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RESEARCH ARTICLE

Government procurement contracts, external audit certification, and financing of small- and medium-sized enterprises

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Abstract Entrepreneurs worldwide often face obstacles in financing their businesses, hindering their ability to grow. Government procurement offers an opportunity to access lucrative contracts and benefit from a procurement auditing process that could enhance access to finance. Likewise, externally audited financial statements can enhance credibility and lessen financing hurdles. We examine whether government procurement contracts and external audit certifications jointly influence financing access and whether ownership, size, and firm age matter. We find that access to finance is more likely to be an obstacle to the operations of small- and medium-sized enterprises (SMEs) with government procurement contracts than those without such contracts, regardless of whether they seek external audit certification. Additionally, the effect of external audit certification on the likelihood of access to finance being an obstacle to SME operations reduces sharply with foreign ownership, size, and age for SMEs involved in government procurement. We also find that the impact of government procurement contracts reverses for SMEs in low- and lower-middle-income countries. Our findings have policy implications, especially with the growing implementation of affirmative action programs to promote the involvement of SMEs in government procurement.

Plain English Summary Obstacles to financing inhibit the growth of small- and medium-sized enterprises globally. SMEs must weigh the cost and benefits of seeking government procurement contracts to improve their cash flows and engaging external auditors to certify their financial statements. Our results show that SMEs with access to government procurement contracts are less likely to cite access to finance as an obstacle to their operations, but only in low- and lower-middle-income countries. External audit certification does not influence access to financing for SMEs. The principal implication of this study is that the opportunity for SMEs to access the public procurement system in developing countries reduces financing obstacles and thereby helps to facilitate growth.

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1 Introduction

Access to financing is frequently cited by entrepreneurs worldwide as an obstacle to creating and sustaining new ventures and growing what are initially privately owned small- and medium-sized enterprises (SMEs) into sustainable long-term businesses.[1] About half of SMEs globally struggle to access financing, and in developing countries about 40% of formal micro, small, and medium enterprises (MSMEs) have a financing gap estimated at $5.7 trillion (The World Bank, 2023).[2] Many of these firms are trapped in a vicious cycle of financing challenges and stagnant or declining growth. They lack the required collateral to access secured debt to enable investment in capital development, which, in turn, inhibits their ability to expand their businesses and generate sustainable cash flows, which then hinders access to short-term unsecured lending and potentially lucrative government procurement contracts (GPCs) that could provide growth opportunities. Additionally, as most SMEs are not subject to public accountability and mandatory external audit certification (EAC), they may not produce reliable financial statements, which exacerbates information asymmetry and, in turn, impedes access to financing. Breaking this cycle of self-reinforcing mechanisms is a challenge to policy makers, despite policy interventions to facilitate access to financing through lines of credit, credit guarantees, and public funding (Arráiz et al., 2014; Kumar, 2017; Martí & Quas, 2018; The World Bank, 2023).

In this study, we focus our attention on the influence of two crucial firm choices: the decision to participate in government procurement and to certify financial statements using an external auditor. We are motivated by contemporary studies that examine these two choices but relate them to different outcomes. Concerning the impact of government procurement on borrowing terms, Cohen et al. (2022) have recently proposed two competing views. One view is that government procurement has an inbuilt superior auditing mechanism that could substitute for scrutiny by lenders and reduce loan covenants and pricing provisions for large government customers relative to corporate customers. Another view is that it could, instead, taint the credibility of government customers and increase their borrowing costs if they fail to meet the contractual and regulatory requirements inherent in the auditing process, exposing them to penalties. These authors find evidence that supports the former view. Dhaliwal et al. (2016) investigate whether customer concentration exposes a firm to greater operational and financial risks and thus a high cost of equity. They find that firms with a higher concentration of government customers exhibit higher borrowing costs when compared with corporate customers. While these authors provide insights into government procurement auditing, the generalizability of their US-based study of large firms to SMEs and to countries with weak procurement mechanisms and financial reporting quality is unclear.

Another role of government procurement auditing relates to how it could influence the likelihood of firms engaging in external audit certification, the quality of financial reporting, and audit fees (Dao et al., 2023; Hope et al., 2021; Samuels, 2021). Others have linked this monitoring role with the quality of financial reporting practice (Samuels, 2021), suggesting that it could reduce information asymmetry and lead to increased transactional lending, which occurs when lending is based on the use of quantitative data, such as information from borrowers' balance sheets (Ferri et al., 2019). Samuels (2021) argues that government procurement auditing in the US is more comprehensive and detailed than financial audits conducted by external auditors. For example, US government procurement audits include scrutiny of a firm's business systems, management policies and procedures, recording and accounting systems, and compliance with

[1] See Kersten et al. (2017) for a review of the literature on SME financing.

[2] An elaborate body of research has documented how firm-specific barriers such as information opacity, inadequate guarantees, weak internal control and management systems, and low-quality financial reporting practices can hinder access to financing.

contractual provisions. Nonetheless, the unresolved question is whether government procurement audits substitute or complement external audit certification in determining access to financing, especially among SMEs and firms in countries with weak government procurement and enforcement systems. Understanding this connection is crucial, given the cost–benefit implications of external audits for small firms (Carey et al., 2000; Dedman et al., 2014; Hope et al., 2012) and the evidence that government procurement increases the likelihood of firms engaging in external audits (Hope et al., 2021).

We use firm-level cross-sectional data from the World Bank Enterprise Survey (WBES) spanning the period 2007 to 2021 to examine whether external audit certification influences the relationship between the decision to participate in government procurement contracts and the extent to which access to financing is perceived to be an obstacle to a firm's operations, and whether this influence varies with ownership structure, firm size, and organizational learning. Because some variables are not observable in several countries and years, our final sample comprises 102,031 firm-year observations. Our preferred estimator is the multi-equation seemingly unrelated mixed process estimator, as it mitigates endogeneity concerns—in our case, the correlation between unobservable variables that could influence access to financing, the decision to participate in government procurement contracts, or the choice to seek external audit certifications. Our results also reveal unique groupings of firms and predicted probability patterns when we interact the two variables with proxies for ownership structure, size, and organizational learning. We consistently observe that, compared with firms that secure government procurement contracts, those that do not have government procurement contracts exhibit higher probabilities of access to financing being an obstacle to their operations, regardless of whether they seek external audit certification. Furthermore, among firms with no government procurement contracts, we find that the effect of seeking external audit certifications on the probability of having no obstacle to financing rises sharply with increases in the proportion of foreign ownership but not for ownership concentration and female ownership.

Our paper contributes to the literature in four ways. First, we contribute to a scant literature that has examined the impact of government procurement contracts on bank financing (Cohen & Li, 2020; Cohen et al., 2022; Dhaliwal et al., 2016; Ngo & Susnjara, 2020) and trade credit (Xu & Dao, 2020). Studies that focus on bank financing have shown that lenders are less likely to scrutinize firms with government procurement contracts and are more likely to provide favorable terms of borrowing because government monitoring reduces information asymmetry. A limitation of this literature is the focus on large or listed firms drawn from the United States, a country with sophisticated financial markets and reporting practices. Our study provides a cross-country and SME perspective with a higher fraction of firms from developing countries, and we focus on financing access perceptions rather than the amount borrowed. We show that government procurement contracts have the opposite effect on firms from high- and low-income countries, indicating that the setting of a study matters.

Second, we extend a strand of literature that has explored the impact of external auditing on SMEs' access to financing (e.g., Allee & Yohn, 2009; Baylis et al., 2017; Briozzo & Albanese, 2020; Palazuelos et al., 2018). These studies have argued that external audit certification enhances the credibility of financial statements produced by SMEs thereby reducing information asymmetry and increasing access to financing. However, the evidence is inconclusive, and some authors have recently called for research that explores the correlation between audit choices and other firm characteristics (Dedman et al., 2014; Lisowsky & Minnis, 2020). Thus, our third contribution relates to recent studies that have linked government procurement contracts with external audit certifications (Dao et al., 2023; Hope et al., 2021). These studies demonstrate that government monitoring incentives influence external audit certification (Hope et al., 2021) and that firms with government procurement contracts, when compared to those without, pay higher audit fees (Dao et al., 2023). In contrast to these studies, we examine whether the two variables influence perceptions about finance access obstacles separately or in combination. We are not aware of any study that has examined these relationships.

Finally, we contribute to several streams of literature that have associated financing constraints with ownership (Aristei & Gallo, 2016; Asiedu et al., 2013; Beck et al., 2006; Chundakkadan &

Sasidharan, 2022; Corten et al., 2017; Hansen & Rand, 2014; Hope et al., 2011; Mertzanis, 2017; Ongena & Popov, 2016; Seema et al., 2021), firm size (Beck et al., 2006, 2008; Berger & Udell, 1998; Gregory et al., 2005), and organizational learning (Corten et al., 2015; Cumming et al., 2019; Veronica et al., 2020). These studies document mixed findings. For example, some studies report that female-owned firms experience lending discrimination and are more credit-constrained than male-owned firms, while others find insignificant differences. Unlike these studies, we explore the influence of ownership, firm size, and organizational learning on the relationship between government procurement contracts, external audit certification, and access to financing.

The rest of the paper is structured as follows; Sect. 2 provides a literature review and presents the hypotheses generated for the study. Section 3 describes the methodology, data sources, and definition of the variables employed in the study. Section 4 discusses the empirical results, while Sect. 5 discusses the robustness results. Section 6 culminates with a discussion of key findings and provides the conclusions.

2 Literature review and hypothesis development

2.1 Government procurement, external audit, and access to financing

2.1.1 Government procurement and access to financing

Government procurement—i.e., the acquisition by government of goods and services from the private sector—has recently attracted research attention owing to public expenditure increases across developed and developing countries (Cohen et al., 2022; Samuels, 2021). Government procurement averaged 12% of global GDP in 2018, representing about $11 trillion out of the total GDP of approximately $90 trillion (Bosio & Djankov, 2020).[3] Although the government procurement share of GDP does not vary significantly across countries, it differs substantially within the group of middle-income countries, ranging from 6% in Sri Lanka to 28% in Botswana. Despite the potential business and growth opportunities afforded by government procurement contracts, SMEs' access to them has remained very low, causing various governments to implement affirmative action to level the playing field and encourage SME participation. However, evidence suggests that these interventions have not increased SMEs' access to government contracts, and many studies have linked low participation with the quality of the procurement process (Bosio et al., 2022; Hoekman & Taş, 2022; Loader, 2015) and with access to, and the cost of, financing (Bates & Robb, 2013; Bates & Williams, 1996; Bates et al., 2018).

More broadly, a group of recent studies has examined whether firms that rely heavily on government procurement achieve better outcomes when compared to those that focus more on corporate customers (Cohen & Li, 2020; Cohen et al., 2022; Dhaliwal et al., 2016; Maksimov et al., 2017; Samuels, 2021). For instance, although focusing on large U.S. government customers, Cohen et al. (2022) examine whether participation in government contracts influences the terms of loan contracts. On the one hand, they argue that because government procurement encompasses a rigorous monitoring process that could reduce operational risk and foster compliance with regulations, government customers can realize more favorable loan contracts than corporate customers, as this process overlaps with creditors' scrutiny. On the other hand, they also contend that government contracts can be risky, contain stringent performance conditions, and be subject to more scrutiny than private-sector contracts, all of which could lead to the imposition of harsh penalties and damage credibility. Samuels (2021) relates government monitoring incentives to financial reporting transparency, finding that the quality of external reports produced by firms that do business with governments improves the first time they win a contract. This suggests that government contracts can facilitate transactional lending. Xu and Dao (2020) find that US firms with government contracts have smaller proportions of trade credit and are more likely to use internal or cheaper external sources of financing, as they exhibit less operational risk and better firm performance. Furthermore, firms that procure government contracts are more likely to take part in government initiatives fostering entrepreneurship—in the form of tax advantages and government support—that in turn reduce the risk faced by SMEs

[3] https://blogs.worldbank.org/developmenttalk/how-large-public-procurement.

so that banks are more likely to provide credit (Moro et al., 2020). Government contracts can also promote networking with government officials, which can promote the use of bank loans (Le & Nguyen, 2009).

Another stream of research indicates that the quality of government procurement systems influences the extent to which firms engage with them. For example, Ghossein et al. (2018) explore the relationship between the quality of government procurement systems and private sector business outcomes by combining data from the WBES with data from the World Bank's Benchmarking Public Procurement project. They find that firms in economies with good public procurement systems are more likely to engage in innovation, research and development, international certification, and to adopt foreign technology. The link between the quality of public procurement systems and the rate of firm participation and corruption levels is investigated by Knack et al. (2019) using data from the WBES combined with data from PEFA (Public Expenditure and Financial Accountability) assessments of procurement systems.[4] They find that procurement system quality is positively associated with firms' reported participation in procurement markets, and negatively associated with kickbacks paid by firms to obtain contracts.

Research into the impact of government procurement systems identifies improved access to financing as an explanatory factor that helps firms to achieve scale economies, a key challenge for improved financial performance and SME growth (Bassi et al., 2022). In a study of financially constrained US firms, Hebous and Zimmerman (2021) finds that increased government demand enables higher levels of capital investment by facilitating access to external financing. A study by Hoekman and Sanfilippo (2020) analyzes data from nineteen sub-Saharan African countries and finds that participation in government procurement is positively associated with different measures of firm performance, especially for SMEs. Fadic (2020) uses a feature in Ecuador's public procurement law that awards contracts to SMEs using a lottery and finds that winners of government contracts report higher revenues and fixed assets than firms that do not win. The study points to reduced credit constraints as a possible factor since government contracts can be used as collateral to qualify for loans. Using a dataset of government procurement tenders in Brazil, Ferraz et al. (2015) find that winning a government contract increases employment growth, consistent with explanations that such firms face lower credit constraints and improve their organizational learning.

Although the above studies provide insights into competing views about the impact of government contracts on the mechanisms that underlie access to financing, the authors acknowledge that findings from developed country contexts with more sophisticated financial markets and better business environments may not be generalizable to developing countries (Xu & Dao, 2020). Our first hypothesis is:

> Hypothesis 1: Ownership of a government procurement contract increases access to financing.

2.1.2 External audit and access to financing

Because of their private nature, most SMEs are not required to publish financial reports and are thus not subject to public accountability (UNCTAD, 2016).[5] SMEs are therefore likely to disclose less public information than larger firms, making risk assessment by lenders more challenging. Further, the usefulness of financial statements prepared by private firms is reduced if they are prepared primarily for tax accounting purposes (Chen et al., 2011). In such instances, there is a high incentive to manage earnings and expenses to keep the tax burden low. This earnings management incentive reduces the credibility of SMEs' financial statements and their reliability for lending. It also weakens bank-client lending relationships that rely on the quantitative data from those statements to assess creditworthiness as it exacerbates information asymmetry. Thus, transactional lending creates an incentive for large firms to have their financial statements certified by an external auditor to enhance their credibility (Ferri et al., 2019). For small firms, however, lenders typically rely less on the data from financial statements

[4] The PEFA program was initiated in 2001 by seven international development partners: The European Commission, International Monetary Fund, World Bank, and the governments of France, Norway, Switzerland, and the UK. In 2019, the Ministries of Finance of the Slovak Republic and the Grand Duchy of Luxembourg became new partners of the program.

[5] The United Nations Conference on Trade and Development.

and more on qualitative data gathered through different networks, also known as relationship lending (Ferri et al., 2019; López-Espinosa et al., 2017). Thus, small firms are less likely to seek external audit certification. Although relationship lending could help these firms avoid the cost of certification, it takes a longer time to establish networks and they might not meet firms' immediate financial needs (López-Espinosa et al., 2017).

An extensive body of research has examined the determinants of the voluntary decision to engage or disengage in external audit certification and its impact on the quality of financial information, and other firm outcomes, among private firms that are (or are not) mandated to do so by law (Allee & Yohn, 2009; Collis, 2012; Dedman et al., 2014; Downing & Langli, 2019; Kausar et al., 2016; Kim et al., 2011; Lennox & Pittman, 2011; Lisowsky & Minnis, 2020; Minnis, 2011). In summary, these studies show that, when compared to firms that do not voluntarily engage in external audit certification, those that engage in this process produce high-quality financial statements (Dedman & Kausar, 2012), enhance their credit ratings (Lennox & Pittman, 2011), tend to comply with tax and accounting regulatory requirements (Downing & Langli, 2019), and are more likely to access financing (Allee & Yohn, 2009; Briozzo & Albanese, 2020; Palazuelos et al., 2018). Yet, there is still an open debate in the literature concerning firm audit incentives, given the high proportion of SMEs that do not seek, or opt out of, external audit certification. Lisowsky and Minnis (2020) suggest that future research should examine why firms still elect not to seek external audit certification, with one plausible reason being the impact of ownership structure, proposed by Dedman et al. (2014).

We revisit the evidence using recent WBES data and, as we discuss below, consider the impact of government contracts. Therefore, our second hypothesis is:

> Hypothesis 2: External audit certification increases access to financing.

2.1.3 *The effect of government procurement and external audit on access to financing*

Several recent studies have sought to link external auditing with government contracts (Dao et al., 2023; Hope et al., 2021). For instance, Hope et al. (2021) use WBES data to report that firms that have their financial statements certified by an external auditor are more likely to access government contracts. They argue that this certification process signals high-quality financial reporting and good corporate governance practice in situations where governments have monitoring incentives. However, they also propose and confirm a competing view that external audit certification and government monitoring incentives diminish in the presence of other complementary monitoring mechanisms by tax authorities or creditors. Dao et al. (2023) link government contracts with audit fees using a sample of US firms. They, too, propose and confirm two competing views on why firms with government contracts might pay low or high audit fees. One argument is that because government customers might have more stable future earnings, lower operational risk, and require less audit, they are more likely to pay lower fees. Their opposing view is that government contracts give rise to high audit fees owing to increased litigation risk, government audits, disclosure requirements, and audit efforts to assure compliance with multiple laws. A result reported by Dao et al. (2023) that is relevant to our study is the observation that firms with government contracts tend to pay higher audit fees compared to those without government contracts.

We conjecture that if government procurement monitoring substitutes for lender scrutiny and enhances financial reporting transparency, we should expect the probability of encountering obstacles in accessing financing to vary depending on whether a firm has or does not have government procurement contracts and/or external audit certification. First, if government procurement provides a monitoring role and enhances financial reporting quality and substitutes for external audit certification, we should expect a positive association between government procurement contracts and financing among firms that do not certify their financial statements using an external audit. Second, for firms that have government contracts and external audit certifications, we should expect to observe a complementary effect for those that have greater probabilities of having no obstacle in accessing financing. Third, for firms that have no government procurement contract and no external audit certification we should expect these firms to be in double jeopardy, i.e., they are unable to benefit from government procurement monitoring and external audit certification.

Therefore, our third hypothesis is:

Hypothesis 3: External audit certification and ownership of a government procurement contract jointly increase access to financing.

2.2 Ownership structure, firm size, and organizational learning

Private firms exhibit significant heterogeneity in how they are financed, which is influenced by specific business contexts and the demand for financial reporting by finance providers (Hope & Vyas, 2017). In a more recent study, Lisowsky and Minnis (2020) report that firm size, ownership, and trade credit also influence the decision to produce GAAP-compliant financial statements and seek an external audit. Mertzanis (2017) used WBES data to show that ownership structure is a significant predictor of firms' access to financing, but this predictive power is influenced by specific firm characteristics and country-level factors. Ownership concentration, government ownership, and foreign ownership are found to be more robust predictors of financing constraints in low-income countries. In this study, we examine how ownership, firm size, and organizational learning interact with external audit certifications and government procurement contracts to affect SME access to financing. Our analysis sheds light on how these factors work together to shape SMEs' ability to access financing and provides valuable insights for policymakers seeking to support SME growth.

2.2.1 The effect of ownership structure

Ownership structure is a crucial factor influencing audit demand, with larger firms and those with more complex ownership structures requiring audits to mitigate agency problems (Dedman et al., 2014). Share ownership concentration can affect access to financing due to agency costs and information asymmetry. Majority shareholders in SMEs typically act as both principal and agent, but agency problems between majority and minority shareholders can reduce access to financing (Hope et al., 2011). However, concentrated share ownership may increase the demand for audit services, reassuring minority shareholders that their interests will not be expropriated and, in turn, improve access to financing. Family-owned firms, for example, have a high ownership concentration and lower demand for audit services because agency problems are less severe, although their financial reports are less transparent (Keasey et al., 2015; Murro & Peruzzi, 2019).

Foreign investors face more challenges assessing financial reporting quality and acquiring private and public information from sources other than their local peers (Beneish & Yohn, 2008; Kim et al., 2019). Therefore, foreign-owned firms exhibit a higher demand for audit services to ensure financial reporting quality and may seek to influence the choice of auditor, such as requesting one of the Big-four auditors (He et al., 2014). Foreign ownership may facilitate access to financing not only through greater availability of funding from foreign partners but also through the adoption of international certification standards, which reduces bankruptcy risk (Mertzanis, 2017).

The gender dimension of ownership can negatively affect access to financing in the presence of discrimination against women, particularly if they are owner/managers (Aristei & Gallo, 2016; Beck et al., 2018; Eddleston et al., 2016). Studies also suggest that behavioral differences between men and women contribute to a gender gap in financing, with female-owned firms demanding less credit than male-owned firms (Aristei & Gallo, 2016). Ongena and Popov (2016) report that female business owners are more likely to opt-out of the loan application process in countries with high gender bias. Moreover, firms with more significant female ownership generally face more credit constraints than their male counterparts, although these constraints are lower for firms with experienced senior management (Seema et al., 2021). The accumulated evidence from prior empirical studies fails to demonstrate whether female-owned firms face discrimination when seeking finance from formal financing institutions.

Our study, therefore, contributes to the debate on the potential gender gap in accessing finance. Our fourth hypothesis is:

Hypothesis 4: Ownership structure influences the impact of external audit certification and government procurement contracts on access to financing.

2.2.2 The effect of firm size

The demand for external audit services and the ability to secure government contracts are likely to increase with firm size, which can be attributed to greater transactional complexity and the presence of multiple

divisions and cost centers. Consequently, larger firms may engage external auditors to mitigate agency conflicts and assure owners of financial reporting quality. In addition, larger firms tend to exhibit greater transparency and have more collateralizable assets, which in turn increases their ability to apply for government contracts and enhances their financing capacity (Berger & Udell, 1998; Gregory et al., 2005). Therefore, we hypothesize that firm size influences the impact of external audit certification and government procurement contracts on access to financing. Specifically:

> Hypothesis 5: The effect of external audit certification and government procurement contracts on access to financing is stronger for larger firms compared to smaller firms.

2.2.3 The effect of organizational learning

Organizational theorists have studied how organizations learn, and while there are differing views about the meaning of organizational learning, most view it as a process that unfolds over time and is associated with knowledge acquisition, pursuit of new ventures, and improved performance (Garvin, 1993; Lumpkin & Lichtenstein, 2005). Organizational learning can improve SMEs' access to finance as they are able to adapt more quickly in a changing environment and thus be more attractive to lenders. We use firm age and managerial experience as measures of organizational learning. Firm age is likely to be positively related to access to financing as it signals credibility to lenders in terms of the financial quality and reputation of the firm, thereby mitigating uncertainty (Crespí & Martín-Oliver, 2015; Diamond, 1989; Serrasqueiro & Nunes, 2012). We conjecture that older and more established firms have the resources that facilitate the engagement of an external auditor and that they may also have the reputation, or political connections, that facilitate access to government contracts. They are also more likely to have enhanced relationship banking than younger firms and so greater access to financing. Firms that lack managerial experience, especially start-ups, are less likely to be embedded in a network (Le & Nguyen, 2009; Owolabi & Pal, 2013) and less likely to develop planning for future growth, and therefore have limited access to sources of finance. For these reasons, they are often associated with failure (Martin & Staines, 1994). However, evidence also suggests that entrepreneurs with less managerial experience are more likely to use bank loans than those with long experience, as they focus more on growth and the long term (Du et al., 2015). We conjecture that greater managerial experience enhances organizational learning, and signals credibility to providers of finance, thereby increasing access to financing. Therefore, our sixth hypothesis is:

> Hypothesis 6: Organizational learning influences the impact of external audit certification and government procurement contracts on access to financing.

3 Methodology

3.1 Sources of data and sample

Our analysis draws on data from the World Bank Enterprise Survey (WBES), which is a comprehensive source of information on SMEs in the manufacturing and service sectors worldwide. Although the definition of SMEs varies across regions and countries (see, e.g., European Commission, 2020; International Finance Corporation, 2024; South African Government, 2009; UK Government, 2023), a firm qualifies as an SME if it generally meets specific thresholds of at least two of the following requirements: the number of employees, annual sales, and balance sheet.[6] In our analysis, we used the WBES's three SME categories: small SMEs—less than 20 employees, medium

[6] For example, according to the World Bank Group and the International Finance Corporation (IFC) (International Finance Corporation, 2024), a small enterprise is a firm with 10–49 employees, annual sales ranging from $100,000 to less than $3 million, and total assets ranging from $100,000 to less than $3 million. On the other hand, a medium-sized enterprise is a firm with 50–300 employees, annual sales ranging from $3 million to $15 million, and assets ranging from $3 million to $15 million. An alternative size proxy used in the absence of employees, sales or assets is the size of a firm's outstanding loan, which should be less than $1 million but more than $100,00 for a small enterprise. Some regions and countries apply this criterion (EU and UK), while others have developed a public interest score based on employees, sales, assets, and loans (e.g., South Africa).

SMEs—20 to 99 employees, and large SMEs—over 100 employees. Covering the period from 2006 to 2021, the survey provides data on various aspects of SMEs' operations, such as control information, management practices, degree of competition, finance, and business-government relations. While the survey uses a standardized instrument and uniform methodology to enable comparability, some survey questions vary across countries, and data for some variables are missing in some years. For instance, information on access to government contracts is available only from 2007 onwards, and data on the percentage of firms owned by females is only available after 2012. To account for these limitations, we use a sample of 102,923 firms for our preferred model, although our baseline estimation includes up to 144,578 firms. To strengthen our analysis, we supplement the WBES data with cross-country variables, including the Financial Development Index from the International Monetary Fund (Svirydzenka, 2016), the Corruption Perception Index from Transparency International (Transparency International, 2022), and a composite index of a country's institutional quality derived from six indicators of governance from the world governance indicators (Kaufmann et al., 2011).

3.2 Definition of variables

Table 1 summarizes the operational definitions of the variables used in this study. Our dependent variable, *finance access obstacles*, is an ordinal variable that captures the extent to which access to finance is an obstacle to a firm's operations, with five response levels. The variable takes the value 1 if the response is a very severe obstacle, 2 if it is a major obstacle, 3 if it is a moderate obstacle, 4 if it is a minor obstacle, and 5 if the response is no obstacle. As described in Sect. 5, we also use an alternative access to finance variable developed by Kuntchev et al. (2013). The two key independent variables of interest are whether a firm has its financial statements checked by an external auditor and whether it has recently secured a government contract. The variable *government procurement contracts* is generated from the question "*Did this establishment secure a government contract in the last 12 months?*" The variable *external audit certification* is generated from the question "*Were the financial statements of this firm checked and certified by an external auditor in the last financial year?*" The two variables are dummies that take the value one if the response is yes and zero otherwise. Previous studies have examined the correlation between the two variables (Hope, et al., 2021) and their impact on bribery intensity, access to credit, adoption of international standards, and business group affiliations (Changwony & Kyiu, 2024; Yi et al., 2018).

We use three sets of independent variables to explore hypotheses 3 to 5, i.e., three proxies for ownership, two for firm size, and two for organizational learning. The proxies for ownership are *foreign ownership*, *ownership concentration*, and *female ownership*, derived from three questions regarding the share of a firm owned by a foreign national, the largest owner, and females, respectively. We use two commonly used variables to proxy for firm size: total sales and number of employees. The variable, *total sales*, is from the first question in the survey regarding the total annual sales realized by a firm for all products and services. The variable, *no of employees*, represents the total number of full-time employees, adjusted for temporary workers. Finally, the proxies for organizational learning are firm age and the top manager years of experience. We calculate the variable *firm age* as the difference between the year when the establishment started its operations and the survey year. The variable *manager experience* is the number of years of experience the highest-ranking management individual has in the sector. We transform the four firm size and organizational learning proxies into logs.

Additionally, because other firm-level factors might influence access to financing or the effects of our key variables of interest, we include several control variables in our estimation models. First, most SMEs face internal and external pressures to adopt international certification standards like ISO 9001 and ISO 14001 to indicate conformity with sustainable practices in their operations (Fikru, 2016; Paunov, 2016). Since such certifications could improve management and financial reporting practices (Fikru, 2016; Kolk & Perego, 2010; Paunov, 2016; Prajogo et al., 2020), their adoption may enhance access to financing. We control for this possibility using a binary variable that takes the value of 1 if the firm has an International Standard Certification and 0 otherwise. Second, evidence indicates that firms involved in export markets tend to have easier access to financing (Beck et al., 2008) and are more likely to

Table 1 Variable descriptions

Variables	Description	Source
Dependent variables		
Finance access obstacles (FAOs)	An ordinal variable with five ranks indicating the degree to which access to finance is perceived to be an obstacle to a firm's operations. The five outcomes are 1 if a firm perceives access to finance to be a very severe obstacle to its operations. The other outcomes are 2—major obstacle, 3—moderate obstacle, 4—minor obstacle, and 5—no obstacle	WBES
Credit constraint	An ordinal objective variable with four outcomes indicating an SME's level of constraint to accessing credit. The variable takes the value 1 if a firm is fully credit constrained, 2—partially credit constrained, 3—marginally credit constrained, and 4—not credit constrained	WBES
Variables of interest		
Government procurement contracts (GPCs)	A binary variable that takes the value of 1 if the firm has applied and/or received a government contract in the recent fiscal year and 0 otherwise	WBES
External audit certification (EAC)	A binary variable that takes the value of 1 if a firm has an external audit of its financial statements and 0 otherwise	WBES
Foreign ownership	A continuous variable indicating the percentage of ownership of a firm by foreign entities	WBES
Ownership concentration	A continuous variable indicating the percentage of ownership for the largest owner of a firm	WBES
Female ownership	A binary variable that takes the value 1 if there is female ownership and 0 otherwise	WBES
Sales	Log of total Sales	WBES
Firm size	Log of number of employees in a firm	WBES
Firm age	A continuous variable generated from taking the difference the year that a firm began its operations and the year that the WBES survey is carried out	WBES
Manager experience	Log of number of years of experience the top manager has in the sector	WBES
Firm controls		
ISC	Binary variable that takes the value of 1 if the firm has an International Standard Certification (ISC) and 0 otherwise	WBES
Exports	Binary variable that takes the value of 1 if the firm exports its products and services, and 0 otherwise	WBES
Informal competition practices—obstacle	An ordinal perception-based variable with five ranks indicating the severity of the practices of informal competition as an obstacle to a firm. The five outcomes are 0 indicating that a firm perceives informal competition practices to be no obstacle. The other outcomes are 1—minor obstacle, 2—moderate obstacle, 3—major obstacle, and 4—very severe obstacle	WBES
Subsidiary status	Binary variable that takes the value of 1 if the firm is part of a larger firm and 0 otherwise	WBES
Business legal status	An ordinal variable with six outcomes indicating the legal status the SME operates under. The six are 1—the firm is a public company with its shares traded; 2—private firm with non-traded shares, 3—sole proprietorship, 4—partnership, 5—limited partnership, 6—any other legal status not described above	WBES
Corruption perception	An ordinal perception-based variable with five ranks indicating the severity of corruption as an obstacle to a firm. The five outcomes are 0 indicating that a firm perceives corruption to be no obstacle. The other outcomes are 1—minor obstacle, 2—moderate obstacle, 3—major obstacle, and 4—very severe obstacle	WBES
Tax inspection	A dummy variable equal to one if a tax official visited the firm over the last 12 months and zero otherwise	WBES
Applied for a loan	A dummy variable equal to one if the firm applied for a new loan or lines of credit in the last fiscal year and zero otherwise	WBES

Table 1 (continued)

Variables	Description	Source
Controls: country level		
Corruption perception index	Continuous variable, which ranks countries based on corruption perception within a nation's public sector, as viewed by business executives and experts. The score ranges from 0, highest corruption score to 100, lowest corruption score	TI
Financial development index (FDI)	Continuous variable that ranks countries according to the depth, access, and efficiency of their financial institutions and financial markets. This index is an aggregate of the financial institution index (FII) and financial market index (FMI). The FII and FMI aggregate data on financial institutions and financial markets are based on depth, access, and efficiency	IMF
Institutional quality	Continuous variable representing the institutional quality within a country. It is a composite index constructed using the principal component analysis method of the six dimensions of governance as presented in the worldwide governance indicators	WGI
Year dummies	Dummies generated for the 16 years of the WBES survey, 2006–2021	WBES
Industry dummies	Dummies generated from 26 industries used to group the SMEs	WBES
Country dummies	Dummies generated from the 151 countries in the sample	WBES

The table presents variable descriptions

have their financial statements checked by an external auditor (Cheng et al., 2020) as they are more exposed to international markets, technology, and managerial expertise (D'Souza et al., 2017). Some studies have also shown that financial constraints reduce the probability of participating in the export market (Pietrovito & Pozzolo, 2021). We control for these bidirectional relationships using a dummy variable that takes the value 1 if a firm exports its products and 0 otherwise.

Third, an elaborate strand of literature has consistently argued that bribery and corruption negatively influence the operational capabilities of SMEs, their access to financing, and bank lending practices (Barth et al., 2009; Ufere et al., 2020). Fourth, and closely related to the above, SMEs face greater competition from the informal sector in developing countries, which has a negative spillover effect on access to financing and markets (Dabla-Norris et al., 2008; Ufere et al., 2020). We exploit two WBES questions regarding whether a firm perceives corruption and competition from the informal sector as obstacles to business. The five categorical response levels from these two questions allow us to capture more variations in the data than binary variables. Fifth, some studies suggest that whether a firm is a corporation, or has an unincorporated organizational form, has implications for financing, legal, and regulatory obstacles (Beck et al., 2013; Demirguc-Kunt et al., 2006). Hence, we control for the legal status of a firm using a categorical variable with six levels. Finally, we also include year, industry, and country dummies.

3.3 Descriptive statistics

Table 2 presents the summary descriptive statistics. Regarding finance access, more than half of the firms in our sample either have a *minor* (35%) or *no* obstacle (20%), whereas approximately 25% have a *very severe* (8%) or *major* obstacle (16%) to financing. While these proportions might suggest modest financing constraints, they mask regional and country variations. For example, disaggregating by region reveals that approximately 39% and 28% of firms in Sub-Saharan Africa (SSA) and Middle East and North Africa (MNA) face *major* or *very severe* obstacles. Approximately 51% of firms have their accounts checked by an external auditor, and 18% have recently secured a government contract. Table 6 of Appendix 1 presents detailed summary statistics for our dependent variables and key independent variables by country and region. Unsurprisingly, most firms exhibit high ownership concentration (79%), but low levels of female ownership (9%) and foreign ownership (8%). The organizational learning variables show that the average age of a firm and top manager experience are 19 and 18 years,

respectively. The mean number of employees is 116. The average number of employees in small, medium, and large firms is 10, 43, and 518, respectively. Small- and medium-sized firms exhibit less variation in their number of employees across the different regions than large firms. In Sub-Saharan Africa, large firms have the lowest average number of employees, 389, while in East Asia and the Pacific, they have the highest average number of employees, 698.

Table 3 reports Spearman rank correlation coefficients. The variables in the study have a low to moderate correlation coefficient (<0.5) with each other (Dormann et al., 2013). Thus, collinearity is not a concern in the study.

3.4 Empirical model

Our objective in this study is to examine whether government procurement contracts and external audit certification influence perceptions about access to financing. Because the dependent variable is an ordinal measure, we use a heteroskedastic ordered probit estimator as our baseline model and a multi-equation model in our main analysis. The heteroskedastic ordered probit model not only accounts for non-linearity and the ordinal nature of the ordered selection response scale, but it also incorporates the differences in variance between firms, or groups of SMEs. The latter feature is crucial for our study as such differences could bias the derived coefficient estimates (Williams, 2009) complicating comparisons between firms that, for example, have government procurement contracts or seek external audit certifications, and those that do not. The baseline heteroskedastic ordered probit model is:

$$FAO_i^* = GPC_{ij} + EAC_{ij} + OS_{ij} + FS_{ij} + OL_{ij} + Interactions + Controls + \varepsilon_i, \quad (1)$$

$$var(\varepsilon_i) = \sigma^2 = [\exp(y' z_i)]^2 \quad (2)$$

where FAO_i^* is the unobservable finance access variable measured across five outcomes (severe obstacle, major obstacle, moderate obstacle, minor obstacle, or no obstacle); GPC is an indicator of whether a firm has a government procurement contract; EAC is an indicator variable of whether an external auditor certifies the firm's financial statements; OS are a set of ownership proxies (foreign ownership, concentrated ownership, and female ownership); FS are firm size proxies (total sales and number of employees); OL are proxies for organizational learning (firm age and top managers' years of experience); Interactions is a set of two- and three-way interactions where we interact GPC and EAC with the proxies of OS, FS, or OL; Controls is a set of other firm characteristics, year dummies, and country dummies; ε_i is an error term that is a function of the key explanatory variables—GPC and EAC.

Although the heteroskedastic ordered probit model in Eq. (1) mitigates hidden biases, endogeneity and reverse causality concerns could still weaken the estimates. For example, it is likely that unobserved firm characteristics and capabilities influence how firms respond to financing obstacles and opportunities. It is also conceivable that firms with greater access to financing are more likely to engage the services of external auditors (Lisowsky & Minnis, 2020) or have more chances of securing government contracts, suggesting a reverse relationship. Furthermore, the literature has also shown that government contracts influence the decision to have financial statements checked by an external auditor (Hope et al., 2021). Although our cross-sectional data structure and the lack of suitable instruments limit our ability to address these concerns, we run a three-equation seemingly unrelated mixed-process model with two types of dependent variables.[7] The first equation is the finance access ordered probit model, followed by two probit equations where the indicators of government procurement contracts and external audit certification are the dependent variables. We simplify the model in Eq. (1) using dummies instead of the categorical variables to achieve convergence but also follow the literature in selecting variables for each equation (e.gDedman et al., 2014; Hope et al., 2021; Ojala et al., 2016).[8] The three-equation seemingly unrelated mixed process model is:

[7] The model allows for non-zero error correlations between equations (Zellner, 1962), and we use Roodman's (2011) conditional mixed process estimator (cmp) in STATA.

[8] The unique variables that appear in each of the three equations are external audit and ownership variables in the finance access equation; tax inspection in the government contracts equation; and applied for a loan, export, and international standards certification in the external audit equation. Corruption perception and informal competition appear in the finance access and government contracts equations while legal status and industry dummy are in the government contracts and external audit equations. We include sales, size, age, management experience, and year dummies in all three equations.

Table 2 Summary statistics

Variable	N	Mean	Std. dev	Min	Max
Dependent variables					
Finance access obstacles					
Very severe obstacle	139,185	.084	.277	0	1
Major obstacle	139,185	.156	.363	0	1
Moderate obstacle	139,185	.216	.412	0	1
Minor obstacle	139,185	.199	.399	0	1
No obstacle	139,185	.345	.476	0	1
Credit constraint					
Fully credit constrained	123,551	.156	.363	0	1
Partially credit constrained	123,551	.162	.368	0	1
Maybe credit constrained	123,551	.195	.396	0	1
Not credit constrained	123,551	.486	.5	0	1
Variables of interest					
EAC	139,185	.516	.5	0	1
GPC	121,033	.175	.38	0	1
Foreign ownership	137,803	.08	.254	0	1
Ownership concentration	133,994	.794	.263	0	1
Female ownership	137,540	.088	.245	0	1
Log of sales	124,298	16.780	3.176	0	35.532
Number of employees	138,573	116	4592	0	1,673,000
Firm size					
Small	139,185	.473	.499	0	1
Medium-sized	139,185	.338	.473	0	1
Large	139,185	.188	.391	0	1
Firm age	137,699	19.382	16.982	0	225
Manager experience	136,081	17.994	11.268	0	70
Firm controls					
ISC	139,185	.23	.421	0	1
Exporter status	139,185	.097	.296	0	1
Informal competition obstacle					
Very severe obstacle	139,185	.356	.479	0	1
Major obstacle	139,185	.184	.387	0	1
Moderate obstacle	139,185	.198	.398	0	1
Minor obstacle	139,185	.16	.367	0	1
No obstacle	139,185	.103	.304	0	1
Business legal status					
Shareholding company with shares trade in the stock market	139,185	.053	.224	0	1
Shareholding company with non-traded shares or shares traded privately	139,185	.434	.496	0	1
Sole proprietorship	139,185	.317	.465	0	1
Partnership	139,185	.087	.282	0	1
Limited partnership	139,185	.091	.288	0	1
Other	139,185	.018	.132	0	1
Subsidiary status	139,185	.171	.376	0	1

Table 2 (continued)

Variable	N	Mean	Std. dev	Min	Max
Firm corruption perception					
Very severe obstacle	139,185	.348	.476	0	1
Major obstacle	139,185	.158	.365	0	1
Moderate obstacle	139,185	.164	.37	0	1
Minor obstacle	139,185	.179	.383	0	1
No obstacle	139,185	.151	.358	0	1
Country controls					
Corruption Perception Index	136,676	.367	.141	.131	.91
Financial Development Index	134,405	.313	.162	.047	.777
Institutional quality	138,116	.411	.223	.012	.996

The table presents summary statistics of the variables used in the study, as defined in Table 1

$$FAO_{ij} = GPC_{ij}\beta_1 + EAC_{ij}\beta_2 + OS_{ijk}\beta_{3k} + FS_{ijk}\beta_{4k} + OL_{ijk}\beta_{6k} + Interactions_{ij}\beta_{6k} + Controls_{ijk}\alpha + \varepsilon_{iFAO}, \quad (3)$$

$$GPC_{ij} = EAC_{ij}\alpha_1 + FS_{ij}\alpha_2 + OL_{ij}\alpha_{3k} + TI_{ij}\alpha_{4k} + Controls_{ij}\delta_{4k} + \varepsilon_{iGPC}, \quad (4)$$

$$EAC_{ij} = GPC_{i3}\gamma_1 + FS_{ij}\gamma_{2k} + OL_{ij}\gamma_{3k} + LA_{ij}\gamma_{4k} + Controls_{i3}\lambda_{3k} + \varepsilon_{iEAC}, \quad (5)$$

$$\left.\begin{aligned} \mathrm{Cov}(\varepsilon_{iFAO}, \varepsilon_{iGPC}) \neq 0, \\ \mathrm{Cov}(\varepsilon_{iFAO}, \varepsilon_{iEAC}) \neq 0, \\ \mathrm{Cov}(\varepsilon_{iGPC}, \varepsilon_{iFAO}) \neq 0, \end{aligned}\right\}$$

Because the raw coefficient estimates from a probit model are not straightforward to interpret (Ai & Norton, 2003), especially for ordered probit models and interaction terms, we compute the marginal effect of changes in the regressors and their interactions for the five outcomes. We also plot the marginal effects on the probability of each outcome for the three-way interaction terms comprising continuous variables. Where we report raw coefficients, larger values correspond to a higher response level—no obstacle.

4 Results

4.1 Main results

We begin our analysis by examining the main effects of external audits and government contracts on perceptions regarding finance access obstacles. Table 4 reports raw coefficients from a heteroskedastic ordered probit estimator, where we regress finance access obstacles on government procurement contracts (columns 1 to 3), external audit certification (columns 4 to 6), and the two variables in one model (columns 7 and 8). The models in columns 1 and 4 include the control variables and time effects. We then add industry and country effects in columns 2, 5, and 7 and incorporate the proxies for ownership, size, and organizational learning in columns 3, 6, and 8. We use government procurement contracts and external audit certification to model the variance, as we suspect that finance access variability may differ between firms that have access to government procurement or have their financial statements audited and those that do not.

Surprisingly, the coefficient for government procurement contracts in columns 1 to 3 are all negative and highly significant, indicating that firms with a government contract face obstacles in accessing financing. The negative association in column 1 decreases when we control for industry and country

Table 3 Pairwise correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
(1)	1																					
(2)	0.35*	1																				
(3)	−0.06*	−0.07*	1																			
(4)	0.05*	0.02*	0.10*	1																		
(5)	−0.05*	−0.06*	0.13*	0.02*	1																	
(6)	0.01*	0.03*	−0.17*	−0.07*	−0.11*	1																
(7)	−0.06*	−0.04*	0.01	0.00	−0.04*	−0.13*	1															
(8)	−0.06*	0.00	0.16*	0.07*	0.13*	−0.12*	−0.02*	1														
(9)	−0.09*	−0.07*	0.31*	0.11*	0.19*	−0.27*	−0.02*	0.46*	1													
(10)	−0.07*	−0.06*	0.16*	0.04*	−0.00	−0.15*	0.07*	0.09*	0.26*	1												
(11)	−0.04*	−0.07*	0.08*	0.04*	−0.03*	−0.14*	0.07*	0.02*	0.13*	0.48*	1											
(12)	−0.09*	−0.05*	0.23*	0.06*	0.16*	−0.14*	0.00	0.20*	0.36*	0.16*	0.07*	1										
(13)	−0.00	−0.02*	0.05*	0.02*	0.08*	−0.05*	0.04*	0.03*	0.12*	0.06*	0.04*	0.12*	1									
(14)	0.30*	0.12*	−0.04*	0.03*	−0.04*	−0.01	−0.02*	−0.04*	−0.08*	0.02*	0.04*	−0.09*	−0.01	1								
(15)	−0.09*	−0.06*	0.29*	0.10*	0.19*	−0.25*	−0.01*	0.43*	0.92*	0.24*	0.11*	0.35*	0.11*	−0.08*	1							
(16)	0.08*	0.08*	−0.04*	−0.05*	−0.09*	0.12*	−0.00	−0.07*	−0.17*	−0.08*	−0.08*	−0.09*	−0.04*	0.04*	−0.16*	1						
(17)	−0.02*	−0.00	0.03*	0.02*	−0.01*	−0.21*	0.66*	0.01*	0.03*	0.06*	0.06*	0.02*	0.03*	0.02*	0.03*	−0.07*	1					
(18)	−0.04*	−0.06*	0.16*	0.03*	0.15*	−0.09*	0.01*	0.11*	0.19*	0.08*	0.02*	0.15*	0.04*	−0.03*	0.19*	−0.04*	0.00	1				
(19)	0.30*	0.11*	0.03*	0.05*	−0.01*	−0.06*	−0.05*	−0.03*	0.02*	0.03*	0.03*	−0.02*	0.00	0.31*	0.01*	0.06*	−0.03*	0.02*	1			
(20)	−0.12*	−0.12*	0.13*	−0.00	0.00	−0.10*	0.05*	−0.15*	0.07*	0.15*	0.17*	0.17*	0.06*	−0.09*	0.07*	−0.11*	0.05*	0.02*	−0.18*	1		
(21)	−0.18*	−0.13*	0.09*	−0.03*	−0.09*	−0.14*	0.03*	−0.06*	0.14*	0.15*	0.14*	0.20*	0.04*	−0.16*	0.13*	−0.16*	0.03*	0.02*	−0.12*	0.58*	1	
(22)	−0.13*	−0.12*	0.13*	−0.01*	−0.01*	−0.08*	0.07*	−0.08*	0.07*	0.14*	0.13*	0.17*	0.05*	−0.13*	0.07*	−0.07*	0.04*	0.01*	−0.20*	0.93*	0.59*	1

The table presents a Spearman rank correlation matrix of the key variables. The variables are (1) finance access obstacles, (2) credit constraint, (3) external audit, (4) government contracts, (5) foreign ownership, (6) ownership concentration, (7) female ownership (continuous), (8) annual sales, (9) firm size (employee headcount), (10) firm age, (11) manager experience, (12) international standard certification, (13) exporter status, (14) informal competition obstacle, (15) size (small/medium/large), (16) legal status, (17) female ownership (dummy), (18) subsidiary status, (19) firm corruption perception obstacle, (20) corruption perception index (CPI), (21) financial development index (FDI), and (22) institutional quality (IQ)

effects in column 2 but increases when we add the proxies for ownership structure, size, and age in column 3. The coefficients for the ownership (foreign ownership and female ownership), size (total sales), and organizational learning (firm age) measures are all positive and significant except for ownership concentration, number of employees, and manager experience. In contrast, the results reported in columns 4 to 6 show a positive association between external audit certification and the probability that a firm does not encounter any obstacle in accessing finance. This association declines when we include industry and country dummies in column 5 and becomes insignificant when we control for the proxies for ownership, size, and organizational learning in column 6. This finding contradicts the significant positive effect of external auditing reported in Briozzo and Albanese (2020), who use a different access to financing measure. Additionally, the proxies for ownership, size, and organizational learning are consistent with those reported in column 3, except for foreign ownership (which increases in magnitude) and ownership concentration (which becomes significant). Columns 7 and 8 of Table 4 report the results where we include government procurement contracts and external audit certification in one model. The signs of the coefficients of the two variables are identical to those in columns 3 and 6, but their magnitudes change. Unlike the results in column 6, the coefficient for external audit certification is significant. When we include the proxies for ownership, size, and organizational learning in column 8, the coefficient for government procurement contracts increases and mirrors that reported in column 3.[9] Taken together, the above results suggest that government procurement contracts and external audit certification can separately and together influence access to financing. They also indicate that ownership, size, and organizational learning can influence these relationships.

Table 5 reports estimates from three-equation seeming unrelated mixed-process regressions where we include interaction terms to test hypotheses 3 to 5 using the specification in column 8 of Table 4. The correlations between the three equations are non-zero.[10] Panel A reports our results of interest, but we also report the results for Eqs. 4 and 5 in panels B and C for completeness. We interact our two variables of interest with the proxies for ownership in columns 1 to 3, firm size in columns 4 and 5, and organizational learning in columns 6 and 7. The main effects of government procurement contracts and external audit certifications are consistent with those reported in column 8 of Table 4, although their magnitudes increase and vary across the seven specifications. Several coefficients of the two-way and three-way interactions are significant, except for ownership concentration. However, although these coefficients provide a rough indication of their association with financing, the magnitudes and significance could be misleading because of the log normal distribution. The lower part of panel A presents the predicted probabilities of having no obstacle for the two-way interactions between government procurement contracts and external audit certification and the three-way interaction between these variables and the binary indicator of female ownership. We find that the probability of having no obstacles is significantly higher for firms with no government procurement contracts, regardless of whether they have or do not have external audit certification. The predicted probabilities for firms with government procurement contracts are more than two times lower than those without contracts.

We also observe a similar pattern for the three-way interactions between government procurement contracts, external audit certification, and the binary female ownership indicator. The predicted probabilities are higher for firms with no government procurement contract with or without external audit certifications, with female-owned firms having a greater probability of

[9] In Table 7 of Appendix 1, we report the marginal effects of all the variables on the five outcomes using the model in column 8. As expected, government procurement increases the probability that a firm will encounter severe, major, or moderate obstacles but reduces the likelihood of having minor or no obstacles. In contrast, external audit certification has the opposite effect: it reduces the probability that a firm faces severe or major obstacles but increases the probability of moderate or minor obstacles. External audit certification has no effect for firms that do not encounter any obstacle.

[10] The non-zero correlations between equations are evident in the results reported in the bottom panel of Table 5, i.e., the correlation between finance access and government contracts equations is positive, but that between finance access and external audit, and between government contracts and external audit, are negative.

Table 4 Estimates from a heteroskedsatic ordered probit model

	Government procurement contracts (GPCs)			External audit certification (EAC)			GPC and EAC	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GPC	−0.123***	−0.095***	−0.117***				−0.099***	−0.116***
	(−14.92)	(−11.06)	(−12.28)				(−11.53)	(−12.33)
EAC				0.079***	0.057***	0.012	0.063***	0.016**
				(12.97)	(8.48)	(1.53)	(8.51)	(1.97)
Foreign ownership			0.189***			0.201***		0.184***
			(11.27)			(13.46)		(11.12)
Ownership concentration			0.021			0.039**		0.022
			(1.20)			(2.50)		(1.25)
Female ownership			0.023***			0.015**		0.021***
			(2.86)			(2.01)		(2.68)
Total sales			0.034***			0.033***		0.033***
			(14.23)			(14.86)		(14.00)
Number of employees			−0.005			−0.006		−0.007*
			(−1.28)			(−1.62)		(−1.77)
Firm age			0.056***			0.050***		0.056***
			(10.58)			(10.49)		(10.61)
Manager experience			0.005			0.006		0.006
			(0.89)			(1.27)		(1.07)
ISC	0.151***	0.091***	0.022**	0.122***	0.078***	0.014*	0.081***	0.020**
	(20.38)	(11.33)	(2.32)	(17.47)	(10.41)	(1.67)	(9.99)	(2.14)
Exports	−0.056***	−0.032***	−0.059***	−0.046***	−0.025***	−0.045***	−0.035***	−0.059***
	(−5.64)	(−3.11)	(−5.06)	(−5.07)	(−2.63)	(−4.19)	(−3.37)	(−5.10)
Informal competition								
Minor obstacle	−0.211***	−0.218***	−0.212***	−0.205***	−0.214***	−0.204***	−0.215***	−0.206***
	(−24.18)	(−24.37)	(−21.31)	(−25.34)	(−25.67)	(−22.23)	(−23.92)	(−20.92)
Moderate obstacle	−0.374***	−0.380***	−0.364***	−0.349***	−0.361***	−0.339***	−0.373***	−0.354***
	(−43.14)	(−42.60)	(−36.72)	(−43.33)	(−43.34)	(−36.96)	(−41.41)	(−35.78)
Major obstacle	−0.544***	−0.516***	−0.495***	−0.518***	−0.495***	−0.467***	−0.509***	−0.485***
	(−55.34)	(−51.00)	(−43.88)	(−56.69)	(−52.58)	(−44.98)	(−49.52)	(−42.76)
Very severe obstacle	−0.698***	−0.644***	−0.606***	−0.659***	−0.631***	−0.590***	−0.636***	−0.593***
	(−54.24)	(−48.56)	(−40.35)	(−57.00)	(−52.58)	(−44.26)	(−47.36)	(−39.49)
Subsidiary	0.080***	0.096***	0.052***	0.070***	0.096***	0.054***	0.091***	0.051***

Table 4 (continued)

	Government procurement contracts (GPCs)			External audit certification (EAC)			GPC and EAC	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(9.70)	(10.93)	(5.14)	(9.11)	(11.87)	(5.88)	(10.34)	(5.15)
Legal status								
Shareholding	0.076***	0.018	0.072***	0.062***	0.010	0.062***	0.028*	0.075***
	(5.24)	(1.23)	(4.08)	(4.69)	(0.73)	(3.82)	(1.88)	(4.33)
Sole proprietorship	−0.106***	−0.070***	0.032	−0.115***	−0.072***	0.013	−0.050***	0.038*
	(−7.10)	(−4.42)	(1.62)	(−8.33)	(−4.87)	(0.71)	(−3.10)	(1.91)
Partnership	−0.065***	−0.051***	0.019	−0.097***	−0.071***	−0.005	−0.038**	0.022
	(−3.85)	(−2.82)	(0.89)	(−6.25)	(−4.22)	(−0.25)	(−2.10)	(1.05)
Limited partnership	−0.047***	−0.044**	0.021	−0.060***	−0.050***	0.009	−0.031*	0.024
	(−2.86)	(−2.50)	(1.02)	(−3.91)	(−3.04)	(0.45)	(−1.77)	(1.19)
Other	−0.033	0.016	0.019	−0.034	−0.005	0.006	0.019	0.022
	(−1.17)	(0.55)	(0.55)	(−1.35)	(−0.20)	(0.18)	(0.65)	(0.64)
Corruption perception								
Minor obstacle	−0.330***	−0.301***	−0.290***	−0.321***	−0.296***	−0.286***	−0.299***	−v0.287***
	(−35.76)	(−31.43)	(−27.31)	(−37.21)	(−33.07)	(−29.07)	(−31.17)	(−27.24)
Moderate obstacle	−0.467***	−0.435***	−0.433***	−0.438***	−0.419***	−0.413***	−0.433***	−0.427***
	(−50.86)	(−44.62)	(−40.06)	(−50.91)	(−45.91)	(−41.17)	(v44.03)	(−39.56)
Major obstacle	−0.585***	−0.551***	−0.546***	−0.541***	−0.528***	−0.516***	−0.546***	−0.538***
	(−61.01)	(−53.84)	(−47.73)	(−61.04)	(−55.73)	(−49.24)	(−52.58)	(−46.79)
Very severe obstacle	−0.754***	−0.723***	−0.712***	−0.687***	−0.682***	−0.665***	−0.715***	−0.699***
	(−69.63)	(−61.54)	(−53.94)	(−68.93)	(−63.09)	(−55.45)	(−59.77)	(−52.55)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	No	Yes	Yes	No	Yes	Yes	Yes	Yes
Country effects	No	Yes	Yes	No	Yes	Yes	Yes	Yes
lnsigma								
GPC	0.022***	0.036***	0.020**				0.037***	0.022**
	(2.77)	(4.54)	(2.20)				(4.65)	(2.46)
EAC				−0.038***	−0.020***	−0.039***	−0.014**	−0.030***
				(−6.55)	(−3.49)	(−5.98)	(−2.27)	(−4.28)
Observations	128,041	128,041	102,923	139,185	139,185	116,899	126,365	102,031

Robust standard errors are reported in parentheses. Significance at 1%, 5%, and 10% is denoted by ***, **, and *, respectively

having no financing obstacle than male-owned firms. Consistent with the literature (Ai & Norton, 2003), we also calculate and plot the predicted probabilities of having no obstacle for the three-way interaction term involving continuous variables.[11] Figure 1 displays the predicted probabilities from the specifications in columns 1, 2, and 4 to 7 of Table 5, with 95% confidence intervals. The solid lines represent firms with a government procurement contract but no external audit certification; long-dash-dotted lines are for those firms with government procurement contract and external audit certification; shot-dashed lines are for those firms with no government contract but with external audit certification; and dotted lines are for those firms with no government contract and external audit certifications. Consistent with the predicted probabilities in Table 5, firms with no government procurement contracts have higher probabilities of having no financing obstacles than those with contracts. However, these effects vary with ownership, size, and organizational learning.

The two graphs at the top panel of Fig. 1 are for the interaction terms between proxies for ownership and government procurement contracts and external audit certification. Foreign ownership increases the likelihood of no financing obstacles for firms with external audit certification at a higher rate than those without, conditional on not having a government contract. This trend is also replicated for firms with government contracts, although the probabilities are substantially lower. In contrast, ownership concentration has a negligible impact on firms without government contracts but with external audit certification, and it has a negative and indistinguishable impact on other categories of firms—the confidence levels overlap.

The two graphs in the middle of Fig. 1 plot the probabilities of the interaction terms between external auditing, government contracts, and the two proxies for firm size for each outcome. In contrast to the patterns displayed for ownership, and as expected, we can see that the probability of having no obstacle to accessing financing increases with sales volume, regardless of whether a firm has a government contract, engages in external auditing, or any combination of the two. However, firms that do not have government contracts exhibit higher probabilities than those with government contracts. Interestingly, firms that have their financial statements checked by external auditors compared to those that do not seem to have greater access to financing beyond a specific threshold of total sales if they have a government contract. As for the number of employees, we observe a unique trend where beyond a specific threshold, the probability of having no obstacle for firms with no external audit certification surpasses that for firms with a certification. A similar pattern is also apparent for firms with government contracts: however, firms with external audit certifications surpass those without certifications beyond that threshold. Most importantly, however, the number of employees increases the probability of having no obstacle from about 30% for small firms to 60% for large firms among firms with no government contract and external certification.

Finally, the two graphs at the bottom of Fig. 1 plot the predicted probabilities for the interaction term between external audit, government contracts, and the two proxies for organizational learning. The firm age graph shows that firms without government contracts but with external audit certifications exhibit higher probabilities of having no obstacles than those without audit certifications. However, the gap between these two firm groups diminishes gradually with age and becomes the same at maturity. Among firms with government contracts, their probability of having no obstacle increases with age, with those having no external audit certification exhibiting higher probabilities.

The top manager experience graph on the bottom right side of Fig. 1 displays predicted probability patterns that are like those for ownership concentration. For firms that do not have government contracts, manager experience has no influence on the probability of having no obstacle for firms with or without external audits. For firms with government contracts, the probability of having no obstacle increases with manager experience regardless of whether they have or do not have external audits. Notwithstanding the overlapping confidence intervals for these firms, the predicted probability rises faster for firms without external audits.[12]

[11] This is because the numerical relationships between the coefficients of the model and the outcome variables are nonlinear.

[12] We also used a heteroskedastic ordered probit to rerun the specifications in columns 1, 2, 4, 5, 6 and 7 of Table 5 to ascertain that the 3SLS model captures additional information. The patterns of the predicted probabilities are largely unclear in this model, as displayed in Figure 6 of Appendix 2.

4.2 Additional analysis

In the above analysis, despite our use of dummies to control for industry and country effects, socioeconomic and business environment factors could also drive our results (Ayyagari et al., 2008; King & Levine, 1993). Arguably, the depth, access, and breadth of financial development, the inflow of foreign direct investment, participation in the international market, economic growth, and government effectiveness can heterogeneously influence access to finance in different countries. For instance, some studies have shown that well-developed financial markets and institutions facilitate access to financing in less developed countries, especially for firms that engage in international trade (Manova, 2013; Muûls, 2015; Pietrovito & Pozzolo, 2021). Other related studies have found that foreign direct investment can mitigate domestic credit constraints and imperfections in financial markets (Harrison & McMillan, 2003; Manova et al., 2015). The business environment in a country can also influence the effect of our firm-level variables of interest—external audit certification and government procurement contracts (Changwony & Kyiu, 2024; Lee & Weng, 2013; Yi et al., 2018; Zhou & Peng, 2012). Thus, to control for these factors, we include several country-level variables: the log of GDP per capita, the log of foreign direct investment, and the log of exports. Despite a drop in the number of observations owing to missing data for some countries, the results reported in Table 8 of Appendix 1 mirror those in Table 5. The predicted probabilities for firms without contracts drop in magnitude but increase for those with contracts. Despite these changes, the patterns of the predicted probabilities of the three-way interactions (not reported) are identical to those in Fig. 1. In further analysis, we included the IMF's financial development index but found no substantial changes in our results (not reported).

We also examine whether our results vary across two sub-samples of our data. Our first sub-sample analysis explores whether our results mask variations between country income groups. We noted in Sect. 2 that the composition of public procurement expenditure as a fraction of GDP varies substantially across World Bank country income groups. Thus, it is likely that the effect of government procurement contracts captures those differences. Recent studies have shown that the quality of public procurement, payment delays, and enforcement of procurement laws influence SMEs' access to government contracts, which varies across countries (Bosio et al., 2022; Hoekman & Taş, 2022). Studies have also shown that high- and upper-income countries exhibit better financial reporting practices, suggesting that firms in these countries are more likely to seek external audit certifications voluntarily. We use the 2021 World Bank income classification of countries to split our data into two sub-samples: i.e., countries in the high- or upper-income categories versus those in the low or lower middle-income categories.

We replay the models in Table 5 using the two samples. Table 9 and Table 10 of Appendix 1 report the results from these regressions and reveal remarkable differences between the two country groups and between firms with and without government procurement contracts. The pattern of the predicted probabilities in all the specifications for high- or upper-income countries is consistent with those in Table 5, although their magnitudes change slightly. In sharp contrast, we notice a different trend in low- or lower-middle-income countries; the magnitudes of the predicted probabilities for firms with government procurement contracts are about one and a half times larger than for firms without contracts, irrespective of their audit certification status.[13] The influence of ownership, size, and organization learning are virtually unchanged for high- or upper-income countries as depicted in Fig. 2 compared to Fig. 1. In contrast, Fig. 3 shows that size has a unique effect among firms with external audit certification but without government contracts in low- or lower-middle-income countries. Sales increase the likelihood of having no financing obstacle while the number of employees reduces it. The gap between firms with and without government contracts also narrows.

Our second sub-sample analysis focuses on possible differences between more and less innovative firms that could also influence our results. Some studies have argued that innovative firms—i.e., those that frequently release new products, services, processes, or generate more patents—tend to attract transactional lending as they are more likely to embrace modern management and financial practices (Wellalage &

[13] The results also show that external audit certification contributes significantly to the variance function while government procurement contracts is insignificant in high- and upper-income countries regressions (Table 9a). The contributions are opposite in the low and lower middle-income countries: government procurement contracts make a significant contribution while external audit certification does not (Table 10b).

Table 5 Estimates from three-equation seeming unrelated mixed-process regressions

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: finance access ordered probit equation							
GPC	−0.594***	−0.612***	−0.578***	−0.470***	−0.643***	−0.723***	−0.709***
	(−12.70)	(−9.77)	(−12.02)	(−5.16)	(−10.95)	(−10.66)	(−9.92)
EAC	0.138***	0.057	0.134***	0.220***	0.261***	0.182***	0.090**
	(4.59)	(1.51)	(4.33)	(4.29)	(7.21)	(4.63)	(2.26)
GPC × EAC	−0.179***	−0.063	−0.156***	−0.514***	−0.529***	−0.253***	−0.208***
	(−8.84)	(−1.15)	(−6.57)	(−5.09)	(−10.09)	(−3.94)	(−3.05)
GPC × ownership	0.083	−0.006	0.029				
	(1.06)	(−0.12)	(1.01)				
EAC × ownership	0.147***	0.120***	0.007				
	(4.47)	(4.36)	(0.46)				
GPC × EAC × ownership	−0.017	−0.159**	−0.055				
	(−0.19)	(−2.41)	(−1.49)				
GPC × firm size				−0.008*	−0.014		
				(−1.72)	(−1.19)		
EAC × firm size				−0.007***	−0.041***		
				(−2.67)	(−7.14)		
GPC × EAC × firm size				0.019***	0.086***		
				(3.33)	(5.99)		
GPC × organizational learning						0.046**	0.046**
						(2.53)	(2.43)
EAC × organizational learning						−0.029***	0.007
						(−3.09)	(0.72)
GPC × EAC × organizational learning						0.018	0.008
						(0.79)	(0.32)
Foreign ownership	0.053*			0.157***	0.159***	0.156***	0.157***
	(1.93)			(10.16)	(10.39)	(10.12)	(10.14)
Ownership concentration		−0.043**		0.015	0.016	0.015	0.015
		(−2.06)		(1.16)	(1.25)	(1.15)	(1.16)
Female ownership			0.017	0.024***	0.024***	0.024***	0.023***
			(1.51)	(3.21)	(3.23)	(3.19)	(3.16)
Total sales	0.012***	0.013***	0.015***	0.018***	0.016***	0.016***	0.015***
	(9.90)	(10.64)	(12.32)	(10.00)	(12.23)	(12.18)	(11.98)
Number of employees	0.047***	0.052***	0.045***	0.044***	0.061***	0.044***	0.043***
	(11.90)	(12.98)	(11.09)	(10.58)	(11.23)	(10.72)	(10.40)
Firm age	0.066***	0.066***	0.061***	0.066***	0.066***	0.072***	0.067***
	(13.60)	(13.47)	(12.33)	(13.23)	(13.15)	(9.75)	(13.37)
Manager experience	0.012**	0.010**	0.008	0.011**	0.012**	0.011**	−0.001
	(2.46)	(2.06)	(1.50)	(2.17)	(2.42)	(2.15)	(−0.20)
Corruption (no obstacle)	0.511***	0.507***	0.500***	0.493***	0.486***	0.492***	0.494***
	(59.56)	(58.45)	(57.93)	(55.95)	(55.97)	(56.06)	(56.07)
Informal competition (no obstacle)	0.396***	0.396***	0.395***	0.392***	0.388***	0.391***	0.393***

Table 5 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(51.69)	(51.19)	(50.97)	(49.66)	(49.41)	(49.66)	(49.77)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Predicted probabilities (two-way interactions)							
Very severe obstacle							
GPC = No × EAC = No	0.062***	0.063***	0.059***	0.057***	0.057***	0.057***	0.057***
	(31.16)	(30.57)	(30.10)	(29.58)	(29.39)	(29.69)	(29.60)
GPC = No × EAC = Yes	0.046***	0.046***	0.045***	0.046***	0.044***	0.046***	0.046***
	(29.08)	(28.67)	(27.83)	(27.39)	(28.71)	(27.53)	(27.21)
GPC = Yes × EAC = No	0.172***	0.180***	0.160***	0.164***	0.187***	0.163***	0.161***
	(12.80)	(12.99)	(12.31)	(12.14)	(13.87)	(12.30)	(11.95)
GPC = Yes × EAC = Yes	0.180***	0.189***	0.169***	0.185***	0.221***	0.189***	0.181***
	(14.19)	(14.68)	(13.69)	(13.76)	(17.23)	(14.38)	(13.62)
No obstacle							
GPC = No × EAC = No	0.362***	0.364***	0.370***	0.377***	0.385***	0.379***	0.375***
	(61.06)	(61.50)	(61.02)	(60.73)	(65.93)	(61.62)	(60.06)
GPC = No × EAC = Yes	0.419***	0.422***	0.422***	0.419***	0.433***	0.419***	0.417***
	(50.92)	(50.35)	(50.44)	(48.97)	(52.40)	(49.52)	(48.68)
GPC = Yes × EAC = No	0.173***	0.167***	0.184***	0.181***	0.163***	0.182***	0.183***
	(14.91)	(14.79)	(14.93)	(14.57)	(15.50)	(14.82)	(14.48)
GPC = Yes × EAC = Yes	0.165***	0.158***	0.174***	0.160***	0.135***	0.156***	0.163***
	(16.27)	(16.39)	(16.22)	(15.45)	(17.50)	(15.96)	(15.52)
Predicted probabilities (three-way interaction)							
Female = No × GPC = No × EAC = No			0.364***				
			(59.49)				
Female = No × GPC = No × EAC = Yes			0.416***				
			(49.41)				
Female = No × GPC = Yes × EAC = No			0.177***				
			(14.49)				
Female = No × GPC = Yes × EAC = Yes			0.172***				
			(15.87)				
Female = Yes × GPC = No × EAC = No			0.380***				
			(55.40)				
Female = Yes × GPC = No × EAC = Yes			0.435***				
			(48.58)				
Female = Yes × GPC = Yes × EAC = No			0.197***				
			(14.26)				
Female = Yes × GPC = Yes × EAC = Yes			0.178***				
			(15.72)				
Panel B: GPC probit equation							
Total sales	0.010***	0.010***	0.010***	0.010***	0.010***	0.010***	0.010***

Table 5 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(6.04)	(6.06)	(6.03)	(6.24)	(6.01)	(6.03)	(6.03)
Number of employees	0.057***	0.057***	0.057***	0.057***	0.059***	0.057***	0.057***
	(15.41)	(15.46)	(15.46)	(15.41)	(16.02)	(15.37)	(15.44)
Firm age	0.027***	0.027***	0.027***	0.026***	0.026***	0.030***	0.026***
	(4.07)	(4.07)	(4.07)	(4.04)	(4.03)	(4.49)	(4.02)
Manager experience	0.051***	0.051***	0.051***	0.051***	0.050***	0.050***	0.053***
	(7.45)	(7.46)	(7.46)	(7.47)	(7.37)	(7.44)	(7.71)
Tax inspection	0.305***	0.304***	0.303***	0.303***	0.302***	0.303***	0.303***
	(35.98)	(35.98)	(35.82)	(35.79)	(36.11)	(35.75)	(35.64)
Informal competition (no obstacle)	−0.011	−0.011	−0.010	−0.011	−0.011	−0.011	−0.011
	(−1.16)	(−1.19)	(−1.13)	(−1.20)	(−1.26)	(−1.22)	(−1.21)
Corruption (no obstacle)	−0.105***	−0.105***	−0.105***	−0.105***	−0.105***	−0.105***	−0.105***
	(−11.34)	(−11.36)	(−11.30)	(−11.34)	(−11.40)	(−11.36)	(−11.33)
Legal status (shareholding)	0.159***	0.160***	0.160***	0.162***	0.161***	0.162***	0.162***
	(8.50)	(8.59)	(8.55)	(8.64)	(8.70)	(8.64)	(8.63)
Industry (basic metals and metal products)	0.030	0.031	0.035	0.032	0.034	0.032	0.032
	(0.87)	(0.91)	(1.02)	(0.93)	(0.99)	(0.92)	(0.91)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	−1.785***	−1.786***	−1.785***	−1.789***	−1.788***	−1.791***	−1.789***
	(−51.35)	(−51.41)	(−51.33)	(−51.39)	(−51.59)	(−51.47)	(−51.34)
Panel C: EAC probit equation							
GPC	1.441***	1.441***	1.450***	1.444***	1.450***	1.441***	1.441***
	(58.09)	(58.60)	(60.99)	(59.11)	(63.42)	(58.79)	(57.60)
Total sales	0.004***	0.005***	0.004***	0.004***	0.004***	0.004***	0.004***
	(3.15)	(3.15)	(3.11)	(3.11)	(3.12)	(3.13)	(3.14)
Number of employees	0.169***	0.169***	0.168***	0.169***	0.168***	0.169***	0.169***
	(39.92)	(40.04)	(40.09)	(39.97)	(40.57)	(40.02)	(39.80)
Firm age	0.072***	0.072***	0.071***	0.072***	0.072***	0.072***	0.072***
	(12.80)	(12.80)	(12.77)	(12.80)	(12.79)	(12.82)	(12.81)
Manager experience	0.014**	0.014**	0.014**	0.014**	0.014**	0.014**	0.014**
	(2.44)	(2.44)	(2.42)	(2.43)	(2.40)	(2.44)	(2.44)
Applied for a loan	0.106***	0.106***	0.107***	0.110***	0.109***	0.111***	0.111***
	(10.33)	(10.27)	(10.33)	(10.65)	(10.62)	(10.78)	(10.67)
Export	0.035***	0.035***	0.035***	0.036***	0.036***	0.036***	0.036***
	(2.87)	(2.88)	(2.90)	(2.96)	(2.96)	(2.98)	(2.96)
ISC	0.321***	0.321***	0.320***	0.319***	0.319***	0.319***	0.320***
	(32.87)	(32.86)	(32.84)	(32.71)	(32.86)	(32.64)	(32.65)
Legal status (shareholding)	0.041**	0.040**	0.039**	0.040**	0.039**	0.041**	0.040**
	(2.13)	(2.11)	(2.06)	(2.09)	(2.05)	(2.12)	(2.11)
Industry (basic metals and metal products)	0.043	0.043	0.041	0.044	0.043	0.044	0.044
	(1.33)	(1.32)	(1.27)	(1.33)	(1.30)	(1.35)	(1.34)
Subsidiary	0.254***	0.254***	0.253***	0.253***	0.252***	0.253***	0.254***
	(24.10)	(24.11)	(24.07)	(24.03)	(24.10)	(24.02)	(24.01)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 5 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
Constant	−1.175***	−1.175***	−1.171***	−1.174***	−1.171***	−1.176***	−1.175***
	(−36.16)	(−36.22)	(−36.16)	(−36.16)	(−36.36)	(−36.22)	(−36.13)
Correlation between equations							
Equation_12	0.325***	0.343***	0.309***	0.334***	0.401***	0.342***	0.326***
	(10.38)	(11.07)	(9.83)	(10.33)	(14.09)	(10.84)	(9.98)
Equation_13	−0.127***	−0.134***	−0.118***	−0.113***	−0.138***	−0.110***	−0.109***
	(−6.06)	(−6.27)	(−5.48)	(−5.16)	(−6.49)	(−5.10)	(−4.97)
Equation_23	−0.920***	−0.920***	−0.934***	−0.925***	−0.934***	−0.920***	−0.920***
	(−27.86)	(−28.16)	(−28.95)	(−28.25)	(−30.38)	(−28.23)	(−27.58)
Observations	112,136	112,096	112,201	112,078	112,078	112,078	112,078

The dependent variables in the three equations are panel A, the ordinal variable, *finance access obstacles,* with five ordered response levels—from very severe obstacle, major obstacle, moderate obstacle, and minor obstacle to no obstacle; panel B, the binary variable, *government procurement contracts,* that takes the value of 1 if a firm has a government contract and 0 otherwise; and panel C, the binary variable, *external audit certification,* that takes the value of 1 if a firm has its financial statements checked by an auditor and 0 otherwise. Robust standard errors are reported in parentheses. Significance at 1%, 5%, and 10% is denoted by ***, **, and *, respectively

Fernandez, 2019; Wellalage et al., 2020). Ayyagari et al. (2011) show that access to financing influences innovation and that innovativeness increases with managers' education, family ownership, and foreign competition. However, others have also suggested that innovative firms find it difficult to access financing or pay higher interest rates as their prospects are uncertain and risky, their operations are opaque, and they do not disclose comprehensive financial performance information (Hutton & Lee, 2012; Mina et al., 2013; Rostamkalaei & Freel, 2016). We exploit a binary question in the WBES on whether a firm released a new product or service over the last 3 years, to which the response is yes or no. Table 11 and Table 12 of Appendix 1 report the raw coefficients for firms that introduced and those that did not introduce a new product or service, respectively, using the specifications in Table 5. Although the results are consistent with those in Table 5, we find that the predicted probabilities for non-innovative firms are larger than those for innovative firms. Additionally, the impacts of ownership, size, and organizational learning shown in Figs. 4 and 5 are similar to those in Fig. 1.

5 Robustness checks

This section presents the results of robustness checks to address potential concerns in our analysis. First, according to Kuntchev et al. (2013), relying solely on perception-based measures to assess access to financing is not as effective as using hard data—based on facts and quantifiable information regarding access. Instead, they suggest a more comprehensive approach that considers SME finance usage and the ability to obtain new financing. In their view, this approach provides a greater understanding of the factors that determine financing access. These authors use several questions related to credit access, usage, demand, and ability to obtain credit to construct a more objective credit constraint measure that mitigates the above self-selection problem. Using data from the WBES question about constraints in accessing credit, we follow the approach of Kuntchev et al. (2013) and classify firms into four ordinal categories: Not Credit Constrained, Maybe Credit Constrained, Partially Credit Constrained, and Fully Credit

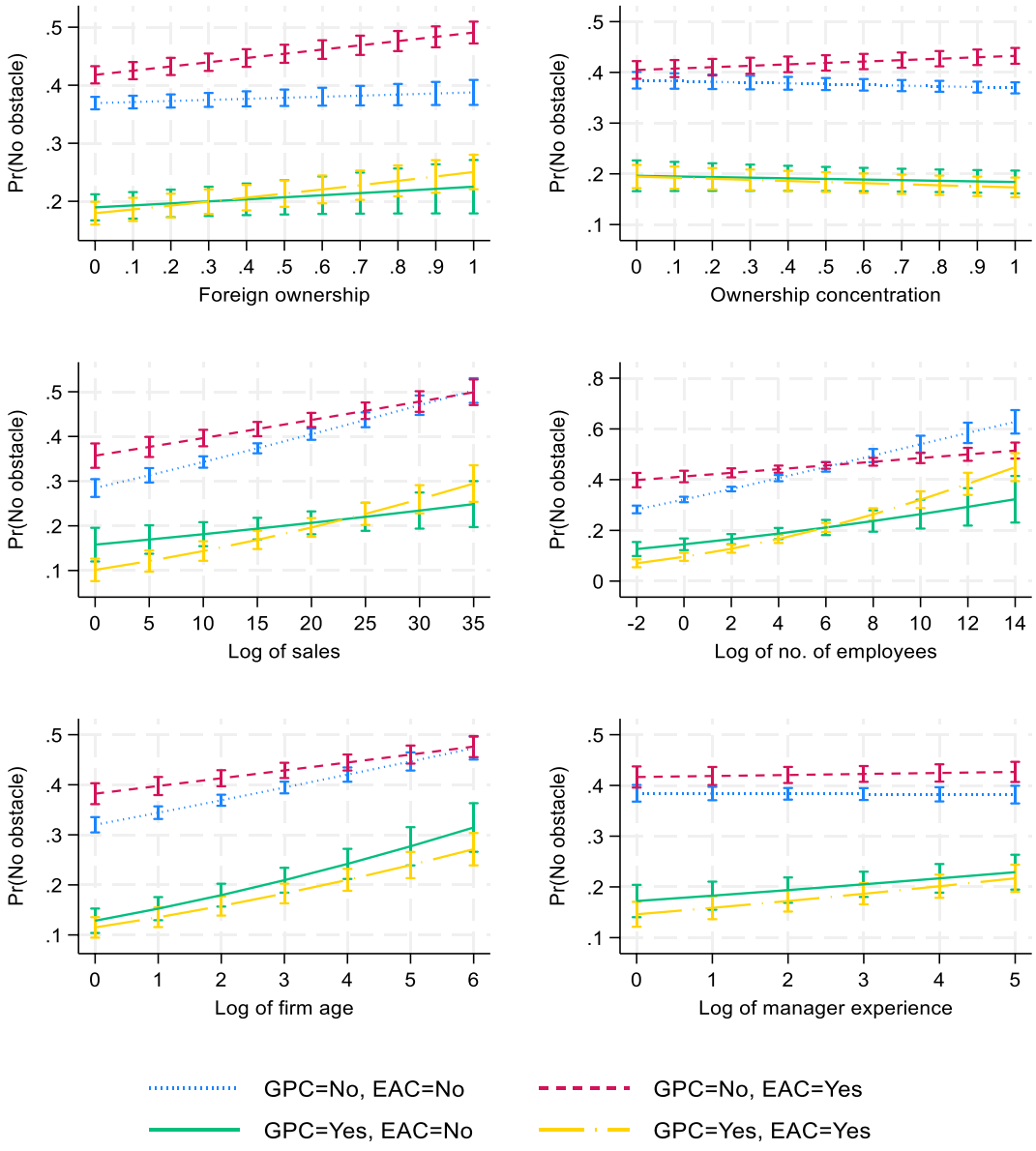

Fig. 1 Predicted probabilities from 3SLS estimates. This figure displays predicted probabilities with 95% confidence intervals for the three-way interaction terms in columns 1, 2, 4, 5, 6, and 7 of Table 5 between government procurement contracts (GPCs), external audit certification (EA), and the proxies for ownership (foreign and concentrated ownership), size (sales and number of employees), and organizational learning (firm age and the top manager experience). The dotted lines are for firms with no GPC and EAC; shot-dashed lines are for firms with no GPC but have EAC; solid lines are for firms with GPC but have no EAC; and long-dash-dotted lines are for firms that have GPC and EAC

Constrained. For example, firms that are Fully Credit Constrained are those that (1) "did not use external sources of finance for both working capital and investments during the previous fiscal year"; (2) "applied for a loan during the previous fiscal year"; and (3) "do not have a loan outstanding at the time of the survey which was disbursed during the last fiscal year or later" (Kuntchev et al., 2013, p. 9). Firms that fall under the Not Credit Constrained category are those that (1) "did not apply

for a loan during the previous fiscal year" and (2) "the reason for not applying for a loan was having enough capital for the firm's needs" (Kuntchev et al., 2013, p. 12). Several studies have used this measure to explore various firm outcomes (e.g., Fowowe, 2017; Islam et al., 2018). The results reported in Table 13 of Appendix 1 are consistent with those in Table 5. Indeed, the magnitudes of the predicted probabilities are greater for firms with government contracts and considerably lower for those without contracts, regardless of whether the firms possess external audit certifications. The patterns of the three-way interaction terms displayed in Fig. 7 of Appendix 2 are also identical to those in Fig. 1.

Second, as debated in multiple strands of literature (Greene & Hensher, 2010; Van de Ven & Van Praag, 1981), there could be a self-selection bias in our estimation samples that could give rise to erroneous inferences regarding the impact of our variables of interest on financing obstacles. For instance, this bias could occur because the unobservable factors that underlie the response to the financing obstacles question are also related to the unobservable factors that determine the probability of applying for bank finance. Our data show that, among firms that did not apply (applied) for bank finance, 37% (27%) indicate that they face no obstacle, while 8% (11%) say that they face very severe obstacles in accessing finance. Among firms that face no obstacle, 80% did not apply for a loan, while 20% applied. This response pattern suggests a potential self-selection bias in our results because, for example, there may be some unobserved factors that motivate a firm to seek external financing (e.g., relationships with lenders, social networks, approach to risk taking) that are likely the same factors that contribute to their perceptions about financing obstacles. We address this concern by running maximum-likelihood ordered probit models with sample selection (Greene & Hensher, 2010; Luca & Perotti, 2011). We estimate an ordered probit sample-selection model for the outcome of financing obstacles with selection based on new loans or line of credit applications. The results from this set of analyses (not reported) do not change our conclusions.

6 Discussion and conclusion

This study investigates the separate and joint impact of government procurement contracts and external audit certifications on the likelihood that access to financing is an obstacle to a firm's operations, and explores how ownership structure, firm size, and organizational learning influence this relationship. The benefits and costs of participating in government procurement and engaging external auditors remain controversial. For example, while the monitoring mechanisms inherent in government contracts can improve access to financing, the associated operational risk could also harm a firm's reputation and hinder access (Cohen & Li, 2020; Cohen et al., 2022). There is also an active debate over the connection between government procurement monitoring mechanisms and financial reporting transparency (Samuels, 2021) and between external auditing and financial reporting quality. Although many governments have implemented policy measures to facilitate access to procurement contracts for SMEs, we still do not know whether these interventions also translate into increased borrowing by SMEs to fulfil contract obligations (Loader, 2015).

Using 102,031 firm-year observations covering the 2007 to 2021 period, we uncover a unique access to financing grouping of firms based on participation in government procurement contracts, engagement in external audit certification, and country income classification. First, we find that government procurement contracts reduce the likelihood that access to finance is no obstacle to a firm's operations and increase the likelihood that it is a very severe obstacle. This finding contradicts the evidence that the in-built monitoring mechanisms in government contracts facilitate credit access (Cohen & Li, 2020; Cohen et al., 2022). We interpret this result as a likely indication of the weaknesses in government procurement systems, such as services not being paid for on time (Potoski, 2008) or corruption-induced payments (Ufere et al., 2012), especially in developing countries, which could overshadow the monitoring mechanisms in government contracts. Consistent with the literature, we find a positive association between external audit certification and access to finance being no obstacle to a firm's operations, but only when included with government procurement contracts in one model. Most importantly, our results show that the probability of access to finance

being no obstacle to a firm's operations is significantly greater for firms that do not have government procurement contracts, irrespective of whether they have external audit certification.

Conditional on not having a government procurement contract, the impact of external audit certification increases with increases in foreign ownership, female ownership, sales, the number of employees, and age. Evidence from country income classification sub-samples reveals opposite effects. The above results hold for upper-middle- and high-income countries but are reversed for lower-middle- and low-income countries—firms with government procurement contracts are more likely to have no obstacles to accessing financing, with no significant difference between those that have or do not have external audit certifications. We find insignificant differences between firms that are innovative and those that are not. This result is consistent with the finding of Mina et al. (2013) that research-intensive firms do not exhibit a substantially higher demand for financing than less research-intensive firms.

Our results have implications for policy and future research. For example, given the increased commitments by governments worldwide to ringfence a portion of public procurement contracts for SMEs (Hoekman & Taş, 2022), our study provides crucial empirical evidence to policymakers on the need to also focus on interventions that could reduce financing obstacles and facilitate access to credit. These interventions could include providing lines of credit, credit guarantees, public funding, or digital financing that targets younger SMEs and those with low turnover or an insufficient capital base (Kumar, 2017). The finding that external auditing exerts an infinitesimally small or zero influence on access to financing for firms that engage in government business raises questions about the role of financial reporting transparency in enhancing transactional lending. Whether this finding is consistent with the monitoring mechanisms in government procurement, or the associated corruption documented in the literature, is an open question, a subject for policy debate, and future research.

As our study is cross-sectional, we cannot definitively establish causality between the relationships uncovered, and the split sample approach may be critiqued on methodological grounds. For example, financing-constrained firms might seek external audit certification to enhance credibility or government contracts to exploit affirmative action to accelerate growth, leading to reverse causality. In this regard, future research can extend our work in two ways. First, as more cross-country panel data become available, future studies can control for country and firm heterogeneity that could bias our results. Countries differ in their colonial histories, financial institutions, religious affiliations, and political regimes, which could affect attitudes towards borrowing and default. Second, future authors can exploit policy reform shocks relating to external audit certifications and government procurement affirmative action to design quasi-experiment studies.

Another future opportunity for research relates to differences in the quality of public procurement systems across countries (Bosio et al., 2022; Hoekman & Taş, 2022). For example, those public procurement systems that enable timely payments to be made should reduce liquidity constraints, especially for SMEs in low-income countries, thereby enhancing credit quality. The quality of public procurement services is important in such countries, as they are more prone to corruption and have weak regulatory enforcement mechanisms. Our results show that in low- and lower middle-income countries SMEs with government contracts are less likely to perceive access to finance as an obstacle to their operations. Although we control for corruption in our study, there are other factors that could impact the quality of public procurement systems and outcomes, such as payment delays, integrity of contracts, and affirmative action. Future research can exploit recent data on the quality of public procurement systems (Bosio et al., 2022) to explore their implications for access to finance.

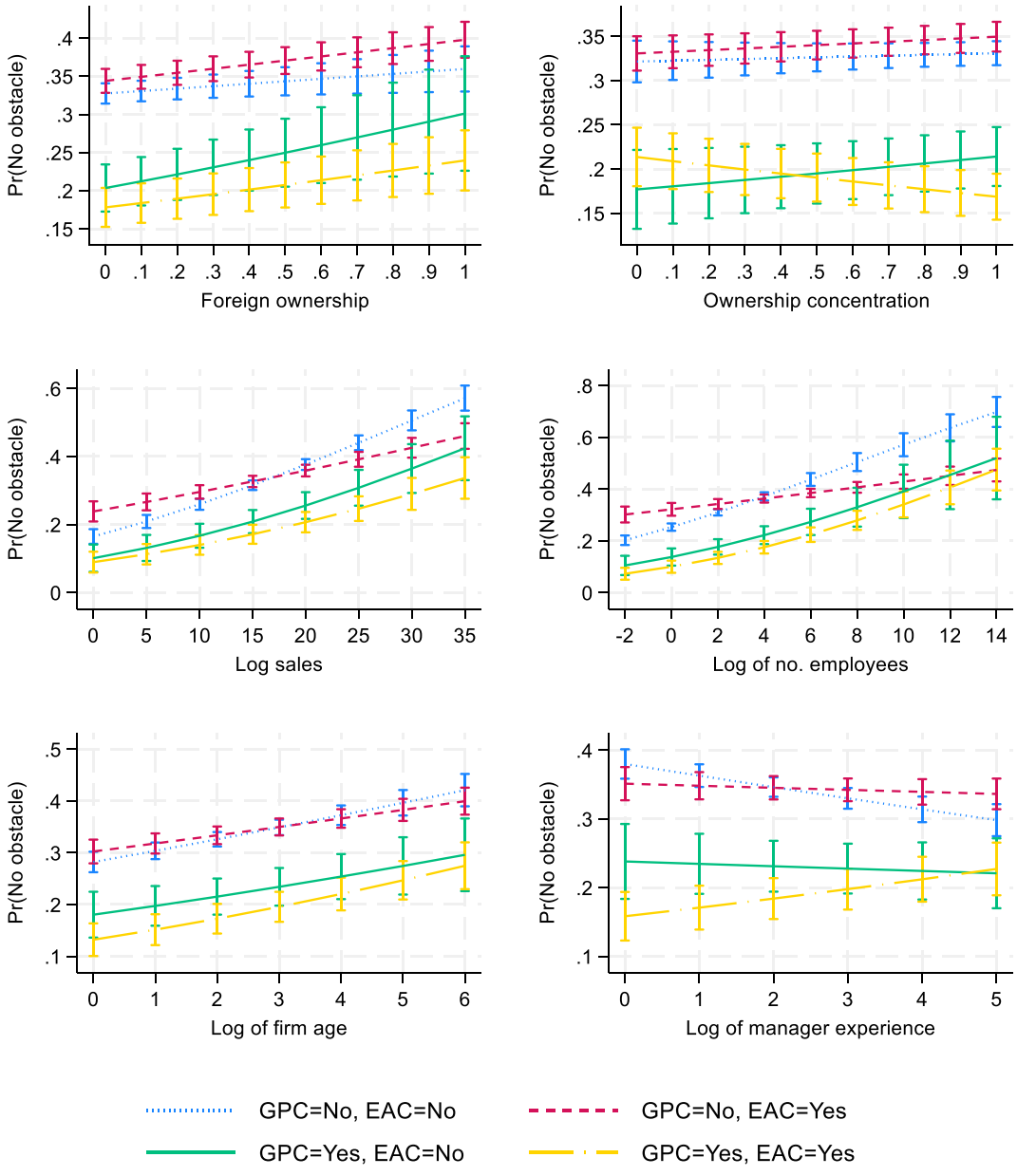

Fig. 2 High and upper middle-income countries This figure displays predicted probabilities with 95% confidence intervals for the three-way interaction terms in columns 1, 2, 4, 5, 6 and 7 of Table 9 between government procurement contracts (GPCs), external audit certification (EAC), and the proxies for ownership (foreign and concentrated ownership), size (sales and number of employees), and organizational learning (firm age and the top manager experience). The dotted lines are for firms with no GPC and EAC; shot-dashed lines are for firms with no GPC but have EAC; solid lines are for firms with GPC but have no EAC; and long-dash-dotted lines are for firms that have GPC and EAC

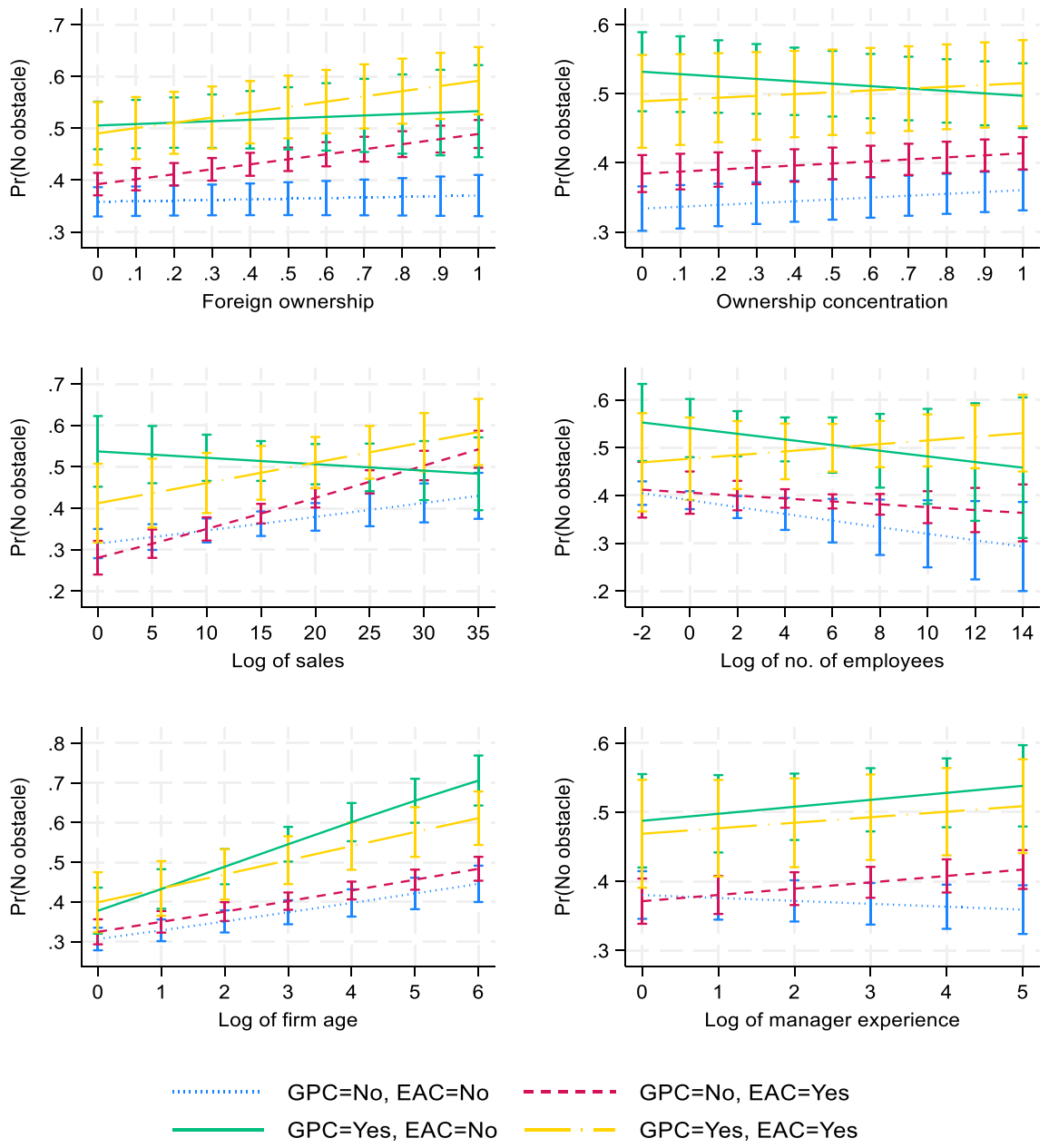

Fig. 3 Low- and lower-middle income countries. This figure displays predicted probabilities with 95% confidence intervals for the three-way interaction terms in columns 1, 2, 4, 5, 6 and 7 of Table 10 between government procurement contracts (GPCs), external audit certification (EAC), and the proxies for ownership (foreign and concentrated ownership), size (sales and number of employees), and organizational learning (firm age and the top manager experience). The dotted lines are for firms with no GPC and EAC; shot-dashed lines are for firms with no GPC but have EAC; solid lines are for firms with GPC but have no EAC; and long-dash-dotted lines are for firms that have GPC and EAC

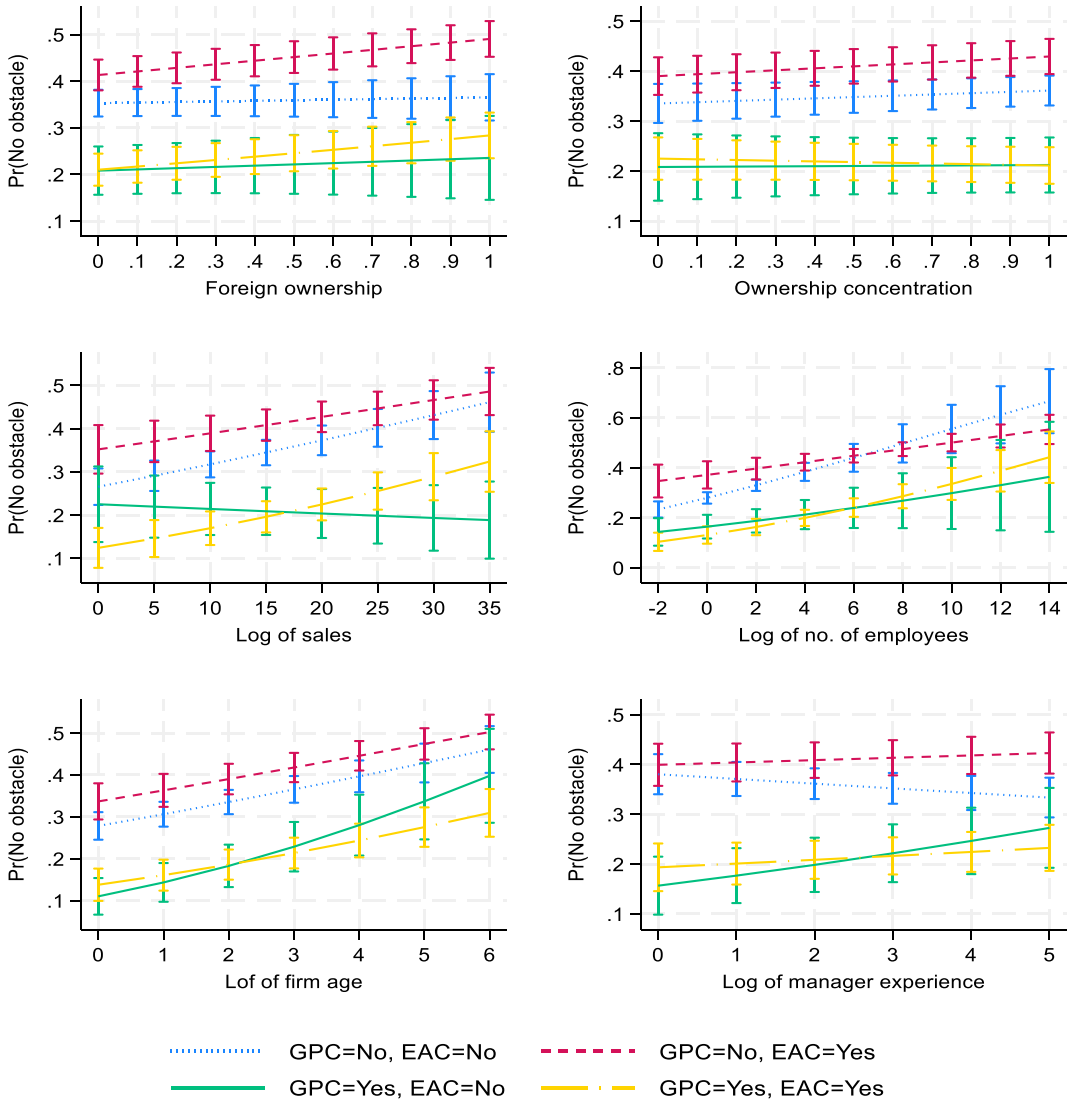

Fig. 4 Innovative firms. This figure displays predicted probabilities with 95% confidence intervals for the three-way interaction terms in columns 1, 2, 4, 5, 6, and 7 of Table 11 in Appendix 1 between government procurement contracts (GPCs), external audit certification (EAC), and the proxies for ownership (foreign and concentrated ownership), size (sales and number of employees), and organizational learning (firm age and the top manager experience). The dotted lines are for firms with no GPC and EAC; shot-dashed lines are for firms with no GPC but have EAC; solid lines are for firms with GPC but have no EAC; and long-dash-dotted lines are for firms that have GPC and EAC

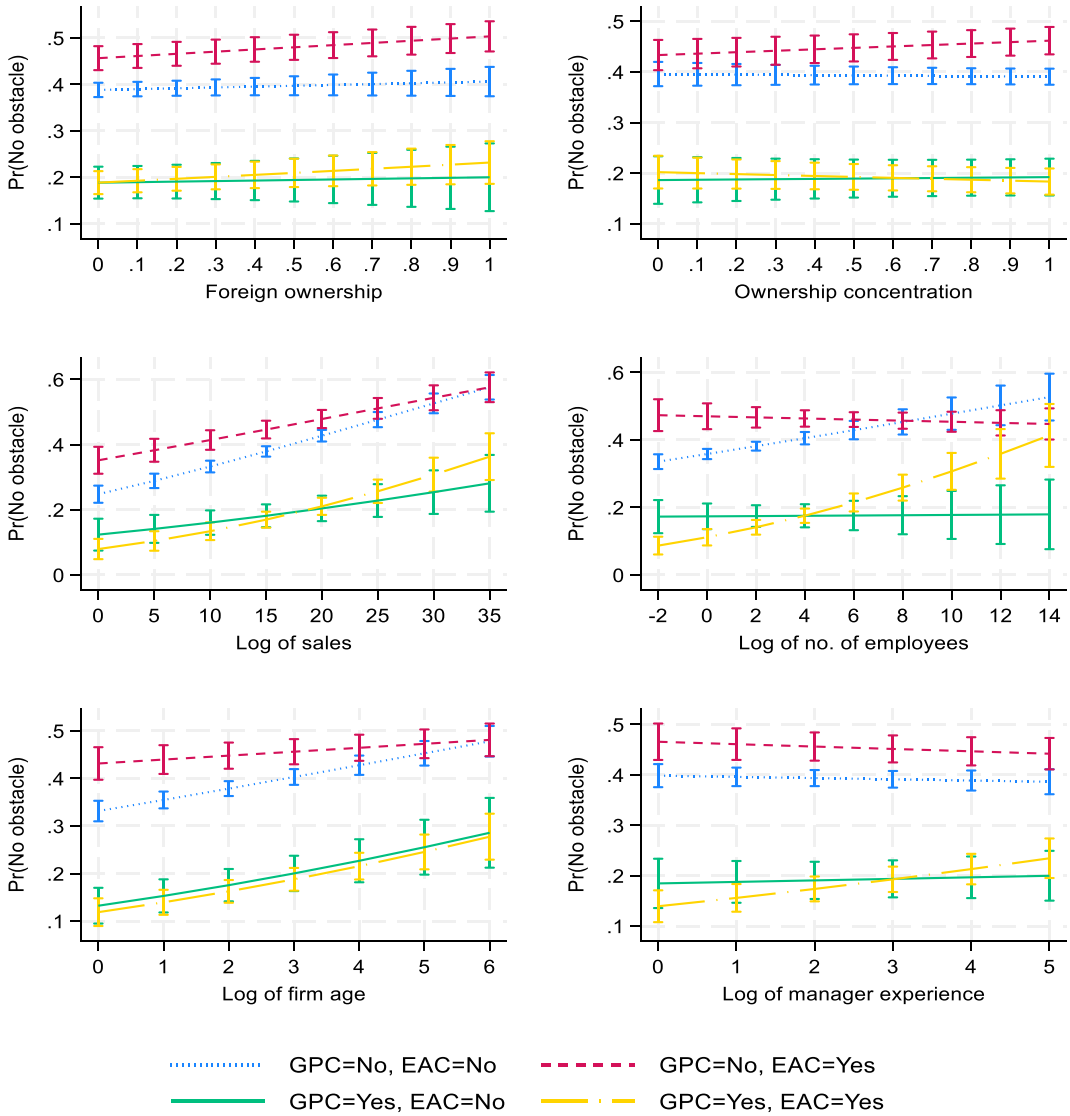

Fig. 5 Non-innovative firms. This figure displays predicted probabilities with 95% confidence intervals for the three-way interaction terms in columns 1, 2, 4, 5, 6, and 7 of Table 12 in Appendix 1 between government procurement contracts (GPCs), external audit certification (EAC), and the proxies for ownership (foreign and concentrated ownership), size (sales and number of employees), and organizational learning (firm age and the top manager experience). The dotted lines are for firms with no GPC and EAC; shot-dashed lines are for firms with no GPC but have EAC; solid lines are for firms with GPC but have no EAC; and long-dash-dotted lines are for firms that have GPC and EAC

Appendix 1

Table 6 Detailed summary statistics by country

Region/country	Finance access obstacles	External audit certification	Government procurement contracts
Sub-Saharan Africa Region			
Angola	3	0.33	0.5
Benin	2.67	0.17	0.5
Botswana	3.44	0.78	0.56
Burkina Faso	2.2	0.3	0.33
Burundi	2.88	-	-
Cameroon	3	0.5	0.08
Cape Verde	2	0.5	0.5
CAR	3	0.5	0.5
Congo	4	0.6	-
Djibouti	2.87	1	0.21
DRC	3.33	1	-
Eritrea	4	-	-
Eswatini	3.5	1	1
Ethiopia	3.22	0.75	0.26
Gabon	2.4	0.4	-
Gambia	2.5	0.5	-
Ghana	2.33	0.73	0.23
Guinea	4	0.25	-
Ivory Coast	1.22	0.47	0.19
Kenya	2.82	0.5	0.14
Lesotho	5	1	-
Liberia	3.14	-	0.17
Madagascar	3.64	0.57	0.1
Malawi	3.25	0.67	0.17
Mali	2.71	0.43	0.14
Mauritania	2.6	0.6	1
Mauritius	3.27	0.73	0.29
Mozambique	4	0.2	0.3
Namibia	2.67	0.5	-
Niger	3.57	0.29	0.43
Nigeria	3.15	0.21	0.13
Rwanda	3.59	0.47	0.59
Senegal	3.5	0.75	0.25
Sierra Leone	2.67	0.67	-
South Africa	4.11	0.56	-
South Sudan	2.82	0.41	0.24
Sudan	5	0.56	-
Tanzania	3.08	0.54	-
Togo	3	0.78	-
Uganda	3.57	0.71	-
Zambia	3.94	0.75	0.13
Zimbabwe	2.58	0.84	0.47

Table 6 (continued)

Region/country	Finance access obstacles	External audit certification	Government procurement contracts
Total	**3.15**	**0.56**	**0.22**
East Asia and the Pacific			
Cambodia	3.4	0.2	
China	3.83	0.75	0.08
Fiji	3.88	1	0.25
Indonesia	4.15	0.23	0.1
Laos	3.11	0.11	0.16
Malaysia	3.14	1	0.43
Mongolia	3.07	0.67	0.31
Myanmar	4.04	0.14	-
Philippines	4.38	0.88	0.09
Samoa	3.75	0.5	0.5
Solomon Islands	4	1	0.08
Thailand	4.14	0.43	0.29
Timor-Leste	4	-	0.5
Tonga	4	0.33	0.17
Vietnam	4.03	0.35	0.2
Total	**3.89**	**0.51**	**0.16**
Europe and Central Asia			
Albania	3.87	0.29	0.13
Armenia	3.25	0.29	0.23
Austria	4.82	0.86	0.05
Azerbaijan	3.69	0.38	0.33
Belarus	3.85	0.44	0.19
Belgium	4.22	0.73	0.21
Bosnia and Herzegovina	4	0.5	0.2
Bulgaria	4.27	0.43	0.11
Croatia	4.57	0.67	0.1
Cyprus	3.85	0.48	0.22
Czech Republic	2.13	0.47	0.07
Denmark	1.67	0.22	0.06
Estonia	4.6	0.55	0.29
Finland	4.08	0.92	0.08
Georgia	3.53	0.23	0.2
Greece	3.82	0.32	0.15
Hungary	4.09	0.62	0.09
Ireland	4	0.9	0.1
Italy	3.48	0.23	-
Kazakhstan	3.67	0.28	0.22
Kosovo	3.78	0.33	0.22
Kyrgyzstan	4.14	0.5	0.39
Latvia	4.58	0.5	0.3
Lithuania	4.21	0.31	0.13
Luxembourg	4.42	0.85	0.28
Moldova	3.8	0.21	0.19
Montenegro	4.26	0.56	0.33

Table 6 (continued)

Region/country	Finance access obstacles	External audit certification	Government procurement contracts
Netherlands	4.39	0.8	0.16
Poland	3.87	0.18	0.15
Portugal	4.02	0.49	0.11
North Macedonia	3.56	0.56	0.06
Romania	3.74	0.38	0.2
Russia	3.56	0.28	0.28
Serbia	3.83	0.44	0.19
Slovakia	3.77	0.59	0.12
Slovenia	4.35	0.37	0.39
Sweden	4.37	0.97	0.17
Tajikistan	4.04	0.46	0.25
Turkey	4.03	0.59	0.17
Ukraine	3.31	0.36	0.12
Uzbekistan	3.95	0.25	0.03
Total	**3.94**	**0.51**	**0.19**
Latin America and the Caribbean			
Antigua and Barbados	4	0.33	0.67
Argentina	2.92	0.66	0.24
Bahamas	3.8	0.4	0.1
Bolivia	3.74	0.84	-
Brazil	2.54	0.46	0.17
Chile	3.52	0.6	0.2
Colombia	3.42	0.63	0.22
Costa Rica	4.43	0.57	0.14
Dominica	4.38	0.5	0.13
Ecuador	3.75	0.65	-
El Salvador	3.46	0.73	0.33
Grenada	5	1	-
Guatemala	3.6	0.13	0.11
Guyana	5	1	-
Honduras	3.75	0.83	0.25
Jamaica	4.07	0.84	0.22
Mexico	3.81	0.73	0.17
Nicaragua	4	0.67	0.2
Panama	4.5	1	
Paraguay	4.06	0.38	0.18
Peru	3.9	0.38	0.33
St Kitts and Nevis	3	-	-
St Vincent and Grenadines	2.56	0.78	0.22
Suriname	3.4	0.8	-
Trinidad and Tobago	3.33	0.92	0.27
Uruguay	3.87	0.42	0.07
Venezuela	3.5	0.5	0.5
Total	**3.56**	**0.62**	**0.19**
Middle East and North Africa			

Table 6 (continued)

Region/country	Finance access obstacles	External audit certification	Government procurement contracts
Egypt	3.62	0.86	0.16
Iraq	2.67	0.42	0.46
Israel	4.35	0.96	0.18
Jordan	3.28	0.41	0.14
Lebanon	3.3	0.93	0.12
Malta	4.13	0.83	0.2
Morocco	4.06	0.52	0.21
Tunisia	3.92	0.42	0.25
West Bank and Gaza	2.98	0.81	0.17
Yemen	3.57	0.38	0.09
Total	**3.66**	**0.8**	**0.17**
South Asia Region			
Afghanistan	1.5	-	0.25
Bangladesh	2	0.75	-
Bhutan	4	-	1
India	3.89	0.88	0.05
Nepal	3.09	0.85	-
Pakistan	3.61	0.33	0.1
Sri Lanka	3.33	0.67	0.17
Total	**3.68**	**0.76**	**0.06**

Table 7 Marginal effects at different outcomes

	Severe obstacle	Major obstacle	Moderate obstacle	Minor obstacle	No obstacle
	(1)	(2)	(3)	(4)	(5)
GPC	0.017***	0.021***	0.009***	−0.009***	−0.038***
	(9.16)	(13.21)	(4.27)	(−4.86)	(−9.76)
EAC	−0.007***	−0.005***	0.003*	0.007***	0.001
	(−5.06)	(−3.46)	(1.87)	(4.66)	(0.39)
Foreign ownership	−0.019***	−0.032***	−0.023***	0.005***	0.068***
	(−11.10)	(−11.09)	(−11.05)	(10.58)	(11.13)
Ownership concentration	−0.002	−0.004	−0.003	0.001	0.008
	(−1.25)	(−1.25)	(−1.25)	(1.25)	(1.25)
Female ownership	−0.002***	−0.004***	−0.003***	0.001***	0.008***
	(−2.68)	(−2.68)	(−2.67)	(2.67)	(2.68)
Total sales	−0.003***	−0.006***	−0.004***	0.001***	0.012***
	(−13.88)	(−13.92)	(−13.88)	(12.86)	(13.99)
Number of employees	0.001*	0.001*	0.001*	−0.000*	−0.003*
	(1.76)	(1.76)	(1.76)	(−1.76)	(−1.76)
Firm age	−0.006***	−0.010***	−0.007***	0.002***	0.021***
	(−10.56)	(−10.59)	(−10.56)	(10.11)	(10.62)
Manager experience	−0.001	−0.001	−0.001	0.000	0.002
	(−1.07)	(−1.07)	(−1.07)	(1.07)	(1.07)
ISC	−0.002**	−0.003**	−0.002**	0.001**	0.007**
	(−2.16)	(−2.14)	(−2.12)	(2.23)	(2.13)
Exports	0.006***	0.010***	0.007***	−0.002***	−0.022***
	(4.90)	(5.05)	(5.29)	(−4.40)	(−5.16)
Informal competition					
Minor obstacle	0.017***	0.033***	0.029***	0.000	−0.080***
	(19.68)	(20.69)	(21.10)	(1.32)	(−21.19)
Moderate obstacle	0.033***	0.059***	0.046***	−0.005***	−0.133***
	(32.57)	(35.42)	(35.39)	(−12.55)	(−36.88)
Major obstacle	0.051***	0.083***	0.058***	−0.014***	−0.177***
	(36.05)	(41.49)	(44.27)	(−19.55)	(−45.61)
Very severe obstacle	0.068***	0.102***	0.064***	−0.024***	v0.210***
	(29.22)	(38.39)	(49.15)	(−18.42)	(−44.61)
Subsidiary	−0.005***	v0.009***	−0.006***	0.002***	0.019***
	(−5.15)	(−5.15)	(−5.15)	(5.09)	(5.15)
Legal status					
Shareholding	−0.008***	−0.013***	−0.009***	0.002***	0.028***
	(−4.12)	(−4.29)	(−4.54)	(3.54)	(4.40)
Sole proprietorship	−0.004*	−0.007*	−0.004*	0.001*	0.014*
	(−1.87)	(−1.90)	(−1.94)	(1.79)	(1.91)
Partnership	−0.002	−0.004	−0.003	0.001	0.008
	(−1.05)	(−1.05)	(−1.06)	(1.03)	(1.05)
Limited partnership	−0.003	−0.004	−0.003	0.001	0.009
	(−1.18)	(−1.19)	(−1.20)	(1.16)	(1.19)
Other	−0.002	−0.004	−0.003	0.001	0.008
	(−0.65)	(−0.64)	(−0.64)	(0.66)	(0.64)
Corruption perception					

Table 7 (continued)

	Severe obstacle	Major obstacle	Moderate obstacle	Minor obstacle	No obstacle
Minor obstacle	0.022***	0.045***	0.042***	0.002***	−0.111***
	(24.66)	(26.68)	(27.41)	(5.93)	(−27.68)
Moderate obstacle	0.038***	0.070***	0.057***	−0.004***	−0.162***
	(34.34)	(38.74)	(39.43)	(−7.44)	(−40.96)
Major obstacle	0.053***	0.090***	0.067***	−0.011***	−0.199***
	(39.19)	(45.37)	(46.99)	(−16.08)	(−49.54)
Very severe obstacle	0.080***	0.119***	0.075***	−0.026***	−0.248***
	(39.65)	(51.08)	(55.97)	(−23.37)	(−58.58)
Observations	102,031	102,031	102,031	102,031	102,031

This table presents marginal effects from heteroskedastic ordered probit regressions for five finance access obstacles outcomes using the specifications in column 8 of Table 4. Robust standard errors are reported in parentheses. Significance at 1%, 5%, and 10% is denoted by ***, **, and *, respectively

Table 8 Estimates with additional country-level control variables

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: finance access obstacles ordered probit equation							
GPC	−0.414***	−0.405***	−0.410***	−0.246***	−0.470***	−0.525***	−0.525***
	(−8.38)	(−5.95)	(−8.06)	(−2.59)	(−7.19)	(−7.20)	(−6.92)
EAC	0.083**	0.051	0.085**	0.173***	0.201***	0.142***	0.003
	(2.39)	(1.21)	(2.37)	(3.10)	(4.82)	(3.18)	(0.08)
GPC × EAC	−0.129***	−0.035	−0.101***	−0.474***	−0.473***	−0.189***	−0.137*
	(−5.71)	(−0.60)	(−3.89)	(−4.41)	(−8.21)	(−2.74)	(−1.90)
GPC × ownership	0.082	−0.027	0.062**				
	(0.98)	(−0.48)	(2.04)				
EAC × ownership	0.152***	0.050*	0.008				
	(4.30)	(1.71)	(0.47)				
GPC × EAC × ownership	−0.017	−0.133*	−0.065*				
	(−0.18)	(−1.90)	(−1.66)				
GPC × firm size				−0.010**	−0.018		
				(−2.15)	(−1.42)		
EAC × firm size				−0.007***	−0.038***		
				(−2.71)	(−6.20)		
GPC × EAC × firm size				0.020***	0.083***		
				(3.29)	(5.41)		
GPC × organizational learning						0.040**	0.050**
						(2.12)	(2.52)
EAC × organizational learning						−0.034***	0.020*
						(−3.39)	(1.90)
GPC × EAC × organizational learning						0.013	0.001
						(0.55)	(0.03)
Foreign ownership	0.040			0.141***	0.142***	0.140***	0.140***
	(1.35)			(8.56)	(8.74)	(8.52)	(8.54)
Ownership concentration		0.024		0.032**	0.033**	0.032**	0.033**
		(1.09)		(2.31)	(2.39)	(2.28)	(2.32)
Female ownership			−0.009	0.003	0.004	0.003	0.003
			(−0.79)	(0.44)	(0.47)	(0.44)	(0.38)
Total sales	0.017***	0.018***	0.019***	0.023***	0.020***	0.020***	0.019***
	(12.82)	(13.42)	(14.62)	(12.04)	(14.70)	(14.70)	(14.49)
Number of employees	0.039***	0.046***	0.039***	0.039***	0.056***	0.039***	0.038***
	(9.43)	(10.74)	(9.25)	(8.91)	(9.68)	(9.07)	(8.70)
Firm age	0.058***	0.059***	0.055***	0.060***	0.060***	0.070***	0.061***
	(11.41)	(11.42)	(10.63)	(11.53)	(11.53)	(9.05)	(11.70)
Manager experience	−0.003	−0.004	−0.006	−0.003	−0.002	−0.004	−0.023***

Table 8 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(−0.55)	(−0.84)	(−1.22)	(−0.61)	(−0.32)	(−0.70)	(−2.91)
Corruption (no obstacle)	0.484***	0.477***	0.476***	0.467***	0.459***	0.466***	0.468***
	(55.16)	(53.57)	(53.85)	(51.37)	(50.16)	(51.48)	(51.84)
Informal competition (no obstacle)	0.396***	0.397***	0.393***	0.391***	0.387***	0.390***	0.392***
	(50.56)	(50.10)	(49.60)	(48.43)	(47.81)	(48.40)	(48.63)
Institutional quality	0.083***	0.093***	0.047*	0.070**	0.070**	0.068**	0.073**
	(3.11)	(3.42)	(1.69)	(2.46)	(2.47)	(2.39)	(2.56)
GDP per capita	0.045***	0.045***	0.043***	0.043***	0.041***	0.043***	0.043***
	(9.87)	(9.75)	(9.06)	(8.89)	(8.55)	(8.89)	(8.90)
Foreign direct investment	−0.000*	−0.000	−0.001**	−0.001**	−0.001**	−0.001**	−0.001**
	(−1.80)	(−1.40)	(−2.45)	(−2.42)	(−2.34)	(−2.43)	(−2.43)
Exports	0.004***	0.004***	0.005***	0.005***	0.005***	0.005***	0.005***
	(18.72)	(19.20)	(20.43)	(19.48)	(20.03)	(19.56)	(19.35)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Predicted probabilities (two-way interactions)							
Very severe obstacle							
GPC = No × EAC = No	0.058***	0.058***	0.056***	0.054***	0.053***	0.054***	0.055***
	(28.54)	(28.10)	(27.86)	(27.20)	(26.90)	(27.45)	(27.32)
GPC = No × EAC = Yes	0.048***	0.048***	0.047***	0.048***	0.046***	0.048***	0.049***
	(23.15)	(22.62)	(22.35)	(21.67)	(22.89)	(21.92)	(21.54)
GPC = Yes × EAC = No	0.123***	0.126***	0.115***	0.117***	0.139***	0.116***	0.113***
	(10.88)	(10.70)	(10.61)	(10.10)	(10.87)	(10.24)	(10.07)
GPC = Yes × EAC = Yes	0.130***	0.137***	0.122***	0.134***	0.168***	0.137***	0.129***
	(12.51)	(12.36)	(12.19)	(11.54)	(13.08)	(12.01)	(11.71)
No obstacle							
GPC = No × EAC = No	0.359***	0.361***	0.365***	0.373***	0.381***	0.375***	0.370***
	(56.44)	(55.83)	(56.07)	(54.81)	(57.57)	(55.63)	(54.63)
GPC = No × EAC = Yes	0.395***	0.396***	0.398***	0.394***	0.410***	0.394***	0.391***
	(43.35)	(42.13)	(43.24)	(40.98)	(42.56)	(41.52)	(40.97)
GPC = Yes × EAC = No	0.221***	0.217***	0.232***	0.230***	0.202***	0.231***	0.235***
	(14.61)	(14.21)	(14.70)	(13.96)	(13.92)	(14.22)	(14.10)
GPC = Yes × EAC = Yes	0.211***	0.203***	0.221***	0.205***	0.170***	0.201***	0.211***
	(16.48)	(15.88)	(16.56)	(14.91)	(15.10)	(15.32)	(15.39)
Predicted probabilities (three-way interaction)							
Female = No × GPC = No × EAC = No			0.361***				
			(54.67)				
Female = No × GPC = No × EAC = Yes			0.393***				
			(42.58)				

Table 8 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
Female = No × GPC = Yes × EAC = No			0.222***				
			(14.15)				
Female = No × GPC = Yes × EAC = Yes			0.217***				
			(16.14)				
Female = Yes × GPC = No × EAC = No			0.374***				
			(51.20)				
Female = Yes × GPC = No × EAC = Yes			0.409***				
			(41.58)				
Female = Yes × GPC = Yes × EAC = No			0.252***				
			(14.42)				
Female = Yes × GPC = Yes × EAC = Yes			0.229***				
			(16.20)				
Panel B: GPC probit equation							
Total sales	0.010***	0.010***	0.010***	0.010***	0.010***	0.010***	0.010***
	(5.68)	(5.70)	(5.68)	(5.80)	(5.70)	(5.70)	(5.69)
Number of employees	0.053***	0.053***	0.054***	0.053***	0.055***	0.053***	0.053***
	(13.84)	(13.85)	(13.89)	(13.84)	(14.22)	(13.81)	(13.88)
Firm age	0.025***	0.025***	0.025***	0.025***	0.024***	0.026***	0.024***
	(3.60)	(3.59)	(3.59)	(3.57)	(3.56)	(3.83)	(3.56)
Manager experience	0.044***	0.044***	0.045***	0.045***	0.044***	0.044***	0.046***
	(6.25)	(6.26)	(6.29)	(6.28)	(6.20)	(6.27)	(6.41)
Tax inspection	0.318***	0.318***	0.317***	0.317***	0.316***	0.317***	0.317***
	(35.69)	(35.72)	(35.54)	(35.62)	(35.63)	(35.60)	(35.53)
Informal competition (no obstacle)	−0.010	−0.010	−0.010	−0.010	−0.011	−0.010	−0.010
	(−1.06)	(−1.07)	(−1.06)	(−1.09)	(−1.16)	(−1.11)	(−1.09)
Corruption (no obstacle)	−0.138***	−0.138***	−0.138***	−0.138***	−0.139***	−0.138***	−0.138***
	(−14.34)	(−14.34)	(−14.32)	(−14.34)	(−14.39)	(−14.34)	(−14.32)
Legal status (shareholding)	0.132***	0.134***	0.133***	0.134***	0.135***	0.134***	0.133***
	(6.67)	(6.72)	(6.65)	(6.71)	(6.87)	(6.72)	(6.68)
Industry (basic metals and metal products)	0.050	0.050	0.053	0.051	0.052	0.051	0.051
	(1.41)	(1.42)	(1.48)	(1.44)	(1.48)	(1.44)	(1.43)
Institutional quality	0.144***	0.143***	0.144***	0.144***	0.142***	0.144***	0.144***
	(4.74)	(4.73)	(4.77)	(4.77)	(4.67)	(4.74)	(4.76)
GDP per capita	−0.023***	−0.022***	−0.023***	−0.023***	−0.022***	−0.023***	−0.023***
	(−3.72)	(−3.71)	(−3.76)	(−3.72)	(−3.63)	(−3.72)	(−3.74)

Table 8 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
FDI	−0.000	−0.000	−0.000	−0.000	−0.000	−0.000	−0.000
	(−1.21)	(−1.21)	(−1.20)	(−1.19)	(−1.19)	(−1.20)	(−1.19)
Exports	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***
	(12.25)	(12.24)	(12.26)	(12.22)	(12.17)	(12.22)	(12.23)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	−1.770***	−1.771***	−1.770***	−1.773***	−1.773***	−1.774***	−1.772***
	(−31.95)	(−31.97)	(−31.98)	(−32.01)	(−32.05)	(−32.03)	(−31.99)
Panel C: EAC probit equation							
GPC	1.507***	1.506***	1.510***	1.507***	1.504***	1.504***	1.506***
	(80.18)	(79.69)	(81.84)	(79.99)	(79.85)	(79.18)	(79.31)
Total sales	0.008***	0.008***	0.008***	0.008***	0.008***	0.008***	0.008***
	(5.32)	(5.32)	(5.31)	(5.30)	(5.33)	(5.31)	(5.31)
Number of employees	0.159***	0.159***	0.159***	0.159***	0.159***	0.159***	0.159***
	(38.20)	(38.19)	(38.26)	(38.19)	(38.31)	(38.16)	(38.12)
Firm age	0.058***	0.058***	0.058***	0.058***	0.058***	0.058***	0.058***
	(9.93)	(9.93)	(9.92)	(9.93)	(9.94)	(9.94)	(9.93)
Manager experience	0.012**	0−.012**	0.012**	0.012**	0.012**	0.012**	0.012**
	(2.01)	(2.02)	(2.01)	(2.02)	(2.01)	(2.03)	(2.03)
Applied for a loan	0.097***	0.098***	0.098***	0.102***	0.101***	0.103***	0.102***
	(8.70)	(8.73)	(8.76)	(9.07)	(9.01)	(9.19)	(9.08)
Export	0.028**	0.029**	0.029**	0.030**	0.030**	0.030**	0.030**
	(2.22)	(2.25)	(2.25)	(2.33)	(2.32)	(2.36)	(2.33)
ISC	0.290***	0.290***	0.289***	0.289***	0.289***	0.289***	0.289***
	(29.45)	(29.37)	(29.40)	(29.29)	(29.31)	(29.24)	(29.27)
Legal status (shareholding)	0.104***	0.104***	0.104***	0.105***	0.104***	0.105***	0.105***
	(5.22)	(5.22)	(5.20)	(5.25)	(5.21)	(5.27)	(5.26)
Industry (basic metals and metal products)	−0.030	−0.030	−0.031	−0.029	−0.030	−0.029	−0.029
	(−0.91)	(−0.90)	(−0.93)	(−0.89)	(−0.91)	(−0.88)	(−0.88)
Subsidiary	0.236***	0.236***	0.236***	0.236***	0.236***	0.236***	0.236***
	(22.04)	(22.00)	(22.00)	(21.98)	(22.01)	(21.97)	(21.97)
Institutional quality	0.922***	0.923***	0.921***	0.922***	0.923***	0.923***	0.923***
	(33.98)	(33.98)	(33.99)	(33.97)	(33.98)	(33.98)	(33.97)
GDP per capita	−0.109***	−0.109***	−0.109***	−0.109***	−0.110***	−0.110***	−0.110***
	(−20.80)	(−20.80)	(−20.79)	(−20.82)	(−20.82)	(−20.83)	(−20.82)
FDI	−0.000	−0.000	−0.000	−0.000	−0.000	−0.000	−0.000
	(−0.87)	(−0.87)	(−0.87)	(−0.87)	(−0.87)	(−0.87)	(−0.88)
Exports	−0.004***	−0.004***	−0.004***	−0.004***	−0.004***	−0.004***	−0.004***
	(−15.41)	(−15.42)	(−15.41)	(−15.44)	(−15.42)	(−15.44)	(−15.44)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	−0.614***	−0.614***	−0.613***	−0.612***	−0.614***	−0.613***	−0.613***
	(−12.74)	(−12.75)	(−12.73)	(−12.71)	(−12.75)	(−12.71)	(−12.71)

Table 8 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
Correlation between equations							
Equation_12	0.191***	0.203***	0.176***	0.196***	0.276***	0.205***	0.184***
	(6.07)	(6.29)	(5.55)	(5.80)	(8.51)	(6.20)	(5.50)
Equation_13	−0.064***	−0.065***	−0.055**	−0.048*	−0.080***	−0.047*	−0.043*
	(−2.63)	(−2.61)	(−2.20)	(−1.86)	(−3.16)	(−1.84)	(−1.67)
Equation_23	−1.023***	−1.021***	−1.028***	−1.022***	−1.018***	−1.018***	−1.021***
	(−35.86)	(−35.67)	(−36.55)	(−35.80)	(−35.98)	(−35.52)	(−35.44)
Observations	103,762	103,727	103,826	103,709	103,709	103,709	103,709

The dependent variables in the three equations are panel A, the ordinal variable, *finance access obstacles,* with five ordered response levels—from very severe obstacle, major obstacle, moderate obstacle, and minor obstacle to no obstacle; Panel B, the binary variable, *government procurement contracts,* that takes the value of 1 if a firm has a government contract and 0 otherwise; and Panel C, the binary variable, *external audit certification,* that takes the value of 1 if a firm has its financial statements checked by an auditor and 0 otherwise. Robust standard errors are reported in parentheses. Significance at 1%, 5%, and 10% is denoted by ***, **, and *, respectively

Table 9 Estimates from income group classification sub-samples—high and upper middle income

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: finance access obstacles ordered probit equation							
GPC	−0.661***	−0.692***	−0.671***	−0.524***	−0.636***	−0.750***	−0.708***
	(−10.98)	(−7.51)	(−11.01)	(−3.93)	(−7.69)	(−7.84)	(−7.10)
EAC	0.192***	0.106	0.207***	0.331***	0.316***	0.290***	0.189***
	(3.49)	(1.61)	(3.79)	(4.00)	(5.06)	(4.39)	(2.77)
GPC × EAC	−0.192***	−0.043	−0.169***	−0.609***	−0.623***	−0.363***	−0.394***
	(−5.78)	(−0.49)	(−4.59)	(−3.73)	(−7.67)	(−3.53)	(−3.76)
GPC × ownership	−0.004	0.039	0.029				
	(−0.03)	(0.46)	(0.62)				
EAC × ownership	0.078	0.094**	−0.008				
	(1.51)	(2.32)	(−0.34)				
GPC × EAC × ownership	0.041	−0.194*	−0.062				
	(0.26)	(−1.82)	(−1.04)				
GPC × firm size				−0.009	−0.032*		
				(−1.29)	(−1.76)		
EAC × firm size				−0.009***	−0.038***		
				(−2.60)	(−4.58)		
GPC × EAC × firm size				0.025***	0.115***		
				(2.61)	(5.18)		
GPC × organizational learning						0.031	0.019
						(1.10)	(0.67)
EAC × organizational learning						−0.047***	−0.006
						(−3.46)	(−0.44)
GPC × EAC × organizational learning						0.055	0.074**
						(1.50)	(1.97)
Foreign ownership	0.051			0.091***	0.092***	0.090***	0.089***
	(1.25)			(3.65)	(3.74)	(3.65)	(3.57)
Ownership concentration		−0.015		0.044**	0.044**	0.044**	0.044**
		(−0.50)		(2.23)	(2.28)	(2.22)	(2.25)
Female ownership			0.063***	0.064***	0.064***	0.064***	0.064***
			(3.94)	(5.70)	(5.72)	(5.70)	(5.66)
Total sales	0.024***	0.024***	0.024***	0.027***	0.024***	0.024***	0.024***
	(12.58)	(12.66)	(12.63)	(10.81)	(12.59)	(12.65)	(12.47)
Number of employees	0.015**	0.020***	0.017***	0.020***	0.034***	0.019***	0.018***
	(2.43)	(3.22)	(2.86)	(3.17)	(4.38)	(3.15)	(2.96)
Firm age	0.051***	0.051***	0.049***	0.055***	0.054***	0.070***	0.056***
	(6.88)	(6.83)	(6.62)	(7.25)	(7.19)	(6.61)	(7.33)
Manager experience	0.000	0.002	−0.003	−0.001	−0.000	−0.001	−0.007

Table 9 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(0.00)	(0.27)	(−0.42)	(−0.08)	(−0.03)	(−0.15)	(−0.66)
Corruption (no obstacle)	0.577***	0.574***	0.574***	0.570***	0.565***	0.570***	0.572***
	(47.23)	(46.43)	(47.08)	(45.97)	(45.61)	(46.16)	(46.15)
Informal competition (no obstacle)	0.461***	0.462***	0.461***	0.460***	0.457***	0.461***	0.462***
	(41.17)	(40.90)	(41.19)	(40.50)	(40.23)	(40.62)	(40.66)
Time effects							
Predicted probabilities (two-way interactions)							
Very severe obstacle							
GPC = No × EAC = No	0.049***	0.049***	0.050***	0.048***	0.049***	0.048***	0.048***
	(16.04)	(15.75)	(16.17)	(15.51)	(15.44)	(15.66)	(15.55)
GPC = No × EAC = Yes	0.032***	0.033***	0.032***	0.033***	0.032***	0.033***	0.033***
	(15.79)	(15.23)	(15.95)	(15.05)	(15.72)	(15.02)	(14.86)
GPC = Yes × EAC = No	0.161***	0.159***	0.162***	0.162***	0.179***	0.158***	0.157***
	(8.09)	(7.87)	(8.19)	(7.87)	(8.40)	(7.89)	(7.74)
GPC = Yes × EAC = Yes	0.159***	0.163***	0.158***	0.169***	0.196***	0.171***	0.163***
	(11.03)	(10.98)	(11.09)	(11.10)	(12.42)	(11.46)	(11.03)
No obstacle							
GPC = No × EAC = No	0.380***	0.383***	0.379***	0.384***	0.387***	0.387***	0.383***
	(44.39)	(43.81)	(44.89)	(43.40)	(44.92)	(43.66)	(43.07)
GPC = No × EAC = Yes	0.457***	0.453***	0.458***	0.453***	0.463***	0.451***	0.450***
	(31.65)	(30.48)	(32.05)	(30.04)	(31.30)	(30.20)	(29.74)
GPC = Yes × EAC = No	0.167***	0.169***	0.166***	0.166***	0.153***	0.170***	0.170***
	(9.45)	(9.24)	(9.54)	(9.15)	(9.28)	(9.28)	(9.12)
GPC = Yes × EAC = Yes	0.168***	0.165***	0.170***	0.159***	0.138***	0.157***	0.164***
	(13.29)	(13.01)	(13.44)	(12.87)	(13.26)	(13.19)	(13.07)
Predicted probabilities (three-way interaction)							
Female = No × GPC = No × EAC = No			0.367***				
			(42.80)				
Female = No × GPC = No × EAC = Yes			0.448***				
			(31.37)				
Female = No × GPC = Yes × EAC = No			0.156***				
			(9.17)				
Female = No × GPC = Yes × EAC = Yes			0.165***				
			(13.14)				
Female = Yes × GPC = No × EAC = No			0.406***				
			(42.47)				

Table 9 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
Female = Yes × GPC = No × EAC = Yes			0.484***				
			(31.49)				
Female = Yes × GPC = Yes × EAC = No			0.189***				
			(9.22)				
Female = Yes × GPC = Yes × EAC = Yes			0.180***				
			(12.19)				
Panel B: GPC probit equation							
Total sales	0.013***	0.013***	0.013***	0.013***	0.013***	0.013***	0.013***
	(4.93)	(4.94)	(4.94)	(5.15)	(4.92)	(4.93)	(4.93)
Number of employees	0.053***	0.053***	0.053***	0.053***	0.055***	0.052***	0.053***
	(9.26)	(9.29)	(9.25)	(9.25)	(9.79)	(9.21)	(9.27)
Firm age	0.035***	0.035***	0.035***	0.035***	0.034***	0.039***	0.034***
	(3.30)	(3.31)	(3.30)	(3.26)	(3.22)	(3.70)	(3.23)
Manager experience	0.031***	0.031***	0.031***	0.031***	0.030***	0.031***	0.035***
	(2.87)	(2.88)	(2.86)	(2.85)	(2.79)	(2.81)	(3.16)
Tax inspection	0.373***	0.373***	0.374***	0.373***	0.370***	0.372***	0.373***
	(30.18)	(30.18)	(30.20)	(30.18)	(30.17)	(30.11)	(30.09)
Informal competition (no obstacle)	−0.013	−0.013	−0.012	−0.013	−0.013	−0.013	−0.013
	(−0.95)	(−0.95)	(−0.93)	(−0.96)	(−0.98)	(−0.97)	(−0.96)
Corruption (no obstacle)	−0.118***	−0.118***	−0.118***	−0.118***	−0.117***	−0.118***	−0.118***
	(−8.55)	(−8.52)	(−8.54)	(−8.54)	(−8.54)	(−8.54)	(−8.53)
Legal status (shareholding)	0.235***	0.237***	0.238***	0.238***	0.237***	0.237***	0.238***
	(7.65)	(7.71)	(7.71)	(7.73)	(7.76)	(7.72)	(7.72)
Industry (basic metals and metal products)	0.008	0.010	0.009	0.006	0.007	0.006	0.007
	(0.17)	(0.20)	(0.18)	(0.13)	(0.14)	(0.12)	(0.13)
Constant	−1.777***	−1.777***	−1.776***	−1.783***	−1.779***	−1.786***	−1.783***
	(−30.34)	(−30.36)	(−30.33)	(−30.48)	(−30.47)	(−30.52)	(−30.43)
Panel C: EAC probit equation							
GPC	1.649***	1.648***	1.651***	1.649***	1.653***	1.647***	1.648***
	(69.83)	(70.02)	(70.65)	(70.24)	(71.89)	(70.31)	(69.82)
Total sales	−0.001	−0.001	−0.001	−0.001	−0.001	−0.001	−0.001
	(−0.33)	(−0.33)	(−0.33)	(−0.35)	(−0.35)	(−0.35)	(−0.34)
Number of employees	0.131***	0.132***	0.131***	0.132***	0.131***	0.132***	0.132***
	(23.74)	(23.75)	(23.74)	(23.76)	(23.77)	(23.78)	(23.75)
Firm age	0.061***	0.061***	0.061***	0.061***	0.061***	0.061***	0.061***
	(7.27)	(7.28)	(7.26)	(7.28)	(7.27)	(7.28)	(7.28)
Manager experience	0.042***	0.042***	0.042***	0.042***	0.042***	0.042***	0.042***

Table 9 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(4.85)	(4.84)	(4.86)	(4.85)	(4.84)	(4.86)	(4.86)
Applied for a loan	0.130***	0.133***	0.129***	0.133***	0.132***	0.135***	0.134***
	(7.39)	(7.50)	(7.36)	(7.51)	(7.45)	(7.66)	(7.54)
Export	0.028	0.029	0.028	0.029	0.028	0.029	0.029
	(1.50)	(1.53)	(1.48)	(1.54)	(1.52)	(1.56)	(1.55)
ISC	0.300***	0.300***	0.300***	0.299***	0.299***	0.299***	0.299***
	(21.30)	(21.22)	(21.37)	(21.20)	(21.26)	(21.12)	(21.16)
Legal status (shareholding)	−0.071**	−0.072**	−0.073**	−0.072**	−0.072**	−0.072**	−0.072**
	(−2.42)	(−2.43)	(−2.48)	(−2.45)	(−2.47)	(−2.43)	(−2.44)
Industry (basic metals and metal products)	0.149***	0.149***	0.148***	0.150***	0.149***	0.151***	0.150***
	(3.43)	(3.43)	(3.42)	(3.46)	(3.45)	(3.47)	(3.46)
Subsidiary	0.265***	0.265***	0.265***	0.265***	0.264***	0.265***	0.265***
	(17.69)	(17.72)	(17.69)	(17.72)	(17.69)	(17.72)	(17.72)
Constant	−1.061***	−1.062***	−1.060***	−1.062***	−1.060***	−1.063***	−1.063***
	(−21.90)	(−21.93)	(−21.91)	(−21.93)	(−21.90)	(−21.96)	(−21.95)
Correlation between equations							
Equation_12	0.348***	0.350***	0.346***	0.360***	0.406***	0.361***	0.348***
	(8.99)	(8.86)	(9.03)	(9.10)	(10.66)	(9.27)	(8.76)
Equation_13	−0.176***	−0.168***	−0.181***	−0.169***	−0.189***	−0.161***	−0.163***
	(−4.62)	(−4.29)	(−4.77)	(−4.26)	(−4.87)	(−4.10)	(−4.08)
Equation_23	−1.141***	−1.139***	−1.145***	−1.140***	−1.148***	−1.137***	−1.139***
	(−29.25)	(−29.43)	(−29.57)	(−29.54)	(−30.37)	(−29.71)	(−29.33)
Observations	50,983	50,970	51,028	50,966	50,966	50,966	50,966

The dependent variables in the three equations are panel A, the ordinal variable, *finance access obstacles,* with five ordered response levels—from very severe obstacle, major obstacle, moderate obstacle, and minor obstacle to no obstacle; panel B, the binary variable, *government procurement contracts,* that takes the value of 1 if a firm has a government contract and 0 otherwise; and panel C, the binary variable, *external audit certification,* that takes the value of 1 if a firm has its financial statements checked by an auditor and 0 otherwise. Robust standard errors are reported in parentheses. Significance at 1%, 5%, and 10% is denoted by ***, **, and *, respectively

Table 10 Estimates from income group classification sub-samples — low and lower middle income

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: finance access obstacles ordered probit equation							
GPC	0.423***	0.571***	0.396***	0.646***	0.427***	0.218**	0.307***
	(4.74)	(5.49)	(4.34)	(4.59)	(4.25)	(2.03)	(2.61)
EAC	0.101	0.152*	0.118	−0.111	0.045	0.057	−0.026
	(1.41)	(1.89)	(1.58)	(−1.09)	(0.56)	(0.69)	(−0.30)
GPC×EAC	−0.144***	−0.273***	−0.107***	−0.242	−0.225***	0.005	−0.026
	(−4.37)	(−3.51)	(−2.82)	(−1.64)	(−2.95)	(0.05)	(−0.25)
GPC×ownership	0.041	−0.179**	0.081**				
	(0.36)	(−2.57)	(2.14)				
EAC×ownership	0.239***	0.004	0.002				
	(4.89)	(0.10)	(0.11)				
GPC×EAC×ownership	−0.030	0.167*	−0.118**				
	(−0.23)	(1.79)	(−2.29)				
GPC×firm size				−0.014**	0.005		
				(−2.23)	(0.28)		
EAC×firm size				0.012***	0.012		
				(3.15)	(1.45)		
GPC×EAC×firm size				0.006	0.015		
				(0.70)	(0.74)		
GPC×organizational learning						0.089***	0.041
						(3.53)	(1.54)
EAC×organizational learning						0.008	0.039**
						(0.57)	(2.53)
GPC×EAC×organizational learning						−0.067**	−0.045
						(−1.98)	(−1.25)
Foreign ownership	0.036			0.181***	0.185***	0.187***	0.188***
	(0.88)			(7.92)	(8.08)	(8.20)	(8.24)
Ownership concentration		0.081***		0.074***	0.073***	0.074***	0.075***
		(2.77)		(3.67)	(3.65)	(3.69)	(3.73)
Female ownership			0.017	0.035***	0.035***	0.035***	0.035***
			(1.11)	(3.30)	(3.28)	(3.27)	(3.32)
Total sales	0.011***	0.013***	0.013***	0.010***	0.013***	0.013***	0.013***
	(4.92)	(5.72)	(5.62)	(3.32)	(5.75)	(5.75)	(5.78)
Number of employees	−0.012	−0.009	−0.008	−0.013	−0.021*	−0.011	−0.011
	(−1.30)	(−0.87)	(−0.78)	(−1.30)	(−1.94)	(−1.10)	(−1.12)
Firm age	0.077***	0.077***	0.074***	0.081***	0.081***	0.069***	0.084***
	(9.46)	(9.35)	(9.00)	(9.70)	(9.75)	(6.00)	(10.05)
Manager experience	0.009	0.007	0.004	0.010	0.010	0.010	−0.013
	(1.09)	(0.83)	(0.55)	(1.20)	(1.23)	(1.20)	(−1.13)
Corruption (no obstacle)	0.526***	0.525***	0.527***	0.527***	0.528***	0.528***	0.528***
	(45.40)	(44.66)	(44.98)	(44.57)	(44.63)	(44.69)	(44.70)
Informal competition (no obstacle)	0.371***	0.376***	0.372***	0.370***	0.370***	0.370***	0.370***
	(31.92)	(31.88)	(31.60)	(31.11)	(31.03)	(31.09)	(31.09)

Table 10 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Predicted probabilities (two-way interactions)							
Very severe obstacle							
GPC = No × EAC = No	0.067***	0.070***	0.066***	0.064***	0.065***	0.064***	0.063***
	(9.56)	(9.30)	(9.31)	(9.10)	(9.27)	(9.42)	(9.28)
GPC = No × EAC = Yes	0.053***	0.051***	0.052***	0.054***	0.054***	0.055***	0.054***
	(15.76)	(15.51)	(15.28)	(14.72)	(15.10)	(15.50)	(15.08)
GPC = Yes × EAC = No	0.027***	0.028***	0.026***	0.026***	0.025***	0.024***	0.026***
	(7.56)	(7.67)	(7.59)	(7.34)	(7.72)	(7.95)	(7.58)
GPC = Yes × EAC = Yes	0.029***	0.027***	0.029***	0.030***	0.031***	0.030***	0.030***
	(5.85)	(5.72)	(5.68)	(5.46)	(5.63)	(5.72)	(5.60)
No obstacle							
GPC = No × EAC = No	0.346***	0.341***	0.350***	0.354***	0.353***	0.355***	0.356***
	(21.57)	(20.93)	(21.19)	(20.64)	(20.95)	(21.39)	(21.09)
GPC = No × EAC = Yes	0.391***	0.399***	0.395***	0.388***	0.386***	0.385***	0.387***
	(31.90)	(30.98)	(31.11)	(29.63)	(30.01)	(30.76)	(30.34)
GPC = Yes × EAC = No	0.511***	0.508***	0.517***	0.516***	0.527***	0.536***	0.520***
	(19.32)	(19.40)	(19.66)	(19.13)	(20.66)	(21.76)	(19.97)
GPC = Yes × EAC = Yes	0.501***	0.514***	0.503***	0.494***	0.492***	0.497***	0.493***
	(14.64)	(14.70)	(14.37)	(13.62)	(13.93)	(14.38)	(13.92)
	50,221	49,210	49,043	47,846	47,846	47,846	47,846
Predicted probabilities (three-way interaction)							
Female = No × GPC = No × EAC = No			0.345***				
			(20.93)				
Female = No × GPC = No × EAC = Yes			0.389***				
			(30.02)				
Female = No × GPC = Yes × EAC = No			0.499***				
			(18.56)				
Female = No × GPC = Yes × EAC = Yes			0.503***				
			(14.18)				
Female = Yes × GPC = No × EAC = No			0.358***				
			(20.85)				
Female = Yes × GPC = No × EAC = Yes			0.404***				
			(30.63)				
Female = Yes × GPC = Yes × EAC = No			0.546***				
			(19.89)				
Female = Yes × GPC = Yes × EAC = Yes			0.504***				
			(14.12)				
Panel B: GPC probit equation							
Total sales	0.026***	0.026***	0.026***	0.026***	0.026***	0.026***	0.026***
	(9.78)	(9.79)	(9.79)	(9.75)	(9.80)	(9.81)	(9.79)

Table 10 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
Number of employees	0.071***	0.072***	0.071***	0.071***	0.071***	0.072***	0.071***
	(12.59)	(12.60)	(12.59)	(12.54)	(12.51)	(12.63)	(12.57)
Firm age	0.010	0.009	0.010	0.010	0.010	0.008	0.009
	(1.04)	(1.00)	(1.05)	(1.04)	(1.06)	(0.83)	(1.02)
Manager experience	0.059***	0.058***	0.058***	0.058***	0.058***	0.058***	0.056***
	(5.95)	(5.92)	(5.93)	(5.94)	(5.94)	(5.92)	(5.74)
Tax inspection	−0.118***	−0.118***	−0.117***	−0.116***	−0.117***	−0.118***	−0.117***
	(−9.13)	(−9.09)	(−9.08)	(−8.99)	(−9.17)	(−9.25)	(−9.07)
Informal competition (no obstacle)	−0.071***	−0.071***	−0.072***	−0.071***	−0.072***	−0.072***	−0.072***
	(−5.53)	(−5.50)	(−5.55)	(−5.52)	(−5.59)	(−5.61)	(−5.55)
Corruption (no obstacle)	−0.156***	−0.155***	−0.155***	−0.155***	−0.155***	−0.155***	−0.155***
	(−12.19)	(−12.17)	(−12.15)	(−12.14)	(−12.17)	(−12.19)	(−12.15)
Legal status (shareholding)	0.139***	0.140***	0.139***	0.141***	0.140***	0.140***	0.141***
	(5.27)	(5.31)	(5.27)	(5.34)	(5.30)	(5.34)	(5.34)
Industry (basic metals and metal products)	−0.079	−0.076	−0.082	−0.077	−0.077	−0.077	−0.077
	(−1.53)	(−1.48)	(−1.59)	(−1.47)	(−1.48)	(−1.49)	(−1.48)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	−1.731***	−1.731***	−1.732***	−1.732***	−1.730***	−1.725***	−1.726***
	(−31.53)	(−31.51)	(−31.55)	(−31.46)	(−31.47)	(−31.38)	(−31.38)
Panel C: EAC probit equation							
GPC	−1.274***	−1.276***	−1.274***	−1.271***	−1.276***	−1.277***	−1.274***
	(−43.59)	(−43.85)	(−43.47)	(−42.80)	(−44.85)	(−44.84)	(−43.73)
Total sales	0.019***	0.019***	0.019***	0.019***	0.019***	0.019***	0.019***
	(8.28)	(8.30)	(8.29)	(8.25)	(8.29)	(8.30)	(8.28)
Number of employees	0.222***	0.222***	0.222***	0.222***	0.222***	0.222***	0.222***
	(39.70)	(39.72)	(39.73)	(39.67)	(39.74)	(39.74)	(39.71)
Firm age	0.076***	0.076***	0.076***	0.076***	0.076***	0.076***	0.076***
	(9.11)	(9.10)	(9.12)	(9.12)	(9.12)	(9.12)	(9.11)
Manager experience	0.033***	0.033***	0.033***	0.033***	0.033***	0.033***	0.033***
	(3.87)	(3.88)	(3.86)	(3.85)	(3.86)	(3.86)	(3.84)
Applied for a loan	0.071***	0.066***	0.071***	0.074***	0.074***	0.075***	0.075***
	(4.11)	(3.79)	(4.07)	(4.23)	(4.32)	(4.42)	(4.34)
Export	0.062***	0.061***	0.063***	0.063***	0.063***	0.064***	0.063***
	(3.70)	(3.63)	(3.71)	(3.73)	(3.75)	(3.77)	(3.75)
ISC	0.360***	0.361***	0.360***	0.360***	0.359***	0.358***	0.359***
	(26.95)	(27.00)	(26.83)	(26.88)	(26.77)	(26.76)	(26.82)
Legal status (shareholding)	0.195***	0.195***	0.196***	0.197***	0.196***	0.197***	0.197***
	(7.81)	(7.80)	(7.83)	(7.89)	(7.87)	(7.89)	(7.89)
Industry (basic metals and metal products)	−0.163***	−0.162***	−0.165***	−0.162***	−0.162***	−0.162***	−0.162***
	(−3.51)	(−3.50)	(−3.54)	(−3.48)	(−3.48)	(−3.48)	(−3.48)
Subsidiary	0.228***	0.229***	0.228***	0.227***	0.226***	0.226***	0.227***
	(14.86)	(14.85)	(14.80)	(14.80)	(14.76)	(14.74)	(14.77)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	−1.199***	−1.199***	−1.199***	−1.198***	−1.198***	−1.198***	−1.198***

Table 10 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(−26.21)	(−26.23)	(−26.22)	(−26.17)	(−26.20)	(−26.22)	(−26.20)
Correlation between equations							
Equation_12	−0.269***	−0.274***	−0.270***	−0.258***	−0.271***	−0.275***	−0.261***
	(−5.54)	(−5.62)	(−5.49)	(−5.12)	(−5.63)	(−5.82)	(−5.31)
Equation_13	−0.124**	−0.144***	−0.122**	−0.107**	−0.109**	−0.107**	−0.104**
	(−2.50)	(−2.80)	(−2.39)	(−2.03)	(−2.11)	(−2.11)	(−2.03)
Equation_23	1.115***	1.119***	1.114***	1.109***	1.118***	1.120***	1.115***
	(22.80)	(22.84)	(22.75)	(22.49)	(23.44)	(23.38)	(22.89)
Observations	51,065	51,054	51,069	51,050	51,050	51,050	51,050

The dependent variables in the three equations are panel A, the ordinal variable, *finance access obstacles,* with five ordered response levels—from very severe obstacle, major obstacle, moderate obstacle, and minor obstacle to no obstacle; panel B, the binary variable, *government procurement contracts,* that takes the value of 1 if a firm has a government contract and 0 otherwise; and panel C, the binary variable, *external audit certification,* that takes the value of 1 if a firm has its financial statements checked by an auditor and 0 otherwise. Robust standard errors are reported in parentheses. Significance at 1%, 5% and 10% is denoted by ***, **, and *, respectively

Table 11 Estimates from sub-samples—innovative firms

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(1)	(2)	(3)	(7)	(4)	(5)	(6)
Panel A: finance access obstacles ordered probit equation							
GPC	−0.478***	−0.427***	−0.466***	−0.142	−0.430***	−0.701***	−0.776***
	(−5.50)	(−3.45)	(−5.27)	(−0.83)	(−3.70)	(−5.39)	(−5.92)
EAC	0.174**	0.160*	0.190**	0.270**	0.281***	0.183**	0.054
	(2.21)	(1.67)	(2.40)	(2.43)	(3.30)	(1.96)	(0.56)
GPC × EAC	−0.166***	−0.097	−0.154***	−0.711***	−0.440***	−0.033	0.104
	(−4.48)	(−0.95)	(−3.55)	(−3.85)	(−4.35)	(−0.27)	(0.83)
GPC × ownership	0.065	−0.062	0.025				
	(0.44)	(−0.58)	(0.46)				
EAC × ownership	0.177***	0.034	−0.036				
	(2.63)	(0.61)	(−1.16)				
GPC × EAC × ownership	−0.021	−0.101	−0.024				
	(−0.13)	(−0.81)	(−0.37)				
GPC × firm size				−0.021**	−0.030		
				(−2.39)	(−1.21)		
EAC × firm size				−0.006	−0.043***		
				(−1.14)	(−3.45)		
GPC × EAC × firm size				0.032***	0.070**		
				(3.01)	(2.52)		
GPC × organizational learning						0.088**	0.117***
						(2.49)	(3.27)
EAC × organizational learning						−0.011	0.041**
						(−0.61)	(2.11)
GPC × EAC × organizational learning						−0.057	−0.100**
						(−1.35)	(−2.30)
Foreign ownership	0.037			0.170***	0.174***	0.171***	0.172***
	(0.61)			(6.43)	(6.59)	(6.46)	(6.46)
Ownership concentration		0.077*		0.055**	0.058**	0.054**	0.055**
		(1.70)		(2.20)	(2.32)	(2.18)	(2.20)
Female ownership			0.015	0.002	0.003	0.002	0.002
			(0.60)	(0.17)	(0.19)	(0.15)	(0.14)
Total sales	0.013***	0.014***	0.014***	0.017***	0.014***	0.013***	0.013***
	(5.18)	(5.42)	(5.43)	(4.07)	(5.27)	(5.22)	(5.13)
Number of employees	0.047***	0.056***	0.054***	0.050***	0.079***	0.052***	0.050***
	(5.00)	(5.66)	(5.67)	(4.85)	(5.21)	(5.18)	(4.97)
Firm age	0.087***	0.087***	0.087***	0.092***	0.093***	0.089***	0.094***
	(9.28)	(9.16)	(9.21)	(9.49)	(9.62)	(5.52)	(9.69)
Manager experience	0.011	0.005	0.005	0.008	0.009	0.008	−0.028*

Table 11 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(1.18)	(0.51)	(0.48)	(0.88)	(0.93)	(0.86)	(− 1.75)
Corruption (no obstacle)	0.478***	0.473***	0.482***	0.472***	0.469***	0.473***	0.474***
	(28.22)	(27.44)	(28.43)	(27.13)	(26.94)	(27.19)	(27.27)
Informal competition (no obstacle)	0.354***	0.356***	0.355***	0.352***	0.352***	0.353***	0.353***
	(23.60)	(23.47)	(23.59)	(23.06)	(23.02)	(23.09)	(23.13)
Time effects							
Predicted probabilities (two-way interactions)							
Very severe obstacle							
GPC = No × EAC = No	0.061***	0.061***	0.060***	0.060***	0.055***	0.058***	0.060***
	(10.28)	(9.96)	(10.39)	(9.60)	(9.14)	(9.75)	(9.79)
GPC = No × EAC = Yes	0.041***	0.041***	0.042***	0.042***	0.042***	0.043***	0.043***
	(13.37)	(12.78)	(13.10)	(12.49)	(12.39)	(12.36)	(12.28)
GPC = Yes × EAC = No	0.141***	0.141***	0.137***	0.144***	0.144***	0.133***	0.135***
	(5.51)	(5.30)	(5.52)	(5.22)	(5.24)	(5.10)	(5.10)
GPC = Yes × EAC = Yes	0.136***	0.138***	0.134***	0.143***	0.159***	0.142***	0.137***
	(7.86)	(7.61)	(7.88)	(7.53)	(8.20)	(7.45)	(7.32)
No obstacle							
GPC = No × EAC = No	0.343***	0.344***	0.344***	0.346***	0.364***	0.349***	0.343***
	(21.72)	(21.15)	(21.81)	(20.52)	(20.33)	(20.63)	(20.53)
GPC = No × EAC = Yes	0.415***	0.415***	0.411***	0.411***	0.413***	0.407***	0.407***
	(22.58)	(21.54)	(22.36)	(20.80)	(21.01)	(20.77)	(20.57)
GPC = Yes × EAC = No	0.191***	0.191***	0.195***	0.187***	0.188***	0.200***	0.196***
	(7.05)	(6.78)	(7.14)	(6.60)	(6.60)	(6.74)	(6.65)
GPC = Yes × EAC = Yes	0.197***	0.194***	0.199***	0.188***	0.172***	0.188***	0.194***
	(10.84)	(10.39)	(10.89)	(10.06)	(10.41)	(9.96)	(9.98)
Predicted probabilities (three-way interaction)							
Female = No × GPC = No × EAC = No			0.335***				
			(21.32)				
Female = No × GPC = No × EAC = Yes			0.406***				
			(22.07)				
Female = No × GPC = Yes × EAC = No			0.186***				
			(6.91)				
Female = No × GPC = Yes × EAC = Yes			0.196***				
			(10.56)				
Female = Yes × GPC = No × EAC = No			0.359***				
			(20.66)				

Table 11 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
Female = Yes × GPC = No × EAC = Yes			0.418***				
			(21.79)				
Female = Yes × GPC = Yes × EAC = No			0.211***				
			(7.04)				
Female = Yes × GPC = Yes × EAC = Yes			0.204***				
			(10.64)				
Panel B: GPC probit equation							
Total sales	0.007**	0.007**	0.007**	0.007**	0.007**	0.007**	0.007**
	(2.15)	(2.16)	(2.15)	(2.24)	(2.16)	(2.16)	(2.16)
Number of employees	0.019***	0.019***	0.019***	0.018***	0.019***	0.018***	0.018***
	(2.63)	(2.64)	(2.64)	(2.59)	(2.77)	(2.60)	(2.63)
Firm age	0.027**	0.027**	0.027**	0.027**	0.027**	0.028**	0.027**
	(2.32)	(2.33)	(2.33)	(2.30)	(2.30)	(2.41)	(2.30)
Manager experience	0.029**	0.029**	0.029**	0.029**	0.029**	0.029**	0.029**
	(2.36)	(2.36)	(2.37)	(2.39)	(2.37)	(2.38)	(2.38)
Tax inspection	0.301***	0.300***	0.300***	0.301***	0.301***	0.301***	0.300***
	(19.81)	(19.85)	(19.77)	(19.89)	(20.32)	(19.87)	(19.72)
Informal competition (no obstacle)	0.042**	0.042**	0.043**	0.042**	0.042**	0.042**	0.042**
	(2.51)	(2.51)	(2.52)	(2.51)	(2.48)	(2.48)	(2.50)
Corruption (no obstacle)	−0.063***	−0.062***	−0.062***	−0.063***	−0.062***	−0.063***	−0.063***
	(−3.50)	(−3.49)	(−3.49)	(−3.50)	(−3.50)	(−3.51)	(−3.50)
Legal status (shareholding)	0.034	0.036	0.035	0.038	0.037	0.038	0.038
	(1.00)	(1.06)	(1.02)	(1.12)	(1.11)	(1.10)	(1.10)
Industry (basic metals and metal products)	0.105**	0.105**	0.106**	0.103*	0.103*	0.103*	0.103*
	(1.97)	(1.98)	(2.00)	(1.94)	(1.96)	(1.94)	(1.94)
Constant	−1.264***	−1.263***	−1.264***	−1.267***	−1.266***	−1.267***	−1.264***
	(−19.27)	(−19.27)	(−19.28)	(−19.32)	(−19.35)	(−19.29)	(−19.24)
Panel C: EAC probit equation							
GPC	1.387***	1.392***	1.390***	1.392***	1.398***	1.385***	1.386***
	(34.48)	(35.25)	(35.40)	(35.48)	(37.66)	(34.21)	(34.03)
Total sales	0.013***	0.013***	0.013***	0.013***	0.013***	0.013***	0.013***
	(4.51)	(4.50)	(4.50)	(4.49)	(4.49)	(4.51)	(4.51)
Number of employees	0.206***	0.205***	0.205***	0.205***	0.204***	0.206***	0.206***
	(22.94)	(22.98)	(23.10)	(23.06)	(23.35)	(22.98)	(22.90)
Firm age	0.074***	0.074***	0.074***	0.074***	0.074***	0.074***	0.074***
	(6.98)	(6.96)	(6.97)	(6.98)	(6.98)	(6.99)	(6.99)
Manager experience	0.005	0.005	0.005	0.004	0.004	0.005	0.005

Table 11 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(0.41)	(0.41)	(0.41)	(0.40)	(0.39)	(0.41)	(0.41)
Applied for a loan	0.022	0.023	0.023	0.023	0.028	0.026	0.024
	(1.07)	(1.10)	(1.15)	(1.13)	(1.34)	(1.26)	(1.17)
Export	−0.021	−0.020	−0.020	−0.020	−0.018	−0.019	−0.020
	(−1.00)	(−0.97)	(−0.95)	(−0.96)	(−0.89)	(−0.93)	(−0.95)
ISC	0.283***	0.282***	0.282***	0.282***	0.279***	0.282***	0.282***
	(16.26)	(16.17)	(16.21)	(16.20)	(15.93)	(16.09)	(16.16)
Legal status (shareholding)	0.012	0.011	0.012	0.010	0.010	0.011	0.011
	(0.34)	(0.32)	(0.32)	(0.29)	(0.29)	(0.30)	(0.30)
Industry (basic metals and metal products)	−0.018	−0.018	−0.019	−0.017	−0.017	−0.017	−0.017
	(−0.35)	(−0.35)	(−0.36)	(−0.33)	(−0.34)	(−0.32)	(−0.33)
Subsidiary	0.168***	0.168***	0.168***	0.167***	0.166***	0.167***	0.168***
	(9.18)	(9.15)	(9.17)	(9.16)	(9.11)	(9.13)	(9.14)
Constant	−1.382***	−1.381***	−1.382***	−1.381***	−1.379***	−1.386***	−1.385***
	(−21.34)	(−21.36)	(−21.40)	(−21.41)	(−21.49)	(−21.41)	(−21.37)
Correlation between equations							
Equation_12	0.273***	0.274***	0.261***	0.281***	0.314***	0.276***	0.264***
	(4.80)	(4.62)	(4.62)	(4.67)	(5.44)	(4.54)	(4.30)
Equation_13	−0.165***	−0.164***	−0.155***	−0.164***	−0.156***	−0.149***	−0.154***
	(−3.07)	(−2.92)	(−2.88)	(−2.85)	(−2.70)	(−2.62)	(−2.67)
Equation_23	−1.007***	−1.016***	−1.012***	−1.015***	−1.028***	−1.004***	−1.006***
	(−14.97)	(−15.16)	(−15.32)	(−15.29)	(−16.09)	(−14.91)	(−14.78)
Observations	30,240	30,228	30,267	30,223	30,223	30,223	30,223

The dependent variables in the three equations are panel A, the ordinal variable, *finance access obstacles,* with five ordered response levels—from very severe obstacle, major obstacle, moderate obstacle, and minor obstacle to no obstacle; panel B, the binary variable, *government procurement contracts,* that takes the value of 1 if a firm has a government contract and 0 otherwise; and panel C, the binary variable, *external audit certification,* that takes the value of 1 if a firm has its financial statements checked by an auditor and 0 otherwise. Robust standard errors are reported in parentheses. Significance at 1%, 5%, and 10% is denoted by ***, **, and *, respectively

Table 12 Estimates from sub-samples—non-innovative firms

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: finance access obstacles ordered probit equation							
GPC	−0.661***	−0.692***	−0.671***	−0.524***	−0.636***	−0.750***	−0.708***
	(−10.98)	(−7.51)	(−11.01)	(−3.93)	(−7.69)	(−7.84)	(−7.10)
EAC	0.192***	0.106	0.207***	0.331***	0.316***	0.290***	0.189***
	(3.49)	(1.61)	(3.79)	(4.00)	(5.06)	(4.39)	(2.77)
GPC × EAC	−0.192***	−0.043	−0.169***	−0.609***	−0.623***	−0.363***	−0.394***
	(−5.78)	(−0.49)	(−4.59)	(−3.73)	(−7.67)	(−3.53)	(−3.76)
GPC × ownership	−0.004	0.039	0.029				
	(−0.03)	(0.46)	(0.62)				
EAC × ownership	0.078	0.094**	−0.008				
	(1.51)	(2.32)	(−0.34)				
GPC × EAC × ownership	0.041	−0.194*	−0.062				
	(0.26)	(−1.82)	(−1.04)				
GPC × firm size				−0.009	−0.032*		
				(−1.29)	(−1.76)		
EAC × firm size				−0.009***	−0.038***		
				(−2.60)	(−4.58)		
GPC × EAC × firm size				0.025***	0.115***		
				(2.61)	(5.18)		
GPC × organizational learning						0.031	0.019
						(1.10)	(0.67)
EAC × organizational learning						−0.047***	−0.006
						(−3.46)	(−0.44)
GPC × EAC × organizational learning						0.055	0.074**
						(1.50)	(1.97)
Foreign ownership	0.051			0.091***	0.092***	0.090***	0.089***
	(1.25)			(3.65)	(3.74)	(3.65)	(3.57)
Ownership concentration		−0.015		0.044**	0.044**	0.044**	0.044**
		(−0.50)		(2.23)	(2.28)	(2.22)	(2.25)
Female ownership			0.063***	0.064***	0.064***	0.064***	0.064***
			(3.94)	(5.70)	(5.72)	(5.70)	(5.66)
Total sales	0.024***	0.024***	0.024***	0.027***	0.024***	0.024***	0.024***
	(12.58)	(12.66)	(12.63)	(10.81)	(12.59)	(12.65)	(12.47)
Number of employees	0.015**	0.020***	0.017***	0.020***	0.034***	0.019***	0.018***
	(2.43)	(3.22)	(2.86)	(3.17)	(4.38)	(3.15)	(2.96)
Firm age	0.051***	0.051***	0.049***	0.055***	0.054***	0.070***	0.056***
	(6.88)	(6.83)	(6.62)	(7.25)	(7.19)	(6.61)	(7.33)
Manager experience	0.000	0.002	−0.003	−0.001	−0.000	−0.001	−0.007

Table 12 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(0.00)	(0.27)	(−0.42)	(−0.08)	(−0.03)	(−0.15)	(−0.66)
Corruption (no obstacle)	0.577***	0.574***	0.574***	0.570***	0.565***	0.570***	0.572***
	(47.23)	(46.43)	(47.08)	(45.97)	(45.61)	(46.16)	(46.15)
Informal competition (no obstacle)	0.461***	0.462***	0.461***	0.460***	0.457***	0.461***	0.462***
	(41.17)	(40.90)	(41.19)	(40.50)	(40.23)	(40.62)	(40.66)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Predicted probabilities (two-way interactions)							
Very severe obstacle							
GPC = No × EAC = No	0.049***	0.049***	0.050***	0.048***	0.049***	0.048***	0.048***
	(16.04)	(15.75)	(16.17)	(15.51)	(15.44)	(15.66)	(15.55)
GPC = No × EAC = Yes	0.032***	0.033***	0.032***	0.033***	0.032***	0.033***	0.033***
	(15.79)	(15.23)	(15.95)	(15.05)	(15.72)	(15.02)	(14.86)
GPC = Yes × EAC = No	0.161***	0.159***	0.162***	0.162***	0.179***	0.158***	0.157***
	(8.09)	(7.87)	(8.19)	(7.87)	(8.40)	(7.89)	(7.74)
GPC = Yes × EAC = Yes	0.159***	0.163***	0.158***	0.169***	0.196***	0.171***	0.163***
	(11.03)	(10.98)	(11.09)	(11.10)	(12.42)	(11.46)	(11.03)
No obstacle							
GPC = No × EAC = No	0.380***	0.383***	0.379***	0.384***	0.387***	0.387***	0.383***
	(44.39)	(43.81)	(44.89)	(43.40)	(44.92)	(43.66)	(43.07)
GPC = No × EAC = Yes	0.457***	0.453***	0.458***	0.453***	0.463***	0.451***	0.450***
	(31.65)	(30.48)	(32.05)	(30.04)	(31.30)	(30.20)	(29.74)
GPC = Yes × EAC = No	0.167***	0.169***	0.166***	0.166***	0.153***	0.170***	0.170***
	(9.45)	(9.24)	(9.54)	(9.15)	(9.28)	(9.28)	(9.12)
GPC = Yes × EAC = Yes	0.168***	0.165***	0.170***	0.159***	0.138***	0.157***	0.164***
	(13.29)	(13.01)	(13.44)	(12.87)	(13.26)	(13.19)	(13.07)
Predicted probabilities (three-way interaction)							
Female = No × GPC = No × EAC = No			0.367***				
			(42.80)				
Female = No × GPC = No × EAC = Yes			0.448***				
			(31.37)				
Female = No × GPC = Yes × EAC = No			0.156***				
			(9.17)				
Female = No × GPC = Yes × EAC = Yes			0.165***				
			(13.14)				
Female = Yes × GPC = No × EAC = No			0.406***				
			(42.47)				

Table 12 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
Female = Yes × GPC = No × EAC = Yes			0.484***				
			(31.49)				
Female = Yes × GPC = Yes × EAC = No			0.189***				
			(9.22)				
Female = Yes × GPC = Yes × EAC = Yes			0.180***				
			(12.19)				
Panel B: GPC probit equation							
Total sales	0.013***	0.013***	0.013***	0.013***	0.013***	0.013***	0.013***
	(4.93)	(4.94)	(4.94)	(5.15)	(4.92)	(4.93)	(4.93)
Number of employees	0.053***	0.053***	0.053***	0.053***	0.055***	0.052***	0.053***
	(9.26)	(9.29)	(9.25)	(9.25)	(9.79)	(9.21)	(9.27)
Firm age	0.035***	0.035***	0.035***	0.035***	0.034***	0.039***	0.034***
	(3.30)	(3.31)	(3.30)	(3.26)	(3.22)	(3.70)	(3.23)
Manager experience	0.031***	0.031***	0.031***	0.031***	0.030***	0.031***	0.035***
	(2.87)	(2.88)	(2.86)	(2.85)	(2.79)	(2.81)	(3.16)
Tax inspection	0.373***	0.373***	0.374***	0.373***	0.370***	0.372***	0.373***
	(30.18)	(30.18)	(30.20)	(30.18)	(30.17)	(30.11)	(30.09)
Informal competition (no obstacle)	−0.013	−0.013	−0.012	−0.013	−0.013	−0.013	−0.013
	(−0.95)	(−0.95)	(−0.93)	(−0.96)	(−0.98)	(−0.97)	(−0.96)
Corruption (no obstacle)	−0.118***	−0.118***	−0.118***	−0.118***	−0.117***	−0.118***	−0.118***
	(−8.55)	(−8.52)	(−8.54)	(−8.54)	(−8.54)	(−8.54)	(−8.53)
Legal status (shareholding)	0.235***	0.237***	0.238***	0.238***	0.237***	0.237***	0.238***
	(7.65)	(7.71)	(7.71)	(7.73)	(7.76)	(7.72)	(7.72)
Industry (basic metals and metal products)	0.008	0.010	0.009	0.006	0.007	0.006	0.007
	(0.17)	(0.20)	(0.18)	(0.13)	(0.14)	(0.12)	(0.13)
Constant	−1.777***	−1.777***	−1.776***	−1.783***	−1.779***	−1.786***	−1.783***
	(−30.34)	(−30.36)	(−30.33)	(−30.48)	(−30.47)	(−30.52)	(−30.43)
Panel C: EAC probit equation							
GPC	1.649***	1.648***	1.651***	1.649***	1.653***	1.647***	1.648***
	(69.83)	(70.02)	(70.65)	(70.24)	(71.89)	(70.31)	(69.82)
Total sales	−0.001	−0.001	−0.001	−0.001	−0.001	−0.001	−0.001
	(−0.33)	(−0.33)	(−0.33)	(−0.35)	(−0.35)	(−0.35)	(−0.34)
Number of employees	0.131***	0.132***	0.131***	0.132***	0.131***	0.132***	0.132***
	(23.74)	(23.75)	(23.74)	(23.76)	(23.77)	(23.78)	(23.75)
Firm age	0.061***	0.061***	0.061***	0.061***	0.061***	0.061***	0.061***
	(7.27)	(7.28)	(7.26)	(7.28)	(7.27)	(7.28)	(7.28)
Manager experience	0.042***	0.042***	0.042***	0.042***	0.042***	0.042***	0.042***

Table 12 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(4.85)	(4.84)	(4.86)	(4.85)	(4.84)	(4.86)	(4.86)
Applied for a loan	0.130***	0.133***	0.129***	0.133***	0.132***	0.135***	0.134***
	(7.39)	(7.50)	(7.36)	(7.51)	(7.45)	(7.66)	(7.54)
Export	0.028	0.029	0.028	0.029	0.028	0.029	0.029
	(1.50)	(1.53)	(1.48)	(1.54)	(1.52)	(1.56)	(1.55)
ISC	0.300***	0.300***	0.300***	0.299***	0.299***	0.299***	0.299***
	(21.30)	(21.22)	(21.37)	(21.20)	(21.26)	(21.12)	(21.16)
Legal status (shareholding)	−0.071**	−0.072**	−0.073**	−0.072**	−0.072**	−0.072**	−0.072**
	(−2.42)	(−2.43)	(−2.48)	(−2.45)	(−2.47)	(−2.43)	(−2.44)
Industry (basic metals and metal products)	0.149***	0.149***	0.148***	0.150***	0.149***	0.151***	0.150***
	(3.43)	(3.43)	(3.42)	(3.46)	(3.45)	(3.47)	(3.46)
Subsidiary	0.265***	0.265***	0.265***	0.265***	0.264***	0.265***	0.265***
	(17.69)	(17.72)	(17.69)	(17.72)	(17.69)	(17.72)	(17.72)
Constant	−1.061***	−1.062***	−1.060***	−1.062***	−1.060***	−1.063***	−1.063***
	(−21.90)	(−21.93)	(−21.91)	(−21.93)	(−21.90)	(−21.96)	(−21.95)
Correlation between equations							
Equation_12	0.348***	0.350***	0.346***	0.360***	0.406***	0.361***	0.348***
	(8.99)	(8.86)	(9.03)	(9.10)	(10.66)	(9.27)	(8.76)
Equation_13	−0.176***	−0.168***	−0.181***	−0.169***	−0.189***	−0.161***	−0.163***
	(−4.62)	(−4.29)	(−4.77)	(−4.26)	(−4.87)	(−4.10)	(−4.08)
Equation_23	−1.141***	−1.139***	−1.145***	−1.140***	−1.148***	−1.137***	−1.139***
	(−29.25)	(−29.43)	(−29.57)	(−29.54)	(−30.37)	(−29.71)	(−29.33)
Observations	50,983	50,970	51,028	50,966	50,966	50,966	50,966

The dependent variables in the three equations are panel A, the ordinal variable, *finance access obstacles,* with five ordered response levels—from very severe obstacle, major obstacle, moderate obstacle, and minor obstacle to no obstacle; panel B, the binary variable, *government procurement contracts,* that takes the value of 1 if a firm has a government contract and 0 otherwise; and panel C, the binary variable, *external audit certification,* that takes the value of 1 if a firm has its financial statements checked by an auditor and 0 otherwise. Robust standard errors are reported in parentheses. Significance at 1%, 5%, and 10% is denoted by ***, **, and *, respectively

Table 13 Estimates using an alternative dependent variable - credit constraint

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: credit constraint ordered probit equation							
GPC × ownership	−1.231***	−1.160***	−1.185***	−1.363***	−1.243***	−1.234***	−1.248***
	(−16.97)	(−13.08)	(−11.62)	(−11.55)	(−11.03)	(−12.70)	(−11.11)
EAC × ownership	0.180***	0.205***	0.198***	0.356***	0.215***	0.313***	0.105
	(2.72)	(2.72)	(2.75)	(4.34)	(2.69)	(4.11)	(1.31)
GPC × EAC × ownership	−0.169***	−0.201***	−0.188***	−0.483***	−0.302***	−0.543***	−0.290***
	(−4.73)	(−3.45)	(−4.62)	(−5.00)	(−4.12)	(−8.94)	(−3.76)
GPC × firm size	0.050	−0.073	0.027				
	(0.64)	(−1.43)	(1.00)				
EAC × firm size	0.083**	0.028	−0.000				
	(2.38)	(0.95)	(−0.01)				
GPC × EAC × firm size	−0.046	0.018	−0.041				
	(−0.54)	(0.29)	(−1.21)				
GPC × organizational learning				0.010**	0.037**		
				(2.56)	(2.11)		
EAC × organizational learning				−0.014***	−0.035***		
				(−5.29)	(−3.31)		
GPC × EAC × organizational learning				0.015***	0.026		
				(2.96)	(1.18)		
GPC × EAC						0.023*	0.024
						(1.89)	(1.33)
GPC						−0.054***	0.013
						(−7.56)	(1.28)
EAC						0.071***	0.031
						(5.08)	(1.38)
Foreign ownership	0.134***			0.195***	0.194***	0.199***	0.193***
	(4.51)			(12.19)	(11.98)	(12.33)	(12.03)
Ownership concentration		−0.026		−0.020	−0.021	−0.019	−0.021
		(−1.14)		(−1.49)	(−1.57)	(−1.39)	(−1.52)
Female ownership			0.005	0.005	0.005	0.005	0.004
			(0.39)	(0.67)	(0.62)	(0.73)	(0.55)
Total sales	0.001	0.001	0.003*	0.005***	0.003**	0.003**	0.003*
	(0.41)	(1.05)	(1.92)	(2.73)	(2.14)	(2.18)	(1.95)
Number of employees	0.056***	0.056***	0.055***	0.057***	0.055***	0.073***	0.053***
	(7.84)	(7.54)	(7.19)	(7.01)	(6.71)	(7.02)	(6.58)
Firm age	0.028***	0.024***	0.024***	0.030***	0.038***	0.030***	0.030***
	(4.89)	(4.22)	(4.10)	(5.01)	(4.21)	(4.89)	(5.05)
Manager experience	0.031***	0.027***	0.028***	0.031***	0.030***	0.031***	0.015*

Table 13 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(5.82)	(5.01)	(5.03)	(5.62)	(5.41)	(5.64)	(1.90)
Corruption (no obstacle)	0.094***	0.094***	0.090***	0.084***	0.086***	0.084***	0.085***
	(11.00)	(10.66)	(9.80)	(9.53)	(9.39)	(9.51)	(9.41)
Informal competition (no obstacle)	0.130***	0.131***	0.128***	0.121***	0.123***	0.123***	0.122***
	(15.40)	(15.13)	(14.28)	(13.98)	(13.81)	(14.24)	(13.83)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Predicted probabilities (two-way interactions)							
No obstacle							
GPC = No × EAC = No	0.537***	0.527***	0.535***	0.551***	0.553***	0.550***	0.546***
	(40.65)	(38.28)	(37.15)	(37.07)	(37.37)	(36.05)	(36.25)
GPC = No × EAC = Yes	0.610***	0.616***	0.613***	0.601***	0.605***	0.597***	0.601***
	(45.45)	(43.54)	(40.74)	(36.66)	(35.26)	(34.51)	(36.70)
GPC = Yes × EAC = No	0.128***	0.125***	0.138***	0.144***	0.153***	0.154***	0.143***
	(7.37)	(6.60)	(5.86)	(6.44)	(6.42)	(5.73)	(5.99)
GPC = Yes × EAC = Yes	0.131***	0.134***	0.138***	0.121***	0.115***	0.129***	0.129***
	(16.59)	(14.46)	(11.46)	(14.47)	(15.25)	(11.93)	(12.85)
Predicted probabilities (three-way interaction)							
Female = No × GPC = No × EAC = No			0.533***				
			(36.54)				
Female = No × GPC = No × EAC = Yes			0.610***				
			(40.57)				
Female = No × GPC = Yes × EAC = No			0.135***				
			(5.79)				
Female = No × GPC = Yes × EAC = Yes			0.137***				
			(11.20)				
Female = Yes × GPC = No × EAC = No			0.540***				
			(37.08)				
Female = Yes × GPC = No × EAC = Yes			0.617***				
			(40.07)				
Female = Yes × GPC = Yes × EAC = No			0.145***				
			(5.91)				
Female = Yes × GPC = Yes × EAC = Yes			0.139***				
			(11.63)				
Panel B: GPC probit equation							

Table 13 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
Total sales	0.009***	0.009***	0.009***	0.012***	0.009***	0.009***	0.009***
	(5.73)	(5.70)	(5.71)	(6.96)	(5.74)	(5.73)	(5.77)
Number of employees	0.071***	0.071***	0.069***	0.069***	0.069***	0.075***	0.070***
	(16.65)	(16.01)	(15.24)	(16.30)	(15.30)	(17.13)	(15.76)
Firm age	0.024***	0.025***	0.025***	0.024***	0.031***	0.025***	0.024***
	(3.77)	(3.80)	(3.78)	(3.76)	(4.61)	(3.81)	(3.69)
Manager experience	0.055***	0.055***	0.054***	0.054***	0.053***	0.053***	0.059***
	(8.13)	(8.08)	(7.95)	(7.96)	(7.87)	(7.80)	(8.35)
Tax inspection	0.228***	0.231***	0.235***	0.234***	0.238***	0.242***	0.232***
	(12.89)	(12.09)	(11.45)	(14.01)	(12.77)	(16.82)	(12.04)
Informal competition (no obstacle)	−0.023**	−0.022**	−0.021**	−0.020**	−0.020**	−0.016*	−0.022**
	(−2.25)	(−2.14)	(−2.04)	(−1.99)	(−1.96)	(−1.69)	(−2.13)
Corruption (no obstacle)	−0.110***	−0.111***	−0.111***	−0.111***	−0.111***	−0.107***	−0.111***
	(−11.20)	(−11.26)	(−11.24)	(−11.28)	(−11.23)	(−11.07)	(−11.27)
Legal status (shareholding)	0.113***	0.117***	0.115***	0.116***	0.118***	0.115***	0.118***
	(6.60)	(6.75)	(6.59)	(6.68)	(6.67)	(6.59)	(6.71)
Industry (basic metals and metal products)	0.068**	0.073**	0.071**	0.068**	0.066**	0.067**	0.068**
	(2.24)	(2.38)	(2.30)	(2.23)	(2.15)	(2.20)	(2.21)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	−1.812***	−1.813***	−1.810***	−1.843***	−1.823***	−1.829***	−1.820***
	(−50.91)	(−50.89)	(−50.79)	(−51.33)	(−51.08)	(−51.51)	(−50.82)
Panel C: EAC probit equation							
GPC	0.818***	0.857***	0.919***	0.935***	0.964***	1.062***	0.896***
	(6.64)	(6.26)	(6.16)	(8.30)	(7.33)	(11.84)	(6.56)
Total sales	0.007***	0.007***	0.006***	0.006***	0.006***	0.006***	0.006***
	(4.27)	(4.20)	(3.99)	(3.94)	(3.82)	(3.67)	(3.99)
Number of employees	0.204***	0.203***	0.200***	0.199***	0.197***	0.192***	0.201***
	(30.30)	(27.34)	(24.31)	(28.85)	(25.31)	(29.91)	(26.26)
Firm age	0.087***	0.086***	0.086***	0.085***	0.085***	0.083***	0.086***
	(14.05)	(13.78)	(13.40)	(13.79)	(13.49)	(13.61)	(13.66)
Manager experience	0.028***	0.027***	0.026***	0.026***	0.025***	0.023***	0.026***
	(4.25)	(4.11)	(3.87)	(3.93)	(3.78)	(3.64)	(3.96)
Applied for a loan	0.130***	0.123***	0.128***	0.142***	0.142***	0.143***	0.138***
	(6.38)	(5.88)	(6.05)	(6.66)	(6.68)	(6.86)	(6.43)
Export	0.034**	0.034**	0.033**	0.033**	0.033**	0.033**	0.033**
	(2.37)	(2.37)	(2.38)	(2.38)	(2.37)	(2.39)	(2.37)
ISC	0.373***	0.373***	0.369***	0.367***	0.366***	0.360***	0.370***
	(31.59)	(30.57)	(28.69)	(29.86)	(28.20)	(29.24)	(29.41)
Legal status (shareholding)	0.099***	0.097***	0.093***	0.090***	0.088***	0.082***	0.093***

Table 13 (continued)

	Ownership structure			Firm size		Organizational learning	
	Foreign	Concentration	Female	Total sales	Employees	Firm age	Manager experience
	(4.58)	(4.40)	(4.13)	(4.17)	(3.96)	(3.86)	(4.18)
Industry (basic metals and metal products)	0.060*	0.057*	0.055	0.057*	0.057	0.052	0.058*
	(1.74)	(1.65)	(1.59)	(1.66)	(1.64)	(1.52)	(1.68)
Subsidiary	0.296***	0.296***	0.292***	0.289***	0.287***	0.282***	0.291***
	(21.82)	(21.28)	(20.14)	(20.42)	(19.50)	(19.94)	(20.35)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	−1.316***	−1.311***	−1.300***	−1.295***	−1.290***	−1.268***	−1.302***
	(−34.73)	(−33.09)	(−30.73)	(−33.32)	(−31.01)	(−32.90)	(−32.14)
Correlation between equations							
Equation_12	0.906***	0.895***	0.855***	0.890***	0.844***	0.883***	0.870***
	(14.97)	(12.80)	(10.13)	(12.61)	(10.14)	(12.56)	(11.13)
Equation_13	−0.127***	−0.155***	−0.146***	−0.112**	−0.109**	−0.132***	−0.113**
	(−3.01)	(−3.48)	(−3.17)	(−2.34)	(−2.23)	(−2.68)	(−2.35)
Equation_23	−0.349***	−0.375***	−0.418***	−0.431***	−0.451***	−0.528***	−0.403***
	(−4.26)	(−4.02)	(−3.95)	(−5.33)	(−4.67)	(−7.36)	(−4.22)
Observations	107,613	107,581	107,671	107,565	107,565	107,565	107,565

The dependent variables in the three equations are panel A, the ordinal variable, *credit constraint,* with four ordered categories: not credit constrained, maybe credit constrained, partially credit constrained, and fully credit constrained; panel B, the binary variable, *government procurement contracts,* that takes the value of 1 if a firm has a government contract and 0 otherwise; and panel C, the binary variable, *external audit certification,* that takes the value of 1 if a firm has its financial statements checked by an auditor and 0 otherwise. Robust standard errors are reported in parentheses. Significance at 1%, 5%, and 10% is denoted by ***, **, and *, respectively

Appendix 2

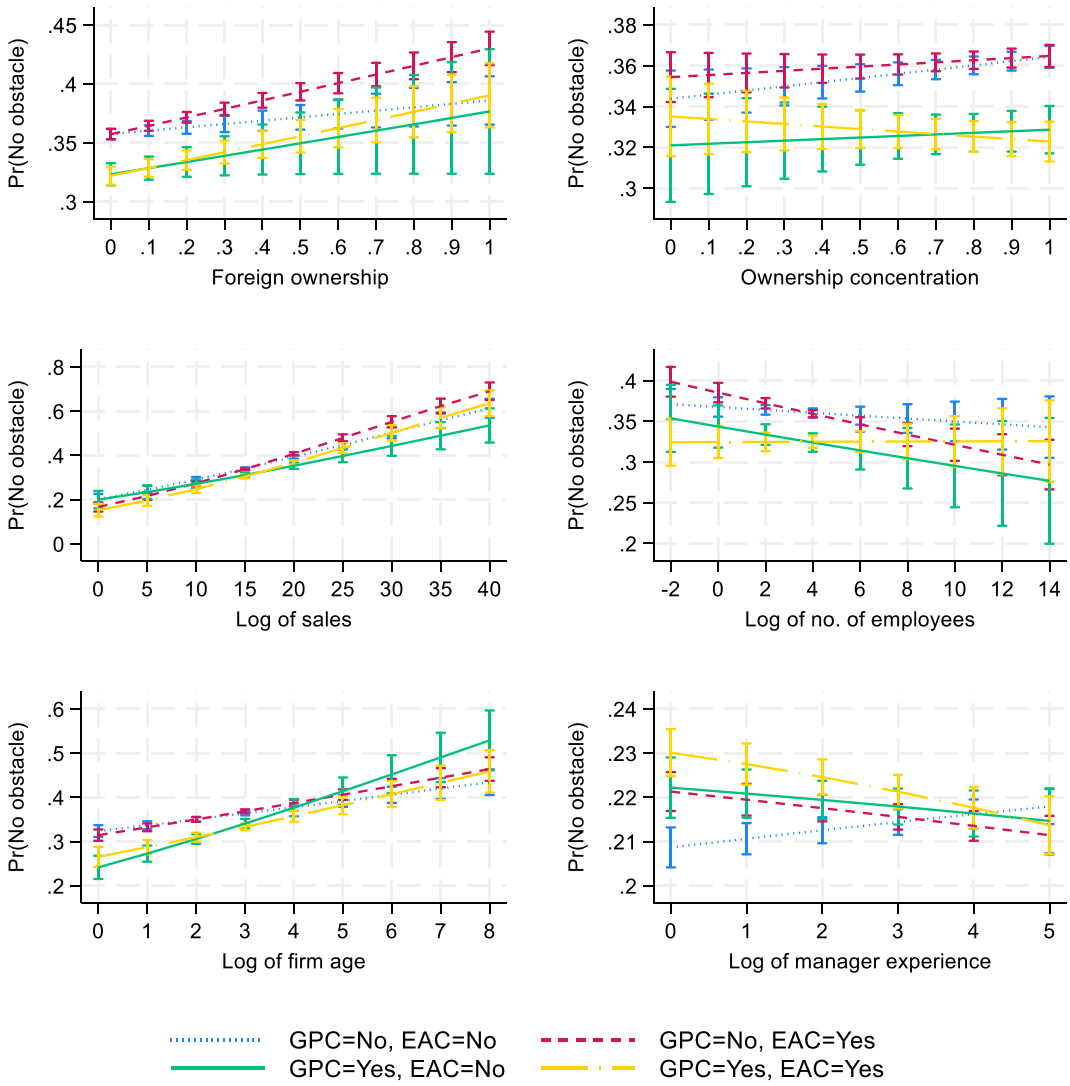

Fig. 6 Predicted probabilities from heteroskedastic ordered probit regressions. This figure displays predicted probabilities with 95% confidence intervals for the three-way interaction from a heteroskedastic ordered probit model using the specifications in columns 1, 2, 4, 5, 6, and 7 of Table 5. The interactions are between government procurement contracts (GPCs), external audit certification (EAC), and the proxies for ownership (foreign and concentrated ownership), size (sales and number of employees), and organizational learning (firm age and the top manager experience). The dotted lines are for firms with no GPC and no EAC; shot-dashed lines are for firms with no GPC but have EAC; solid lines are for firms with GPC but have no EAC; and long-dash-dotted lines are for firms that have GPC and EAC

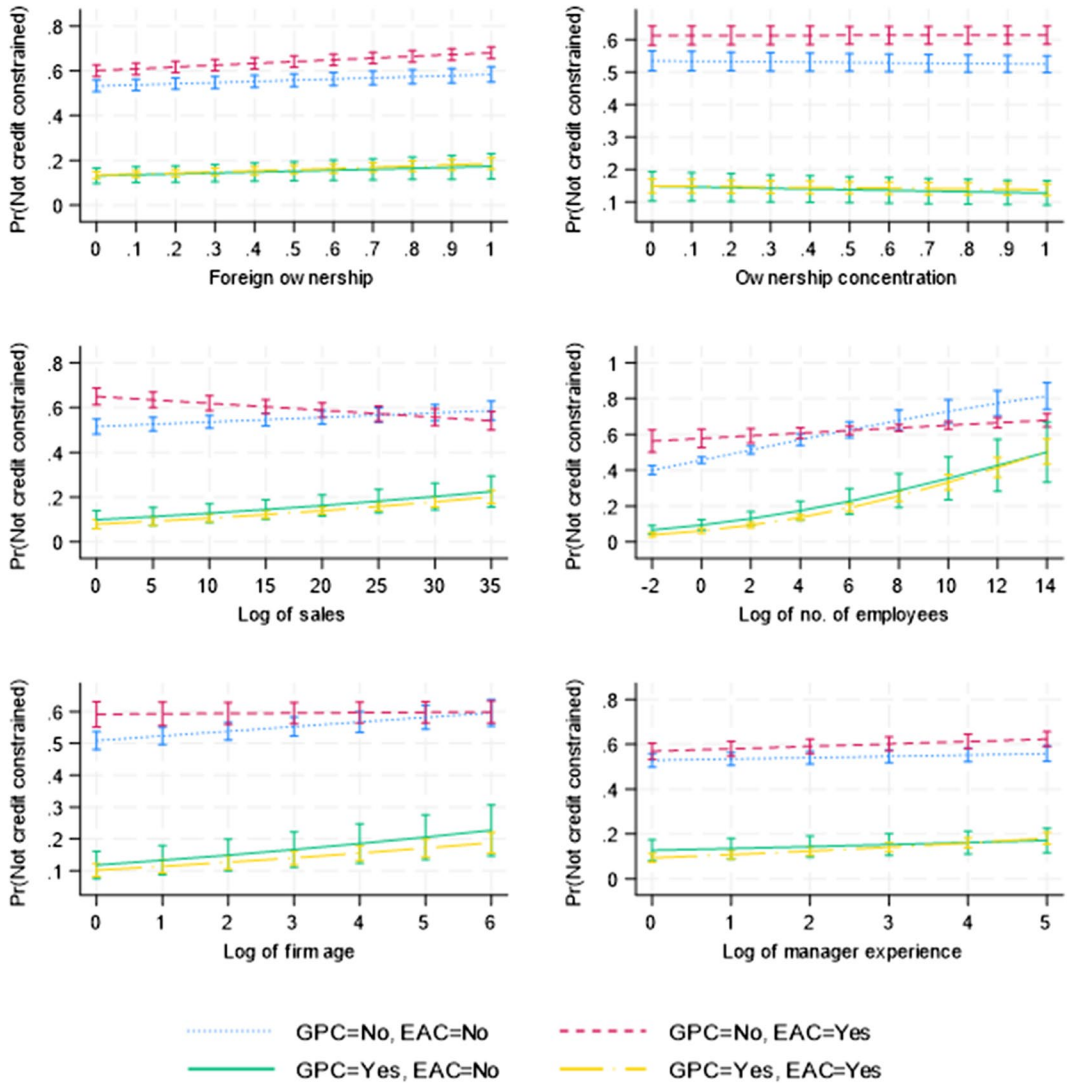

Fig. 7 Predicted probabilities from 3SLS estimates using an alternative dependent variable. This figure displays predicted probabilities with 95% confidence intervals for the three-way interaction terms in columns 1, 2, 4, 5, 6, and 7 of Table 13 between government procurement contracts (GPCs), external audit certification (EAC), and the proxies for ownership (foreign and concentrated ownership), size (sales and number of employees), and organizational learning (firm age and the top manager experience). The dotted lines are for firms with no GPC and no EAC; shot-dashed lines are for firms with no GPC but have EAC; solid lines are for firms with GPC but have no EAC; and long-dash-dotted lines are for firms that have GPC and EAC

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Data Availability Those authors have made the data available on the journal website: https://www.aeaweb.org/articles?id=10.1257/aer.20200738. Access to the data we use in our study is available from the World Bank and requires permission.

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