i>Sales Growth</i>	The Average of the difference of log sales in year (<i>t</i> -1) (WBES data item 'd2') and log sales in year (<i>t</i> -3) (WBES data item 'n3').	WBES
<i>Productivity</i>	Log of the ratio of a firm's sales in year (<i>t</i> -1) (WBES data item 'd2') over its number of permanent, full-time employees at (<i>t</i> -1) (WBES data item 'l1').	WBES
<i>Corruption</i>	"How problematic is corruption for the current operations of a business?" No Obstacle =0, Minor Obstacle =1, Moderate Obstacle=2, Major Obstacle =3, and Very Severe Obstacle=4 (WBES data item 'j30f').	WBES
<i>Exporter</i>	Dummy variable equal to 1 if firm exports (using WBES data item s'd3a', 'd3b' and 'd3c'), 0 otherwise.	WBES
<i>Firm Size</i>	Logarithm of number of permanent, full-time employees at the end of year (<i>t</i> -1) (WBES data item 'l1').	WBES
<i>Size</i>	A firm is defined as small if it has between 5 and 50 employees, medium-sized if it has between 51 and 500 employees, and large if it has more than 500 employees (WBES data item 'l1').	WBES
<i>Firm Age</i>	Logarithm of a firm's actual age, age=survey year – firm founding year (WBES data item 'b5').	WBES
<i>Government</i>	Dummy variable that takes on the value 1 if firm is owned by government/state (WBES data item 'b2c'), 0 otherwise.	
<i>Foreign</i>	Dummy variable equal to 1 if any foreign company or individual has a financial stake in the ownership of the firm (WBES data item 'b2b'), 0 otherwise.	WBES
<i>Control of Corruption</i>	Country-level corruption estimate of <i>Worldwide Governance Indicators (WGI)</i> and ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance	WGI
<i>CPI Score</i>	Country-level corruption score based on how corrupt a country's public sector is perceived to be according to <i>Corruption Perceptions Index (CPI)</i> and ranges between 10 (highly clean) and 0 (highly corrupt).	TI
<i>GDP</i>	GDP in current US\$, the average over year (<i>t</i> -3), (<i>t</i> -2) and (<i>t</i> -1).	WDI
<i>GDP per capita</i>	Real per capita in US\$, the average real GDP per capita over year (<i>t</i> -3), (<i>t</i> -2) and (<i>t</i> -1).	WDI
<i>Growth</i>	GDP growth rate, the average over year (<i>t</i> -3), (<i>t</i> -2) and (<i>t</i> -1).	WDI
<i>Inflation</i>	Log difference of consumer prices, the average over year (<i>t</i> -3), (<i>t</i> -2) and (<i>t</i> -1)	WDI

Sources of Data: **WDI** = World Development Indicators, the World Bank; **WBES** = World Bank Enterprise Survey (WBES); **WGI** = Worldwide Governance Indicators, the World Bank; **TI** = Transparency International.

Vita

Sk. Md. Barkat Ullah earned his Bachelor of Business Administration and Master of Business Administration degrees in Marketing from University of Dhaka, Bangladesh in 2002 and 2004, respectively. He received his second Master of Business Administration degree in International Finance in 2010 from Texas A&M International University. In 2010, he joined the doctoral program in International Business (Finance concentration) at The University of Texas at El Paso. His doctoral dissertation was supervised by Dr. Zuobao Wei. His dissertation, entitled “*Firm Growth around the World: Financial Constraints, Corruption, and Privatization*”, consists of three essays that are broadly related to firm-level financial constraints, corruption, and firm growth across the globe. He has currently two research papers under review (revise and resubmit) at high quality finance journals: one at *Journal of Banking and Finance* and the other at *Journal of Corporate Finance*. His research has been presented at the FMA annual meetings in 2012 (Atlanta) and 2013 (Chicago), ECCE-USB conference in 2013 (Cape Town), Privatization conference in 2013 (North Carolina), SWFA conference in 2014 (Dallas), and EFA annual meeting in 2014 (Pittsburgh). He has served as an ad-hoc reviewer of *Journal of Development Economics*. While pursuing his doctoral degree, he has taught various Finance and Economics courses at undergraduate level including Investments, Financial Analysis of Firm and Valuation, Principles of Economics-Macro and Micro. He will join Rhode Island College as an Assistant Professor of Finance in Fall 2014.

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