ADBI Working Paper Series

SUSTAINABLE FINANCING STRATEGIES FOR SMEs: TWO ALTERNATIVE MODELS

Monzur Hossain, Naoyuki Yoshino,
and Kenmei Tsubota

No. 1391
June 2023

Asian Development Bank Institute

Monzur Hossain is Research Director at the Bangladesh Institute of Development Studies, Dhaka, Bangladesh. Naoyuki Yoshino is Professor Emeritus at Keio University and former Dean and CEO of the Asian Development Bank Institute, Tokyo, Japan. Kenmei Tsubota is a Professor at the Faculty of Global and Regional Studies of Toyo University, Tokyo, Japan.

Suggested citation:

Hossain, M., N. Yoshino, and K. Tsubota. 2023. Sustainable Financing Strategies for SMEs: Two Alternative Models. ADBI Working Paper 1391. Tokyo: Asian Development Bank Institute. Available: https://doi.org/10.56506/HTQA5302

Please contact the authors for information about this paper.

Email: monzur71@gmail.com

This paper uses the data collected by BIDS to evaluate the SME Foundation's activities in 2018. We thank the SME Foundation for allowing us to use the data for writing this paper. We thank the participants and discussants for their comments on the earlier version of the paper at the "ADB-SMU Conference on Digital Finance and Sustainability" held virtually from 7 to 9 January 2023 in Tokyo. We especially thank Shin-Ichi Fukuda for his valuable comments on the paper. The first author also acknowledges that the initial work on the paper was done while he was a visiting fellow at the Institute of Developing Economies (IDE-JETRO) between January and March 2020.

Asian Development Bank Institute
Kasumigaseki Building, 8th Floor
3-2-5 Kasumigaseki, Chiyoda-ku
Tokyo 100-6008, Japan

Tel: +81-3-3593-5500
Fax: +81-3-3593-5571
URL: www.adbi.org
E-mail: info@adbi.org

Abstract

A sustainable financing strategy for SMEs should aim to enhance a low-cost collateral-free supply of loans to SMEs with good track records of repayments to banks. This paper suggests two alternative financing mechanisms to overcome certain borrowing constraints of SMEs. First, it suggests an institutional mechanism involving the government, banks, and SMEs. Under the mechanism, a government's subsidized loan fund with the provision of training and capacity-building support to borrower SMEs could reduce, on the one hand, the fund constraint of banks and, on the other hand, the asymmetry of information about borrowers, and so does the default risks. This model will allow banks to offer collateral-free lower-interest credit to SMEs, thereby improving their access to finance and their performance as well. Second, as the first model might involve borrower selection bias and moral hazard problems, an alternative model has been proposed with a digital financing mechanism with/without subsidized funds that could produce similar or better results. Using survey data from 526 SMEs in Bangladesh, the empirical results are found to be consistent with the prediction of our theoretical model.

Keywords: SME financing models, credit wholesale program, default risk, digital finance, Bangladesh

JEL Classification: O16, L25

Contents

1. INTRODUCTION

Access to formal finance has been a predominant problem for the development of SMEs in developing countries. A high interest rate, stringent collateral requirements, the opaqueness of SMEs, etc. affect SMEs' access to finance. As a result, most SMEs depend on informal sources for financing that are costly, and on top of that, they do not meet all the financing needs. Beck and Demirgüç-Kunt (2006) show that smaller firms could finance on average 13% lower investments with bank finance compared to large firms. A survey of manufacturing SMEs in Bangladesh shows that though small firms can finance 52% of their total investments with formal credit, they still blame high interest rates as the main obstacle to gaining access to formal credit (INSPIRED SME Survey 2013). Default risk is the main concern for banks while processing a loan for SMEs (Yoshino and Taghizadeh-Hesary 2015). A higher interest rate for SMEs is usually justified by the high default risk for SME loans, which ultimately increases the borrowing costs of SMEs (Hossain, Yoshino and Taghizadeh-Hesary 2021).

To solve the financing bottlenecks of SMEs, various innovative financial approaches, such as credit guarantee schemes (CGSs), business angels, factoring, etc., are applied in many countries (Yoshino and Taghizadeh-Hesary 2019; Demirguc-Kunt and Peria 2010; Love and Peria 2015). None of the methods are completely flawless (Kang 2005; Inha Oh et al. 2009; Yoshino 2015). For example, for the credit guarantee scheme, moral hazard problems and political interferences are two competing constraints that jeopardize the objective of the financing mechanism. Factoring and business angel models are followed less and have demerits as well. A new strand of research argues that local-level financial development by expanding bank branches at the subnational level may largely solve SMEs' financing bottlenecks, though the process is complex and may take time (Fafchamps and Schündeln 2013; Hossain, Yoshino, and Taghizadeh-Hesary 2021). Therefore, countries are still in search of a sustainable financing model for SMEs. In Bangladesh, a special credit program, known as the "credit wholesale program" (CW program), was initiated by the government through its agency the "SME Foundation" (SMEF) in 2009. The program provides subsidized loanable funds to selected banks to disburse loans at a government-determined lower interest rate among the beneficiary firms of the SMEF.[1] Interestingly, the repayment rate of the CW program is over 95%, making it a very successful one compared to banks' regular credit programs for SMEs. One reason for the low default rate is that the SMEF plays a matchmaking role here between the banks and the borrowers by asking the banks to select the borrowers from their program intervention clusters.[2] Putting this into perspective, the CW program addresses both supply-side and demand-side problems of SME financing. Now the question is, can this financing approach be a sustainable financing program for SMEs? What is the impact of the program on firm performance? Can this program be modified into a better one? This paper attempts to answer these questions by scrutinizing the sustainability of the CW program both theoretically and empirically.

[1] The program sets the interest rate at 9%, which is lower than the market rate of 12% or more. The SMEF provides various training courses on business processes, MIS, accounting procedures, etc. to the beneficiary firms. These firms' business situations are well known and are held with the database of the SMEF.

[2] The SMEF provides various training courses on business support measures and human capital development to SMEs located in different clusters.

This paper has two qualifications. First, it theoretically tests whether a government agency-based subsidized financing approach can be sustainable by integrating three sectors, namely the public sector, the banking sector, and the SME sector. While the public sector has an objective of increasing the supply of loans to SMEs with low interest, some instruments might be in place so that banks can increase their profitability with credit flowing to good SME borrowers. Our theoretical framework provides some insights into this. Second, it proposes an alternative blended framework of digital finance with an agency-based approach that might solve some of the bottlenecks of the first model and produce better results for both banks and SMEs.

The theoretical underpinning is that a subsidized government fund could lead to moral hazard and selection bias, and therefore the model is not sustainable in the long run. This paper suggests that a public agency's subsidized credit program may be useful for increasing access to finance for SMEs at a lower cost, but it may suffer from low coverage due to the government's fund constraints, and consequently, moral hazard and political interference may surface in borrower selection. It is argued in the paper that a blended digital financing mechanism with information about the quality and creditworthiness of the borrowers from a dedicated government agency for SME development might improve the access to finance for SMEs in a sustainable manner by reducing moral hazard problems and transaction costs for the banks. Some empirical results suggest that the CW program runs well with improved performance by SMEs as well as the lending conditions of the program, which could be instrumental in supporting the theoretical framework of the financing strategies.

The paper is organized as follows. Section 2 provides theoretical model frameworks for two alternative financing strategies for SMEs. Section 3 discusses the CW program, data, and variables for empirical analysis. Section 4 develops empirical strategies and discusses the results. Section 5 concludes the paper.

2. THEORETICAL MODEL FRAMEWORK FOR SME FINANCING STRATEGIES

A simple theoretical model framework involving three sectors, namely banks, SMEs, and the government, has been developed to derive sustainable financing strategies for SMEs. The model considers (i) the government's (agency's) policy objective function; (ii) banks' profit function; and (iii) SMEs' profit function.

2.1 Government's Policy Objective Function

The equation below shows the policy objective function of the government:

$$\cup = w_1(L - L^*)^2 + w_2(\rho - \rho^*)^2 \quad (1)$$

Where U is the government's objective function. Eq. 1 shows that the government has two objectives while determining bank loans to SMEs. The first objective is to ensure the optimal quantity of loans to SMEs $(L - L^*)$, where *L* is actual SME loans and *L** is desired SME loans. The second objective of the government is to set the nonperforming loans ratio to the desired ratio $(\rho - \rho^*)$; here ρ is the current default loan ratio and ρ^* is the desired default loan ratio. w_1 and w_2 in Eq. 1 are the policy weights for the two objectives. w_1 is the weight for optimal SME loans and w_2 is the weight for reducing the nonperforming loan ratio. If the two objectives have equal weight, then $w_1 + w_2 = 0.5$. In Eq. 1, $L^* = (1 + \alpha)L_{t-1}$, α is the desired growth rate of

SME loans and is set by the government. And also in Eq. 1, $\rho^* = (1-b)\rho_{t-1}$, b is the change in the desired nonperforming loan ratio compared with the previous year.

The loan demand function for Eq. 1 is:

$$L = \alpha_0 - \alpha_1 r_l + \alpha_2 Y^e \quad (2)$$

where α_0 is the fixed demand for loans, r_l is the loan interest rate, and Y^{ε} is the expected output of SMEs. α_1 is the coefficient of the interest rate on loans and is theoretically negative. When the interest rate increases, the demand for loans decreases, which means the slope of the function is negative. In good economic conditions, the demand for loans will increase, hence α_2 is expected to be positive.

2.2 SME Sector

In this section, we look at firm (SME) behavior in order to obtain the loan demand equation. In Eq. 3 we assume a Cobb-Douglas production function for SMEs:

$$Y = Y(N,K) = Y\big(N, K(\rho)\big) = N^{\alpha}[K(\rho)]^{1-\alpha} \quad (3)$$

where Y is the total output of SMEs, and N *and* K are the labor input and capital input of SMEs. Capital (loan) is a function of the default risk of the bank. Next, a firm's objective function is defined in Eq. 4:

$$\pi = P \times Y\big(N, K(\rho)\big) - w \times N - r \times K \quad (4)$$

where π denotes the firm's (SME) profit with respect to L and L*, P is the price of the firm's product, and w is the wage rate. We are assuming that the capital of the firm is only coming from a bank loan, ($L^d = K$).

The firm is maximizing its profit, hence we get the first-order condition π with respect to *K* and write it in Eq. 5:

$$\frac{\partial \pi}{\partial K} = (1-\alpha)\frac{P \times Y(\rho)}{K(\rho)} - r = 0 \quad (5)$$

Solving Eq. 5, we get *K* in Eq. 6:

$$K(\rho) = \frac{(1-\alpha)P \times Y(\rho)}{r} \quad (6)$$

Then, replacing K with loan demand in Eq. 6, we get

$$L^d = \frac{P(1-\alpha)\,Y(N,K(p))}{r} \quad (7)$$

The log-linear form of Eq. 7 is thus

$$l^d = K(\rho) = -\beta \times r + \gamma(1-\alpha)P \times Y(\rho) \quad (8)$$

If an agency provides training to the firm's employees, human capital will be more productive. In that case, we assume $N = N^*$, and if the agency provides loanable funds (deposit) to the bank, it is assumed that the default risk ratio will decline. In that case, $\rho = \rho^*$.

Now, the loan demand will increase from good firms with lower interest rates because banks are willing to provide loans to SMEs due to the lower default ratio. The log-linear loan demand function will thus be as follows:

$$l^{d*} = -\beta \times r^* + \gamma(1-\alpha)\, P \times\, Y(\rho^*) \tag{9}$$

2.3 Banking Sector

Let us assume that π^b denotes a bank's profit, r_l denotes the bank's lending interest rate, r_l^* denotes the bank's lending interest rate under the subsidized government credit program (desired interest rate), L^s is the amount of the bank loan, ρ is the default risk of bank loans, which is dependent on the information about the borrower (g) and the marginal cost (or transaction costs) of lending, *MC*. r_d denotes the deposit interest rate, D is the amount of deposits that banks receive, and C denotes the total costs of the bank, which is a function of loan supply, and the amount of deposits. For simplicity, we are assuming that the supply of loans is equal to deposits and the capital of the bank is zero (as banks' main source of funds is deposits due to low exposure to the capital market) and banks keep all of their assets in the form of loans and all of the banks' debts are in the form of deposits. The objective is to maximize the profit function of a bank:

$$\text{Max. } \pi^b = r_l \times L^s - \rho(g) \times L^s - r_D \times (L^s - A) - C(L^s, D) \tag{10}$$

$$S.t.\, balance\ sheet\ of\ a\ bank\text{: } L^s = D + \bar{A}$$

The cost function of a bank is:

$$C(L^s, D) = C_1(L^s)^2 + C_2(D)^2 + C_3(D \times\, L^s) \tag{11}$$

Now, the first-order condition turns out to be:

$$\frac{\partial \pi^b}{\partial L^s} = r_l - \rho(g, MC) \times L^s - r_D - 2C_1 \times L^s - C_3 \times D = 0$$

$$\text{Then, } L^s = \frac{1}{2C_1}[r_l - \rho(g, MC) - r_D - 2C_1 \times L^s - C_3 \times D] \tag{12}$$

where $\rho = \rho(g, MC)$, that is, the loan default ratio is a function of information about the borrower (g) and the marginal cost of the loan. Here, g presents information about SMEs' performance, including their creditworthiness, and the marginal cost of the loan, $MC = \frac{\partial C}{\partial L^s}$.

If an agency provides a certain amount of subsidized loanable funds to the bank (D_A) to increase its supply of loans with information about the creditworthiness of the borrower (say, ρ^*), then the total deposit of a bank is

$$D^* = D + D_A.$$

Then the new profit function of the bank with government support (agency intervention) will be

$$\pi^* = r_l \times L^* - \rho^*(g, MC) \times\, L^* - r_{D*} \times (L^* - A) - C^*. \tag{13}$$

Then, solving $\frac{\partial \pi^*}{\partial L^*} = 0$, the desired loan is L^* in Eq. 14:

$$L^* = \frac{1}{2C_1}[r_l - \rho^*(g, MC) - r_D - C_3 \times D^*] \quad (14)$$

Eq. 14 reveals that lending to SMEs will increase as the transaction costs of lending (C_1) go down because of a lower default risk with better information about the borrowers. In Eq. 14, the interest rate is expected to go down due to an improvement in the loan default ratio. Hence, in the government's agency-based lending program for SMEs, the bank's performance is expected to be better as the indicators are better than the usual situation as indicated below:

$$C^* < C, r^* < r, \rho^*(g) < \rho, D^* > D.$$

2.4 A Blended Approach: Digital Finance with Agency Information

The previous section discusses an innovative agency-based approach that involves two distinct features: The government agency provides funds to banks and information about the borrowers who received training from the agency. Both the funds and information about the borrowers reduce the fund constraints and default risks of the banks and therefore increase access to low-cost formal finance for the SMEs. This model apparently works better with limited coverage and scope. However, as the government's funds are limited, it is very unlikely to scale up the program. Moreover, the limited scope of this financing strategy might induce moral hazard problems in the selection of borrowers, which might jeopardize the model in the long run. Therefore, it is important to find a sustainable solution to the problems involved in the financing model.

Against this backdrop, we extend the model with two improvements: (i) to avoid borrower selection biases and widen the coverage of the program, instead of providing funds to the banks, in this model the government (a dedicated government agency) provides credit information about the SME borrowers to banks by making a credit scoring of the SME borrowers through credit risk analysis of the respective SMEs; and (ii) the banks use the scores to disburse loans under a digital financing method in order to reduce transaction costs and default risks that will facilitate a faster loan disbursement and recovery process. In this model, it is crucial for the government to set up a dedicated agency such as the Credit Risk Database (CRD) of Japan (Kuwahara et al. 2015)[3] to collect credit information about SMEs and provide big data analytics to come up with a credit score for each of the SMEs based on their previous credit history.

The model is expected to reduce banks' transaction costs for lending (MC_{ICT}) and improve the loan default ratio, ρ_{ICT}. The use of the digital platform, either the mobile financial service (MFS) or agent banking or any other form, is possible as the credit size for SMEs is reasonably lower than that of larger firms. In this model, we assume that ρ_{ICT} is a function of information about the borrowers from the CRD and the marginal cost of lending through a digital platform. Then,

[3] Japan's CRD is a successful database that has been created by the CRD Association. The members of the CRD Association maintain the database by offering SME financial statements. The Small and Medium Enterprise Agency of the Ministry of Economy, Trade, and Industry provides funds to the CRD Association for the development of the CRD. The public sector has also offered human resources to establish the CRD.

$$\rho_{ICT} = (g_{CRD}, MC_{ICT}). \quad (15)$$

Eq. 14 will now take the form

$$L^*_{ICT} = \frac{1}{2C_{1(ICT)}}[r_l - \rho^*(g_{CRD}, MC_{ICT}) - r_D - C_3 \times D^*]. \quad (16)$$

Thus, the digital microfinance L^*_{ICT} will depend on the marginal cost of lending C_{1ICT} through digital finance, which is expected to be lower than C_1 in Eq. (14). Whether L^*_{ICT} is greater than L^* in Eq. 14 depends on successful implementation of the digital financing strategies of the banks and the CRD. Presumably, Eq. 16 provides better results with higher coverage, and from that perspective, the blended approach in Eq. 16 is likely to produce better results than the subsidized lending-based approach in Eq. 14.

A comparative scenario of outcomes of the three financing strategies (Eqs. 12 (baseline), 14 (subsidized fund), and 16 (CRD and digital finance)) is shown in a simple form in Figure 1. Note that in the agency-based credit program, the interest rate is $r^* = r_A + \rho^* + MC^*$, that is, the interest rate will be determined by the agency's subsidized interest rate to banks (r_A), the new default risk (ρ^*), and the marginal costs of the bank (MC^*). In Figure 1, the middle line represents the supply and demand for loans in a subsidized agency-based credit program, which is better than the usual SME credit programs of the banks (baseline). The third line represents the supply of and demand for loans in a proposed blended approach of a CRD-based digital finance program, which is better than the agency-based subsidized credit program.

Figure 1: Impact of Agency's Subsidized Fund on Banks Loan Performance

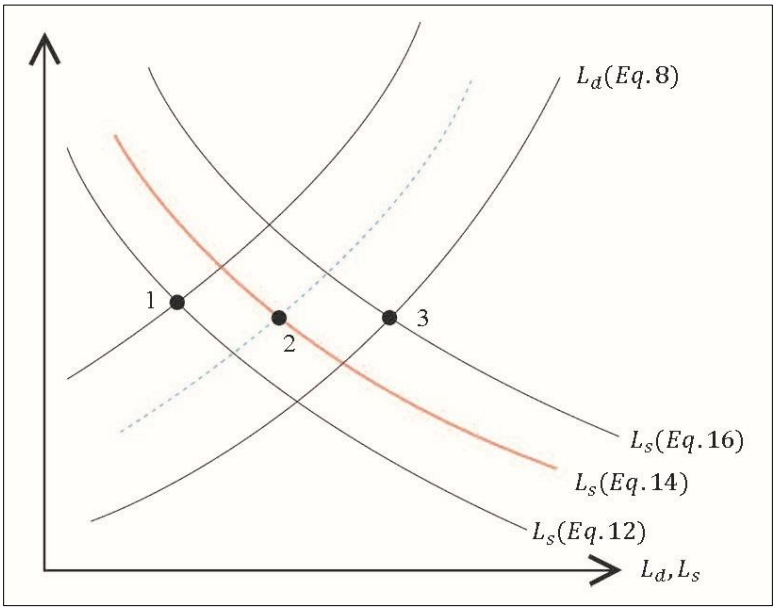


Figure 1 shows that the banks default rate will decrease and so does MC due to the government's subsidized loan fund and information about good borrowers. The equilibrium loan position will shift from [1] to [2], that is, the interest rate will decrease for the beneficiaries, and therefore the supply of loans will increase. With further innovations in Model 2, the loan equilibrium position will further shift from point [2] to point [3] in the long run. This point determines the desirable amount of credit to

SMEs with the possible lower interest rate because of the lower loan default ratio. These positive outcomes are expected to overcome financing bottlenecks for SMEs. Even credit guarantee schemes or other existing schemes may be accommodated in our proposed blended approach.

3. THE CW PROGRAM, DATA, AND VARIABLES

3.1 The CW Program

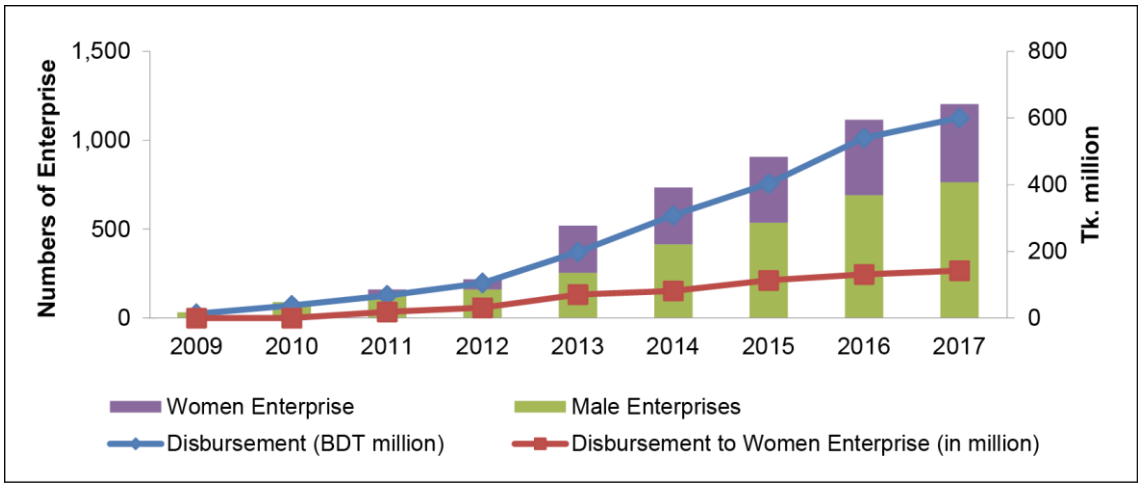
Our theoretical model predicts that a government-agency-induced program with a supply of loanable funds and information about borrowers could be beneficial for both the banks and borrowers as it reduces the default risk of the banks and thereby increases access to finance with lower interest rates for the borrowers. We consider a program, namely the Credit Wholesale Program of Bangladesh, which is run by a government agency, the SME Foundation (SMEF) of Bangladesh to understand the theoretical model. The SMEF initiated the CW program in 2009 with the objective of ensuring the supply of loans to SMEs without collateral and at a single-digit rate of interest (say, 9%, which is lower than the market rate). Under the program, the SMEF provides funds to partner financial institutions (PFIs) at a 4–5% interest rate (lower than the deposit rate) so that they can have an interest margin of about 4–5%. Furthermore, the borrower SMEs are selected from the pool of SMEF beneficiaries who had received training in business support services, and for the sake of better selection, the program is restricted to only the country's 177 SME clusters.

Furthermore, beneficiary banks adopt a group-based lending approach like the one adopted widely in microcredit programs to reduce the default risk.[4] Therefore, these two criteria for selecting borrowers—an SMEF beneficiary and being a part of group-based lending—reduce the asymmetry of information about the borrowers and increase the probability of loan repayment significantly. Therefore, these repayment criteria make banks willing to implement the program with lower interest rates and without any collateral or guarantor. Here the identification of a firm by the SMEF and including them in a group-based lending work as an implicit guarantee (without any collateral) of the credit repayment. In reality, a repayment rate of over 95% confirms the working of this strategy. Furthermore, since the beneficiary firms receive various types of training in business improvement, they are in need of financing, which is met by the CW program. Therefore, receiving loans might have an incremental beneficial impact on the performances of the firms, which also facilitated the repayment of loans under the CW program.

The CW program's coverage in terms of both loan amount and the number of beneficiaries is limited due to the fund constraints of the SME Foundation. The program has so far disbursed Tk2271.5 million to 5,000 micro and small enterprises, with a substantial number being female entrepreneurs. From 2009 to 2017, though the overall disbursement had an annual growth of 53.75%, the credit amount was still meager compared to SMEs' needs, ranging between Tk0.05 million and Tk2 million with a maximum four-year loan repayment period (Figure 2).

[4] Joint-liability mechanism works successfully as a safeguard against credit default in many microcredit programs, particularly in Bangladesh (Chowdhury, Chowdhury, and Sengupta 2014; Pitt and Khandker 2002).

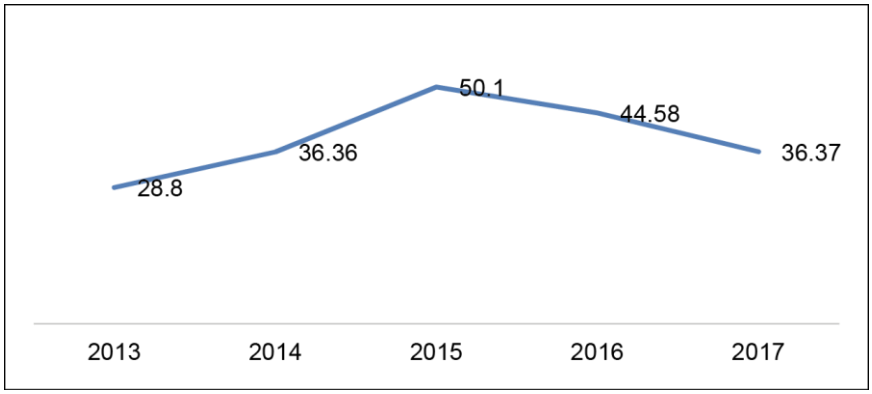
Figure 2: Growth of Beneficiaries and Amount of Credit under CW Program



Source: SME Foundation (2018).

BIDS Survey (2018) results show that credit from the CW program could meet up to only 51% of the financing needs of SMEs and contributed 26% of the total loan portfolio and 36% of other loans in 2016 (Figure 3). The main source of credit was personal savings (49.5%) followed by commercial banks (32%). The rate of interest on credit was the lowest for the CW program (9%) compared to other sources. The interest rate on credit offered by other commercial banks was reported to be approximately 11% for SMEs, and this rate jumped to around 15% when the loan was taken from NGOs or other private institutions.

Figure 3: CW Loans as a Percentage of Other Loans, 2013–2017



Source: BIDS Survey (2018).

The CW beneficiary firms appear to receive a higher amount of credit from banks compared to nonbeneficiaries, indicating a positive spillover effect of the CW program (Table 1). The reason could be that firms that receive CW credit appear to be more trustworthy and creditworthy as they were identified by the SMEF. Similarly, such recognition helps them to obtain commercial bank loans at a lower rate.

Table 1: Loan Volume, Interest Rate, and Finance Gap

A. Amount of loan (last 5 years) across sources				
	Treatment (CW beneficiary)	Control	Diff.	P-value
Loan from banks	3,133,833	1,063,750	1,412,542	0.03
Loan from CW program	546,217.9	–	–	–
Loan from personal sources	600,000	204,285.7	–196,574.1	0.65
NGOs/microfinance institutions	4,850,000	664,815.4	–4,185,185	0.02
Others	40,000	186,111.1	146,111.1	–
B. Interest on loan (%)				
Commercial bank	10.81	10.92	0.11	0.85
CW program	9.00	–		
Personal sources	12	12	0	–
NGOs/pvt. Institutions	15.25	15.20	0.05	0.97
Others*	10	12.40	–	–
C. Financing gap according to the sources of finance (%)				
Commercial bank	46	67.07	21.07	0.01
CW program	51	–		
Personal sources	50	69.22	19.22	0.34
NGOs/pvt. Institutions	42.25	54.69	12.44	0.45
Others*	10	12.40	–	–

* Small sample; source: BIDS Survey (2018).

3.2 Data and Variables

In this section, we perform empirical analysis not to estimate the parameters of the theoretical model, rather to understand the outcomes of a program that is close to our proposed theoretical SME financing model. We use the data on 526 SMEs taken from a survey conducted in January–February 2018 across six divisions and ten districts of Bangladesh among both beneficiary and nonbeneficiary firms including manufacturing and service enterprises (BIDS Survey 2018). Of the sample firms, 83% are manufacturing and 17% are service firms. Sample firms were selected from the list of beneficiaries of the SMEF (who received training from the SMEF) across clusters in different locations using the PPS (probability proportional to size) method. Through this process, a total of 104 CW beneficiary enterprises (if a firm has received credit from the CW program in the last 4 years) are selected and the remaining 422 enterprises belong to non-CW beneficiary (control) enterprises. However, due to some missing information, sample size varies across regression analyses.

Access to the CW program is the key outcome variable. In addition to some common factors, such as age and gender of owner, size and age of firm, manufacturing type, ownership type, etc., we include lagged values of some performance indicators to see whether firms were selected for CW loans based on their previous year's performances.

4. ESTIMATION STRATEGY AND RESULTS

4.1 Determinants of a Firm's Access to CW Program

Given the importance of a firm's selection process for the CW program, we examine here what determines a firm's access to the CW program. We estimate the reduced-form equation as follows:

$$C_{it} = \alpha + \beta X_{it} + \varepsilon_{it} \quad (17)$$

where C_{it} is firm *i*'s access to the CW program in year *t*, X_{it} is a set of firm-level characteristics, and ε_{it} is an unobserved random error term. β are unknown parameters to be estimated.

Table 2: Determinants of Firms' Access to CW Program (Probit Model)

Variables	(1) CW in 2017 (T=42; C=348)	(2) CW in 2016 (T=37; C=228)	(3) CW in 2015 (T=40; C=308)	(4) CW in 2014 (T=12; C=303)	(5) All (T=104; C=333)
Age of owner	–0.001	–0.008***	–0.001	–0.000	–0.006***
	(0.001)	(0.003)	(0.001)	(0.000)	(.002)
Gender of owner (1=men,	–0.078**	–0.131**	–0.030	0.017***	–0.115***
0=women)	(0.035)	(0.055)	(0.033)	(0.006)	(0.052)
Enterprise size (1=micro,	–0.001	0.019	0.014	0.004	–0.023
2= small, 3=medium)	(0.014)	(0.028)	(0.016)	(0.005)	(0.022)
Manufacturing type (1–38	0.004	–0.009*	–0.000	–0.004	–0.0034
categories)	(0.002)	(0.005)	(0.003)	(0.002)	(0.0057)
Belong to a cluster	0.095**	0.104**	0.079**	–0.009	0.162***
	(0.043)	(0.050)	(0.040)	(0.009)	(0.058)
Ownership type	–0.039	–	–0.089*	0.011	–0.236***
	(0.029)		(0.051)	(0.012)	(0.078)
Member of a business	0.048*	0.030	–0.023	0.013**	–0.0088
association (1=yes, 0=no)	(0.024)	(0.039)	(0.031)	(0.007)	(0.045)
Age of firm	0.002	0.003	0.001	0.001	0.0111***
	(0.002)	(0.003)	(0.002)	(0.001)	(0.003)
Have a bank account	0.050**	–	0.069**	0.007	0.189***
	(0.025)		(0.027)	(0.009)	(0.042)
Lagged profit (%)	0.002	0.002	0.000	–0.001**	–
	(0.001)	(0.002)	(0.001)	(0.001)	
Lagged log (sale)	–0.002	–0.016	0.022**	0.002	–
	(0.008)	(0.015)	(0.011)	(0.002)	
Have taken training from SMEF	0.055***	0.022	0.103***	0.003	0.161***
	(0.021)	(0.042)	(0.026)	(0.007)	(0.037)
Lagged log (employee)	0.015	0.050*	0.001	–0.007	–
	(0.013)	(0.029)	(0.016)	(0.005)	
Observations	390	265	348	315	437

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Lagged values for some performance indicators are used to examine whether a firm's performance did matter to get access to CW program. Marginal effects are reported. T represents treatment (CW beneficiary) and C represents control (non-CW beneficiary). In Regression (5), all the CW beneficiaries during 2013–2017 are included in the model and the performance variables are excluded from the regression as their access is not commensurate with yearly performances.

We consider the access of firms to the CW program for the years 2014–2017 as the outcome variable. Since access to CW is a dummy variable, we apply the *probit* model to determine the factors. The results are reported in Table 2. In addition to some common factors, such as age and gender of owner, size and age of firm, manufacturing type, ownership type, etc., we include lagged values of some performance indicators to see whether firms were selected for CW loans based on their previous year's performances. To assess the sensitivity over time, we run several regressions over the years 2014–2017. The results suggest that 'female entrepreneurs,' 'belong to a cluster,' and 'received training from SME Foundation' are the key factors that determine firms' access to loans from the CW program. These findings are consistent with the basic criteria for eligibility of a firm to receive credit from the program. However, the previous year's performance of a firm was not found to be significant for receiving loans from the CW program, which allows us to assess the performance of the firms after their access to CW loans.[5]

4.2 Impact of CW on Firm Performances

Though the above analysis rules out the possibility of selection bias towards better firms for CW loans, there might still be some unobserved factors that may affect the firm selection process. Therefore, to overcome endogeneity biases or reverse causation, we adopt several estimation strategies.

First, we adopt an estimation strategy involving firms that received CW loans in different years over the 2013–2017 period within the cluster. Out of 104 CW beneficiaries, eight firms received credit in 2013, 11 firms in 2014, 37 firms in 2015, 31 firms in 2016, and 17 firms in 2017 (see Table 3). So, for 2013, eight firms are considered as treatment firms, and the remaining firms are considered as control. Similarly, for 2014, 19 firms (8 in 2013 plus 11 in 2014) are treatment firms and the rest are control, and so on. And then we apply the difference-in-differences estimation technique as described below in Eq. 18 to obtain the impact of CW loans on different indicators of firm performance. This estimation strategy allows us to control for selection biases.

Again, we wanted to see the impact of CW loans if all the SME beneficiary firms are considered. Our motivation here is that since all 381 firms have received training and consultancy support from the SMEF, comparing them with CW loan beneficiaries will provide a better understanding of the impact of access to formal finance on firms' performances.

We first run the following difference-in-difference regression:

$$Y_{it} = \beta_0 + \beta_1 Time_{it} + \beta_2 Treatment_{it} + \beta_3 Time_{it} * Treatment_{it} + X_{it} + u_{it} \quad (18)$$

where Y_{it} is the outcome indicator for firm *i* in period *t*, with *t* representing 2013–2017. The variable $Time_{it}$ is a dummy variable that takes the value of 1 if the year corresponds to the year(s) after the intervention (CW loan) is received and 0 otherwise. This *time* variable captures the impact of the duration since the first CW loan is taken. The *Treatment* variable is also a dummy variable that is 1 if the firm received the CW loan anytime between 2013 and 2017 and 0 otherwise. β_1 captures the time trend common to treatment and control firms. β_2 accounts for the average permanent difference in outcome variables between the treatment and control firms. The

[5] In the survey, information on performance indicators of firms, such as sales, production, profit, etc., was collected for several years on a retrospective basis.

coefficient β_3 captures the treatment effect—the impact of CW on the outcome variables. We run OLS to estimate the impact of CW loans at the firm level. We use a wide range of control variables (X_{it}) that might have a bearing on the likelihood of being treated. These include firm size, firm location, whether the firm is a member of a business association, types of ownership, age of the factory, and so on. The results are reported in Table 3. Columns 1, 3, and 5 report the results for the treated firms only while columns 2, 4, and 6 report the results for the combined sample for different time periods (years).

Table 3: Impact of CW on Firm Performances

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	**Log (Sales Revenue) (Only Treated Firms)**	**Log (Sales Revenue) (All SMEF Beneficiaries)**	**Profit (Only Treated Firms)**	**Profit (All SMEF Beneficiaries)**	**Log (Productivity) (Only Treated Firms)**	**Log (Productivity) (All SMEF Beneficiaries)**
Time	–2.817***	–3.205***	–0.088***	–0.129***	–2.523***	–2.540***
	(0.238)	(0.101)	(0.007)	(0.012)	(0.291)	(0.209)
Treated	0.160	0.179**	0.016**	0.020	0.098	0.080
	(0.136)	(0.088)	(0.008)	(0.015)	(0.122)	(0.077)
Diff-in-diff	3.047***	3.422***	0.061***	0.101***	2.632***	2.616***
(Time*treated)	(0.268)	(0.134)	(0.012)	(0.020)	(0.306)	(0.224)
Small	–1.821***	0.624***	0.057***	–0.116***	–2.980***	0.284**
	(0.553)	(0.154)	(0.009)	(0.020)	(0.396)	(0.126)
Medium	1.663***	1.639***	–0.021**	–0.060***	0.490***	0.298***
	(0.167)	(0.100)	(0.008)	(0.015)	(0.165)	(0.093)
Micro	0.537***	0.723***	–0.002	–0.049***	0.206	0.289***
	(0.133)	(0.071)	(0.006)	(0.015)	(0.138)	(0.060)
Manufacturer	0.827***	0.729***	–0.086***	–0.079***	0.202	0.249***
	(0.213)	(0.093)	(0.010)	(0.018)	(0.207)	(0.073)
Firm's age (years)	0.014**	0.056***	0.000	–0.000	–0.000	0.016***
	(0.006)	(0.006)	(0.000)	(0.001)	(0.006)	(0.004)
Months of operation (in a year)	0.446***	0.407***	–0.010	0.027***	0.422***	0.318***
	(0.083)	(0.047)	(0.007)	(0.003)	(0.068)	(0.039)
Age of firm owner	0.016**	0.002	–0.000	–0.000	0.005	0.005
	(0.008)	(0.005)	(0.000)	(0.001)	(0.007)	(0.004)
Gender of firm owner	–0.165	–0.700***	0.015**	0.046***	0.038	–0.417***
	(0.147)	(0.084)	(0.007)	(0.010)	(0.146)	(0.068)
Education of owner	–0.036*	0.075***	–0.010***	–0.008***	–0.047***	–0.011
	(0.020)	(0.015)	(0.001)	(0.002)	(0.017)	(0.012)
Constant	7.862***	8.175***	0.534***	0.084*	7.605***	8.991***
	(1.102)	(0.595)	(0.086)	(0.049)	(0.958)	(0.495)
Observations	485	1,618	485	1,618	485	1,616
R-squared	0.441	0.435	0.154	0.197	0.288	0.169

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

4.3 Assessing Spillover Benefits of the CW Program

Further, we attempt to examine whether participation in the CW program has any spillover effect on firms' overall access to credit. For example, a firm's access to CW credit might facilitate its access to credit from other sources, such as banks and nonbanks, due to its good track record of loan repayment under the CW program as well as its relationship with banks. Therefore, we make an attempt to test further whether participation in the CW program has an impact on the volume of loans, loan interest rate, and reducing the financing gap. Thus, our regression model specification here is as follows:

$$F_{it} = \beta C_{it} + \gamma X_{it} + \varepsilon_{it} \quad (19)$$

where F_{it} represents financing indicators such as loan, interest rate, and finance gap, C_{it} represents firm *i*'s access to the CW program at time *t* (1 if a firm gets credit under the CW program), and X_{it} is a set of firm-level characteristics. β and γ are unknown parameters to be estimated, and ε_{it} is a zero-mean disturbance term.

Following the specification in Eq. 19, we run several regressions in Table 4. First, in Column 1 we assess the impact of participation in the CW program on bank loans (other than CW loans) taken in 2017. We observe that CW participation has a negative but insignificant effect on firms' access to a bank loan. Next, in column 2 we assess whether CW participation has any impact on the total loan a firm receives from various sources. We see that CW has a significant impact on a firm's access to loans, implying that a CW loan improves the firm's capacity to obtain credit from other sources. CW participation increases the chances of a firm receiving loans from other sources by 40%. Further, to substantiate the findings, we examine the impact of CW access on the ratio of bank loans to CW loans in column 3. We find that participation in CW increases the amount of bank loans for the respective firm significantly, indicating that a firm that receives a loan under the CW program has a higher probability of obtaining a loan from other sources. Next, from the regression results reported in Column 4, we observe that participation in the CW program reduces the financing gap of a firm significantly, which is about 59%. Finally, the results suggest that a CW beneficiary firm might enjoy some benefits from the bank because of its good reputation for loan repayment (lower default risk) with the bank. This analysis indirectly suggests that CW participation reduces the loan default risk of a bank.

This analysis encourages us to believe that a subsidized loan program with information (training and other soft information) about the borrowers might increase the access to finance for SMEs and improve their performances. Due to the low default risk under this program, a bank may become interested in providing loans to CW beneficiaries beyond its regular program. The findings have interesting caveats. Information about the credit track record of a firm (SME) plays a crucial role regarding further opportunities for the firm to gain access to finance. Therefore, a credit scoring based on a firm's previous credit history might be useful for credit disbursements to that firm. This is consistent with our theoretical proposition that credit risk analysis and a scoring method might play a crucial role in widening the access to formal finance for SMEs. As the digital finance method could reduce the transaction costs, adopting the digital finance method for SME finance could be a viable option for the banks. Therefore, a credit-risk score might be instrumental for adopting digital finance for SMEs.

A sustainable financing strategy for SMEs should aim to enhance the supply of loanable funds to banks with a provision to identify good borrowers, which reduces the transaction costs and default risks of banks. This purpose is being served by the CW program. However, the CW program works better because of its low coverage and low scalability. This also allows banks to apply a joint-liability approach. But the challenge lies in scaling up the program where joint liability may or may not work if firms are not located in a cluster or clientele. In that situation, the role of the organization that will be in charge of SME financing will be crucial, particularly in identifying the borrowers. Further, choosing beneficiaries by an agency like the SME Foundation might involve certain risks of moral hazard and politicization of the program. To address the problem, in this paper a model of digital finance with support from a government agency dedicated to collecting data and analyzing the credit risk of SMEs and preparing credit scores of SMEs is suggested.

Table 4: OLS Estimates on the Impact of CW Program on Firms' Financial Indicators

Variables	(1) Log (Bank Loan in 2017)	(2) Log (Total Loan in 2017)	(3) Ratio of Bank Loan to CW Loan	(4) Log (Finance Gap)	(5) Log (Interest Rate in 2017)
CW (1=beneficiary, 0=nonbeneficiary)	–0.332	2.840***	0.113*	–0.594***	–0.022
	(–0.75)	(3.95)	(1.60)	(–3.74)	(–1.37)
Enterprise size	–0.209	–0.134	–0.009	–0.012	0.000
	(–0.97)	(–0.50)	(–0.58)	(–0.15)	(0.08)
Age of firm	–0.065***	–0.078***	–0.000	–0.023***	0.000
	(–3.62)	(–3.36)	(–0.22)	(–3.16)	(0.67)
Owner's education	0.215	–0.455*	0.025	0.003	–0.005
	(1.18)	(–1.77)	(1.23)	(0.05)	(–1.46)
Log (total employees in 2017)	0.876***	1.246***	0.038*	0.446***	–0.004
	(3.89)	(4.45)	(1.92)	(5.06)	(–1.12)
Training received from SMEF	–0.408	–0.456	0.008	–0.070	–0.006
	(–1.04)	(–0.92)	(0.38)	(–0.49)	(–0.86)
Participated in SME Fair	0.150	–0.602	0.012	0.488***	–0.012
	(0.40)	(–1.10)	(0.56)	(3.09)	(–1.38)
Constant	2.353**	5.216***	–0.106	0.719	0.027
	(1.98)	(3.27)	(–1.08)	(1.55)	(1.18)
Observations	507	507	507	507	507
R-squared	0.074	0.134	0.044	0.133	0.986

Robust t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

5. CONCLUSIONS

This paper proposes two alternative financing strategies for SMEs. One is based on subsidized funds from the government channeled through banks and financial institutions with support in selecting good borrowers. Under this model, our theoretical proposition suggests that a subsidized fund reduces banks' marginal costs, and information about the borrowers (e.g., information about the training and human capital) reduces the default risks of the banks. The model does not require collaterals and guarantees because providing information about the borrowers works here as an implicit guarantee. Therefore, under this financing strategy, a firm can get credit with a collateral-free lower interest rate, which might improve its performance. Our motivation for this financing strategy comes from a similar financing model, namely the Credit Wholesale program in Bangladesh. Our empirical results suggest that the financing conditions and benefits of the Credit Wholesale program are consistent with the prediction of our theoretical model.

From empirical analysis, we find that participation in the CW program not only improves overall access to finance, but it also improves SMEs' performance by giving them better access to credit from other sources too. We observe that the supply of funds and indirect selection of borrowers by the SME Foundation make the CW program successful in terms of collateral-free low-interest credit with a higher than 95% repayment rate. However, apparently, the program has been successful because of its small coverage and limited financing capabilities. The challenge lies in the scaling up of the program and its sustainability in the long run.

The program might suffer from selection biases because of moral hazard and political interferences as the subsidized government fund is involved, which might jeopardize the program by increasing the default risk. To overcome the problem, we propose an alternative financing model for SMEs based on credit information about SME borrowers and the disbursement of loans through digital platforms. In this model, instead of the government's subsidized fund, a government agency will analyze the credit information of SMEs using big data analytics or other methods to create a score for each of the firms. Later, banks will use the score while approving loans to the respective firm. This mechanism might reduce the default risks of the banks, which will allow banks to charge a lower interest rate. We also propose adopting a digital financing approach in disbursing loans, which might reduce transaction costs by accelerating the process. The credit-score-based digital finance mechanism is expected to overcome the selection biases in SME borrower selection.

A sustainable financing approach for SMEs is a long-standing objective of respective governments, particularly in developing countries. Since the developing country governments do not have enough funds to cater to the needs of the SMEs, the governments could rather invest in creating institutions for providing unbiased credit risk scores for the SMEs and providing training to SMEs in business, human capital, and financial matters. At the same time, governments should invest in developing digital financing platforms to accelerate the financing process. All these efforts together could provide a basis for sustainable financing for SMEs.

REFERENCES

BIDS Survey (2018). Impact Assessment of SME Foundation's Activities, Bangladesh Institute of Development Studies (BIDS), Dhaka.

Beck, T., and A. Demirgüç-Kunt. 2006. Small and Medium-size Enterprises: Access to Finance as a Growth Constraint. *Journal of Banking and Finance* 30: 2931–2943.

Chowdhury, S., P. R., Chowdhury, and K. Sengupta. 2014. Sequential Lending with Dynamic Joint Liability in Micro-finance. *Journal of Development Economics* 111(2014): 167–180.

Demirgüç-Kunt, A., and M. S. Martínez Pería. 2010. A Framework for Analyzing Competition in the Banking Sector: An Application to the Case of Jordan. Policy Research Working Paper 5499, The World Bank, Development Research Group, December.

Fafchamps, M., and M. Schündeln. 2013. Local Financial Development and Firm Performance: Evidence from Morocco. *Journal of Development Economics* 103:15−28.

Hossain, M., N. Yoshino, and F. Taghizadeh-Hesary. 2021. Optimal Branching Strategy, Local Financial Development, and SMEs' Performance. *Economic Modelling* 96(March 2021): 421–432.

INSPIRED SME Survey (2013). *Ministry of Industries, Government of Bangladesh.*

Inha Oh, J.-D. Lee, A. Heshmati, and G.-G. Choi 2009. Evaluation of Credit Guarantee Policy Using Propensity Score Matching. *Small Business Economics* 33: 335–351.

International Finance Corporation (IFC). 2013. Closing the Credit Gap for Formal and Informal Micro, Small and Medium Enterprises, IFC, The World Bank Group.

International Monetary Fund (IMF). 2015. Financial Access Survey, IMF, Washington DC.

Kang, D. 2005. Corporate Distress and Restructuring Policy of Korean Small and Medium-sized Enterprises: Role of Credit Guarantee Scheme. (Paper presented at the 2005 KDI-KAEA conference, Korea Development Institute, Seoul, Republic of Korea).

Kuwahara, S., N. Yoshino, M. Sagara, and F. Taghizadeh-Hesary. 2015. Role of the Credit Risk Database in Developing SMEs in Japan: Lessons for the Rest of Asia. ADBI Working Paper 547. Tokyo: Asian Development Bank Institute. Available: http://www.adb.org/publications/role-credit-risk-database-developing-smes-japan-lessonsrest-asia/.

Love, I., and M. S. Martínez Pería. 2015. How Bank Competition Affects Firms' Access to Finance. *The World Bank Economic Review* 29(3): 413–448.

Ministry of Finance 2016. Bangladesh Economic Review, 2016. Dhaka: Ministry of Finance. The Government of Bangladesh.

Pitt, M. M., and S. R. Khandker. 2002. Credit Programs for the Poor and Seasonality in Rural Bangladesh. *Journal of Development Studies* Taylor & Francis Journals, 39(2): 1–24.

SME Foundation. 2017. Sustainable SME Banking Modeling. http://www.smef.org.bd/v2/smef_download/credit/papers/Sustainable_SME_Banking_Modeling.PDF (accessed 5 January 2020).

———. 2018. Credit Wholesale Program. https://www.slideshare.net/Suman_saha/credit-wholesaling-program-of-sme-foundation (accessed 10 March 2020).

Yoshino, N. 2015. The Credit Guarantee System and Policy-based Finance for Small- and Medium-sized Enterprises and a Database of Small- and Medium-sized Enterprises (Japanese). Policy Discussion Papers (Japanese) 15003, Research Institute of Economy, Trade and Industry (RIETI).

Yoshino, N., and F. Taghizadeh-Hesary. 2014. Analytical Framework on Credit Risks for Financing SMEs in Asia. *Asia-Pacific Development Journal* 21(2): 1−21.

———. 2015. Analysis of Credit Risk for Small and Medium-Sized Enterprises: Evidence from Asia. *Asian Development Review (ADR)* 32(2): 8−37, MIT Press.

———. 2019. Optimal Credit Guarantee Ratio for Small and Medium-sized Enterprises' Financing: Evidence from Asia. *Economic Analysis and Policy* 62(June 2019): 342–356.