Effect of Credit Access on Innovation Activities in SMEs: A Mediating Role of Bribery and Bargaining Power

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Abstract:

The paper uses data from 104 developing countries varying from 2010 to 2019 period to examine the effect of credit access on firm innovation. The paper first regressed the model with full sample, then with sub-sample by size, legality and bribery to check the moderation effect of bargaining power and bribery. The findings of the regression analysis demonstrate a favorable relationship between corporate innovation and loan access. For companies with higher negotiating strength (proxies by firm size and legality), this effect becomes more significant. However, the influence of financial availability on corporate innovation is likely to be hampered by the perception of bribery. Finally, the paper brought some policy implications to the paper, especially for developing countries.

Keywords: *credit access, innovation, bargaining power, bribery*

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Introduction

Today, every economic transaction is digitalized as the globe transitions to a digital economy. Many activities rely on technology, including production and manufacturing with high-tech applications like AI, payment (through cards or e-wallets rather than using cash), and production. Since businesses innovate to catch up with the entire economy, this increases the importance of innovation activities. The implementation of R&D activities at businesses is one of the various ways that innovation activities may be carried out, along with the development of new products, operating systems, and manufacturing methods. Additionally, innovation is crucial for businesses to narrow the gap with market leaders and boost productivity to keep up with the modern economy. Regarding the significance of innovation, many nations establish regulations to aid businesses in conducting this activity, such as providing financial and human resources. To assist businesses, identify the key drivers of innovation and effectively allocate resources, it is crucial to comprehend the link between innovation and company resources.

Many earlier researchers, such (Solow, 1957; Schumpeter, 1934; Palacios et al., 2009; Terziovski, 2010), examined the firm's innovation. Using a resource-based perspective, (Kamasak, 2015) investigated innovation activities, while Wellalage & Locke (2020) investigated the connection between innovation and formal and informal financing. The qualities of the company and the nation are just two of the numerous variables that determine a firm's innovation, according to (Qi & Ongena, 2020). Additionally, according to (Ajayi & Morton, 2015), financing is a crucial element in encouraging business innovation. In reality, credit plays a significant role in helping to provide operational capital for businesses when they are unable to do so on their own due to a lack of internal financial resources. Numerous academics investigated the connection between finance and business innovation. Venture capital financing, according to (Kortum & Lerner, 2000), supports enterprises' innovativeness in US manufacturing firms. In 47 developing nations, (Ayyagari et al., 2011) provided evidence of the beneficial impact of bank financing on corporate innovation. We decided to research the impact of credit availability on a firm's innovation activities in developing countries since we are aware that formal finance has a significant impact on a firm's innovation. This research will be the first to evaluate the results when bribery and negotiating leverage are used moderately.

This paper will rely on resource-based theory, finance theory and institutional theory to analyze the basis for developing hypotheses related to the effect of credit on innovation and the hypothesis of the mediating effect of bargaining power and bribery. The study's quantitative analysis indicates that credit access has a positive impact on firms' innovation. This effect is particularly greater for firms with higher bargaining power and this impact is

impeded when firms need to pay bribes to survive. This paper also suggests some policy implications, especially for developing countries.

The paper is presented in 5 sections: Section 1 is the introduction to the paper; section 2 demonstrates theoretical underpinnings and hypotheses development; section 3 presents the description of data and model specification; section 4 contains the key results; and finally, section 5 is some policy implications.

Theoretical underpinnings & Hypothesis development

Theoretical underpinnings

The article proposes theories based on institutional theory, finance theory, and resource-based theory. First off, according to (Cuerva et al., 2014) and (Amit & Schomaker, 1993), resource-based theory focuses on the firm's resources to explain its capabilities and competitive advantage. Second, according to finance theory, companies should prioritize internal resources before turning to external ones while conducting innovative activity (Myer & Majluf, 1984). Since internal resources are generally relatively constrained for SMEs, it is crucial to seek out external sources, such as loans, in order to execute innovation (Myer, 1984). Last but not least, institutional theory investigates how institutional elements like laws, social norms, or rules influence how a corporation makes choices (Meyer & Rowan, 1977; Ha & Le, 2021). Researchers (Anokhin & Schulze, 2009) and (Goedhuys et al., 2016) look at how corruption affects the creativity of businesses. In conclusion, the three theories mentioned above are used to investigate the factors that influence innovation as well as the mediating effects of bribery and company bargaining power.

Hypothesis development

Access to financing is essential for commercial and manufacturing operations in organizations. Companies can manage capital to employ in capital-intensive activities like innovation by raising funds through credit channels. Numerous writers, including (Ullah & Wei, 2017; Robb & Robinson, 2012), have investigated the consequences of formal credit. Credit, in my opinion, has a good impact on creativity for the two primary reasons listed below.

First off, formal credit from financial organizations is a trustworthy source of money since these entities are governed by laws and procedures. As a result, the risk associated with knowledge asymmetry is diminished, which has had a positive impact on both lenders and borrowers. Compared to informal sources of credit (such borrowing from family or friends), financial institutions have a larger supply of credit (Ullah, 2019). Additionally,

the loan's interest rate will be acceptable and in accordance with businesses' capacities. Companies can use credit as a form of long-term finance for innovative activities due to acceptable and stable interest rates, extended payback terms, and flexible repayment options (Eisenhardt & Tabrizi, 1995). Additionally, as innovation activities sometimes take a long time and are ongoing, access to finance aids businesses in building up capital for use in future innovation activities (Ullah, 2019).

Therefore, we suggested the following hypothesis:

H1: Firm's credit accessibility has positive impact on firm's innovation activities.

Studies on firms' negotiating strength include those by (Rose-Ackerman, 1998) and (Ha et al., 2021). (Ha et al., 2021) claim that enterprises with stronger negotiating power often profit more from loan availability, and that firm size and legality may be used as proxies for bargaining power. First off, lending is frequently prioritized for large-sized businesses since it is thought that they may benefit society more by producing more benefits like more jobs or more contributions to government budgets (Ha et al., 2021). Additionally, according to (ACS & Audrestch, 1988), innovation is more lucrative for big businesses than it is for small businesses. Since innovation costs a lot of capital (Galbraith, 1956) and calls for several complex paperwork (licensing, patents, etc.), larger organizations frequently have more relationships (Zhou & Peng, 2012) and it is simpler for larger enterprises to apply for finance. Additionally, larger businesses benefit more from the quality of their workforce since they can pay for the needs of skilled individuals (Scherer, 1980). These individuals may be top-level managers who play a crucial role in the company's survival and possess the business acumen necessary to allocate credit for innovative activities in the most effective manner. As a result, larger businesses gain more from loan availability than smaller ones.

Along with business size, a firm's legality also affects its negotiating power and the impact of loan availability on innovation. Particularly, legally registered businesses benefit from legal protection, have a better chance of connecting to government resources, or can hire employees with more formal education (Fajnzylber et al., 2011). Moreover, financial institutions favor formal enterprises over informal ones since the latter have larger default risks (Pagano, 2001).

According to the above discussion, we proposed the following hypothesis:

H2: The effect of credit access on firm's innovation activities becomes greater if firm possessed higher bargaining power.

The impact of bribery on innovation has been extensively researched in the past (Acs & Audretsch, 1988; Goedhuys et al., 2016). This study contends that bribery will impede the impact of loan availability on businesses' innovation for a number of reasons.

First off, due to the problem of information asymmetry, when adopting new activities or requesting for credit, regulators frequently want sophisticated records from businesses for licensing, or the credit institutions need a lot of documentation to substantiate the business' status and lower the risk to banks. Companies must thus pay bribes in order to improve processes or get around obstacles posed by banks or public authorities (Ha et al., 2021). As a result, authorities have the opportunity to deliberately prolong a procedure in order to demand larger payments (Guriev, 2004; Mydral, 1968). Due to this, business expenses rise (Kaufmann & Wei, 1999), business investment incentive is hampered, and business innovation is impacted (Mahagaonkar, 2008; Gauthier & Goyette, 2014).

In order to acquire government contracts or to gain an advantage over other businesses, companies often switch to "rent-seeking bribery" (Ha & Le, 2021). As a result, it becomes more difficult for other businesses to enter or remain in business. As a result, businesses must bribe customers in order to remain in business (Zhou & Peng, 2012).

Based on the above discussion, we suggest the following hypothesis:

H3: The effect of credit access on firm's innovation activities becomes greater/weaker under the moderation of firm's bribery to public officials.

Data description & Model specification

Data description

For manufacturing companies located in 104 developing nations between 2010 and 2019, this study uses data from the World Bank Enterprise Survey. There are 42,530 observations in total after the data has been cleaned by removing missing observations and outliers.

Dependent and independent variables of this paper are presented in Table 1. Variable innovation is generated based on the question whether a firm is involved in at least one of the three following activities: (i) Create new products; (ii) Improved existing process; (iii) Conduct R&D activity. The set of independent variables include variables that affect a firm's innovation, based on a model developed by (Qi & Ongena, 2020).

Table 2 describes the difference in innovation behavior between credit access and non-credit access firms, where the percentage of firms conducting innovation is likely to be greater if the firm gets formal credit access. Additionally, correlation matrix is displayed in Table 3 with no correlation coefficient greater than 0.4. This indicates that further regressions of this paper will not face multicollinearity problems.

Table 1. Variable description

VARIABLES	Description
Dependent variables	
innovation	= 1 if firm involved in innovative activity = 0 otherwise
Key independent variable	
credit	= 1 if firm gets credit from financial institutions = 0 otherwise
lnage	Natural logarithm of firm age
lnsize	Natural logarithm of number of employees in a firm
lnexp	Natural logarithm of top manager's years of experience in current working industry
state	Percentage of firm is state-owned
export	= 1 if firm involves in export activity = 0 otherwise
audit	= 1 if firm is audited by independent auditor = 0 otherwise
sole	= 1 if firm is sole proprietorship

Table 2. Comparison of innovation between credit and non-credit access firms

Credit access	Percentage of firm conducting innovation
Yes	54.53%
No	74.72%

Table 3. Correlation matrix

	credit	lnage	lnsize	lnexp	state	export	audit	sole
credit	1.000							
lnage	0.108	1.000						
lnsize	0.203	0.223	1.000					
lnexp	0.107	0.370	0.057	1.000				
state	-0.012	0.028	0.085	-0.017	1.000			
export	0.181	0.139	0.410	0.078	0.017	1.000		
audit	0.112	0.109	0.330	0.008	0.039	0.169	1.000	
sole	-0.197	-0.142	-0.312	-0.125	-0.051	-0.234	-0.154	1.000

Table 4. Statistical summary

VARIABLES	Observations	Mean	Std.Dev	Min	Max
innovation	41,245	0.625	0.485	0	1
credit	41,245	0.400	0.489	0	1
lnage	41,245	2.810	0.798	0.693	4.454
lnsize	41,245	3.623	1.425	1.386	7.496
lnexp	41,245	2.747	0.738	0	3.912
state	41,245	0.460	5.590	0	100
export	41,245	0.239	0.426	0	1
audit	41,245	0.588	0.492	0	1
sole	41,245	0.338	0.472	0	1

Model specification

The benchmark model of this paper is in equation (1), specified as follows:

$$Innovation_i = \beta_0 + \beta_1 Credit_i + \beta_2 CONTROL_i + v_c + \lambda_t + \varepsilon_i \quad (1)$$

where subscripts *i*, *c*, and *t* denote firm, country, and year, respectively. v_c and λ_t are country and year fixed effects, respectively. $Innovation_i$ is innovation of firm *i*. $Credit_i$ is credit access of firm, $CONTROL_i$ is set of other independent variables specified in Table 1, and ε_i is a term of error. Probit model is applied in all further estimation results and marginal effects are recorded at mean level.

In order to investigate the connection between innovation and loan access, we first regressed the question using all data. The next step was to re-estimate equation (1) using sub-samples by size (SMEs and Large-sized enterprises) and sub-sample by legality (firm is formally-registered or not), in order to examine the mediating functions of firm bargaining power. To see if bribery moderated the impact of loan availability on firms' innovation, we re-regressed the equation using data split into groups with bribery action.

Estimation results

Main results[1]

Regression results are presented in Table 5 on the impact of credit access on innovation in enterprises in developing countries with fixed effect. Column (2) - (4) presents regression results in each type of innovation including new products, improved process and R&D

[1] All regression results in this section are performed with country and year fixed effects.

implementation. The estimated coefficient of the credit in all 4 columns is significant and positive. Column coefficient (1) indicates that enterprises with credit access will have a 0.43% higher probability of implementing innovation than non-credit access ones. Similarly, for credited enterprises, the ability to implement new products, improved process or perform R&D is 0.35%, 0.31% and 0.33% higher respectively than non-credit access enterprises. Overall, this supports Hypothesis 1 that credit access has a positive impact on innovation in businesses.

Besides *credit*, other variables also show their influences on firm's innovation activity. Firm size variable (*lnsize*) shows a positive impact on business innovation due to positive and significant coefficients in all 4 columns in Table 5. This indicates that the larger the scale of the enterprise, the higher the probability of implementing innovation. This is a testament to the mediating effect of size in this relationship. The estimated coefficients in other variables remain the same signs as Qi & Ongena (2020).

Table 5. Benchmark results

	(1)	(2)	(3)	(4)
VARIABLES	**Innovation**	**New products**	**Improved process**	**R&D**
credit	0.43***	0.35***	0.31***	0.33***
	(0.014)	(0.013)	(0.013)	(0.014)
lnage	0.04***	0.06***	0.00	0.04***
	(0.009)	(0.009)	(0.009)	(0.010)
lnsize	0.08***	0.04***	0.09***	0.13***
	(0.006)	(0.005)	(0.005)	(0.006)
lnexp	0.01	0.05***	-0.03***	0.00
	(0.010)	(0.009)	(0.009)	(0.010)
state	-0.01***	-0.00***	-0.00***	-0.00***
	(0.001)	(0.001)	(0.001)	(0.001)
export	0.27***	0.25***	0.14***	0.31***
	(0.017)	(0.016)	(0.016)	(0.017)
audit	0.19***	0.08***	0.19***	0.24***
	(0.014)	(0.014)	(0.014)	(0.015)
sole	-0.11***	-0.15***	-0.02*	-0.26***
	(0.014)	(0.014)	(0.014)	(0.016)
Constant	-0.39***	-0.75***	-0.55***	-1.49***
	(0.035)	(0.034)	(0.034)	(0.038)
Observations	41,245	41,158	41,021	41,245

Robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

Then, to check the moderation effect of bargaining power, in Table 6, we use regression with sub-sample by size and by legality, which are two proxies of firm's bargaining power. We define the size of firms based on the definition of the survey that firms with number of employees higher than 100 are large-sized firms and firms with number of employees lower than 100 belong to the SME group. The coefficient of the *credit* still carries a positive coefficient and has statistical significance, which is fully in line with the prediction at the H1 hypothesis. However, the marginal effect of each coefficient is different. Specifically, the effect of credit on innovation at SMEs is smaller than in Large-sized firm. This may be explained by the fact that large enterprises can have better experience, leading to a more reasonable allocation of credit than smaller enterprises, which in turn, makes credit more efficiently used in innovation. Regarding formally-registered firms, we divided this sample into two groups by a question in the survey that whether a firm is registered or not. Hence, the estimated coefficient of *credit* is slightly larger for formally-registered firms, which is 0.43 for formally-registered firms and 0.42 for non-register firms. In short, the results show that bargaining power positively moderates the effect of credit access on firm's innovation activity. Therefore, H2 is supported.

Table 6. Estimation results with sub-sample by bargaining power

VARIABLES	(1)	(2)	(3)	(4)
	Firm size		**Firm is formally-registered**	
	SME	Large-sized firm	No	Yes
credit	0.42***	0.45***	0.42***	0.43***
	(0.016)	(0.028)	(0.128)	(0.014)
lnage	0.01	0.11***	0.21***	0.04***
	(0.011)	(0.019)	(0.062)	(0.009)
lnsize	0.12***	0.09***	0.10*	0.08***
	(0.010)	(0.018)	(0.055)	(0.006)
lnexp	0.03***	-0.05**	-0.19**	0.01
	(0.011)	(0.021)	(0.074)	(0.010)
state	-0.00***	-0.01***	0.05	-0.01***
	(0.002)	(0.001)	(0.033)	(0.001)
export	0.32***	0.21***	0.21	0.27***
	(0.022)	(0.028)	(0.171)	(0.017)
audit	0.16***	0.32***	0.04	0.19***
	(0.015)	(0.033)	(0.127)	(0.014)
sole	-0.11***	-0.07*	0.03	-0.12***
	(0.016)	(0.038)	(0.127)	(0.015)

VARIABLES	(1)	(2)	(3)	(4)
	Firm size		Firm is formally-registered	
	SME	Large-sized firm	No	Yes
Constant	-0.46***	-0.64***	-0.53*	-0.38***
	(0.043)	(0.118)	(0.289)	(0.035)
Observations	30,912	10,333	611	40,634

Robust standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1*

In Table 7, moderation effect of bribery is checked. This paper creates a variable to state if a firm pays a bribery or not. This is based on the question whether firm pays informal payments during its operation period or not. The results show that the coefficient of credit access variable in column (1) is more sizable than that in column (2). This can be explained by institutional theory. Since bribery may act as a type of tax to firm, it might increase firm cost in operation and thus "sand the wheel" of a firm's operation. Overall, bribery negatively moderate the effect of credit on firm's innovation, which aligns with hypothesis H3.

Table 7. Estimation results with sub-sample by bribery

	(1)	(2)
VARIABLES	No bribery	Bribery
credit	0.49***	0.34***
	(0.018)	(0.022)
lnage	0.05***	0.03**
	(0.012)	(0.015)
lnsize	0.09***	0.07***
	(0.007)	(0.009)
lnexp	-0.01	0.04**
	(0.012)	(0.015)
state	-0.01***	-0.00
	(0.001)	(0.002)
export	0.25***	0.30***
	(0.022)	(0.028)
audit	0.19***	0.20***
	(0.018)	(0.022)

	(1)	(2)
VARIABLES	**No bribery**	**Bribery**
sole	-0.10***	-0.13***
	(0.018)	(0.023)
Constant	-0.45***	-0.30***
	(0.045)	(0.056)
Observations	25,386	15,859

Robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

Link-test

In the further step, we implemented a link-test to examine whether the used set of variables is appropriate or not. The result of the link-test in benchmark regressions shows that coefficient of _hat is significant and _hatsq is insignificant, which implies that the model specification is correct.

innovation	**Coefficient**
_hat	1.010*** (0.039)
_hatsq	-0.013 (0.044)
_cons	-0.000 (0.008)

Standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

Policy implication

The paper deployed data from 104 developing countries to examine the relationship between credit access and innovation activity. The regression results imply that formal credit positively influences firms' innovation activity, especially at larger firms with greater bargaining power. However, this effect is impeded if firms pay bribes to facilitate procedures or to overcome complicated required documents. All results are in line with hypotheses developed in section 2 of this paper.

Based on the above analysis, the author would like to make some policy implications related to promoting innovation in firms as follows. Regarding the government, as innovation is so important in today's digital economy, it is necessary to promote innovation in business. To boost innovation activity, especially in SMEs, the government should have

more policies to help support innovation such as tax reduction or exemption for innovation firms, removing barriers to licensing such as complex procedures and paperwork. In addition, the government also needs to strengthen the country's financial system, as a basis for making appropriate credit support policies for firms. Finally, more anti-corruption policies are needed. This is not only a problem in the short term that reduces the burden on firms, but in the long term, it also helps create a fair competitive environment and also a condition to attract more innovation firms from abroad.

On the banking side, it is necessary to implement appropriate capital mobilization to strengthen the support credit source for firms, especially for SMEs. At the same time, banks should have anti-corruption mechanisms to avoid inappropriate credit allocations to inefficient firms but bribed banks' officials.

Regarding firms, firms should always prepare formal documents in advance such as business register paper, financial statements, etc. in order to facilitate loan application/ licensing procedure. More notably, the experience of top-management personnel plays important roles in the implementation of innovation activities at the company. This is because innovation is a long-term, costly operation, while top-management personnel play vital roles in business decision-making. Therefore, enterprises need to add policies to treat talents, foster knowledge for employees, especially personnel from management level and above.

Declaration of confict of interests:

There is no financial and personal relationships with other people or organizations that could inappropriately influence (bias) our work.

Appendix: List of countries in the dataset

Afghanistan	Burkina Faso	Egypt	Iran	Malawi	Pakistan	Tanzania
Albania	Burundi	El Salvador	Iraq	Malaysia	Panama	Thailand
Angola	Cambodia	Eswatini	Jamaica	Mauritania	Paraguay	Timor-Leste
Argentina	Cameroon	Ethiopia	Jordan	Mexico	Peru	Togo
Armenia	Chad	Fiji	Kazakhstan	Moldova	Philippines	Tunisia
Azerbaijan	Chile	Gambia	Kenya	Mongolia	Rwanda	Uganda
Bangladesh	China	Georgia	Kosovo	Montenegro	Senegal	Ukraine
Belarus	Colombia	Ghana	Kyrgyz Republic	Morocco	Serbia	Uruguay
Benin	Costa Rica	Guatemala	Lao P.D.R.	Mozambique	Sierra Leone	Uzbekistan
Bhutan	Côte d'Ivoire	Guinea	Lebanon	Myanmar	South Africa	Venezuela

Bolivia	Croatia	Guinea-Bissau	Lesotho	Namibia	South Sudan	Vietnam
Bosnia and Herzegovina	Djibouti	Honduras	Liberia	Nepal	Sri Lanka	Yemen
Botswana	Dominica	Hungary	Libya	Nicaragua	Sudan	Zambia
Brazil	DRC	India	FYR Macedonia	Niger	Suriname	Zimbabwe
Bulgaria	Ecuador	Indonesia	Madagascar	Nigeria	Tajikistan	

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