DOI: 10.1111/fire.12361

ORIGINAL ARTICLE

The Financial Review WILEY

Credit information sharing and cost of debt: Evidence from the introduction of credit bureaus in developing countries

Samuel Fosu[1] | Henry Agyei-Boapeah[2] | Neytullah Ciftci[3,4]

[1]University of Sussex Business School, University Sussex, Brighton, UK

[2]Essex Business School, University of Essex, Colchester, UK

[3]Department of Business Administration, Faculty of Economics and Administrative Sciences, Hakkari University, Hakkari, Türkiye

[4]The Pentland Centre for Sustainability in Business, Lancaster University, Lancaster, UK

Correspondence
Samuel Fosu, University of Sussex Business School, University Sussex, Brighton, BN1 9SL, UK.
Email: s.fosu@sussex.ac.uk

Henry Agyei-Boapeah was previously affiliated to the University of Nottingham, UK.

Funding information
United Arab Emirates University, Grant/Award Number: G00003367

Abstract

We investigate the effect of credit information sharing on cost of debt, with particular focus on the introduction of credit bureaus in developing countries. Using a large dataset of firms from 28 developing countries over the period 2004–2019, we find that firms' average cost of debt significantly declines following the introduction of credit bureaus. This finding is robust to an alternative measure of cost of debt, several firm- and country-level controls and to firm- and year-fixed effects. The reduction in cost of debt is more pronounced for less transparent firms and for firms domiciled in countries with weak institutional framework.

KEYWORDS
cost of debt, credit bureaus, information sharing, institutional quality, transparency

1 | INTRODUCTION

In the past two decades, motivated by the need to improve the availability of credit, several countries have implemented credit information-sharing schemes. Between 2004 and 2018, more than 75 developing countries instituted credit information-sharing schemes, and this arguably (partly) explains the burgeoning research on the economic consequences of credit information-sharing schemes (Ayyagari et al., 2021; De Haas et al., 2021; Martinez-Peria & Singh, 2014). For instance, Ayyagari et al. (2021) investigate the effect of credit information sharing on job growth in developing countries, while De Haas et al. (2021) study how information sharing affects the microcredit market in Bosnia and Herzegovina. We contribute to this strand of literature by examining the impact of credit information sharing on

corporate cost of debt in developing countries, with a particular focus on the introduction of credit bureaus.[1] We further investigate the moderating role of national institutional quality and firm opacity (i.e., lack of transparency). Due to the institutional voids that characterize most developing countries such as weak legal structures and contract enforcement mechanisms (Agyei-Boapeah & Machokoto, 2018; Rajan & Zingales, 1998; Tunyi et al., 2019), borrowers in such countries face a higher cost of credit and may, therefore, benefit from credit information-sharing schemes.

In theory, by sharing credit information about borrowers, lenders can expect to mitigate several lending problems including adverse selection, borrower hold-up, and agency costs which results in lower default rates in credit markets (e.g., Klein, 1992; Padilla & Pagano, 2000; Pagano & Jappelli, 1993; Vercammen, 1995). Credit information sharing gives banks easy access to information about the credit worthiness of new and potential borrowers to make safe lending decisions and to effectively monitor borrower behavior. Existing evidence, rarely based on developing countries, supports this view by documenting that countries with functional credit information-sharing schemes experience improved access to credit and reduced default rates (e.g., Brown et al., 2009; Fosu, 2014; Fosu et al., 2020a; Houston et al., 2010).

Other studies extend this literature by exploring the relationship between credit information sharing on the one hand and credit constraints (e.g., Brown et al., 2009; Love & Mylenko, 2003; Martinez-Peria & Singh, 2014) or credit intermediation cost (Fosu et al., 2020b) on the other hand. Despite the incremental contributions made by prior studies to this burgeoning literature, they have often focused on either bank-level outcomes or firms' perceived credit constraints. Thus far, there has been limited focus on firm-level observable outcomes. We seek to add to the literature by linking credit information sharing to the firm's *actual* cost of debt, measured at both real and nominal rates.

Linking credit information directly to the firm's actual cost of debt is important for at least two reasons. First, most firms in developing countries depend on bank loans (Gwatidzo & Ojah, 2014), so the cost of debt can be a critical constraint that affects firm growth and economic growth. Therefore, both managers and policymakers tend to be keenly interested in the drivers of the corporate cost of debt which makes the relationship between information sharing and cost of debt a policy-relevant issue. Second, the firm's actual cost of debt can easily be analyzed to permit a more robust and objective analysis that is devoid of the subjective perceptions of firms' constraints in Brown et al. (2009) and Martinez-Peria and Singh's (2014) survey measures. Besides directly linking information sharing to firms' cost of debt, we also draw from the institutional and information asymmetry theoretical perspectives to contend that our primary hypothesis could be moderated by country-level institutional quality and firm-level transparency.

Our work relates to but also differs from the work of Martinez-Peria and Singh (2014). First, the authors of the prior study examine how credit information-sharing systems impact firms' access to finance and cover the interest rates of firms' most recent loans in their analysis. Therefore, their analysis considers the interest rates on specific loans taken by firms and fails to capture the average cost of debt for firms that access multiple loans over a period from the same or different financiers. We overcome this limitation by examining the average cost of debt of firms,[2] defined to include loans from all sources (banks as well as private and public lenders) that the firm has accessed. Next, we cover a more recent sample period, 2004–2019 (compared to 2002–2013 in the prior study), which enables us to capture the impact of information-sharing schemes introduced after 2009. Thus, our analysis includes recent schemes introduced in countries such as Ghana, Indonesia, Jamaica, Jordan, Malawi, Nigeria, and Vietnam. Further, our reliance on accounting data published in the annual accounts (vis-a-vis survey data) provides us with a larger panel dataset for robust statistical analysis. For instance, due to the survey data limitation, Martinez-Peria and Singh (2014) could not control for firm-fixed effects for most of their firms, which heightens omitted variable concerns in their empirical analysis. Our panel dataset helps us to mitigate such econometric concerns. Last, we extend the prior study by

[1] We focus on credit bureaus instead of credit registries for these reasons: (1) credit bureaus are run by private sector firms that tend to be more efficient in developing countries than public sector-run organizations such as credit registries; (2) credit registries focus more on regulatory and supervisory matters rather than directly facilitate the exchange of credit information and provision of credit scores for lending purposes (Jappelli & Pagano, 2002); (3) very few countries in our sample introduced credit registries during our sample period. Nonetheless, we use credit registry as an alternative proxy of credit information sharing in the final paragraph of Section 4.5.1.

[2] Chui et al. (2016) cite several advantages that cost of debt has over interest rate in estimating firms' financing ability. For example, it helps to capture the firm's dealings with both public and private debtholders, hence, better reflecting the firm's total cost of debt.

investigating how the relationship between information-sharing systems and corporate cost of debt might vary with (1) country-level institutional quality; and (2) firm-level information asymmetry. Overall, we provide a more focused, richer, and statistically robust analysis of the relationship between information-sharing schemes and corporate cost of debt.

Examining the relationship between information-sharing schemes and corporate cost of debt is complicated, not least because of endogeneity concerns. For example, there are potentially many factors that could affect both credit information sharing and firms' cost of debt. We mitigate this identification concern by employing the introduction of a credit bureau as an exogenous shock to the credit market. We follow an approach similar to Ayyagari et al. (2021) and Martinez-Peria and Singh (2014) by utilizing a difference-in-difference (DID) technique to estimate the impact of credit bureau introduction on the corporate cost of debt, by comparing countries that introduced credit bureaus, and those which did not, and the years pre- and post-introduction. We focus on credit bureaus because these are private commercial institutions that facilitate the exchange of credit information and provide associated services such as credit scores for lending purposes (Jappelli & Pagano, 2002). On the other hand, credit registries are publicly owned institutions and usually focus on regulatory and supervision requirements and typically cover loans above a specified threshold, which may limit the number of borrowers covered (Jappelli & Pagano, 2002). This focus is also motivated by empirical findings that suggest the introduction of credit registries has no significant effect on firm financing (Martinez-Peria & Singh, 2014).

Using the DID approach and a large dataset of over 7200 firms from 28 developing countries over the 2004–2019 period, we find a significant reduction in firms' cost of debt by an average of 3.2% to 3.8% points following the introduction of credit information-sharing systems (specifically, credit bureaus). This result is robust to a battery of robustness tests, including controlling for the firm-, industry-, country-, and year-fixed effects and using alternative measures of the cost of debt. Further, we find that the introduction of a credit bureau has an asymmetric effect on firms located in countries that differ in terms of institutional quality. Specifically, introducing a credit bureau appears to be associated with a greater reduction in the cost of debt for firms that operate in countries with poorer institutional quality (i.e., low rule of law, high corruption, and poor regulatory quality). Our results imply that effective credit information-sharing schemes could, to some extent, substitute for the roles played by developed governance institutions. In other words, where national institutions are weak and underdeveloped, credit information-sharing schemes can deliver the greatest benefits to firms by way of significantly reducing their cost of debt. Finally, our analyses reveal that (1) less transparent firms tend to enjoy greater reductions in their cost of capital following credit bureau introductions, and (2) introducing credit bureaus tend to significantly increase firms' debt maturity.

We make the following contributions to the literature. First, we are one of the early studies to provide evidence of a direct and robust link between the introduction of a credit bureau and firms' actual cost of debt for developing countries. Thus, our paper is aligned with the work of Brown et al. (2009), Martinez-Peria and Singh (2014), and Fosu et al. (2020b) who show that credit information sharing alleviates credit constraints. Based on survey data collected from firms in transition countries, Brown et al. (2009) investigate the effect of credit information sharing on how firms *perceive* the cost of credit to be a major business obstacle. We add to Brown et al.'s (2009) work by examining how credit information sharing impacts a firm's actual (observable) cost of debt measured from information contained in the firm's financial statements. Another related study is Fosu et al. (2020b), which examines the relationship between credit information sharing and banks' credit intermediation cost (i.e., the bank's loan spread). While Fosu et al. (2020b) consider the issue from the lender bank's perspective, we take the perspective of the borrower firm by focusing on corporate cost of debt. Overall, our empirical measure of cost of debt gives us the ability to explore how credit information-sharing schemes directly impact a specific attribute of the borrower firm—*the cost of debt*—a crucial variable for managerial decisions.

An additional contribution that we make to the literature is the new insights we offer by showing how country-level *institutional quality* (and its dimensions such as control of corruption, rule of law, regulatory quality, etc.) shape the relationship between credit information sharing and cost of debt. This aspect of our study has the potential to guide national policy formulation and evaluation. Further, our paper adds to the work of Francis et al. (2005) who examine the relationship between information asymmetry and risk pricing. The authors find that information uncertainty as

measured by accounting information quality is related to firms' cost of debt. Our finding corroborates their results by suggesting that improving the credit information environment at the macro-level through information-sharing schemes helps to reduce the cost of debt for firms. Finally, our paper covers a larger sample of firms from 28 developing countries, a context that is not only under-researched but has firms that are faced with exorbitant costs of credit, resulting in acute financing constraints. Thus, our study offers guidance to policymakers in developing countries with responsibility for managing credit constraints and the information environment.

The rest of the paper is organized as follows: Section 2 provides a review of relevant literature and proceeds to develop the hypotheses. Section 3 describes the data and empirical methods. We present and discuss the empirical results in Section 4, and Section 5 presents our conclusions.

2 | LITERATURE REVIEW

2.1 | Information sharing and cost of debt: Theory and core hypothesis

A bank's role as a lender and delegated monitor poses some challenges. In discharging their roles, banks determine which borrowers are "safe" to lend to and which borrowers pose a risk. Additionally, they decide the level of monitoring required after a loan is extended to a borrower. The borrowers must prove their creditworthiness or face a higher borrowing cost. In fact, these challenges are exacerbated by information asymmetry in credit markets which encourages moral hazards and adverse selection (e.g., Jensen & Meckling, 1976; Myers, 1977). Against this backdrop, the theoretical implication is that any improvement in the information environment such as a credit information exchange between banks will help to improve lending decisions by mitigating information asymmetry and moral hazard problems. Given lower levels of information asymmetry and moral hazard problems in the credit market, borrower firms could enjoy a lower cost of debt.

Existing theoretical perspectives suggest three major channels through which lower cost of debt could occur when banks share credit information. First, credit information sharing is hypothesized to reduce adverse selection problems and to help banks engage in "safe" lending (Pagano & Jappelli, 1993). According to this view, lending banks tend to only have relevant information about the pool of their local borrowers, which makes it difficult for them to safely lend to non-local borrowers. Consequently, the banks may decline to lend to non-local applicants or lend to them at a higher interest rate. However, charging a higher cost of credit ends up pricing out safe borrowers from the market (e.g., Stiglitz & Weiss, 1981). Pagano and Jappelli (1993) posit that credit information sharing can help banks obtain access to the credit history of non-local borrowers to make sound lending decisions. Accordingly, this perspective predicts that under credit information-sharing regimes, there would be more benefits to borrowers with good credit history, while borrowers with poor credit history will enjoy little or no benefits.

Second, credit information sharing implicitly constitutes an effective monitoring mechanism which reduces moral hazards and increases borrower effort to repay loans (Klein, 1992; Padilla & Pagano, 2000; Vercammen, 1995). Typically, borrowers, after securing credit, engage in riskier activities due to the challenges associated with delegated monitoring in high information asymmetry environments. Credit information sharing improves the information environment and enables borrower behavior to be observed by several banks, thus encouraging borrower repayment efforts. This is because borrowers would not want to be classified as "poor borrowers" and suffer reputational damage. In the end, good borrower behavior should reflect in a lower cost of credit for borrowers.

Finally, and related to the earlier channels, credit information sharing reduces opportunistic borrowing in multiple bank relationships. When credit information is not shared, borrowers have incentives to over-borrow from multiple banks as their overall level of indebtedness and their true credit risk cannot be accurately determined (Bennardo et al., 2015). This situation leads to credit rationing and higher costs of lending. However, credit information sharing has the potential to reduce this agency problem and reduce the cost of debt.

Overall, the theoretical channels and the related empirical evidence suggest that credit information sharing improves lending decisions, reduces loan default, and expands access to credit. To the extent that the cost of debt

is a good gauge of a firm's access to credit, we expect credit information sharing to significantly reduce a firm's cost of debt. Hence, we hypothesize as follows:

Hypothesis 1: Credit information sharing reduces the cost of debt for firms.

2.2 | Information sharing and cost of debt: Potential heterogenous effects

Our primary hypothesis of credit information sharing leading to reduced cost of debt may be an oversimplification. Institutional quality (e.g., rule of law, corruption, regulation, etc.) could be a crucial moderator as it determines the monitoring efforts required by banks and the lender confidence in applicable rules and regulations (e.g., Demirgüç-Kunt & Maksimovic, 1998; Kroszner et al., 2007; Porta et al., 2002; Qian & Strahan, 2007; Raddatz, 2006; Rajan & Zingales, 1998). Thus, the institutional quality could impact the severity of the levels of a firm's financial constraints. We extend the literature to incorporate possible heterogeneity from institutional quality on our primary hypothesis.

It is plausible for the benefit of credit information sharing to be limited in countries with better governance institutions. This is because stronger institutions mitigate agency problems, and improve firm valuation (e.g., Shleifer & Vishny, 1997; La Porta et al., 2002), which leads to better access to finance (see Driss et al., 2023; La Porta et al., 1997; Qian & Strahan, 2007). Qian and Strahan (2007) shows that firms in countries with strong creditor protection are much more able to access loans with longer maturity and lower cost. The access to long-maturity loans under environments with better governance institutions suggests less need for costly monitoring (Diamond, 1984). Other studies suggest that institutional quality and financial development are interlinked. For example, for a sample of 49 countries, La Porta et al. (1997) show that countries with weaker institutions have a relatively less developed financial system to support corporate financing. In addition, Acemoglu et al. (2003) show that better institutions could serve as a substitute for financial development. They support their conclusion by demonstrating that although financial development is associated with value creation, this relationship disappears after controlling for the quality of institutions.

Based on the foregoing discussions, we expect the benefit of credit information sharing to be less pronounced in environments where the institutions provide better protection for creditors. Our expectation is consistent with the finding in Djankov et al. (2007) that shows that while credit information sharing is associated with increased credit availability, the effect is stronger in countries with weaker protection for creditors. Accordingly, we formulate our second hypothesis as follows:

Hypothesis 2: The negative relationship between credit information sharing and cost of debt is moderated by institutional quality.

3 | DATA AND METHODOLOGY

We gather data from several sources including World Bank (2021a) Doing Business, World Bank (2021b) World Development Indicators, World Bank (2021c) World Governance Indicators and COMPUSTAT Global to test the relationship between credit information sharing and cost of debt. In this section, we discuss the data sources and the empirical implementation of the hypotheses.

3.1 | Data and measurement of key variables

We obtain firm-level financial data covering all developing countries from the COMPUSTAT Global database over the period 2004 to 2019. We exclude all firms with standard industry classification (SIC) codes ranging from 6000 to 6999

(financial firms) and from 4900 to 4999 (utility firms) as they are heavily regulated. We retain all firms with non-missing values on key variables. We merge the resulting sample with data on credit information sharing from World Bank (2021a) Doing Business database, macroeconomic data from World Bank (2021b) World Development Indicators, and governance data from World Bank (2021c) Worldwide Governance Indicators. This leaves us with an initial sample of 8635 unique firms form 37 countries. We require all firms to have at least two consecutive observations on the key variables and each country to have at least 15 firm-year observations. This leaves a final sample of 7269 unique firms from 28 developing countries over the period 2004 to 2019. Our sample begins from 2004 because the data on credit information sharing starts in 2004.

3.1.1 | Cost of debt

We follow the extant literature (Bliss & Gul, 2012; Chui et al., 2016; Francis et al., 2005; Fungáčová et al., 2017) and measure cost of debt (CoD) as the ratio of contemporaneous interest expense to average total debt, where the average is over the current (year *t*) and the previous year's (year *t-1*) debt. Specifically, we have:

$$CoD = \frac{Interest\ expense}{0.5 \times Debt_t + 0.5 \times Debt_{t-1}} \quad (1)$$

This measure of cost of debt represents the implicit interest rate paid by firms on their debt. This measure is more appropriate for assessing the overall link between credit information sharing and a firm's borrowing cost due to its ability to capture debt capital obtained from banks as well as from other private and public sources. Studies relying on only loan-level data from banks arguably present a partial view of firms' cost of debt (e.g., Chui et al., 2016). To mitigate the effect of extreme outliers, we follow Wang et al. (2020) and winsorize this variable at the top and bottom 5%.

Due to the significant variation in inflation among the sample countries, we follow Chui et al. (2016) and adjust the cost of debt variable (CoD) for inflation (π) to obtain real cost of debt (RCoD) as follows as:

$$RCoD = \left[\frac{1 + CoD}{1 + 0.5 \times \pi_t + 0.5 \times \pi_{t-1}}\right] - 1, \quad (2)$$

Consequently, we use the real cost debt as our main measure of cost of debt and the nominal measure of cost of debt for robustness checks.

3.1.2 | Credit information sharing

We relate our measures of cost of debt to credit information sharing and control for a wide array of firm- and country-level features. The World Bank (2021a) Doing Business database compiles data on the extent and type of credit information on borrowers that financial and non-financial institutions collect and share. We adopt the introduction of private credit bureau (*credit bureau introduction)* as our measure of credit information sharing. In a later analysis for robustness, we also consider the introduction of credit registry as an alternative proxy for improvement in credit information sharing. We do not use other measures, such as the depth of credit information sharing or the coverage of credit bureaus, due to the endogenous nature of these variables, especially when considered together with some general improvements in institutional quality.

3.1.3 | National institutional quality and control variables

We also relate our analysis to country-level institutional quality. We follow the existing studies (Tong & Wei, 2011) and measure *institutional quality* as the simple average of six institutional features of each country, namely, voice and

accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law, and control of corruption. A firm is deemed to have a low level of, or weak, institutional quality when the institutional quality index is below the median country.

Further, we control for other salient firm-level features that could affect cost of debt. Consistent with previous studies (e.g., Bardos et al., 2021; Bauwhede et al., 2015; Chui et al., 2016; Fungáčová et al., 2017), we include the size of the firm (*Firm Size*), measured as the natural logarithm of the firm's assets. Large firms have lower risk of failure (e.g., Berger & Udell, 1995). They may also be older and, thus, have a longer history to meet the disclosure requirement, making them less opaque (Bonaccorsi di Patti & Dell'Ariccia, 2004; Bonini et al., 2016). We also control for the proportion of a firm's tangible assets to total assets (*Tangibility*) because firms with a higher degree of tangible assets are more transparent (Bonaccorsi di Patti & Dell'Ariccia, 2004) and more able to meet collateral requirements and, consequently, have better access to external finance (Fungáčová et al., 2017). Next, we include the firm's liquid assets and cash. Firms with a larger cash balance and those with high liquidity are more likely to meet day-to-day financial obligations and are perceived to be more financially stable. Therefore, these firms are expected to have a lower cost of debt. We measure *Liquidity* as the proportion of the firm's current assets less stock scaled by current liabilities. We measure *Cash* as the ratio of the balance of cash to total assets. More profitable firms are perceived to be more efficient and are, therefore, expected to have lower cost of debt. We control for profitability, measured as the ratio of pre-tax profit to total assets (*Profitability*).

Finally, we control for industry concentration based on the Herfindahl-Hirschman index (HHI), the sum of the squared market shares (by assets) at the three-digit industry standard classification level. At the country level, we also include gross domestic product (GDP per capita) and inflation to control for macro-level differences that can influence cost of debt. Appendix A contains detailed definitions of all variables used in the study.

3.2 | Empirical methods

We investigate the relationship between credit information sharing and cost of debt by estimating a series of panel fixed effect models with several control variables. We take advantage of the time and cross-sectional dimensions of our data to minimize endogeneity problems arising from the omission of time invariant unobservable firm characteristics. We specify the following baseline equation:

$$Cost\ of\ Debt_{ijt} = \propto + \beta\ Credit\ Bureau\ introduction_{jt} + \sum_{k=1}^{n} \emptyset_k X_{kijt} + \lambda_t + \eta_i + \varepsilon_{ijt} \quad (3)$$

where *Credit Bureau introduction* is an indicator variable with a value of one for countries in the years after the introduction of an operational credit bureau (i.e., where the coverage of the credit bureau as a proportion of the adult population is strictly positive), and zero for the prior years and for countries that either never introduced or always had a credit bureau throughout the sample period. Our definition of credit bureau (CB) introduction and empirical approach is in line with Ayyagari et al. (2021). In Equation (3), X is a set of firm-, industry- and country-level control variables discussed in Section 3.1; λ is year fixed-effect; η represents firm fixed-effect; ε is an error term assumed to be independent and identically distributed with mean zero and variance σ_v^2. The inclusion of firm fixed-effect controls for potential omitted variable bias while the year fixed-effect controls for time invariant factors at the country level. A negative and statistically significant value of β will be consistent with our primary hypothesis, H1.

While we address potential endogeneity arising from omitted variables through the inclusion of year fixed-effect (λ) and firm fixed-effect (η), we take a step further to address the potentially endogenous nature of the decision to introduce a credit bureau. Specifically, we match countries that introduced a credit bureau (taken as the treatment group) with those that either never introduced or always had a credit bureau during the sample period (taken together as a control group) and re-estimate our regressions based on the matched sample. We match these countries on the pre-adoption three-year average measures of GDP per capita, real GDP growth and regulatory quality as in Ayyagari

TABLE 1 Summary statistics.

	Mean	Standard deviation	25th percentile	50th percentile	75th percentile	Observations
Real mean cost of debt	0.24	0.46	0.04	0.09	0.22	47,908
Nominal mean cost of debt	0.31	0.49	0.09	0.15	0.29	46,688
Firm size	8.71	2.33	7.30	8.42	9.74	47,908
Tangibility	0.37	0.22	0.20	0.36	0.53	47,908
Liquidity	1.06	0.97	0.52	0.82	1.24	47,908
Cash	0.08	0.09	0.02	0.05	0.12	47,908
Profitability	0.02	0.08	0.00	0.03	0.06	47,908
HHI	0.01	0.06	0.00	0.00	0.00	47,908
Credit bureau introduction	0.38	0.49	0.00	0.00	1.00	47,908
GDP growth (annual %)	6.19	2.57	5.01	6.75	7.66	47,908
Institutional quality	−0.34	0.26	−0.46	−0.32	−0.20	47,908
Financial development	0.86	0.50	0.49	0.52	1.40	47,908

Note: This table presents the summary statistics for the full sample. Detailed definition of each variable can be found in Table A1.

et al. (2021) based on the propensity scores and nearest neighbor one-to-one matching with replacement and common support. We then invoke the difference-in-difference estimation previously described based on the matched sample.

We hypothesized earlier that the impact of credit information sharing on cost of debt is likely to be higher for firms in countries with weaker institutions. To test this hypothesis (H2), we modify our baseline equation to include a relevant interaction term, as follows:

$$\textit{Cost of debt}_{ijt} = \propto + \beta\, \textit{Credit Bureau introduction}_{jt} + \left(\theta + \varphi\, \textit{Credit Bureau introduction}_{jt}\right) \times \textit{Low institutional quality}_{jt} + \sum_{k=1}^{n} \emptyset_k X_{kijt} + \lambda_t + \eta_i + \varepsilon_{ijt} \quad (4)$$

To support H2, we expect the coefficient on the interaction term between credit bureau introduction and Low institutional quality (φ) to be negative and significant.

4 | RESULTS AND DISCUSSION

4.1 | Descriptive statistics

Table 1 displays the descriptive statistics. The average real (nominal) cost of debt for a firm in our sample is 24% (31%). There is a substantial variation in the real (nominal) cost of debt as the standard deviation of 46% (49%) suggests. The credit bureau introduction ranges from zero to one, with an average value of 0.38. The average financial development score is 0.86 and the average institutional quality value is −0.34, which suggests that the average country in our sample is below the world average for institutional quality. The average firm has a size of 8.71, asset tangibility of 0.37, liquidity of 1.06, cash of 0.08, and profitability of 0.02.

Table 2 highlights some key observations across our sample countries. Cost of debt is highest in Ghana (52%), Vietnam (47%), Malawi (43%), Bangladesh (42%), Egypt (42%), Namibia (42%), and Zambia (42%). Vietnam introduced

TABLE 2 Descriptive statistics of key variables at the national level.

	Nominal cost of debt	Cost of debt differential	Credit bureau introduced?	Institutional quality	Firm-year observations	No. of firms
BANGLADESH	0.42	0.14	No*	−0.83	467	103
BOTSWANA	0.19	−2.05	No	0.65	57	9
CHINA	0.27	−0.08	No*	−0.46	14846	2474
COLOMBIA	0.19	−0.09	No	−0.27	241	28
COTE D'IVOIRE	0.06	0.00	Yes (2016)	−0.99	17	3
EGYPT, ARAB REP.	0.42	0.16	Yes (2008)	−0.80	268	53
GHANA	0.52	−0.11	Yes (2010)	0.04	45	8
INDIA	0.36	0.11	Yes (2005)	−0.22	16138	2363
INDONESIA	0.27	−0.10	Yes (2017)	−0.27	2186	327
JAMAICA	0.19	−0.86	Yes (2014)	0.10	161	21
JORDAN	0.27	0.06	Yes (2017)	−0.08	492	75
KENYA	0.25	−0.18	No	−0.63	163	29
MALAWI	0.43	−0.76	Yes (2017)	−0.37	18	3
MEXICO	0.14	−0.05	No	−0.20	1003	103
MOROCCO	0.09	−0.01	Yes (2009)	−0.29	122	19
NAMIBIA	0.42	−0.06	Yes (2008)	0.31	17	4
NIGERIA	0.46	−0.77	Yes (2010)	−1.09	338	64
PAKISTAN	0.36	0.04	No	−1.04	2017	258
PHILIPPINES	0.19	−0.11	No	−0.40	1094	139
SOUTH AFRICA	0.26	−0.18	No	0.27	2097	262
SRI LANKA	0.31	−0.05	No	−0.25	1349	169
THAILAND	0.29	0.10	No	−0.29	3447	480
TRINIDAD AND TOBAGO	0.18	−0.02	Yes (2005)	0.14	108	11
TUNISIA	0.22	0.26	No*	−0.23	167	33
UKRAINE	0.31	−0.11	Yes (2008)	−0.67	51	10
VIETNAM	0.47	0.17	Yes (2014)	−0.43	877	198
ZAMBIA	0.42	1.10	Yes (2008)	−0.32	23	5
ZIMBABWE	0.31	−0.18	No	−1.30	99	18
Total	0.31	−0.13	0.44	−0.34	47908	7269

Note: This table presents the sample countries and indicates whether a country introduced a credit bureau. Cost of debt differential is the difference between the latest period and earliest period cost of debt. Detailed definitions of all variables can be found in the Appendix.

"No*" indicates that the country never introduced a credit bureau during the sample period. "No" indicates that the country always had a credit bureau during the sample period. "Yes" indicates that the country introduced a credit bureau during the sample period (with the year of the introduction stated in parentheses).

operational credit bureau as late as 2014 while Bangladesh never introduced a credit bureau during the sample period. Further, all these countries, except Namibia, have significantly lower levels of institutional quality. Notably, out of the 28 countries in our sample, 15 introduced credit bureaus during the sample period. We also observe a drop in cost of debt for most of the countries (see, cost of debt differentials in Table 2).

The correlation matrix in Table 3 shows that the correlation among our variables is low, with most coefficients falling below 0.5. However, a few correlation coefficients are high. For example, the correlation between nominal cost of debt and real cost of debt is high, but these are alternative measures of cost of debt that do not enter the models simultaneously. There is also a high correlation between credit bureau introduction and some country-level variables (e.g., institutional quality and financial development). There also seems to be a high correlation among the other country-level variables (e.g., GDP growth, financial development, and institutional quality). To mitigate multicollinearity concerns, we run alternative models with and without these variables, and these alternative models do not change our conclusions.

4.2 | Baseline results

We report the results for the test of H1 in Table 4. The dependent variable in all the models is *real cost of debt*, and the independent variable is *Credit bureau (CB) introduction*. In Model 1, we only control for firm and industry level variables and firm- and year-fixed effects. Models 2–4 sequentially add country-level control variables to assess the impact of multicollinearity since some of these variables are moderately correlated. We present the full model that controls for firm-, industry-, and year-fixed effects in Model 5 of Table 4. Models 6 and 7 of Table 4 replicate Models 4 and 5 of Table 4, respectively, but replace the firm-fixed effect with country-fixed effect.

As we show in Table 4, our proxy for credit information sharing (*Credit bureau introduction*) is negative and statistically significant at the 5% level or lower throughout the models. The introduction of *credit bureau* is associated with a reduction in firms' cost of debt by between 3.2% and 3.8% points. Given that the average firm has a cost of debt of 24% in real terms, this effect is economically significant (being as high as a 15.8% reduction for the average firm).[3] Overall, our findings are consistent with H1 and imply that credit information-sharing schemes help to reduce information asymmetry and improve access to credit.

The control variables offer some insight into the determinants of cost of credit in developing countries. First, the coefficients of *Firm Size* and asset *Tangibility* are negative and statistically significant, which suggests that larger firms and firms with more tangible assets are more likely to have lower cost of debt. Also, firms with more liquid assets (*Liquidity*), a larger cash balance (*Cash*), and higher profitability are more likely to have lower cost of debt. Further, firms in more concentrated industries are likely to have a higher cost of debt, possibly due to the view that these firms are less efficient and riskier (e.g., Bolton & Scharfstein, 1990; Chevalier, 1995); however, this effect is statistically insignificant for the models controlling for country-fixed effect. Concerning the country-level variables, we find that better institutional quality and financial development are associated with a lower cost of debt.

4.3 | The moderating effect of institutional quality (H2)

We present the results for the tests of our Hypotheses 2, which posits that institutional quality would moderate the negative relationship between cost of debt and credit information sharing, in Table 5. In Model 1 of Table 5, we interact *Credit bureau (CB) introduction* with an indicator variable for low level of institutional quality (*Low Institutional Quality*). The coefficients on *Credit bureau introduction* are negative but statistically insignificant; however, the coefficients on the interaction term between *Credit bureau introduction* and *Low Institutional Quality* are negative and statistically

[3] The reduction in cost of debt is expressed as a percentage of the average cost of debt.

TABLE 3 Correlations matrix.

	1	2	3	4	5	6	7	8	9	10	11	12
1. Real cost of debt	1.000											
2. Cost of debt	0.996[a]	1.000										
3. Credit bureau intro.	0.046[a]	0.078[a]	1.000									
4. Firm size	−0.100[a]	−0.100[a]	−0.028[a]	1.000								
5. Tangibility	−0.181[a]	−0.181[a]	−0.014[a]	0.025[a]	1.000							
6. Liquidity	−0.010[a]	−0.008	−0.038[a]	−0.044[a]	−0.273[a]	1.000						
7. Cash	−0.003	−0.015[a]	−0.312[a]	0.026[a]	−0.282[a]	0.391[a]	1.000					
8. Profitability	−0.014[a]	−0.011[a]	−0.023[a]	0.120[a]	−0.072[a]	0.237[a]	0.163[a]	1.000				
9. HHI	−0.005	−0.004	0.009	0.332[a]	−0.001	0.038[a]	0.021[a]	0.016[a]	1.000			
10. GDP growth	0.036[a]	0.027[a]	0.042[a]	−0.030[a]	−0.023[a]	−0.049[a]	0.158[a]	0.003	−0.044[a]	1.000		
11. Institutional quality	−0.021[a]	−0.031[a]	0.299[a]	−0.057[a]	−0.123[a]	0.090[a]	−0.070[a]	0.001	0.029[a]	−0.248[a]	1.000	
12. Financial development	−0.021[a]	−0.062[a]	−0.551[a]	−0.057[a]	−0.174[a]	0.062[a]	0.387[a]	−0.013[a]	−0.109[a]	0.122[a]	0.080[a]	1.000

Note: This table presents the correlation among the variables used in our analysis. All variables are as described in the Appendix.
[a]Represents significance at the 5% level or lower.

TABLE 4 Credit information and cost of credit.

	(1) Real cost of debt	(2) Real cost of debt	(3) Real cost of debt	(4) Real cost of debt	(5) Real cost of debt	(6) Real cost of debt	(7) Real cost of debt
Credit bureau introduction	−0.032**	−0.035**	−0.033**	−0.038**	−0.038**	−0.036**	−0.033**
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)	(0.017)
Firm size	−0.047***	−0.046***	−0.046***	−0.043***	−0.043***	−0.032***	−0.032***
	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.002)	(0.002)
Tangibility	−0.250***	−0.254***	−0.257***	−0.280***	−0.280***	−0.463***	−0.437***
	(0.031)	(0.031)	(0.031)	(0.031)	(0.032)	(0.019)	(0.020)
Liquidity	−0.012**	−0.012**	−0.012**	−0.013***	−0.013***	−0.030***	−0.026***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
Cash	−0.095*	−0.095*	−0.096*	−0.088	−0.085	−0.058	−0.045
	(0.057)	(0.057)	(0.057)	(0.057)	(0.057)	(0.047)	(0.047)
Profitability	−0.103**	−0.109***	−0.106***	−0.103**	−0.102**	0.026	0.017
	(0.041)	(0.041)	(0.041)	(0.040)	(0.041)	(0.038)	(0.039)
HHI	0.459**	0.449**	0.453**	0.444**	0.444**	−0.007	−0.030
	(0.220)	(0.220)	(0.219)	(0.218)	(0.219)	(0.076)	(0.083)
GDP growth		0.007***	0.007***	0.002	0.002	0.002	0.002
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Institutional quality			−0.097**	−0.006	−0.005	−0.121***	−0.121***
			(0.043)	(0.044)	(0.044)	(0.044)	(0.043)
Financial development				−0.280***	−0.282***	−0.280***	−0.290***
				(0.038)	(0.038)	(0.036)	(0.036)
Constant	0.774***	0.723***	0.692***	0.980***	0.982***	0.938***	0.925***
	(0.051)	(0.052)	(0.053)	(0.062)	(0.062)	(0.049)	(0.049)
Firm FE	Yes	Yes	Yes	Yes	Yes	No	No
Country FE	No	No	No	No	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	No	No	Yes	No	Yes
Observations	47,908	47,908	47,908	47,908	47,839	47,908	47,839
Adj. R2	0.421	0.422	0.422	0.423	0.421	0.067	0.086

Note: Estimation results for the effect of information sharing on cost of debt. All variables are as described in the Appendix. Standard errors robust to heteroscedasticity and clustering at the firm level are in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

significant at the 1% level. This implies that the average firm in a country with a low level of institutional quality will experience a drop of 6.5% points in its cost of debt following the introduction of credit bureau in its country of domicile. This effect falls to 2.5% points for a similar firm in a country with a high level of institutional quality. This finding suggests that information-sharing schemes deliver the greatest benefits in environments of low institutional quality where institutional voids may heighten information asymmetry and moral hazard problems. Thus, better institutional governance and credit information-sharing schemes seem to be close (but not perfect) substitutes.

TABLE 5 Credit information sharing and cost of debt—moderating effect of institutional quality.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Real cost of debt	Real cost of debt	Real cost of debt	Real cost of debt	Real cost of debt	Real cost of debt	Real cost of debt
Credit bureau (CB) introduction	−0.025	−0.023	−0.016	−0.008	−0.030*	−0.046***	−0.023
	(0.015)	(0.016)	(0.024)	(0.018)	(0.015)	(0.017)	(0.018)
CB introduction × Low Institutional Quality	−0.040***						
	(0.013)						
CB introduction × Low Regulatory Quality		−0.034**					
		(0.014)					
CB introduction × Low Rule of Law			−0.034				
			(0.025)				
CB introduction × Low Control of Corruption				−0.048***			
				(0.014)			
CB introduction × Low Voice and Accountability					−0.027		
					(0.039)		
CB introduction × Low Political Stability and Absence of Violence						0.026	
						(0.017)	
CB introduction × Low Government Effectiveness							−0.021*
							(0.012)
Firm size	−0.043***	−0.043***	−0.043***	−0.042***	−0.043***	−0.043***	−0.043***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Tangibility	−0.278***	−0.279***	−0.279***	−0.277***	−0.281***	−0.280***	−0.280***
	(0.031)	(0.031)	(0.031)	(0.032)	(0.031)	(0.031)	(0.032)
Liquidity	−0.013***	−0.014***	−0.013***	−0.014***	−0.013***	−0.013***	−0.013***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Cash	−0.083	−0.082	−0.083	−0.076	−0.088	−0.086	−0.085
	(0.057)	(0.057)	(0.057)	(0.057)	(0.057)	(0.057)	(0.057)
Profitability	−0.104**	−0.105***	−0.103**	−0.106***	−0.101**	−0.100**	−0.103**
	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)
HHI	0.450**	0.442**	0.445**	0.445**	0.443**	0.447**	0.442**
	(0.217)	(0.218)	(0.218)	(0.218)	(0.219)	(0.219)	(0.219)
GDP growth	0.002	0.003**	0.003*	0.003*	0.003	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Financial development	−0.266***	−0.263***	−0.263***	−0.231***	−0.284***	−0.295***	−0.263***
	(0.037)	(0.037)	(0.037)	(0.039)	(0.037)	(0.038)	(0.038)
Low institutional quality	0.028***						
	(0.008)						
Low regulatory quality		0.010					
		(0.009)					
Low rule of law			0.031***				
			(0.010)				
Low control of corruption				−0.009			
				(0.011)			
Low voice and accountability					−0.062**		
					(0.027)		

(Continues)

TABLE 5 (Continued)

	(1) Real cost of debt	(2) Real cost of debt	(3) Real cost of debt	(4) Real cost of debt	(5) Real cost of debt	(6) Real cost of debt	(7) Real cost of debt
Low political stability and absence of violence						0.000	
						(0.013)	
Low government effectiveness							0.009
							(0.009)
Constant	0.958***	0.960***	0.941***	0.933***	1.013***	0.994***	0.961***
	(0.058)	(0.058)	(0.059)	(0.060)	(0.060)	(0.059)	(0.060)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	47,839	47,839	47,839	47,839	47,839	47,839	47,839
Adj. R2	0.421	0.421	0.421	0.421	0.421	0.421	0.421

Note: Estimation results for the effect of information sharing on cost of debt. All variables are as described in the Appendix. Standard errors robust to heteroscedasticity and clustering at the firm level are in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

Collectively, our results presented in this subsection are in line with Djankov et al. (2007) who show that while credit information sharing is associated with increased credit availability, the effect is stronger in countries with weaker protection for creditors.

In Models 2–7 of Table 5, we take a closer look at our results in the hope to provide deeper insight into the specific institutional arrangements that may substitute for credit information-sharing schemes. As noted earlier, our measure of institutional quality is a composite measure derived as the simple average of six different institutional variables. The variables are voice and accountability, political stability and absence of violence, government effectiveness, rule of law, regulatory quality, and control of corruption. We present results that replace the indicator variable for low level of the composite institutional quality measure with a similar indicator variable for the individual component variables. Since the individual variables are highly correlated, we do not include all the six variables in a single regression. The results show that the moderating impact of institutional quality that we reported earlier is driven by only three of the component variables—(1) regulatory quality, (2) control of corruption, and (3) government effectiveness. It seems that these three variables can shape information asymmetry and moral hazards to alter lending decisions and can ultimately affect cost of debt even in the absence of credit information-sharing schemes.

4.4 | Further analysis

4.4.1 | The effect of firm-level information asymmetry

While we document that the introduction of credit bureau reduces firms' cost of debt especially for countries with lower institutional quality, we need to consider the potential effect of firm-level heterogeneity. We address this issue by looking at the potential moderating role of firm-level information asymmetry. The role played by firm-level information asymmetry (or opacity) in alleviating financial constraints is well documented in the literature stream. Information asymmetry reflects the amount of effort banks need to exert to assess or verify a borrowing firms' credit worthiness (Bonaccorsi di Patti & Dell'Ariccia, 2004; Boot & Schmeits, 2000). At the same time, information asymmetry exacerbates the conflict of interest between shareholders and creditors (Fosu et al., 2016; Liao et al., 2009). Consequently, opaque (i.e., less transparent) firms are perceived as riskier as their quality and risk choices cannot be easily and readily determined.

Further, monitoring may not work as an effective tool to discipline high information asymmetry (less transparent) firms as the quality of their assets and operations cannot be effectively observed. The empirical literature supports the view that less transparent (opaque) firms are riskier (Beck et al., 2008; Bushman & Williams, 2012; Fosu et al., 2017; Kroszner et al., 2007; Nier, 2005; Nier & Baumann, 2006). For instance, Kroszner et al. (2007) show that firms with opaque assets experience a larger decline in growth relative to their less-opaque counterparts during a crisis. Consequently, opaque firms tend to have higher financing costs relative to their less-opaque counterparts (Duffie & Lando, 2001; Lu et al., 2010). Hence, we conjecture that the benefit of credit information sharing should be larger for opaque firms. We test this conjecture by interacting *Credit bureau introduction* with an indicator variable for less-transparent firms (*Less Transparent)*, which takes a value of one where a firm level of transparency is below the median firm's level, and zero otherwise. We measure a firm's level of transparency (as an inverse measure of information asymmetry) using the principal component factor of asset *Tangibility*, *Firm Age*, and *Firm Size*. We present these results in Table 6.

In Model 1 of Table 6, the coefficient on the interaction term of *Credit bureau introduction* with *Less Transparent* firms dummy variable is negative and significant. The findings support our conjecture that the reductions in cost of debt following the introduction of *credit bureau* is greater (lower) for less (more) transparent firms. That is, firms with higher (lower) levels of information asymmetry appear to benefit more from credit information-sharing schemes. Further, we explore the moderation effect of the disaggregated components of our measure of firm-level transparency to identify the crucial factors driving the results. Specifically, we interact *Credit bureau introduction* with *Small Firms*, *Young Firms* and *Low Tangibility* dummy variables (which takes a value of one for firms whose total assets, age and proportion of tangible assets, respectively, are below the median firm's and zero otherwise). The results are presented in Models 2–4 of Table 6. The coefficients on *Credit Bureau introduction* and the interaction terms with *Small Firms* and *Young Firms* (Models 2 and 3) remain negative, the impact on cost of debt is statistically significant only through the interaction terms. Whilst the coefficient on *Credit Bureau introduction* remains significantly negative, the coefficient on the interaction term with *Low Tangibility* is surprisingly significantly positive. Overall, the results essentially indicates that small firm and young firms experience 5.8% and 5.4% point additional reduction in cost of debt respectively following the introduction of credit bureaus, whilst firms with lower level of tangible assets experience relatively higher cost of debt compared with other firms.

4.4.2 | Credit information sharing and credit demand

So far, our analysis indicates that firms experience a significant reduction in their cost of debt following an introduction of credit bureau in the countries within which they operate. It is plausible that that the reduction in the cost of debt and/or any associated increase in credit supply (due to information sharing) will lead to an increase in the volume and term structure (i.e., maturity) of loans extended to the firms. We test this conjecture by replacing cost of debt with firm-level financial leverage (the ratio of total debt to total assets) and the debt maturity (the ratio of long-term debt to total debts). We present the results in Table 7. Model 1 (the leverage regression) shows that the coefficient on *Credit bureau introduction* is positive but statistically insignificant. In Model 2 (the debt maturity regression) the coefficient on *Credit bureau introduction* is positive and statistically significant. These results suggest that although firms in developing countries that introduce credit bureau systems do not experience an increase in their leverage ratios, they seem to have a 2.3% point increase in the maturity of their loans (i.e., the proportion of their long-term debt to total debt).

4.5 | Robustness tests

4.5.1 | Alternative dependent variable and subsample analysis

We execute further tests to ensure robustness of our key findings. The prior analyses are based on the real cost of debt which directly adjusts our nominal cost of debt variable for inflation, and hence, does not include the inflation variable

TABLE 6 Credit information and cost of credit—firm level heterogeneity.

	(1) Real cost of debt	(2) Real cost of debt	(3) Real cost of debt	(4) Real cost of debt
Credit bureau (CB) introduction	0.001	−0.020	−0.009	−0.062***
	(0.018)	(0.018)	(0.018)	(0.016)
CB introduction × Less Transparent	−0.069***			
	(0.015)			
CB introduction × Small Firm		−0.058***		
		(0.018)		
CB introduction × Young Firm			−0.054***	
			(0.015)	
CB introduction × Low Tangibility				0.052***
				(0.016)
Firm size	−0.042***	−0.037***	−0.042***	−0.043***
	(0.005)	(0.006)	(0.005)	(0.005)
Tangibility	−0.279***	−0.282***	−0.279***	−0.244***
	(0.031)	(0.032)	(0.031)	(0.036)
Liquidity	−0.013***	−0.013***	−0.013***	−0.013***
	(0.005)	(0.005)	(0.005)	(0.005)
Cash	−0.082	−0.083	−0.083	−0.081
	(0.057)	(0.057)	(0.057)	(0.057)
Profitability	−0.103**	−0.102**	−0.103**	−0.103**
	(0.041)	(0.041)	(0.041)	(0.041)
HHI	0.445**	0.424*	0.444**	0.446**
	(0.220)	(0.219)	(0.220)	(0.220)
GDP growth	0.001	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Institutional quality	−0.022	−0.005	−0.019	−0.005
	(0.043)	(0.044)	(0.044)	(0.044)
Financial development	−0.231***	−0.265***	−0.248***	−0.274***
	(0.039)	(0.038)	(0.039)	(0.038)
Less transparent		0.053***		
		(0.013)		
Small firm	0.018			
	(0.011)			
Young firm			0.021*	
			(0.011)	
Low tangibility				−0.000
				(0.012)

(Continues)

TABLE 6 (Continued)

	(1) Real cost of debt	(2) Real cost of debt	(3) Real cost of debt	(4) Real cost of debt
Constant	0.920***	0.897***	0.935***	0.965***
	(0.063)	(0.065)	(0.063)	(0.063)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	47,839	47,839	47,839	47,839
Adj. R2	0.421	0.421	0.421	0.421

Note: Estimation results for the effect of information sharing on cost of debt. All variables are as described in the Appendix. Standard errors robust to heteroscedasticity and clustering at the firm level are in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

as a regressor. Further, our main analysis has so far included countries that have had credit bureaus throughout the sample period as part of the control group in our empirical set-up. In this section, we conduct additional analysis to assess the robustness of our results by first replacing the dependent variable with the nominal cost of debt, and second, by excluding the countries that had credit bureaus throughout the sample period. We conduct further analysis of the baseline results based on a propensity score matched sample.

Table 8 presents the results of the set of regressions with *nominal cost of debt* as the dependent variable. Model 1 presents the results for the baseline model, and Models 2 and 3 present the results that include the interaction terms of *Credit bureau introduction* with dummy variables for low institutional quality and less transparent firms. The coefficient on *Credit bureau introduction* remains negative and significant in Model 1, which confirms our baseline results that suggest that the introduction of credit bureaus leads to a reduction in the cost of debt. Also, the sign and significance of the coefficient on the interaction terms in Models 2 and 3 are consistent with our earlier results, which confirms our conjecture that firms in countries with low institutional quality and less transparent firms have greater benefits from the introduction of credit bureaus.

We report the baseline results that exclude countries that had credit bureau throughout the sample period in Table 9. Therefore, in this analysis, countries that introduced credit bureaus during our sample period were strictly compared with those countries that never had credit bureaus. While this analysis has a relatively smaller sample, it offers a cleaner test of the effect of credit information sharing on corporate cost of debt, since those countries that had credit bureaus in place before our sample start date were excluded. The results we report in Table 9 are similar to our baseline results in Table 4, except that the coefficients are larger in Table 9. This indicates that while our results are robust, the original analysis biases our estimates downward, hence, our conclusions are based on conservative estimates of the benefits of introducing credit bureaus.

Additionally, we conduct an analysis that utilizes control firms in similar countries that did not introduce credit bureaus during our sample period. This analysis involves a difference-in-difference estimation based on a (country-level) propensity score matched sample, and we report the findings in Table 10. We matched the sample countries that introduced credit bureaus to control countries based on propensity scores,[4] and we use one-to-one nearest neighbor matching with replacement and common support. Overall, the results based on the matched sample are qualitatively similar to the results based on the unmatched (full) sample. The introduction of bureaus is associated with a 4.4% point

[4] We assess the balancing properties between the countries that introduced a credit bureau and those that did not introduce a credit bureau by using the standardized difference in means and the ratios of the variance of the propensity scores between the two groups.

TABLE 7 The effect of credit information sharing on leverage and debt maturity.

	(1) Leverage	(2) Debt maturity
Credit bureau (CB) introduction	0.022	0.023**
	(0.024)	(0.010)
Firm size	−0.012	0.056***
	(0.009)	(0.005)
Tangibility	0.160***	0.117***
	(0.032)	(0.020)
Liquidity	−0.014***	0.039***
	(0.002)	(0.004)
Cash	0.009	−0.178***
	(0.022)	(0.032)
Profitability	−0.448***	0.110***
	(0.043)	(0.026)
HHI	−0.111	−0.312*
	(0.252)	(0.164)
GDP growth	−0.001	−0.001
	(0.001)	(0.001)
Institutional quality	0.045	0.008
	(0.028)	(0.026)
Financial development	0.059***	0.121***
	(0.021)	(0.021)
Inflation	−0.110	0.005
	(0.074)	(0.067)
Constant	0.218***	0.005
	(0.075)	(0.053)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Industry FE	Yes	Yes
Observations	47,839	46,164
Adj. R2	0.647	0.372

Note: Estimation results for the effect of information sharing on leverage and debt maturity. All variables are as described in the Appendix. Standard errors robust to heteroscedasticity and clustering at the firm level are in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

reduction in the cost of debt, and this effect is significantly higher for firms in countries with weak institutional quality and for less transparent firms.

Our focus has so far been on credit bureaus because of their distinctive feature of facilitating the exchange of credit among lending institutions in developing countries. Being private sector organizations, the credit bureaus tend to be more efficiently run than the public sector-managed credit registries. This notwithstanding, we extend our analysis to cover the introduction of credit registries for robustness purposes. We present the results in Table 11. While the coefficients on credit registries have a negative sign, they are statistically insignificant in all the firm-fixed

TABLE 8 Credit information sharing and nominal cost of credit.

	(1) Nominal cost of debt	(2) Nominal cost of debt	(3) Nominal cost of debt
Credit bureau (CB) introduction	−0.039**	−0.025	0.003
	(0.017)	(0.016)	(0.019)
CB introduction × Low Institutional Quality		−0.044***	
		(0.015)	
CB introduction × Less Transparent			−0.074***
			(0.016)
Firm size	−0.047***	−0.047***	−0.047***
	(0.006)	(0.006)	(0.006)
Tangibility	−0.292***	−0.290***	−0.291***
	(0.033)	(0.033)	(0.033)
Liquidity	−0.013**	−0.013**	−0.012**
	(0.005)	(0.005)	(0.005)
Cash	−0.065	−0.062	−0.062
	(0.061)	(0.061)	(0.061)
Profitability	−0.106**	−0.109***	−0.107***
	(0.042)	(0.042)	(0.041)
HHI	0.490**	0.495**	0.493**
	(0.234)	(0.233)	(0.235)
GDP growth	0.001	0.001	0.000
	(0.002)	(0.002)	(0.002)
Inflation	0.622***	0.699***	0.561***
	(0.134)	(0.140)	(0.133)
Institutional quality	−0.025		−0.050
	(0.046)		(0.045)
Financial development	−0.303***	−0.294***	−0.246***
	(0.040)	(0.038)	(0.041)
Low institutional quality		0.024***	
		(0.008)	
Less transparency			0.020*
			(0.012)
Constant	1.076***	1.061***	1.008***
	(0.066)	(0.062)	(0.067)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	46,543	46,543	46,543
Adj. R2	0.430	0.430	0.430

Note: Estimation results for the effect of information sharing on cost of debt. All variables are as described in the Appendix. Standard errors robust to heteroscedasticity and clustering at the firm level are in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

TABLE 9 Credit information and cost of credit—excluding countries that always had a credit bureau over our sample period.

	(1) Real cost of debt	(2) Real cost of debt	(3) Real cost of debt	(4) Real cost of debt	(5) Real cost of debt	(6) Real cost of debt	(7) Real cost of debt
Credit bureau introduction	−0.043***	−0.054***	−0.057***	−0.057***	−0.057***	−0.062***	−0.060***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.018)	(0.017)
Firm size	−0.044***	−0.042***	−0.043***	−0.038***	−0.038***	−0.031***	−0.030***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.002)	(0.002)
Tangibility	−0.214***	−0.229***	−0.239***	−0.264***	−0.263***	−0.471***	−0.441***
	(0.034)	(0.034)	(0.034)	(0.035)	(0.035)	(0.021)	(0.024)
Liquidity	−0.010*	−0.009	−0.009	−0.010*	−0.011*	−0.029***	−0.026***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)
Cash	−0.028	−0.027	−0.027	−0.020	−0.016	−0.027	−0.008
	(0.064)	(0.064)	(0.064)	(0.064)	(0.064)	(0.052)	(0.052)
Profitability	−0.130***	−0.136***	−0.126***	−0.131***	−0.129***	0.028	0.009
	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)	(0.045)	(0.046)
HHI	0.428*	0.406*	0.406*	0.391*	0.390*	−0.019	−0.030
	(0.227)	(0.227)	(0.224)	(0.222)	(0.223)	(0.077)	(0.085)
GDP growth		0.020***	0.017***	0.004	0.004	0.003	0.004
		(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Institutional quality			−0.456***	−0.296***	−0.294***	−0.449***	−0.439***
			(0.073)	(0.074)	(0.074)	(0.079)	(0.078)
Financial development				−0.367***	−0.369***	−0.362***	−0.373***
				(0.049)	(0.049)	(0.048)	(0.048)
Constant	0.744***	0.600***	0.477***	0.909***	0.912***	0.901***	0.884***
	(0.056)	(0.058)	(0.060)	(0.078)	(0.078)	(0.071)	(0.071)
Firm FE	Yes	Yes	Yes	Yes	Yes	No	No
Country FE	No	No	No	No	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	No	No	Yes	No	Yes
Observations	36,341	36,341	36,341	36,341	36,291	36,341	36,291
Adj. R2	0.422	0.424	0.425	0.428	0.424	0.067	0.087

Note: Estimation results for the effect of information sharing on cost of debt. All variables are as described in the Appendix. Standard errors robust to heteroscedasticity and clustering at the firm level are in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

effect models and only marginally significant in the models that exclude the firm-fixed effects. Overall, we find mild evidence of the introduction of credit registries resulting in reduced cost of debt in developing countries. This finding is consistent with Martinez-Peria and Singh (2014) who report that the introduction of credit registries has no significant effects on firm financing.

TABLE 10 Credit information and cost of credit—matched sample.

	(1) Real cost of debt	(2) Real cost of debt	(3) Real cost of debt
Credit bureau (CB) introduction	−0.044***	−0.031**	−0.008
	(0.016)	(0.015)	(0.018)
CB introduction × Low Institutional Quality		−0.042***	
		(0.014)	
CB introduction × Less Transparent			−0.063***
			(0.016)
Firm size	−0.044***	−0.044***	−0.043***
	(0.006)	(0.006)	(0.006)
Tangibility	−0.299***	−0.298***	−0.299***
	(0.033)	(0.033)	(0.033)
Liquidity	−0.016***	−0.016***	−0.015***
	(0.005)	(0.005)	(0.005)
Cash	−0.068	−0.066	−0.066
	(0.059)	(0.059)	(0.059)
Profitability	−0.110***	−0.112***	−0.111***
	(0.042)	(0.042)	(0.042)
HHI	0.484**	0.488**	0.484**
	(0.226)	(0.225)	(0.228)
GDP growth	0.004**	0.004**	0.003*
	(0.002)	(0.002)	(0.002)
Institutional quality	0.004		−0.012
	(0.057)		(0.057)
Financial development	−0.291***	−0.273***	−0.248***
	(0.039)	(0.037)	(0.040)
Low institutional quality		0.032***	
		(0.009)	
Less transparent			0.022*
			(0.012)
Constant	1.016***	0.986***	0.958***
	(0.067)	(0.061)	(0.068)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	45,179	45,179	45,179
Adj. R2	0.420	0.421	0.421

Note: Estimation results for the effect of information sharing on cost of debt. All variables are as described in the Appendix. Standard errors robust to heteroscedasticity and clustering at the firm level at the firm level are in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

TABLE 11 Credit information and cost of credit—Credit registry.

	(1) Real cost of debt	(2) Real cost of debt	(3) Real cost of debt	(4) Real cost of debt	(5) Real cost of debt	(6) Real cost of debt	(7) Real cost of debt
Credit registry intro.	−0.108	−0.116	−0.114	−0.135	−0.135	−0.216*	−0.210*
	(0.086)	(0.087)	(0.086)	(0.085)	(0.085)	(0.127)	(0.125)
Firm size	−0.046***	−0.045***	−0.045***	−0.042***	−0.042***	−0.032***	−0.032***
	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.002)	(0.002)
Tangibility	−0.250***	−0.255***	−0.258***	−0.280***	−0.280***	−0.464***	−0.438***
	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.019)	(0.020)
Liquidity	−0.012**	−0.012**	−0.012**	−0.013***	−0.013***	−0.030***	−0.026***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
Cash	−0.095*	−0.095*	−0.097*	−0.089	−0.086	−0.058	−0.046
	(0.057)	(0.057)	(0.057)	(0.057)	(0.057)	(0.047)	(0.047)
Profitability	−0.103**	−0.109***	−0.106***	−0.103**	−0.102**	0.027	0.017
	(0.041)	(0.041)	(0.041)	(0.040)	(0.041)	(0.038)	(0.039)
HHI	0.441**	0.429*	0.434**	0.423*	0.423*	−0.010	−0.035
	(0.222)	(0.222)	(0.221)	(0.221)	(0.221)	(0.077)	(0.083)
GDP growth		0.007***	0.007***	0.002	0.002	0.001	0.001
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Institutional quality			−0.100**	−0.010	−0.009	−0.123***	−0.122***
			(0.043)	(0.044)	(0.044)	(0.044)	(0.043)
Financial development				−0.280***	−0.281***	−0.282***	−0.293***
				(0.038)	(0.038)	(0.036)	(0.036)
Constant	0.760***	0.708***	0.676***	0.963***	0.964***	0.935***	0.923***
	(0.050)	(0.051)	(0.052)	(0.061)	(0.061)	(0.048)	(0.049)
Firm FE	Yes	Yes	Yes	Yes	Yes	No	No
Country FE	No	No	No	No	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	No	No	Yes	No	Yes
Observations	47,908	47,908	47,908	47,908	47,839	47,908	47,839
Adj. R2	0.421	0.421	0.422	0.423	0.421	0.068	0.087

Note: Estimation results for the effect of information sharing on cost of debt. All variables are as described in the Appendix. Standard errors robust to heteroscedasticity and clustering at the firm level are in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

4.5.2 | Additional robustness tests

Finally, we explore the causal effect of the introduction of credit bureaus on cost of debt by assessing the parallel trends assumption underlying the difference-in-difference estimates and the implications of the staggered nature of the timing of the introduction of credit bureaus in our sample. The parallel trends assumption suggests that the cost of debt in the countries that introduced a credit bureau (treated group) and in the countries that did not (control groups) would have followed a parallel path in the absence of the introduction of credit bureaus. This helps to rule out the

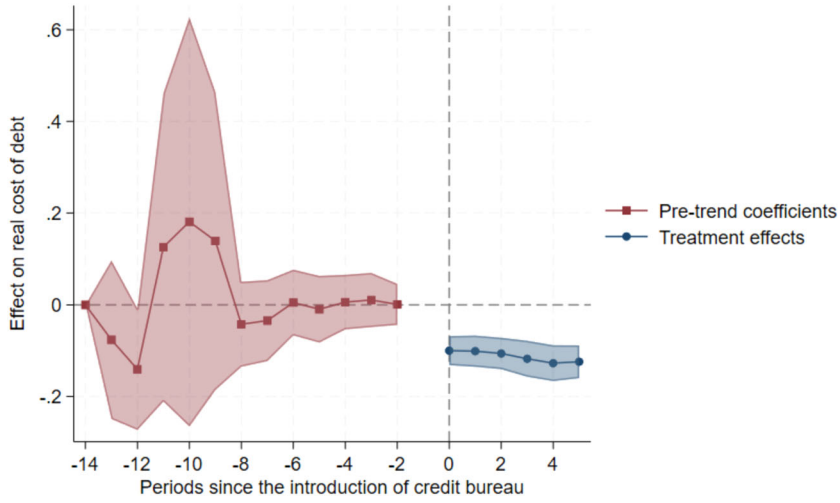

FIGURE 1 Event study of credit information sharing and cost of debt. *Source*: Authors' analysis of credit bureau introduction and cost debt using Sun and Abraham (2021) interaction-weighted estimator ("eventstudyinteract" Stata implementation).

possibility that our results are simply mimicking differential trends in the cost of debt prior to the introduction of credit bureaus in the treated countries (see, Baker et al., 2022).

Traditionally, the parallel trend assumption has been tested using event-study style analysis (Baker et al., 2022). However, recent advances in the econometric literature suggests that this approach could be biased in the presence of dynamic and heterogenous treatment effect (Baker et al., 2022; Borusyak et al., 2022; Callaway & Sant'Anna, 2021; Goodman-Bacon, 2021; Sun & Abraham, 2021). In particular, the average causal effect we document in a staggered difference-in-difference setup could be seen as a weighted average of all possible 2×2 (i.e., two-group and two-period) difference-in-difference estimate based on comparing (1) the countries that introduced a credit bureau during the sample period to the countries that did not (treated vs. never treated), (2) the countries that introduced a credit bureau earlier to the countries that had not yet introduced a credit bureau (early treated vs later controls), and (3) countries that introduced a credit bureau later to the countries that had already introduced credit bureau (later treated vs. earlier controls).[5] As noted in Goodman-Bacon (2021) and Baker et al., 2022), the third group can result in the "bad comparison" or "forbidden comparison" problem as units treated earlier serve as control units in the difference-in-difference estimation, which can attenuate the average estimated effect when the treatment effect is dynamic.

To address this potential attenuation problem arising from the different weights and dynamic effects associated with staggered timing of the introduction of credit bureau in our sample, we employ the novel interaction-weighted estimator by Sun and Abraham (2021). We estimate a difference-in-difference model accommodating relative time and group indicators and, thus, yielding interaction-weighted cohort-specific average treatment effect (CATT).[6] We present the results of this analysis in Figure 1. Overall, our inference remains unchanged. First, the results show that the pre-trend coefficients of the cost of debt are largely not statistically different from zero, with the only significant point noted in the relative time 12 years away from the year of introduction of credit bureau. The insignificant pre-

[5] The weights are based the size of each cohort and the treatment variance.

[6] We use Sun and Abraham's (2021) Stata package ("eventstudyinteract"), with only never-treated units serving as effective controls. Our choice of the length of post-treatment relative periods is based on the belief that the introduction of credit a bureau is likely to have the largest impact at the time that the system is introduced and perhaps an additional marginal impact in the later post-treatment years; hence, extending the length of the post-treatment relative period beyond 5 years may end up picking other unobserved factors. Further, the use of never treated units as effective controls in this regard mitigates potential under-identification problems (Borusyak et al., 2022). These notwithstanding, our inference remains when we include all post-treatment relative periods.

trend coefficients in Figure 1 suggest that the parallel trends assumption holds. Next, the results show that the cost of credit declines sharply after the introduction of the credit bureau, and this decline continues through to the fourth year afterwards and almost flattens out the following year.

5 | CONCLUSION

We rely on a large dataset of over 47,000 firm-years from 28 developing countries to examine the impact of credit information-sharing schemes on firms' cost of debt, with a particular focus on the introduction of credit bureaus in developing countries. Due to reduced information asymmetry and lower moral hazard problems that could result from the implementation of credit information-sharing schemes, firms in developing countries (a context that faces acute financial constraints) are likely to benefit from a lower cost of debt. We find robust empirical evidence in support of this hypothesis. In particular, the introduction of *credit bureau* in a country is associated with a reduction in firms' cost of debt by between 3.2% and 3.8% points. Given that the average firm has a cost of debt of 24% in real terms, this effect is economically significant, that represents a 13.3%−15.8% reduction in the cost of debt for the average firm.

We also find that the benefits of reduced cost of debt resulting from credit information-sharing schemes are significantly higher in countries with lower institutional quality and for less transparent firms. These results provide evidence to suggest that reductions in information asymmetry is potentially a major channel through which credit information sharing impacts corporate cost of debt. Overall, our key analysis leads us to conclude that firms in developing countries indeed enjoy a lower cost of debt when they are domiciled in countries that have functioning credit information-sharing schemes, especially when their countries are characterized by poor institutional quality (particularly, government effectiveness, lower regulatory quality, and high corruption).

Our work has implications for both corporate and national policy formulation. First, firms and countries seeking growth can mitigate financial constraints by instituting schemes that encourage lenders to share information about their borrowers among themselves. That is, to the extent that sharing borrower information reduces information asymmetry problems in credit markets, firms and countries can cut the cost of debt and enhance access to credit. Second, policymakers in countries that have strong governance institutions may not reap huge benefits from credit information-sharing schemes, since these schemes seem to be close (but not perfect) substitutes for institutional quality.

Despite making important contributions to the literature stream, our study is not exempt from the limitations that confront most studies based on archival data. It is possible that our empirical constructs and variables are measured with error. Therefore, our results and conclusions should be interpreted with caution. Future studies can utilize other research approaches including interviews and surveys to validate our findings.

ACKNOWLEDGMENTS

We thank Mike Pagano (Editor) and two anonymous reviewers for their invaluable comments. We are also grateful to the participants at the Business Finance Research Group seminar at University of Sussex (December 2022) for their constructive comments. We acknowledge, without implication, funding by the United Arab Emirates University (UAEU) under research Start-up grant number G00003367. All errors are our own.

ORCID

Samuel Fosu https://orcid.org/0000-0002-5841-0059
Henry Agyei-Boapeah https://orcid.org/0000-0003-4798-6324

REFERENCES

Acemoglu, D., Johnson, S., Robinson, J., & Thaicharoen, Y. (2003). Institutional causes, macroeconomic symptoms: Volatility, crises and growth. *Journal of Monetary Economics*, *50*(1), 49–123.

Agyei-Boapeah, H., & Machokoto, M. (2018). Allocation of internally generated corporate cash flow in Africa. *Journal of Accounting in Emerging Economies*, *8*(4), 495–513.
Ayyagari, M., Juarros, P., Martinez Peria, M. S., & Singh, S. (2021). Access to finance and job growth: Firm-level evidence across developing countries. *Review of Finance*, *25*(5), 1473–1496.
Baker, A. C., Larcker, D. F., & Wang, C. C. (2022). How much should we trust staggered difference-in-differences estimates? *Journal of Financial Economics*, *144*(2), 370–395.
Bardos, K., Kozlowski, S. E., & Puleo, M. R. (2021). Entrenchment or efficiency? CEO-to-employee pay ratio and the cost of debt. *Financial Review*, *56*(3), 511–533.
Bauwhede, H. V., De Meyere, M., & Van Cauwenberge, P. (2015). Financial reporting quality and the cost of debt of SMEs. *Small Business Economics*, *45*(1), 149–164.
Beck, T., Demirgüç-Kunt, A., & Maksimovic, V. (2008). Financing patterns around the world: Are small firms different? *Journal of Financial Economics*, *89*(3), 467–487.
Bennardo, A., Pagano, M., & Piccolo, S. (2015). Multiple bank lending, creditor rights, and information sharing. *Review of Finance*, *19*, 519–570.
Berger, A. N., & Udell, G. F. (1995). Relationship lending and lines of credit in small firm finance. *Journal of Business*, *68*, 351–381.
Bliss, M. A., & Gul, F. A. (2012). Political connection and cost of debt: Some Malaysian evidence. *Journal of Banking & Finance*, *36*(5), 1520–1527.
Bolton, P., & Scharfstein, D. S. (1990). A theory of predation based on agency problems in financial contracting. *American Economic Review*, *80*, 93–106.
Bonaccorsi di Patti, E., & Dell'Ariccia, G. (2004). Bank competition and firm creation. *Journal of Money, Credit and Banking*, *36*, 225–251.
Bonini, S., Dell'Acqua, A., Fungo, M., & Kysucky, V. (2016). Credit market concentration, relationship lending and the cost of debt. *International Review of Financial Analysis*, *45*, 172–179.
Boot, A. W., & Schmeits, A. (2000). Market discipline and incentive problems in conglomerate firms with applications to banking. *Journal of Financial Intermediation*, *9*(3), 240–273.
Borusyak, K., Jaravel, X., & Spiess, J. (2022). Revisiting event study designs: Robust and efficient estimation. CEPR Discussion Paper No. DP17247. Available at SSRN: https://ssrn.com/abstract=4121430
Brown, M., Jappelli, T., & Pagano, M. (2009). Information sharing and credit: Firm-level evidence from transition countries. *Journal of Financial Intermediation*, *18*(2), 151–172.
Bushman, R. M., & Williams, C. D. (2012). Accounting discretion, loan loss provisioning, and discipline of banks' risk-taking. *Journal of Accounting and Economics*, *54*(1), 1–18.
Callaway, B., & Sant'Anna, P. H. (2021). Difference-in-differences with multiple time periods. *Journal of Econometrics*, *225*(2), 200–230.
Chevalier, J. A. (1995). Capital structure and product-market competition: Empirical evidence from the supermarket industry. *The American Economic Review*, *85*, 415–435.
Chui, A. C., Kwok, C. C., & Zhou, G. S. (2016). National culture and the cost of debt. *Journal of Banking & Finance*, *69*, 1–19.
De Haas, R., Millone, M., & Bos, J. (2021). Information sharing in a competitive microcredit market. *Journal of Money, Credit and Banking*, *53*(7), 1677–1717.
Demirgüç-Kunt, A., & Maksimovic, V. (1998). Law, finance, and firm growth. *The Journal of Finance*, *53*(6), 2107–2137.
Diamond, D. W. (1984). Financial intermediation and delegated monitoring. *The Review of Economic Studies*, *51*, 393–414.
Djankov, S., McLiesh, C., & Shleifer, A. (2007). Private credit in 129 countries. *Journal of Financial Economics*, *84*, 299–329.
Driss, H., El Ghoul, S., Guedhami, O., & Wald, J. K. (2023). Governance and leverage: International evidence. *Financial Review*, *58*(2), 261–285.
Duffie, D., & Lando, D. (2001). Term structures of credit spreads with incomplete accounting information. *Econometrica*, *69*(3), 633–664.
Fosu, S. (2014). Credit information, consolidation and credit market performance: Bank-level evidence from developing countries. *International Review of Financial Analysis*, *32*, 23–36.
Fosu, S., Danso, A., Agyei-Boapeah, H., & Ntim, C. G. (2020b). Credit information sharing and bank loan pricing: Do concentration and governance matter? *International Journal of Finance & Economics*, *26*(4), 5884–5911.
Fosu, S., Danso, A., Agyei-Boapeah, H., Ntim, C. G., & Adegbite, E. (2020a). Credit information sharing and loan default in developing countries: The moderating effect of banking market concentration and national governance quality. *Review of Quantitative Finance and Accounting*, *55*(1), 55–103.
Fosu, S., Danso, A., Ahmad, W., & Coffie, W. (2016). Information asymmetry, leverage and firm value: Do crisis and growth matter? *International Review of Financial Analysis*, *46*, 140–150.
Fosu, S., Ntim, C. G., Coffie, W., & Murinde, V. (2017). Bank opacity and risk-taking: Evidence from analysts' forecasts. *Journal of Financial Stability*, *33*, 81–95.

Francis, J. R., Khurana, I. K., & Pereira, R. (2005). Disclosure incentives and effects on cost of capital around the world. *The Accounting Review*, *80*(4), 1125–1162.
Fungáčová, Z., Shamshur, A., & Weill, L. (2017). Does bank competition reduce cost of credit? Cross-country evidence from Europe. *Journal of Banking & Finance*, *83*, 104–120.
Goodman-Bacon, A. (2021). Difference-in-differences with variation in treatment timing. *Journal of Econometrics*, *225*(2), 254–277.
Gwatidzo, T., & Ojah, K. (2014). Firms' debt choice in Africa: Are institutional infrastructure and nontraditional determinants important? *International Review of Financial Analysis*, *31*, 152–166.
Houston, J. F., Lin, C., Lin, P., & Ma, Y. (2010). Creditor rights, information sharing, and bank risk taking. *Journal of Financial Economics*, *96*(3), 485–512.
Jappelli, T., & Pagano, M. (2002). Information sharing, lending and defaults: Cross-country evidence. *Journal of Banking & Finance*, *26*, 2017–2045.
Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, *3*, 305–360.
Kaufmann, D., Kraay, A., & Mastruzzi, M. (2011). The worldwide governance indicators: Methodology and analytical issues1. *Hague Journal on the Rule of Law*, *3*(2), 220–246.
Klein, D. B. (1992). Promise keeping in the great society: A model of credit information sharing. *Economics & Politics*, *4*(2), 117–136.
Kroszner, R. S., Laeven, L., & Klingebiel, D. (2007). Banking crises, financial dependence, and growth. *Journal of Financial Economics*, *84*(1), 187–228.
Liao, H. H., Chen, T. K., & Lu, C. W. (2009). Bank credit risk and structural credit models: Agency and information asymmetry perspectives. *Journal of Banking & Finance*, *33*(8), 1520–1530.
Love, I., & Mylenko, N. (2003). *Credit reporting and financing constraints (World Bank Policy Research Working Paper 3142)*. World Bank.
Lu, C. W., Chen, T. K., & Liao, H. H. (2010). Information uncertainty, information asymmetry and corporate bond yield spreads. *Journal of Banking & Finance*, *34*(9), 2265–2279.
Martinez-Peria, M. S., & Singh, S. (2014). The impact of credit information sharing reforms on firm financing? World Bank Policy Research Working Paper No. 7013. Available at SSRN: https://ssrn.com/abstract=2486938
Myers, S. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, *5*, 147–175.
Nier, E., & Baumann, U. (2006). Market discipline, disclosure and moral hazard in banking. *Journal of Financial Intermediation*, *15*(3), 332–361.
Nier, E. W. (2005). Bank stability and transparency. *Journal of Financial Stability*, *1*(3), 342–354.
Padilla, A. J., & Pagano, M. (2000). Sharing default information as a borrower discipline device. *European Economic Review*, *44*, 1951–1980.
Pagano, M., & Jappelli, T. (1993). Information sharing in credit markets. *The Journal of Finance*, *48*, 1693–1718.
La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. (2002). Investor protection and corporate valuation. *The Journal of Finance*, *57*(3), 1147–1170.
Porta, R. L., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W. (1997). Legal determinants of external finance. *The Journal of Finance*, *52*(3), 1131–1150.
Qian, J., & Strahan, P. E. (2007). How laws and institutions shape financial contracts: The case of bank loans. *The Journal of Finance*, *62*(6), 2803–2834.
Raddatz, C. (2006). Liquidity needs and vulnerability to financial underdevelopment. *Journal of Financial Economics*, *80*(3), 677–722.
Rajan, R. G., & Zingales, L. (1998). Financial dependence and growth. *American Economic Review*, *88*(3), 559–586.
Shleifer, A., & Vishny, R. W. (1997). A survey of corporate governance. *The Journal of Finance*, *52*(2), 737–783.
Stiglitz, J. E., & Weiss, A. (1981). Credit rationing in markets with imperfect information. *The American Economic Review*, *71*(3), 393–410.
Sun, L., & Abraham, S. (2021). Estimating dynamic treatment effects in event studies with heterogeneous treatment effects. *Journal of Econometrics*, *225*(2), 175–199.
Tong, H., & Wei, S. J. (2011). The composition matters: Capital inflows and liquidity crunch during a global economic crisis. *The Review of Financial Studies*, *24*(6), 2023–2052.
Tunyi, A., Agyei-Boapeah, H., Areneke, G., & Agyemang, J. (2019). Internal capabilities, national governance, and performance of African PLCs. *Research in International Business & Finance*, *50*(C), 18–37.
Vercammen, J. A. (1995). Credit bureau policy and sustainable reputation effects in credit markets. *Economica*, *62*, 461–478.
Wang, X., Han, L., & Huang, X. (2020). Bank competition, concentration and EU SME cost of debt. *International Review of Financial Analysis*, *71*, 101534.
World Bank. (2021a). Doing Business: Getting credit methodology. Available at: http://www.doing.business.com

World Bank. (2021b). World Development Indicators. Available at: https://databank.worldbank.org/source/world-development-indicators
World Bank. (2021c). Worldwide Governance Indicators. Available at: https://info.worldbank.org/governance/wgi

How to cite this article: Fosu, S., Agyei-Boapeah, H., & Ciftci, N. (2023). Credit information sharing and cost of debt: evidence from the introduction of credit bureaus in developing countries. *Financial Review*, 1–28. https://doi.org/10.1111/fire.12361

APPENDIX

TABLE A1 Definition of variables

Variable	Definition
Cost of debt	The ratio of contemporaneous interest expense to average total debt, where the average is over the current (year *t*) and the previous year's (year *t*-1) debt.
Real cost of debt	Cost of debt adjusted for inflation.
Firm size	The natural logarithm of the firm's assets.
Tangibility	The proportion of a firm's tangible assets to total assets.
Liquidity	The proportion of a firm's current assets less stock scaled by current liabilities.
Cash	The ratio of the balance of cash to total assets.
Profitability	The ratio of pre-tax profit to total assets.
Leverage	The ratio of total debt to total assets.
Debt maturity	The ratio of long-term debt to total debt.
Young firm	A dummy variable equal to one for a firm whose age is below the median firm's age (where age is proxied by the number of years since a firm's initial public offering [IPO] year, or years since a firm's first appearance in Compustat Global database if IPO year is missing).
Less transparent	A dummy variable equal to one for a firm whose transparency level is below the median firm's level and zero otherwise (where transparency is proxied by the principal component factor of asset Tangibility, Firm Age and Firm Size).
Herfindahl–Hirschman index (HHI)	The sum of the squared market shares (by assets) at the 3-digit industry standard classification level
Coverage of information	The proportion of the adult population covered by public credit registries and private bureaus
Ln(GDP per capita)	The logarithm of Gross domestic product (GDP) per capita.
Inflation	Annual changes in the consumer price index.
Financial development	The ratio of domestic credit to private sector to GDP
Institutional quality	The simple average of six institutional features of each country: namely, voice of accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law, and control of corruption.
Voice and accountability	"The extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media" (Kaufmann et al., 2011, p. 223).
Political stability and absence of violence	"The likelihood that the government will be destabilized by unconstitutional or violent means, including terrorism" (Kaufmann et al. 2011, p. 223).

(Continues)

TABLE A1 (Continued)

Variable	Definition
Government effectiveness	"The quality of public services, the capacity of the civil service and its independence from political pressures; and the quality of policy formulation" (Kaufmann et al. 2011, p. 223).
Regulatory quality	"The ability of the government to provide sound policies and regulations that enable and promote private sector development" (Kaufmann et al. 2011, p. 223).
Rule of law	"The extent to which agents have confidence in and abide by the rules of society, including the quality of contract enforcement and property rights, the police, and the courts, as well as the likelihood of crime and violence" (Kaufmann et al. 2011, p. 223).
Control of corruption	"The extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests" (Kaufmann et al. 2011, p. 223).