



## Discouraged borrowers and the importance of countries' lending infrastructure for SMEs<sup>☆</sup>

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### ABSTRACT

This paper investigates the impact of countries' lending infrastructure on the likelihood of firms becoming discouraged borrowers. We capture this lending infrastructure with proxies for countries' information, legal, judicial, bankruptcy, tax and regulatory environments derived from Berger and Udell's (2006) conceptual model. Using a sample of 28,886 small and medium sized firms (SMEs) from the World Bank Enterprise Survey (WBES) spanning across developed and developing economies, we find all proxies of the countries lending infrastructure impact the likelihood of borrower discouragement. Greater sharing of credit information, weaker legal rights, less efficient judicial and bankruptcy regimes, lower corporate tax rates and a stronger regulatory environment reduces the likelihood of SMEs becoming discouraged borrowers. In particular, credit information sharing, weaker legal rights, inefficient judicial and bankruptcy regimes and stronger regulatory quality matters more for certain cohorts, as depicted in the sub samples. Overall, our results have implications for policies aimed at enhancing the quality of countries lending infrastructure in an effort to encourage more SMEs to apply for finance.

### 1. Introduction

Borrower discouragement has attracted much attention since the empirical work of [Levenson and Willard \(2000\)](#). Much of the focus has been on the supply side, particularly the availability of credit, influenced by the development of the credit rationing literature. The concept of a discouraged borrower represents the demand side—the need for credit—and constitutes a more recent area of study in this field. Defined by [Kon and Storey \(2003\)](#) as firms who need finance but decide not to apply for fear of rejection, discouraged borrowers self-assess that the costs involved in applying for credit outweigh the benefits. The costs incurred include high loan costs, bank screening errors and interest rate differences between the providers of finance ([Kon & Storey, 2003](#)). This discouragement or self-rationing extends beyond traditional credit rationing as it reflects borrowers own financing behaviour, making it an interesting phenomenon ([Kallandranis, Anastasiou, & Drakos, 2023](#)). Indeed, discouragement serves as an indicator of unfulfilled latent demand ([Owen, Botelho, Hussain, & Anwar, 2023](#)) where [Aristei and Angori \(2022\)](#) highlight the intertemporal nature of discouragement such that previous credit constraints can adversely impinge on firm's current demand for credit. This is especially pertinent in the case of small and medium sized firms (SMEs) who are particularly dependent on bank finance ([Ferri & Murro, 2015](#); [Mol-Gómez-Vázquez, Hernández-Cánovas, & Koeter-Kant, 2022](#)) and due to their inherent informational opacity are more likely to be self-rationed and thus discouraged borrowers ([Brown, Liñares-Zegarra, & Wilson, 2022](#); [Murro & Peruzzi, 2022](#)).

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Deemed a complex phenomenon partly because it is unobservable, borrower discouragement stems from a multitude of factors (Cowling & Sclip, 2023). These vary from characteristics of the firm (Anastasiou, Ballis, Kallandranis, & Lakhali, 2024; Brown et al., 2022; Chakravarty & Xiang, 2013; Cowling, Liu, Minniti, & Zhang, 2016; Drakos & Giannakopoulos, 2018; Freel, Carter, Tagg, & Mason, 2012; Han, Fraser, & Storey, 2009; Mac an Bhaird, Sanchez Vidal, & Lucey, 2016), firm ownership (Bertrand, Klein, & Pasiouras, 2024; Cowling et al., 2016; Freel et al., 2012; Moro, Wisniewski, & Mantovani, 2017; Nguyen, Nguyen, Troege, & Nguyen, 2021), industry (Freel et al., 2012), banking structures (Mac an Bhaird et al., 2016; Mol-Gómez-Vázquez, Hernández-Cánovas, & Koëter-Kant, 2019; Mol-Gómez-Vázquez et al., 2022), banking relationships (Chakravarty & Xiang, 2013; Cowling et al., 2016; Freel et al., 2012; Han et al., 2009; Wernli & Dietrich, 2022), characteristics of firm owners (Aristei, Gallo, & Minetti, 2024), macroeconomic conditions (Anastasiou, Kallandranis, & Drakos, 2022; Anastasiou, Krokida, Tsouknidis, & Drakos, 2023; Mac an Bhaird et al., 2016) and climate risk (Anastasiou et al., 2024). Potential borrowers assess the likelihood of a successful loan application, considering their financial circumstances albeit in determining their likelihood of success, Anastasiou et al. (2022) pose the question as to what other factors are considered. Our paper builds on this emerging literature as we study the impact of the lending infrastructure on borrower discouragement. Berger and Udell (2006) presented the idea of a country's lending infrastructure, which encompasses the regulations and circumstances influencing the lending capacity of financial institutions. This infrastructure captures the rules and conditions underpinning financial institutions' ability to lend (Huang, Wang, Han and Laker, 2023) and consists of the information, legal, judicial, bankruptcy, tax and regulatory environments. To date those studies which do assess the impact of countries institutional settings on borrower discouragement do so in an unsystematic, gradual manner. These include Chakravarty and Xiang (2013) evaluation of country development, Mac and Bhaird's et al. (2016) focus on regulation, Gama, Duarte, and Esperança's (2017) analysis of the information environment and legal system, Mol-Gómez-Vázquez et al.'s (2019) analysis of the information, judicial, and bankruptcy environments, Bertrand and Mazza's (2022) focus on the information environment and more recently Bertrand's et al. (2024) use of a broad measure of countries' institutional environment.

We use firm-level data derived from the World Bank Enterprises Survey (WBES) along with various other sources to capture country data. Our sample consists of 28,886 firms from across developed and developing countries, the latter being largely neglected in the literature (Chakravarty & Xiang, 2013) and which are important to include given the different developmental stage of their institutional structures in comparison to developed economies. Using the time frame, 2013–2018, our results show support for the importance of countries' lending infrastructure in influencing borrower discouragement. In particular, greater sharing of credit information, weaker legal rights, less efficient judicial and bankruptcy regimes, lower corporate tax rates and a stronger regulatory environment in countries sees SMEs less likely to be discouraged borrowers. Moreover credit information sharing, weaker legal rights, inefficient judicial and bankruptcy regimes and stronger regulatory quality matters more for certain cohorts as depicted in the sub samples.

The contribution of our paper is as follows. First, we contribute to the literature on borrower discouragement, which is important given that discouraged borrowers are twice as prevalent as denied or rejected borrowers (Anastasiou et al., 2024; Brown et al., 2022; Cole & Sokolyk, 2016; Cowling & Sclip, 2023; Freel et al., 2012; Kallandranis et al., 2023) and spans across both developed and developing markets. Our global sample extends the work conducted primarily on developed markets by Anastasiou et al. (2022), Cole and Sokolyk (2016), Freel et al. (2012), Han et al. (2009), Mac an Bhaird et al. (2016), Mol-Gómez-Vázquez et al. (2019) and adds to the paucity of studies which incorporate solely or primarily developing markets (Anastasiou et al., 2024; Chakravarty & Xiang, 2013; Gama et al., 2017). Discouraged borrowers matter as they may include firms with viable investment opportunities who refrain from seeking loans resulting in adverse consequences for economic growth and development (Anastasiou et al., 2024; Cowling et al., 2016; Kallandranis et al., 2023; Kallandranis & Drakos, 2021). Second, we contribute to the work on countries' lending infrastructure, a relatively new and important phenomenon in the international SME finance literature capturing countries institutional setting. Derived from Berger and Udell's (2006) theoretical framework, to date empirical work on countries' lending infrastructure has been confined to Europe and its impact on the financial reporting quality of SMEs (Huang, Wang et al., 2023), on credit rationing of SMEs (Namara, O'Donohoe, & Murro, 2020) and capital structure of SMEs (Mc Namara, Murro, & O'Donohoe, 2017). Our study as far as we are aware is the first to extend it to borrower discouragement and apply it in a global context also.

The structure of the paper is as follows: Section 2 presents the related literature and hypotheses. Section 3 describes the data and methodology used. Section 4 presents the empirical results and discussion with Section 5 concluding the paper.

## 2. Related literature and hypotheses

### 2.1. Borrower discouragement

In SME finance, much of the focus has traditionally been on credit availability, often referred to as the 'supply side'. However, recent empirical studies have shifted the dialogue towards the 'demand side', highlighting the effects of borrower discouragement (Anastasiou et al., 2024; Khan, Khan, & Ullah, 2021). Discouragement is perceived as a 'self-rationing mechanism in the application decision', which is considered 'efficient when 'bad' borrowers are discouraged' but 'inefficient when good borrowers are discouraged and/or if bad borrowers get into the loan pool' (Han et al., 2009, pp. 415). Analysing US data, Han et al. (2009) suggest that riskier borrowers are more likely to be discouraged, with this likelihood increasing when better quality information from longer banking relationships becomes available. This finding supports the concept of 'efficient self-rationing' and the heterogeneity of discouragement (Han et al., 2009, p.415).

A number of studies evaluate the impact of country factors on borrower discouragement. These include Chakravarty and Xiang's (2013) analysis of country development and find the probability of borrower discouragement is reduced with higher country growth

rates. Mac an Bhaird et al. (2016) find a positive relationship between regulatory quality and the discouragement of borrowers in a European context, positing moral hazard is minimised and 'bad' borrowers are discouraged when a high-quality regulatory framework exists, rendering any concerns of adverse selection to be redundant and facilitating a greater efficiency of resources to 'good' borrowers. Gama et al. (2017) find that the information and legal environments are important where little information sharing and strong legal rights facilitate borrower discouragement. Strong legal rights can extend the presence of collateralised contracts in a county, which for asset restricted firms, can increase their discouragement in applying for bank credit (Gama et al., 2017). Subsequently, Mol-Gómez-Vázquez et al. (2019) focus on the information, judicial, and bankruptcy environments, providing evidence of higher borrower discouragement with greater information availability and lower bankruptcy recovery rates. Bertrand and Mazza (2022) evaluate the information environment, positing more creditor information coupled with increased coverage of credit bureaus and credit registers reduces borrower discouragement with some of their results concurring with Kon and Storey (2003). More recently, Bertrand et al. (2024) in their analysis of the impact of national culture of secrecy on firms' access to credit in emerging economies show how the availability of credit information, along with a better institutional environment in terms of political stability, rule of law, regulatory quality and control of corruption results in lower borrower discouragement.

In terms of firm characteristics, discouraged borrowers tend to be smaller and younger (Anastasiou et al., 2024, 2022; Cole & Sokolyk, 2016; Cowling et al., 2016; Drakos & Giannakopoulos, 2018; Kallandranis & Drakos, 2021; Mac an Bhaird et al., 2016). Indeed, Mac an Bhaird et al. (2016) posit that the collection of information on these firms is more expensive for banks in contrast to older firms which are better equipped to mitigate informational asymmetries through the relationships they have formed with banks. Their results yet again heighten concerns of information opacity in the debt markets for small firms (Mac an Bhaird et al., 2016).

## 2.2. Hypotheses

While the theoretical model proposed by Berger and Udell (2006) highlights the role of financial institutions in shaping SME credit availability, considerable interest also lies in the lending infrastructure. This infrastructure refers to the rules and conditions that influence the ability of financial institutions to lend (Berger & Udell, 2006). Specifically, this paper examines the information environment, legal/judicial/bankruptcy framework, tax environment and regulatory context as outlined by Berger and Udell (2006).<sup>1</sup>

*Information environment.* Initiated by Jaffee and Russell (1976) and Stiglitz and Weiss (1981) the information theories of credit assert that the sharing of information enhances credit availability as it decreased the probability of financing projects which were not viable (Djankov, McLiesh, & Shleifer, 2007). Lower incidence of contract defaults reinforces the merits of information sharing (Degryse, Kokas, Minetti, & Peruzzi, 2023; Doblas-Madrid & Minetti, 2013) and instills greater confidence among borrowers when applying for bank loans, thereby reducing their tendency to self-ration. Gama et al. (2017) concurs with this as more information sharing results in reduced borrower discouragement for SMEs in less developed countries, consistent also with the evidence of Bertrand et al. (2024) and Bertrand and Mazza (2022) for SMEs in emerging markets. H1 suggests:

*H1. SMEs in countries where there is more sharing of credit information are less likely to be discouraged borrowers.*

*Legal, judicial and bankruptcy environment.* The intrinsic nature of law and finance has provoked much research such that La Porta, Lopez-De-Silanes, Shleifer, and Vishny (1997, pp. 1131) in reference to their earlier work posit 'the nature and effectiveness of financial systems around the world can be traced in part to... legal rules and the quality of their enforcement'. The extent of market imperfections attributed to informational opacity and moral hazard 'depends in part on the effectiveness of the legal and financial systems' (Demirgüç-Kunt & Maksimovic, 1998, pp. 2107). A well-functioning legal system has a positive impact on banks' lending to SMEs (Haselmann & Wachtel, 2010) and is important for private credit market growth (Nana, 2014). Stronger laws and their enforcement increase the availability of external finance due to greater lender confidence (Shah, Shan, Smith, & Labianca, 2017), echoing the views of Demirgüç-Kunt and Maksimovic (1998) and La Porta et al. (1997). Known as the 'positive effect' hypothesis of Shah et al. (2017), and representing the supply side view of law and finance, this stronger legal protection for lenders may help to minimise self-rationing among borrowers given the existence of more favourable lending terms. Stronger legal protection for lenders increase their confidence in providing more favourable terms (La Porta et al., 1997). Hence, H2a suggests:

*H2a. SMEs in countries with a strong legal environment are less likely to be discouraged borrowers.*

Yet stronger creditor rights can have an adverse impact on SMEs' appetite for leverage making them more risk averse for fear of going bankrupt (Acharya, Amihud, & Litov, 2011) and subsequently losing control of their business (Cho, El Ghouli, Guedhami, & Suh, 2014). Such fears may be escalated when firms lack suitable collateral to offer to lenders (Gama et al., 2017). Known as 'liquidation bias' of Vig (2013), the assertion is that the fear of premature liquidation from this heightened risk exposure due to stronger legal rights for creditors deters firms from borrowing. This results in liquidation inefficiency when firms want to continue trading (Vig, 2013). Cho et al. (2014) finds stronger creditor rights discourages firms from employing much debt for fear of losing control of their business in the event of a default, echoing the demand side view of law and finance. In a similar vein, Shah et al. (2017) find stronger creditor rights are negatively associated with firm leverage while Gama et al. (2017) report stronger legal protection of creditors and borrowers increases discouragement among borrowers. To that end, H2b suggests:

*H2b. SMEs in countries with a strong legal environment are more likely to be discouraged borrowers.*

<sup>1</sup> Efforts were made by the authors to employ a measure for the social environment albeit due to very limiting data observations, this environment had to be omitted from the analysis.

Modigliani and Perotti (1997) acknowledge the importance of the rule of law but assert that the enforcement of the legal rules is critical in order for the effective functioning of the legal framework. Yet despite this, there is much greater emphasis in the law and finance literature on the law and subsequently creditor rights, with a paucity of studies devoted to the enforcement process (Shah et al., 2017). More efficient judicial systems instill confidence in lenders resulting in greater bank lending (Jappelli, Pagano, & Bianco, 2005), lower costs of financial intermediation and less uncertainty about borrowers' repayments (Laeven & Majnoni, 2005), with longer loan maturities more likely especially for small firms (Shah, 2011). As a result, H3a suggests:

*H3a. SMEs in countries with greater judicial efficiency are less likely to be discouraged borrowers.*

Similar to H2b, a more efficient regime and in this case, greater judicial efficiency can speed up loan recovery in a cost-efficient and timely manner for banks (Shah et al., 2017). However Shah et al.'s, (2017) evidence of a negative relationship between judicial efficiency and leverage levels illustrates how such efficiency curtails SMEs appetite for debt which they attribute to management's fear of losing their jobs. Hence, H3b suggests:

*H3b. SMEs in countries with greater judicial efficiency are more likely to be discouraged borrowers.*

Similar to the judicial environment, the bankruptcy environment represents another dimension of enforcement with one of its goals being to help settle creditor claims (Stef & Dimelis, 2020). Mol-Gómez-Vázquez et al. (2019) find greater borrower discouragement in countries with more inefficient bankruptcy regimes. Thus, H4a suggests:

*H4a. SMEs in countries with greater bankruptcy efficiency are less likely to be discouraged borrowers.*

However, a more efficient bankruptcy regime for creditors may have adverse implications for SMEs whose fear of premature liquidation (Vig, 2013) could be heightened. This concurs with Bernstein, Colonnelli, and Iverson (2019) who argues liquidation can result in less efficient allocation of company assets during the bankruptcy process. As a corollary of this, H4b suggests:

*H4b. SMEs in countries with greater bankruptcy efficiency are more likely to be discouraged borrowers.*

**Tax environment.** Graham (2003) posits firms with high tax rates employ more debt where the debt tax benefits create firm value. Employing cross country data, Djankov, Ganser, McLiesh, Ramalho, and Shleifer (2010) find a positive relationship between the corporate tax rate and debt denoted by the debt to equity ratio. Considering borrower discouragement, Ferrando and Mulier (2022) find a negative relationship between discouragement and taxes such that an increase in taxes reduces the discouragement of borrowers, highlighting the advantageous nature of the tax deduction of interest payments. To that end, H5 suggests:

*H5. SMEs in countries with a higher tax rate are less likely to be discouraged borrowers.*

**Regulatory environment.** Finally, the impact of the regulatory environment has been evaluated in the context of financing obstacles where Beck, Demirgüç-Kunt, Laeven, and Maksimovic (2006) find institutional development reduces the financial obstacles facing firms. Indeed, institutional development, a measure of political, regulatory quality and enforcement along with the law and Government administration, appears the most important country level variable to account for the varying degrees of financing obstacles across countries (Beck et al., 2006). Mac an Bhaird et al. (2016) find greater country regulation increases borrower discouragement such that an increase in regulatory quality minimises moral hazard and simultaneously discourages 'bad' borrowers from applying for debt which ultimately results in more efficient financial resources and more favourable lending conditions for good borrowers. Hence H6 suggests:

*H6. SMEs in countries with a higher regulatory quality are less likely to be discouraged borrowers.*

### 3. Data and method

**Empirical method and data description.** To test our hypotheses, we start building an empirical model that estimates the probability of borrower discouragement. Thus, we can model the probability of discouragement as:

$$P(\text{Discouragement}_{it} = 1) = \Phi(\alpha_1 + \text{LEND}_{it}\beta_1 + Z_{it}\gamma_1) \quad (1)$$

where  $\text{Discouragement}_{it}$  is the dependent variable indicating whether firm  $i$  is discouraged or not in year  $t$ ,  $\beta$  and  $\gamma$  represent the independent variables including, countries lending infrastructure, macroeconomic conditions and firm characteristics, as well as detailed fixed effects at the year and industry levels.

The primary data source for this paper is the World Bank Enterprise Survey (WBES), which has also been used by Bertrand and Mazza (2022), Bertrand and Perrin (2022), Chakravarty and Xiang (2013), Leon (2015) and Osei-Tutu and Weill (2023) to evaluate borrower discouragement across developed and developing countries (World Bank Enterprise Surveys, 2020a). Our study focuses on the period from 2013 to 2018, with approximately 40% of the data from low-income countries and the remainder from high-income countries. The WBES provides a representative sample of a country's private sector, utilising a methodology known as 'stratified random sampling with replacement' (World Bank, 2022a). This methodology involves grouping all population units into homogeneous groups and selecting simple random samples within each group (World Bank, 2022a, pp.1). This approach allows for the formation of estimates with a specified degree of precision for each stratum (World Bank, 2022a). Additionally, using weighted individual observations generates population estimates, where sampling weights account for differing likelihoods of selection (World Bank, 2022a).

Our dependent variable, Discouraged Borrower, is a dummy variable where a value of '1' indicates a discouraged borrower and a value of '0' indicates a non-discouraged borrower. This variable is derived from two questions in the Finance section of the World Bank Enterprise Survey: K16 ("Referring again to fiscal year [Insert last complete fiscal year], did this establishment apply for any lines of credit or loans?") and K17 ("What was the main reason why this establishment did not apply for any line of credit or loan?") (World Bank Enterprise Surveys, 2020b). Firms that answered 'No' to K16 and provided any of the following reasons for

**Table 1**

Sample description.

Complete observations of data where respondents had provided a relevant response to K16	158,781 to 151,590 observations
Only 'Manufacturing' and 'Services' industries were included	151,590 to 107,819 observations
Reflected time period: 2013–2018	107,819 to 28,886 observations

Notes: The table reports the data selection from the World Bank Enterprise Survey data.

**Table 2**

Summary statistics.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Discouraged Borrower	28,886	0.293	0.455	0.000	1.000
Credit Index	28,886	6.106	2.307	0.000	8.000
Legal Index	28,886	4.953	2.896	0.000	12.000
Enforcing Contracts	28,886	6.552	3.174	2.250	17.150
Resolving Insolvency	28,039	2.706	1.133	0.800	6.000
Corporate Tax Rate	28,057	23.677	6.549	7.500	36.000
Regulatory Quality	28,886	36.441	21.881	2.404	86.667
Age	28,881	2.836	0.922	0.000	7.615
Small firm (0/1)	28,886	0.437	0.496	0.000	1.000
Growth of workers (0/1)	26,302	0.436	0.496	0.000	1.000
Audit (0/1)	28,654	0.433	0.495	0.000	1.000
GDP per capita	28,886	7.484	7.479	0.275	34.609
Any female in the board (0/1)	28,556	0.378	0.485	0.000	1.000
Top manager female (0/1)	28,813	0.198	0.398	0.000	1.000
Change workers (%)	26,279	0.110	0.372	-0.600	2.000
Low or medium income (0/1)	28,886	0.374	0.484	0.000	1.000

Notes: The table reports summary statistics for the main variables used in the regressions. All of the variables are defined in Table A1.

K17—'application procedures were complex', 'interest rates were not favourable', 'collateral requirements were too high', 'size of loan and maturity were insufficient', 'did not think it would be approved', or 'other'—were classified as discouraged borrowers (valued at '1'). Firms that answered 'Yes' to K16 were classified as non-discouraged borrowers (valued at '0') (World Bank Enterprise Surveys, 2020b). The sample of 28,886 SMEs was derived from complete observations of data where respondents had provided a response in line with the above definitions of the key questions coupled with focusing on the time frame, 2013–2018. Only the 'Manufacturing' and 'Services' industries were included. This may present potential limitations. Moreover, few observations from some countries also presents further possible limitations (see Table 1). Our definition of a discouraged borrower is consistent with that used by Bertrand et al. (2024), Bertrand and Mazza (2022), Bertrand and Perrin (2022), Chakravarty and Xiang (2013) and Osei-Tutu and Weill (2023). Brown et al. (2022) highlight the variation in the definition of discouraged borrowers used in empirical studies citing differences in surveys used. He does commend the broader and more inclusive approach adopted by Chakravarty and Xiang (2013) in their definition of borrower discouragement. Our independent variables consist of six proxies based on country characteristics which together capture countries lending infrastructure. The variable Credit Index, proxy for the information environment, is an aggregate measure of the sources of credit information available in a country collected and shared by its public or private credit registries; ranging in value 'from 0 to 8, with higher values indicating the availability of more credit information, to facilitate lending decisions' (World Bank, 2022a). The Legal Index variable, proxy for the legal environment, is an aggregate measure of 'the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders' in a country, ranging in value from 0 to 12 with higher scores deemed to facilitate greater lending (World Bank, 2022a). The variable, Enforcing Contracts, proxy for the judicial environment, measures the time it takes to enforce a contract, measured by the number of days from first filing a lawsuit in court to final determination. Fewer days suggest stronger contract enforcement in a country (World Bank, 2022b). The Resolving Insolvency variable, proxy for the bankruptcy environment, represents the number of years from filing insolvency in a country until resolution of the distressed assets, capturing the length of time for creditors to recover their credit with longer time frames symptomatic of weaker bankruptcy regimes (World Bank, 2022c). The Corporate Tax Rate variable (tax proxy) measures the corporate tax rate in a country (Tax Foundation, 2022), while Regulatory Quality, proxy for the regulatory environment, represents perceptions of governments' ability 'to formulate and implement sound policies and regulations that permit and promote private sector development', ranging from 0 to 100, with higher scores reflecting stronger regulatory regimes (World Bank, 2023). Appendix 1 provides the full details of the independent variables used in this paper. We also control for a number of variables that capture firm and economic characteristics similar to Bertrand et al. (2024) and Chakravarty and Xiang (2013). These include gender of firm owner/manager, firm age, firm size, firm growth, whether or not the firm has been audited, and GDP per capita. The definitions for these proxies are included in Table A1.

**Summary statistics.** Table 2 illustrates the summary statistics of the variables. Of the 28,886 firm-year observations, approximately 29.30% are discouraged. In the context of the information environment, there is a relatively high availability of credit information across the sample (average score of 6.11 on a scale from 0–8) while for the legal environment, the sample countries' laws in general appear poorly designed to facilitate more access to credit (average score of just 4.95 on a scale from 0–12). Illustrative of the



**Table 3**  
Baseline results: countries lending infrastructure and discouraged borrowers.

	Probit	Probit	Probit	Probit	Probit	Probit	Probit
Dep. variables	Discouraged borrower	Discouraged borrower	Discouraged borrower	Discouraged borrower	Discouraged borrower	Discouraged borrower	Discouraged borrower
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Credit Index	-0.069*** (0.011)						-0.047*** (0.013)
Legal Index		0.009 (0.010)					0.035*** (0.011)
Enforcing Contracts			-0.015 (0.010)				-0.024** (0.010)
Resolving Insolvency				-0.067** (0.026)			-0.093*** (0.028)
Corporate Tax Rate					0.019*** (0.005)		0.030*** (0.006)
Regulatory Quality						-0.008*** (0.002)	-0.009*** (0.002)
Age	-0.030* (0.016)	-0.035** (0.016)	-0.034** (0.016)	-0.034** (0.016)	-0.046*** (0.016)	-0.030* (0.016)	-0.030** (0.015)
Small firm	0.175*** (0.033)	0.187*** (0.033)	0.191*** (0.032)	0.192*** (0.032)	0.168*** (0.033)	0.188*** (0.032)	0.179*** (0.031)
Growth of workers	-0.119*** (0.031)	-0.107*** (0.030)	-0.104*** (0.031)	-0.099*** (0.031)	-0.112*** (0.031)	-0.110*** (0.031)	-0.122*** (0.031)
Audit	-0.256*** (0.043)	-0.270*** (0.042)	-0.263*** (0.041)	-0.260*** (0.042)	-0.295*** (0.045)	-0.271*** (0.044)	-0.263*** (0.043)
GDP per capita	-0.016*** (0.005)	-0.018*** (0.005)	-0.016*** (0.005)	-0.021*** (0.005)	-0.024*** (0.005)	-0.003 (0.006)	-0.002 (0.007)
Year fixed effects	Y	Y	Y	Y	Y	Y	Y
Sector fixed effects	Y	Y	Y	Y	Y	Y	Y
Observations	26,129	26,129	26,129	25,335	25,359	26,129	24,780

Notes: This table reports the effects of countries lending infrastructures on borrower discouragement. All the columns report the marginal effects and all the regressions include industry and year fixed effects. See Table A1 and Section 3 for details on the control variables. In parentheses are standard errors that are robust to heteroskedasticity and clustered at the regional level.

\* Significant at 10%.

\*\* Significant at 5%.

\*\*\* Significant at 1%.

judicial environment, it takes just over 6 days on average to enforce a contract, the time from when the creditor files the lawsuit to completion, which is a relatively short period of time. The mean value of 2.71 suggests it takes just under 3 calendar years to resolve insolvency and recover the credit owed to the creditor, which again is relatively short. The mean corporate tax rate of the sample is 23.67% while the mean of the proxy for the regulatory quality at 36.44 (max 100) suggests the quality of regulation is relatively low.

Whilst females account for approximately 37.80 per cent of firm ownership, only 19.80% of the firms are managed by females. In terms of the control variables, while firms on average are newly established, have more than 20 employees, yet just under half have grown over the last three years with a similar number having had their financial statements externally audited. Firm growth and audit constitute our control measures for firm quality. Finally, the relative GDP mean value reflects the composition of the sample (approx. 37.40% from low-income countries).

## 4. Results

### 4.1. Baseline results

In Table 3, we show our baseline regressions. The results indicate that the information, legal, judicial, bankruptcy, tax, and regulatory environments significantly impact borrower discouragement. Specifically, credit information sharing, weaker legal rights, less efficient judicial and bankruptcy regimes, lower corporate tax rates, and a stronger regulatory environment in countries help reduce the likelihood of borrower discouragement. These findings align with those of Chakravarty and Xiang (2013) and Kallandranis and Drakos (2021), who also find that borrower discouragement is contingent on country-specific factors.

Increased sharing of credit information between lenders and credit reporting service providers reduces the likelihood of borrower discouragement, corroborating the findings of Bertrand et al. (2024), Bertrand and Mazza (2022) and Gama et al. (2017). Notably, Bertrand et al. (2024), Bertrand and Mazza (2022) and Gama et al. (2017) focused on less developed countries. The assertion is that, regardless of jurisdiction, the sharing of credit information helps lower information asymmetries, improve credit access, and thus curtail self-rationing. Our results therefore support hypothesis 1 and concur with the seminal work on borrower discouragement

by [Kon and Storey \(2003\)](#). The importance of credit information systems was recently highlighted by the [World Bank \(2019\)](#) for their role in minimising portfolio risks and transaction costs for lenders, thereby facilitating more ‘responsible access to finance’ ([World Bank, 2019](#), pp. V11).

Countries legal framework initially appears not relevant in explaining the likelihood of borrower discouragement, but when we include the other proxies for lending infrastructure it becomes significant with weaker legal rights deemed to reduce the likelihood of borrower discouragement (in line with our hypothesis 2b). Concurring with the liquidation bias theory ([Vig, 2013](#)), the assertion is that a stronger legal framework imposes fear of premature liquidation among SMEs and hence results in their self-rationing. Indeed a reduction in the pursuit of risk investments by firms can stem from liquidation inefficiencies, as a result of an increase in creditor rights where the closure of firms and loss of management jobs can occur ([Acharya et al., 2011](#)). While [Shah et al. \(2017\)](#) assert that judicial efficiency could pose as a threat to the continuity of managers jobs in firms that maintain high leverage levels, such a threat is also evident when stronger legal protection prevails. This bankruptcy fear, contingent on the strength of legal rights can lead to sub-optimal levels of debt being employed by firms ([Shah et al., 2017](#)). Any change to the legal environment must thus strive to balance the upside and downside effects of such a change so as to achieve an ‘optimal level of creditor rights’ ([Acharya et al., 2011](#), pp.165). Consideration must be given to the positive impact on supply of bank credit and subsequently the adverse impact on firm demand for bank credit, corporate risk-taking activities and firm performance ([Acharya et al., 2011](#)). Further support for hypothesis 2b and thus the demand side view can also be attributed to concerns of control loss where [Cho et al. \(2014\)](#) posit firms are eschewed from utilising debt when the strength of creditor protection increases so as to minimise concerns of losing control of the business in the event of financial difficulties. [Cho et al. \(2014\)](#) assert the element of creditor protection that focuses on shareholders and managers interest of preserving control negatively impinges on the level of debt. Concomitantly, such stakeholders are encouraged to make decisions of minimal risk when creditor protection is strong, thus leading to a sub optimal value being achieved by firms ([Cho et al., 2014](#)). Indeed, the results of this study and those of [Cho et al. \(2014\)](#) confirm that ‘demand-side forces drive corporate financing’ ([Cho et al., 2014](#), pp. 42) and as such any changes to the legal environment must consider the balance of both demand side and supply side forces of bank credit to ensure such a change remains integral to its purpose. Final support for hypothesis 2b is also illustrative of asset constrained firms where [Gama et al. \(2017\)](#) find a positive relationship between the strength of creditor protection and borrower discouragement such that more stringent lending conditions including collateral can negatively impinge on the employment of debt when firms face asset restrictions. [Wernli and Dietrich \(2022\)](#) also highlight the importance of extensive collateral requirements in explaining borrower discouragement. As a corollary of this, any change to the legal environment warrants consideration of collateral requirements and the capacity of firms to meet such requirements.

Equally the judicial environment emerges significant following the inclusion of all proxies for the lending infrastructure whereby more inefficient regimes in terms of the length of time to enforce a contract are found to reduce borrower discouragement, thus supporting hypothesis 3b. This result supports the liquidation bias ([Vig, 2013](#)) which occupies the demand side view and also concurs with the fear of losing control of the business should a default occur ([Cho et al., 2014](#)). Our results are also in line with [Shah’s et al. \(2017\)](#) evidence of lower leverage in more efficient judicial regimes, attributed to the fear of job losses. Similar to the legal environment, results from the judicial environment can lead to a sub optimal firm value ([Cho et al., 2014](#)) and less risk investments pursued ([Acharya et al., 2011](#)).

Bankruptcy regimes emerge as highly significant with more inefficient systems in terms of lengthier time frames to resolve insolvency found to lower borrower discouragement thereby supporting hypothesis 4b. Our result remains significant when all of the proxies for the lending infrastructure are included, reinforcing countries with more efficient bankruptcy systems sees greater likelihood of self-rationing. Yet again, our results concur with the demand side view and in particular the liquidation bias ([Vig, 2013](#)) and the fear of losing control of the business in the event of a default ([Cho et al., 2014](#)). In addition, our evidence concurs with [Stef and Dimelis \(2020\)](#) assertion of differences in bankruptcy systems, some which encourage survival of distressed firms in contrast to others which facilitate their exit. Our results under the bankruptcy environment are aligned with those from the legal and judicial environment. Support for the importance of the taxation environment is also evident, both on its own and when all environments are considered with the assertion that higher tax rates leads to greater likelihood of discouragement. However contrary to hypothesis 5, the benefits of a tax shield do not seem to matter for SMEs in our sample unlike [Ferrando and Mulier \(2022\)](#). Instead concerns about the cost burden inflicted from higher tax rates and subsequent negative impacts on their cash flow appear of greater paramount for SMEs here. This can partly be explained by the nature of our sample which consists of SMEs in developed and non-developed countries in contrast to [Ferrando and Mulier \(2022\)](#) sample from developed countries only.

Finally, the regulatory environment also proves significant with a more stringent regulatory regime reducing the likelihood of borrower discouragement, thereby supporting hypothesis 6. This is in line with the findings of [Beck et al. \(2006\)](#) where institutional development reduces the extent of financing obstacles for firms. Yet, our result conflicts with [Mac an Bhaird et al. \(2016\)](#) who find a positive relationship between regulatory quality and borrower discouragement. They posit that a regulatory environment can exert an impact on moral hazard and as such reduce the likelihood of ‘bad’ borrowers looking to borrow resulting in minimising issues of adverse selection and creating more favourable lending conditions for ‘good’ borrowers ([Mac an Bhaird et al., 2016](#)). To reconcile such differences, the reduction in borrower discouragement as evident in this paper could be attributable to the more favourable lending conditions for ‘good’ borrowers which may have outweighed the impact on ‘bad’ borrowers. In terms of the control variables, younger and smaller firms are more likely to be discouraged borrowers consistent with [Anastasiou et al. \(2024, 2022\)](#), [Cole and Sokolyk \(2016\)](#), [Drakos and Giannakopoulos \(2018\)](#), [Kallandranis and Drakos \(2021\)](#), [Mac an Bhaird et al. \(2016\)](#). Similarly, non-audited firms are more likely to be discouraged borrowers due to their perceived riskiness, concurring with [Bertrand et al. \(2024\)](#) and [Bertrand and Mazza \(2022\)](#) while poorer performing firms (proxy growth in employees) suffer the same fate.

**Table 4**  
Non linearities: key firm characteristics.

	Firm age		Firm size			Change workers		
	≤10 years	>10 years	Small	Medium	Large	Decrease	Same	Increase
	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit
Dep. variables	Discouraged borrower	Discouraged borrower	Discouraged borrower	Discouraged borrower	Discouraged borrower	Discouraged borrower	Discouraged borrower	Discouraged borrower
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Credit Index	-0.032** (0.014)	-0.049*** (0.014)	-0.050*** (0.013)	-0.038** (0.016)	-0.042 (0.027)	-0.051*** (0.017)	-0.050*** (0.015)	-0.040** (0.016)
Legal Index	0.029** (0.013)	0.038*** (0.011)	0.032*** (0.010)	0.038*** (0.013)	0.036** (0.017)	0.023* (0.012)	0.047*** (0.013)	0.036*** (0.013)
Enforcing Contracts	-0.023** (0.012)	-0.025** (0.010)	-0.022** (0.010)	-0.025** (0.011)	-0.033** (0.016)	-0.024* (0.013)	-0.029** (0.012)	-0.020** (0.010)
Resolving Insolvency	-0.100*** (0.031)	-0.091*** (0.029)	-0.076*** (0.028)	-0.108*** (0.033)	-0.099** (0.040)	-0.088*** (0.031)	-0.123*** (0.035)	-0.078*** (0.030)
Corporate Tax Rate	0.038*** (0.007)	0.028*** (0.006)	0.029*** (0.007)	0.031*** (0.007)	0.027*** (0.009)	0.032*** (0.007)	0.036*** (0.008)	0.028*** (0.006)
Regulatory Quality	-0.010*** (0.003)	-0.009*** (0.003)	-0.008*** (0.002)	-0.011*** (0.003)	-0.005 (0.003)	-0.005* (0.003)	-0.011*** (0.003)	-0.009*** (0.003)
+ controls	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Sector fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Observations	5597	19,183	10,666	8331	5783	5591	8310	10,860

Notes: This table reports the effects of key firm characteristics on the relationship between countries lending infrastructures and borrower discouragement. In columns (1) and (2) we study the effect of firms' age (firms less than 10 years and firms 10 years or older); in columns (3), (4) and (5) we study the effect of firms' size, by classifying firms based on the number of employees (small 5–19 employees, medium 20–99, and large 100+); in columns (6), (7) and (8) we study the effect of firms' growth, by classifying firms based on the employees growth rate. All the columns report the marginal effects and all the regressions include industry and year fixed effects. See Table A1 and Section 3 for details on the control variables. In parentheses are standard errors that are robust to heteroskedasticity and clustered at the regional level.

\* Significant at 10%.

\*\* Significant at 5%.

\*\*\* Significant at 1%.

In summary, the results underline the pivotal role of a country's lending infrastructure in shaping borrower discouragement among SMEs. Key findings demonstrate that efficient credit information systems, weaker legal rights, less efficient judicial and bankruptcy regimes, lower tax burdens, and stricter regulatory environments significantly reduce borrower discouragement. Economically, these outcomes suggest that a well-structured lending infrastructure can mitigate information asymmetries, alleviate fears of premature liquidation or excessive control loss, and create favourable lending conditions for viable borrowers. Policymakers should carefully balance legal, tax, and regulatory frameworks to optimise credit access, support entrepreneurial risk-taking, and ensure a sustainable environment for SME financing, ultimately fostering economic growth.

#### 4.2. Non-linearities

Following our baseline results, we analyse borrower discouragement across a number of sample splits. Tables 4 and 5 present the regressions for the likelihood of borrower discouragement across several subsamples: firm age (firms less than 10 years and firms 10 years or older); firm size (small, medium, and large)<sup>2</sup>; employee growth level (reducing, same, or increasing number of employees compared to the previous year); audit status (audited or not audited); gender of the firm owner (female-owned or not); gender of the top manager (female or not); and country income level (lower income or upper income).

The sharing of credit information significantly reduces borrower discouragement, particularly for older, smaller firms, and those in lower-income countries. This result concurs with Chakravarty and Xiang (2013) who find a negative relationship between firm age and borrower discouragement. Their study also asserts a firm with more banking relationships will be less discouraged. It is possible that with the sharing of credit information, older firms could foster a greater number of banking relationships and thus reduce their level of discouragement (Fracasso, Peruzzi, & Tomasi, 2024). This warrants further investigation. Our findings also aligns with Mac an Bhaird et al. (2016), who suggest that banks face higher costs when gathering information on opaque, smaller firms. Baas and Schrooten (2006) state that for banks, accurate information on SMEs can be limited and expensive. Thus, mechanisms that reduce firm opacity will lower banks' costs and risks, thereby encouraging also greater demand for debt. Bertrand and Mazza (2022) found that credit information significantly reduces discouragement among riskier, smaller, and medium-sized firms given their information opacity. Furthermore, the importance of credit information in lower-income countries corroborates

<sup>2</sup> The size categories are based on firms' number of employees: small (5–19 employees), medium (20–99), and large (100+).



**Table 5**  
Non linearities: other characteristics.

Variables	Audit		Ownership		Top manager		Income	
	Yes	No	Female	No Female	Female	No Female	Low	High
	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit
Dep. variables	Discouraged borrower	Discouraged borrower	Discouraged borrower	Discouraged borrower	Discouraged borrower	Discouraged borrower	Discouraged borrower	Discouraged borrower
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Credit Index	-0.055*** (0.015)	-0.044*** (0.014)	-0.053*** (0.016)	-0.039*** (0.013)	-0.046** (0.020)	-0.043*** (0.012)	-0.091*** (0.013)	-0.049 (0.033)
Legal Index	0.028** (0.012)	0.035*** (0.013)	0.040*** (0.012)	0.034*** (0.012)	0.045*** (0.014)	0.036*** (0.011)	0.039** (0.017)	0.058*** (0.016)
Enforcing Contracts	-0.032*** (0.011)	-0.013 (0.011)	-0.034*** (0.011)	-0.016 (0.010)	-0.046*** (0.015)	-0.017* (0.009)	-0.036** (0.014)	-0.011 (0.013)
Resolving Insolvency	-0.061** (0.031)	-0.113*** (0.032)	-0.119*** (0.028)	-0.075** (0.031)	-0.103*** (0.034)	-0.087*** (0.029)	-0.032 (0.036)	0.001 (0.035)
Corporate Tax Rate	0.016** (0.007)	0.037*** (0.007)	0.027*** (0.007)	0.031*** (0.006)	0.030*** (0.008)	0.031*** (0.006)	0.044*** (0.008)	0.006 (0.009)
Regulatory Quality	-0.004 (0.003)	-0.012*** (0.003)	-0.008*** (0.003)	-0.009*** (0.002)	-0.007** (0.003)	-0.010*** (0.002)	-0.007 (0.006)	-0.016*** (0.003)
+ controls	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Sector fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Observations	10,950	13,830	9473	15,045	4842	19,882	9135	15,645

Notes: This table reports the effects of key firm characteristics on the relationship between countries lending infrastructures and borrower discouragement. In columns (1) and (2) we study the effect of firms' opacity (firms with or without an audited balance sheet); in columns (3) and (4) we study the effect of firms' female ownership; in columns (5) and (6) we study the effect of firms' top management (female or not); in columns (7) and (8) we study the effect of firms' country of origin, by classifying countries based on income levels. All the columns report the marginal effects and all the regressions include industry and year fixed effects. See Table A1 and Section 3 for details on the control variables. In parentheses are standard errors that are robust to heteroskedasticity and clustered at the regional level.

\* Significant at 10%.

\*\* Significant at 5%.

\*\*\* Significant at 1%.

the findings of Bertrand et al. (2024) as well as Fosu, Danso, Agyei-Boapeah, Ntim, and Adegbite (2020), who reported reduced loan defaults in developing countries due to credit information sharing. Fosu, Agyei-Boapeah, and Ciftci (2023) also observed a reduction in debt costs following the introduction of credit bureaus in these countries. Chakravarty and Xiang (2013) identified that borrower discouragement varies across developed and developing countries. They found that younger, smaller, non-government-owned, non-exporting firms with few banking relationships in developing countries are more likely to be discouraged. Our findings further emphasise the importance of the information environment in reducing borrower discouragement, particularly in low-income countries, as predicted by Kon and Storey (2003) and evidenced by both Bertrand et al. (2024) and Chakravarty and Xiang (2013).

The legal environment also significantly impacts borrower discouragement for certain firm cohorts. Stronger legal rights regimes increase borrower discouragement for older, small to medium-sized, non-audited, high-growth firms, and those in upper-income countries. Again our results are illustrative of the support for the liquidation bias theory (Vig, 2013), concerns over loss of control (Cho et al., 2014) and asset constrained firms (Gama et al., 2017). In particular, the fear of premature liquidation (Vig, 2013) and concerns over possible loss of control (Cho et al., 2014) would be greater for older, riskier, high growth firms and those in upper income countries given their establishment, level of risk, greater growth opportunities and their operation in countries where the legal infrastructure is highly developed. Cho et al. (2014) find when firms must employ external finance, the fear of losing control does diminish. Yet, for older and high growth firms, their internal funding resources can reduce their need for external finance, thus heightening their fear of loss of control. Moreover, small and medium sized firms in comparison to larger firms would face greater collateral restrictions due to having fewer assets and hence it is not surprising the impact the legal environment has on this cohort.

The judicial environment significantly affects SMEs owned or led by females and firms with high growth prospects. Efficient enforcement regimes increase self-rationing likelihood for these cohorts, again supporting the liquidation bias hypothesis (Vig, 2013) and concerns of loss of control (Cho et al., 2014). Female-owned/managed enterprises' risk aversion (Croson & Gneezy, 2009) explains their heightened discouragement in efficient enforcement regimes. Huang, Zhu, Yan and Zeng (2023) find female CEOs employ less leverage, attributing much of this to their greater risk aversion in comparison to their male counterparts, consistent also with the work of Croson and Gneezy (2009). In fact, risk aversion can intensify the effects of premature liquidation and concerns of control loss. Interestingly, Bertrand and Perrin (2022) found weaker discouragement among females in women-friendly judicial environments.

Similarly, efficient bankruptcy regimes increase discouragement for non-audited and female-owned firms, reinforcing again the fear of premature liquidation (Vig, 2013) and concerns of control loss (Cho et al., 2014) among risky and female owned enterprises. Efficient bankruptcy regimes also increase discouragement for small and medium sized firms, yet again highlighting the impact

of their asset restrictions. The tax environment significantly affects non-audited firms and those in low-income countries, with the assertion that the cost of tax outweighs any tax advantages of debt. This result is unsurprising given that such firms may be less profitable.

The regulatory environment is crucial in reducing borrower discouragement for small to medium-sized firms and firms which are non-audited. This result is not unusual given small and medium-sized enterprises and risky enterprises face significant financial obstacles and thus, a mechanism which reduces such obstacles i.e. a more stringent regulatory environment would exert a greater impact on such firms.

In summary, the sub-sample analysis provides a closer examination of the impact of countries' lending infrastructure on various firm cohorts, highlighting the importance of credit information, legal, judicial, bankruptcy, taxation, and regulatory environments. These factors are particularly significant for female borrowers and SMEs, reinforcing the need for supportive financial infrastructures to reduce discouragement and promote firm growth. Our evidence concurs with Brown's et al. (2022) and Freel's et al. (2012) assertion that borrower discouragement in SMEs is influenced by a complex mix of inter-related factors.

## 5. Conclusions

This paper examines borrower discouragement which is a particular form of credit rationing experienced by SMEs across the world. Using a sample of 28,886 SMEs derived from the WBES we adopt a novel approach, namely countries' lending infrastructure in analysing borrower discouragement. Our findings suggest relatively strong support for this infrastructure as countries' information, legal, judicial, bankruptcy, tax, and regulatory environments impact the likelihood of borrower discouragement. Our analysis remains robust for a number of subsamples, further illustrating the explanatory power of national lending infrastructures and their importance for the complex phenomenon of borrower discouragement. This work has a number of implications for policy. First, our results suggest the need to enhance the quality of the information environment, in terms of not only the breadth but also the depth of this mechanism so as to alleviate information asymmetries and reduce borrower discouragement. More recently there is greater recognition of the vital role of credit information flow to different stakeholders for well functioning financial markets. The ongoing work of the World Bank and its Credit Reporting Systems team in working with governments and all other stakeholders in enhancing existing and devising new national strategies for credit information systems is a welcomed development. Moreover, the advent of new technologies and new data sources is likely to increase the quantity and quality of credit information being produced for lenders, consumers, regulators and supervisors. Second, the adverse effects we find from stronger legal rights and efficient judicial and bankruptcy system enforcements in heightening self-rationing by borrowers and instilling a fear of premature liquidation may stem from a myriad of factors. These include their own previous experience or that of close family members with high levels of indebtedness which may have been possible given that our sample commences in the aftermath of the Global Financial Crisis. Other possible reasons could be the low self-efficacy among SME owners with this lack of confidence and self-belief compounded by owners' low levels of financial literacy. Policy interventions aimed at alleviating such fears could include the provision of education and financial literacy training for prospective borrowers.

There are a number of limitations to our study. We do not examine the banking structure across countries nor banking relationships with SMEs. In addition we do not analyse the role of cultural differences across countries. We are unable to control for the asset tangibility of the SMEs in our sample due to the lack of balance sheet data. Future work could incorporate the nature of banking relationships and in particular their significance for female owned/female managed firms. It is perceived that females are more discouraged than their male counterparts when applying for a bank loan (Bertrand, Burietz, & Perrin, 2022; De Andres, Gimeno, & De Cabo, 2021). Given that this paper finds several components of the lending infrastructure appear important for increasing the likelihood of self-rationing among SMEs owned or led by females, future research could probe deeper into these, including female self-efficacy levels and unravel other factors in need of attention to minimise discouragement for this cohort. Self-rationing by SMEs and particularly for those owned or led by females is likely to change with the ongoing evolution of the components of the lending infrastructure. This we leave to future research.

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## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Appendix A. Supplementary data

Supplementary material related to this article can be found online at <https://doi.org/10.1016/j.iref.2025.103959>.

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