

Impact of Microcredit on SMEs Performance in Malaysia

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Abstract

This study investigates the relationship between access to microcredit and SMEs' performance. Using survey data on SME's owners/managers in Terengganu, Malaysia in 2016, the study investigates how access to microcredit affects SME sales and employment growth. Employing the Propensity Score Matching method (PSM), the study showed that SMEs with microcredit borrowing had their sales 25.6% to 25.7% higher than non-microcredit borrowers. After minimizing the selection bias from both observable and unobservable characteristics using Differences in Differences method (DID), the difference was much larger (28.7%). However, both PSM and DID analyses revealed no impact of microcredit access on SME employment growth. The Endogenous Switching Regression method (ESR) confirmed these findings.

Keywords: Microcredit, Malaysia, SME performance, Propensity Score Matching, Endogenous Switching Regression

JEL classifications: L26; O53

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1. Introduction

Small and medium enterprises (SMEs) are essential to a country's economic growth, particularly in developing countries. In 2016, SMEs in Malaysia¹ constituted 98.5% of the 920,065 business establishments (Department of Statistics Malaysia, 2016). However, they contributed only 65.3% total employment and 36.6% of GDP (SME Corporation Malaysia, 2017). These numbers are relatively modest compared to other ASEAN economies such as Singapore, Indonesia, Thailand, and Vietnam (ASEAN, 2015).² Saleh and Ndubisi (2006); SME Corporation Malaysia (2014) note that SMEs in Malaysia face challenges in access to technology, information and communication and under high levels of international competition. They also have limited human skilled resources as well as low levels of research and development. Overcoming these challenges involves high cost. Therefore, the limited access to credit has been a major restraint to SME developments (Aris, 2007; Chan, 2005; Wajdi Dusuki, 2008).

Recognition of the potential contribution of credit to SMEs growth and the limitation of formal credit sources for low-income groups such as SMEs give rise to microfinance programs. The Malaysian central bank introduced a Microfinance Institutional Framework in 2006 with the aim of providing credit facilities and financial assistance to SMEs. This framework comprises commercial banks, development finance institutions (DFIs) and credit unions, which aims to promote a sustainable microcredit system. However, the Department of Statistics Malaysia (2011, 2016) reported that only 21.9% (in 2011) and 32.1% (in 2016) of Malaysian SMEs received formal financing from banks, financial and microfinance institutions. Almost 95% of SMEs still relied on informal borrowings from the owners, friends and relatives to finance their enterprises.

The importance of credit and the credit constraints among Malaysian SMEs raise the need for an examination of the SMEs' financial practices to better understand their financing behaviours. However, most previous researchers investigated the accessibility of credit in various forms of financing (for example, see Abdesamed and Wahab (2014); Akoten, Sawada, and Otsuka (2006); Harvie, Narjoko, and Oum (2013). In addition, while the impact of microcredit on education, consumption and expenditure has been well studied in the literature (for example, see Al-Mamun, Malarvizhi, Hossain, and Tan (2012); Chirkos (2014); Li, Gan, and Hu (2011), the impact of microcredit on the SMEs performance is underexplored. Despite several government microcredit programs and schemes to boost SMEs activity and

¹ In Malaysia, SMEs are firms with sales turnover not exceeding RM 50 million and less than 200 full-time employees for manufacturing sector. For services and other sectors, the limit in sale turnovers and employees are RM 20 million and 75 people, respectively (SME Corporation Malaysia, 2015). However, before January 1, 2014, these limits were set at RM 25 million and 150 employees for manufacturing sector, and RM 5 million and 50 employees for services and other sectors (SME Corporation Malaysia, 2013).

² Employment shares of SMEs in Singapore, Indonesia, Thailand and Vietnam are 70%, 97%, 80.96% and 97.60%, respectively. GDP contribution of SMEs in these countries are 50%, 59.10%, 37.4% and 40%, respectively (ASEAN, 2015).

development, improvements in the way in which they are investigated have not provided comprehensive solutions to SMEs performance. Poor business performance and inadequate information are the main obstacles to SMEs obtaining finance from formal financial institutions such as commercial bank.

Therefore, this study examines the impact of microcredit participation of Malaysian SMEs on their performance. Our focus is on the sale growth and employment growth, which are popular financial indicators of firm performance (see Akoten et al. (2006); Ayyagari et al. (2010); Oh et al. (2009)). Sales and number of employees are also criteria for SME classification in Malaysia. This study overcomes the limitation of ignoring the selection bias and endogeneity in assessing the impact of microcredit on SME performance (for example, see Atmadja, Su, and Sharma (2016); Dunn and Arbuckle (2001); Hartarska and Nadolnyak (2008); Osa Ouma and Rambo (2013)). In addition, this study is not limited to Amanah Ikhtiar Malaysia (AIM)³ and National Entrepreneur Economic Fund (TEKUN)⁴ microcredit schemes (see Al-Mamun, Wahab, Mazumder, and Su (2014); Hassan and Ibrahim (2015); Mahmood and Mohd Rosli (2013) but also other microcredit schemes and providers. These include the Agro Bank and Bank Simpanan Nasional to stimulate agricultural production activities as well as expanding SMEs' activities. Furthermore, the rural credit institutions comprise the Farmers Organisation Authority, Federal Land Development Authority and agro-based co-operative societies, which also provide microcredit to the agricultural sector (Li & Rouyih, 2007). Credit Guarantee Corporation Malaysia Berhad was established to assist the micro-enterprises. They developed a scheme called Small Entrepreneur Guarantee Scheme, which offers financing from RM10,000 up to RM50,000.

The next section reviews related literature on microcredit and its impact on SMEs performance. Section 3 presents the data and methodology for the study. Section 4 reports and analyses the results. And section 5 concludes the paper.

2. Literature Review

Microcredit schemes have become important parts of SME development promotion strategies (Hulme, 2000). Hartarska and Nadolnyak (2008) suggest that the microfinance institutions presence minimizes SMEs financial constraints, provides small firms with better credit access and hence, improves their businesses. Mosley and Hulme (1998) assume that a microfinance program intervention can alter people's behaviours and practices, which leads to better achievements. Retrospective data on microfinance instructions in Guatemala, India, and Ghana shows that microfinance has a positive influence on the households and businesses of the borrowers (McIntosh,

³ AIM is a pilot microcredit project, which was launched in North-West Selangor to replicate and adopt the experience and success of the Grameen Bank in Bangladesh (AIM, 2010).

⁴ TEKUN is a microcredit program that focuses on the development of Bumiputera entrepreneurs (an ethnic group in Malaysia including native Malays and indigenous ethnic groups from Sabah and Sarawak) by providing them easy financing facilities for start-up and for further businesses expansion (Bujang, Jiram, Zarin, & Jaafar, 2015).

Villaran, & Wydick, 2011). Durrani, Usman, Malik, and Shafiq (2011) also reveal that the microcredit accessibility and provision can facilitate the poor to accumulate their assets, establish the firms, smooth the consumption, have better risk management, increase the income, and raise the living standards. The authors add that, the firms are able to enlarge their businesses and adopt more advanced technology. Consequently, the microfinance helps stimulate the firm productivity (Islam, 2016).

Despite the positive impact of microfinance on the borrowers, there exists evidences on a negative impact. For example, Atmadja et al. (2016) find a negative association between microcredit and a firm's profit among Indonesian microenterprises. They suggest that higher profits allow firms to replace debts such as microcredit with retained earnings and thus, the microcredit is lower. Similarly, Bauchet and Morduch (2013) also oppose the job-creation role of microcredit for the economy. Mokhtar and Ashhari (2015) claim that microcredit borrowings do not contribute to the business success because firms should have obtained necessary skills before receiving the microcredit financing.

It is obvious from the literature that microcredit can have different influences on SMEs performance. However, most previous studies were either descriptive or ignored the selection bias and endogeneity (Atmadja et al., 2016; Dunn and Arbuckle, 2001; Hartarska and Nadolnyak, 2008; Osa Ouma and Rambo, 2013). Accessing the impact of microcredit on SMEs performance requires the isolation of the intervention effect from other factors (Khandker, 2005). This is usually referred to as a counterfactual, which means what would have happened to the participants if there is no such microcredit program (Baker, 2000; Hulme, 2000). Ignoring the selection bias and endogeneity can distort the results and lead to an over- or under-evaluation the effect of microcredit (Islam, 2016; Nguyen, 2007). Most studies, which address the selection bias, have found positive impacts of microcredit on SMEs performance (see Tedeschi (2008), Peprah and Ayayi (2016), Quaye and Hartarska (2016)).

Regarding the impact of microcredit on SMEs in Malaysia, Al Mamun, Malarvizhi, Abdul Wahab, and Mazumder (2010) examine the AIM's microfinance program and show that the microfinance boosts the SME's income in Peninsular Malaysia. Similarly, Mahmood and Mohd Rosli (2013) employ a regression analysis on 756 micro and small enterprises and find a significant impact of the AIM and TEKUN microcredit schemes on a firm's performance. The authors conclude that a microcredit scheme is effective in bridging the financial gap and enhancing the SMEs performance in Malaysia. Hassan and Ibrahim (2015) study on 350 firms in Penang, Malaysia discloses the usefulness of the microcredit program among the respondents by showing that most respondents felt the usefulness of the program and that the program helps increase the business income of the respondents. Therefore, the authors conclude that microcredit programs exert a positive influence on a firm's business.

Therefore, our hypotheses on the effect of microcredit on SME performance are:

H1: Microcredit participation positively affects Malaysian SMEs' sale growth.

H2: Microcredit participation positively affects Malaysian SMEs' employment growth.

3. Data and Methodology

3.1 Data

This study uses survey data on SMEs in Terengganu (East Coast of West Malaysia) from February to March 2016. A total of 600 survey questionnaires were distributed. We received 596 responses, of which, 98 responses had inadequate information. This yielded 498 useable responses, with an 83.6% response rate.

3.2 Methodology

The participation in microcredit program is a binary choice, and can be denoted as D . For a $D = 1$, the firm participates in the program. For a $D = 0$, it does not participate. We denote the observed outcome as Y , which can take two values depending on the program participation. Accordingly, Y_1 and Y_0 are the outcome of the participant and non-participant, respectively. The impact of the microcredit program on the outcome of a firm i is the difference between the outcomes obtained when participating and not participating in the program:

$$\Delta_i = Y_{1i} - Y_{0i} \quad (1)$$

This study employs two outcomes indicators, which are sales growth and employment growth. The sales growth is measured as the logarithm changes in a SME i 's total sales between the current period and two years ago. The employment growth is measured as the logarithm change in a SME i 's total workers⁵ between the current period and two years ago. The transformation of the dependent variables (outcomes) by taking logarithms has the advantage of reducing the range of the variables and making estimates less sensitive to extreme values (Wooldridge, 2009).

A major challenge in estimating the impact of microcredit on SME performance is obtaining a reliable estimate of counterfactual outcomes. This study utilizes several methods to address this issue. These methods include Propensity Score Matching (PSM), Differences in Differences (DID), and Endogenous Switching Regression (ESR).

⁵ SMEs were asked how many full-time workers they employed; casual and part time workers are not included.

3.2.1 Propensity Score Matching Method

PSM matches participants and non-participants of a program using identical observable characteristics (X) to address the selection bias caused by observable differences between the treatment and control groups by matching (see Baker (2000); Oh et al. (2009); Peprah and Ayayi (2016); Quaye and Hartarska (2016); Shahriar (2012) for example). The PSM method is carried out through two steps. The first step involves estimating the propensity score from observed characteristics X that can affect the probability of the SME to have microcredit borrowing. This can be done by running a logit regression on a set of variables that significantly affect SME microcredit participation. These variables include Married, Ethnicity, Financial training, Age of enterprise, Ownership, Networking with NGOs and Business associations (see Table A.1).⁶ In addition, we also include Gender, Age, Income earner and Sector to balance all covariates (Augurzky & Schmidt, 2001).

The PSM matching creates a new data set consisting of the borrowers and non-borrowers, which are comparable in terms of the observed characteristics in the original data. The comparison between microcredit borrowers and non-borrowers is performed over a common support region with similar characteristics. Out of 498 enterprises, only one SME is outside the common support and is excluded from the analysis. This indicates that the treatment and control groups are similar in terms of observable characteristics, which increases the likelihood of being matched. This study used the remaining 497 enterprises (385 treated and 112 controls) for analysis. The unmatched comparison unit is discarded (Further information can be provided upon request).

The second step requires the estimation of the average treatment effect (ATE) and the average treatment effect on the treated (ATT) to determine the effect of the program on the participants' outcomes. ATE is the difference in expected outcomes between treated and control firms is ATE. Whereas, ATT measures the difference in the outcomes of the treated firms when they are treated and not been treated (Caliendo & Kopeinig, 2008). Since this study is interested in the microcredit participants, ATT is the parameter of interest.

$$\delta_{PSM}^{ATT} = E(Y_1|X, D = 1) - E_X[E(Y_1|X, D = 0)|D = 1] \quad (2)$$

3.2.2 Differences in Differences Method

PSM method addresses the selection bias by controlling for observable factors only (Dehejia & Wahba, 2002). Therefore, Heckman, Ichimura, and Todd (1997) suggest a combination of PSM and DID to additionally control for unobservable factors. DID compares before (b) and after (a) estimates for the microcredit borrowers

⁶ Even though the analysis shows a significant effect of household income on the participation in microcredit, the variable is excluded when estimating the propensity score. According to Caliendo and Kopeinig (2008), variables included in the model should not be influenced by anticipation of participation.

and non-borrowers. The comparison is based on the matching sample after PSM, and thus, make the standard DID assumptions more plausible.

The DID regression is given as:

$$Y_{it} = \beta_0 + \delta_0 d2_t + \beta_1 P_i + \gamma M_{it} + \varepsilon_i \quad (3)$$

Where, Y_{it} is the outcome of SME i at period t . Y_{it} is proxied by the SME's sales growth and employment growth, respectively. The time dummy variable is represented by $d2_t$, which equals 1 for year t and 0 otherwise. P_i is a group dummy variable, which equals 1 if SME i borrows from microcredit, and 0 otherwise. M_{it} is an interaction between $d2_t$ and P_i . M_{it} equals 1 if SME i borrows from microcredit in year t , and 0 otherwise. If there exists a correlation between the error terms and the treatment status ($corr(\varepsilon_i, M_{it}) \neq 0$), there is an estimation bias.

An unbiased estimate is obtained by subtracting the difference outcome of the treatment group (microcredit borrower) over the two periods and similarly, for the control group. Then, one subtracts the difference between the treated and control groups over two periods. The DID estimate is given as:

$$DID = E(Y_{i,t+1} - Y_{it} | D = 1) - E(Y_{i,t+1} - Y_{it} | D = 0) \quad (4)$$

3.2.3 Endogenous Switching Regression Method

Another important issue in assessing the impact of microcredit on SME performance is the endogeneity issue, which is caused by the correlation between the error term and the explanatory variable (Gamage, 2013). The causal effect between SMEs performance and microcredit participation has been identified in Khalily and Khaleque (2013) study. On one hand, microcredit providers have opportunity to screen SME applications and provide credit to wealthy enterprises, which are expected to achieve better performances. On the other hand, SMEs with credit access can expand and generate higher profits, thereby enabling their growth. Therefore, access to credit is endogenous.

Following Khalily and Khaleque (2013) study, we also employ the Endogenous Switching Regression (ESR) method to investigate the microcredit effect on SME performance. The ESR method involves using a two-stage method to derive consistent starting values. The first step involves estimating a selected equation based on a discrete choice model on SME participation in microcredit (Maddala, 1983). The selected equation is given as:

$$D_i = 1 \text{ if } D_i = \alpha Z_i + u_i > 0, D_i = 0, \text{ otherwise} \quad (5)$$

Where D_i is the SME microcredit status, which equals 1 if the SME borrows from microcredit, and 0 otherwise. Z_i is a vector of the firm's owner characteristics; household characteristics; SME characteristics, networking and distance; u_i is the error term. Equation (5) is estimated using binary probit regression since D_i is a binary variable.

The second step involves estimating the coefficients for the effect of microcredit on SME performance by considering two regime equations for microcredit borrowers and non-microcredit borrowers. Specifically,

$$\text{Regime 1 (SMEs with microcredit): } Y_{1i} = \delta_1 X_i + \epsilon_{1i} \text{ if } D_i = 1 \quad (6a)$$

$$\text{Regime 2 (SMEs without microcredit): } Y_{0i} = \delta_0 X_i + \epsilon_{0i} \text{ if } D_i = 0 \quad (6b)$$

Where Y_{1i} and Y_{0i} are outcomes (sales growth and employment growth) for microcredit borrowers and non-microcredit borrowers, respectively. ϵ_{1i} and ϵ_{0i} are random disturbance terms. X_i is a set of exogenous variables that may influence the outcomes. X_i comprises of all variables in Z_i , except “Distance”.⁷

Following Maddala (1983), the covariance matrix of u_i , ϵ_{1i} and ϵ_{0i} is presented as:

$$\Omega = \begin{bmatrix} \sigma_u^2 & \sigma_{1u} & \sigma_{0u} \\ \sigma_{1u} & \sigma_1^2 & \cdot \\ \sigma_{0u} & \cdot & \sigma_0^2 \end{bmatrix} \quad (7)$$

where σ_u^2 , σ_1^2 and σ_0^2 are variances of u_i , ϵ_{1i} and ϵ_{0i} , respectively. σ_{1u} , and σ_{0u} are covariances of u_i and ϵ_{1i} and u_i and ϵ_{0i} , respectively.

$\rho_1 = \sigma_{1u}^2 / \sigma_u \sigma_1$ is a correlation coefficient between ϵ_{1i} and u_i , and $\rho_0 = \sigma_{0u}^2 / \sigma_u \sigma_0$ is a correlation coefficient between ϵ_{0i} and u_i . The significant difference from zero of either ρ_1 or ρ_0 evidences the endogeneity of microcredit participation and suggests the usefulness of ESR method (Lokshin & Sajaia, 2004).

The system of equations (5), (6a), and (6b) are estimated simultaneously using full-information maximum likelihood method (Lokshin & Sajaia, 2004). Table 1 describes the study’s main variables.

⁷ Since ESR estimation requires at least one variable in Z_i that does not appear in X_i . The excluded variable should affect the accessibility of microcredit but have no effect on the outcomes. We choose “Distance” as an identifying instrument since it positively and significantly affects access to credit, but does not affect SME performance (Petersen and Rajan, 2002). Table A.1 and the OLS Regression Results on Sale and Employment Growth confirm this effect. These information can be provided upon request.

Table 1. Variables Description

Variable	Definition	Measurement
SME Performance		
SALE	Sales growth	Log (Total Sales ₂₀₁₄) – Log (Total Sales ₂₀₁₂)
EMPLOYMENT	Employment growth	Log (Employee ₂₀₁₄) – Log (Employee ₂₀₁₂)
Microcredit participation		
D	Microcredit participation	Dummy variable, equals 1 if SMEs borrow with microcredit, and 0 for female
Owner/managers' characteristics		
Gender	Gender of SME's owner/manager	Dummy variable, equals 1 for male, and 0 for female
Age ₍₁₎	SME's owner/manager who are under 35 years old	Dummy variable, equals 1 if SME's owner/manager is under 35 years old, and 0 otherwise
Age ₍₂₎	SME's owner/manager who is 36-45 years old	Dummy variable, equals 1 if SME's owner/manager is 36-45 years old, and 0 otherwise
Age ₍₃₎	SME's owner/manager who is over 46 years old	Dummy variable, equals 1 if SME's owner/manager is over 46 years old, and 0 otherwise
Married	Marital status of SME's owner/manager	Dummy variable, equals 1 if married, and 0 otherwise
Ethnicity	Ethnicity of SME's owner/manager	Dummy variable, equals 1 if ethnicity is Malay, and 0 otherwise
Financial training	Whether the owner/managers receive financial training	Dummy variable, equals 1 if owner/manager received financial training, and 0 otherwise
Experience	Owner/manager experience before running business	Dummy variable, equals 1 if owner/manager received has work or business experience before own running business, and 0 otherwise
Household characteristics		
Household size ₍₁₎	Number of people in the household	Dummy variable, equals 1 for 3 or fewer people, and 0 otherwise
Household size ₍₂₎	Number of people in the household	Dummy variable, equals 1 for 4 people, and 0 otherwise
Household size ₍₃₎	Number of people in the household	Dummy variable, equals 1 for 5 or more people, and 0 otherwise
Income earners ₍₁₎	Number of income earners in the SME's owner/manager household	Dummy variable, equals 1 for 1-2 people, and 0 otherwise
Income earners ₍₂₎	Number of income earners in the SME's owner/manager household	Dummy variable, equals 1 for 3-4 people, and 0 otherwise
Income earners ₍₃₎	Number of income earners in the SME's owner/manager household	Dummy variable, equals 1 for more than 4 people, and 0 otherwise
Household income	Household annual income	Discrete variable, 1- RM 1000 to RM 2000; 2 – RM 2001 to RM 3000; 3 – RM 3001 to RM4000; and 4 - over RM4000
SME characteristics		
Age of enterprise	Number of years established	Survey year – year of establishment (refers to the year SMEs started the business before registering with the state)
Ownership	Ownership of the firm	Dummy variable, equals 1 if firm is sole proprietor, and 0 otherwise
Manufacturing sector	SME operates in manufacturing sector	Dummy variable, equals 1 if firm is in manufacturing sector, and 0 otherwise
Service sector	SME operates in service sector	Dummy variable, equals 1 if firm is in service sector, and 0 otherwise
Agriculture sector	SME operates in agriculture sector	Dummy variable, equals 1 if firm is in agriculture sector, and 0 otherwise
Distance	Distance between borrower and microcredit providers	Continuous variable, measure in kilometre
Networking		
Commercial bank	The extent to which the firm networks with a commercial bank	Likert (5 point) scale, ranging from 0 = "Not at all" to 5 = "very extensive"
NGO	The extent to which the firm networks with a non-profit organization	Likert (5 point) scale, ranging from 0 = "Not at all" to 5 = "very extensive"
MFI	The extent to which the firm networks with a microfinance institution	Likert (5 point) scale, ranging from 0 = "Not at all" to 5 = "very extensive"
Business associations	The extent to which the firm networks with a business association	Likert (5 point) scale, ranging from 0 = "Not at all" to 5 = "very extensive"

Note: Age₍₁₎, Household size₍₁₎, Income earner₍₁₎, and Agriculture sector are set as reference groups to avoid multicollinearity.

4. Results

4.1 Descriptive Statistics

Table 2 exhibits the characteristics of SMEs in the survey sample. Table 2 shows that most SME owners/managers are males, age from 36-55 years old, married, Malay ethnic, had experience before running business, in families with more than 4 people, 2 to 3 income earners, and more than RM 4000 annual income. Most SME firms have established from 5 to 15 years, have sole proprietorship ownership, and operate in the service sector. This pattern is also observed across microcredit borrowers and non-borrowers. However, the chi-square tests for the significant difference in the respondents characteristics between the microcredit borrowers and non-borrowers suggest that SME owners/managers' age, marital status, ethnicity, household size, income earner, household income, and firm age are different between the two groups.

Table 2. Profile of the Sampled Respondents

		Non-microcredit borrowers		Microcredit borrowers		All Respondents		Statistical Test
		N _t	%	N _c	%	N	%	
Gender	Female	27	24.1%	101	26.2%	128	25.7%	$\chi^2 = 0.193$
	Male	85	75.9%	285	73.8%	370	74.3%	
Age	Below 35 years	28	24.9%	43	11.1%	72	14.2%	$\chi^2 = 19.353***$
	36-45 years	46	41.1%	142	36.8%	188	37.8%	
	46-55 years	33	29.5%	157	40.7%	190	38.2%	
	More than 55 years	5	4.5%	44	11.4%	49	9.8%	
Marital Status	Single	8	7.1%	10	2.6%	18	3.6%	$\chi^2 = 27.671***$
	Married	91	81.3%	369	95.6%	460	92.4%	
	Divorce	13	11.6%	7	1.8%	22	4.0%	
Ethnicity	Malays	74	66.1%	306	79.3%	380	76.3%	$\chi^2 = 9.648**$
	Chinese	30	26.8%	63	16.3%	93	18.7%	
	Indian	8	7.1%	16	4.1%	24	4.8%	
	Kanaan	0	0.0%	1	0.3%	1	0.2%	
Experience	No	34	30.4%	119	30.8%	153	30.7%	$\chi^2 = 0.009$
	Yes	78	69.6%	267	69.2%	345	69.3%	
	2	10	8.9%	16	4.1%	26	5.2%	
	3	19	17.0%	48	12.4%	67	13.5%	
Household Size	4	37	33.0%	109	28.2%	146	29.3%	$\chi^2 = 9.545**$
	5	22	19.6%	114	29.5%	136	27.3%	
	Over 5	24	21.4%	99	25.6%	123	24.7%	
Income earner	1	11	9.8%	23	6.0%	34	6.8%	$\chi^2 = 8.640*$
	2	40	35.7%	105	27.2%	145	29.1%	

	Non-microcredit borrowers		Microcredit borrowers		All Respondents		Statistical Test	
	N _t	%	N _c	%	N	%		
Household income	3	30.4%	122	31.6%	156	31.3%	$\chi^2 = 13.367^{***}$	
	4	7.1%	58	15.0%	66	13.3%		
	Over 4	17.0%	78	20.2%	97	19.5%		
	RM1000-RM2000	4	3.6%	17	4.4%	21		4.2%
	RM2001-RM3000	4	3.6%	40	10.4%	44		8.8%
	RM3,001 - RM4,000	10	8.9%	72	18.7%	82		16.5%
	Over RM4,000	94	83.9%	257	66.6%	351		70.5%
Age of firm	Less than 5 years	36	32.1%	35	9.1%	71	14.3%	$\chi^2 = 73.066^{***}$
	5 to 9 years	50	44.6%	96	24.9%	146	29.3%	
	10 to 14 years	14	12.5%	161	41.7%	175	35.1%	
	15 to 19 years	7	6.3%	66	17.1%	73	14.7%	
	More than 20 years	5	4.5%	28	7.3%	33	6.6%	
Ownership	Household business establishment	6	5.4%	9	2.3%	15	3.0%	$\chi^2 = 4.654$
	Sole proprietorship	98	87.5%	341	88.3%	439	88.2%	
	Collective/ Co-operative	2	1.8%	3	0.8%	5	1.0%	
	Limited liability company	6	5.4%	33	8.5%	39	7.8%	
Sector	Manufacturing	28	25.0%	102	26.4%	130	26.1%	$\chi^2 = 2.742$
	Service	78	69.6%	245	63.5%	323	64.9%	
	Agriculture	6	5.4%	39	10.1%	45	9.0%	
Total	112	100%	386	100%	498	100%		

*, **, ***indicate significance levels at 10%, 5%, 1%, respectively

Sources: Authors' calculations based on the survey data.

Table 3. SME Performance

	Year	Non-microcredit borrowers		Microcredit borrowers		All Respondents		Mean difference (t-statistic)
		Mean	SD	Mean	SD	Mean	SD	
Annual sales (RM)	2012	101664	71199	105675	67821	102566	70406	$t = -0.545$
	2014	128803	81749	150185	92430	145376	90502	$t = 2.364^{**}$
Employment (people)	2012	5.39	2.56	6.10	3.05	6.17	3.16	$t = 2.445^{**}$
	2014	5.82	2.85	6.54	3.32	5.78	2.84	$t = 2.393^{**}$

*, **, ***indicate significance levels at 10%, 5%, 1%, respectively.

Sources: Authors' calculations based on the survey data.

Table 3 describes the SME performance in terms of sales and employment. The average annual sale of SMEs in the sample is less than RM 200,000 and the total employees are less than 20. This suggests that most SMEs in the sample are micro-enterprises. On average, people with microcredit borrowings have higher annual sales and employees than those without borrowings. These differences are confirmed in t-tests for mean difference between the two groups, except for annual sale in 2012.

4.2 Propensity Score Matching Method Results

Table 4 reports the average treatment effect on the treated (ATT) of microcredit participants using radius (with a default radius of 0.1) and kernel matching (with a default bandwidth of 0.06).⁸ The PSM analysis shows that microcredit positively affects the SME's sale growth. The effect is significant impact at 1% level. An enterprise borrowing from a microcredit provider, on average, experienced 25.6% to 25.7% higher sales growth than non-borrowers. This difference is based on the matching of 386 borrowers from microcredit with 112 non-borrowers. In addition, the results from radius and kernel matching are similar. It is clear that the treated group members improved their sales more than the control group. The findings support our hypothesis H1 on the positive effect of microcredit on SME sales growth. It is also accordant to previous evidences in other countries (see Osa Ouma and Rambo (2013); Peprah and Ayayi (2016); Sebstad and Walsh (1991)). With improvement in sales growth, enterprises are in a favourable position to improve their business profits and accumulate capital resources for reinvestment. Sustained investment in working capital is required for the growth and expansion of enterprises.

Table 4. Average Treatment Effect (ATT) on SMEs' Sales Growth

Variable	N_t/N_c	ATT	S. E	T-stat
Radius Matching				
Sales growth	385/112	0.256	0.044	5.78***
Employment growth	385/112	-0.030	0.027	-1.11
Kernel Matching				
Sales growth	385/112	0.257	0.047	5.47***
Employment growth	385/112	-0.034	0.028	-1.21

N_t = number of treated, N_c =number of controls.

*, **, and *** indicate significance levels at 10%, 5%, and 1%, respectively.

Source: Author's calculation based on survey data.

Regarding the employment growth, Table 4 shows no significant impact of microcredit participation, regardless of matching method. Thus, our hypothesis H2 is

⁸ Radius matching uses all the control units (non-borrowers) within the caliper. In Kernel matching, all treated are matched with a weighted average of all controls with weights inversely proportional to the distance between the propensity scores of the treated and control groups (Setboonsarng and Parpiev, 2008).

not supported. This insignificant effect can be explained by the self-employment tendency of microcredit clients as they are continually involved in survival activity. In addition, SMEs often employ a few people, such as friends or relatives, as workers. Van Rooyen, Stewart, and De Wet (2012) report no evidence of increased employment creation among microcredit borrowers. Bauchet and Morduch (2013) also note that non-microcredit borrower SMEs provide more employment than microcredit borrowers.

4.3 Difference in Differences Method Results

Table 5 shows the SMEs’ performance in sales and employment growth. The sales growth for microcredit borrowers improves substantially between 2012 and 2014 (column 3). The average sales growth for microcredit borrowers rises by 21.0 percent after two years and statistically significant at a 1% level. However, the significant enhancement in the performance of the microcredit borrowers can be an effect of both time trend and the microcredit program. To discover the real impact of the program on microcredit borrowing enterprises, the time trend should be controlled. Therefore, we use the average changes in the outcome of non-microcredit borrowers between 2012 and 2014 to approximate effect of the time trend on the non-microcredit borrowers. Column 6 in Table 5 shows that non-microcredit borrowers experience sales growth decreases by 7.7 percent from 2012 to 2014. The result is statistically significant at the 5% level. After eliminating possible bias due to the unobservable time-invariant, we find that microcredit borrowers have a significant and positive impact on sales growth. Specifically, microcredit borrowers have 28.7% higher sales growth than non-borrowers (see column 7 in Table 5).

Table 5. DID Estimates of Microcredit Impact on Sales and Employment Growth

	Microcredit Borrowers			Non-Microcredit Borrowers			DID impact
	Year 2012	Year 2014	Difference (D ₁)	Year 2012	Year 2014	Difference (D ₂)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Outcome	Y _{1t}	Y _{1,t+1}	D ₁ = Y _{1,t+1} – Y _{1t}	Y _{0t}	Y _{0,t+1}	D ₀ = Y _{0,t+1} – Y _{0t}	DID = D ₁ – D ₀
Log of sales	0.109 (0.014)	0.319 (0.017)	0.210*** (0.026)	0.130 (0.017)	0.053 (0.028)	-0.077** (0.034)	0.287*** (0.052)
Log of employment	0.033 (0.011)	0.035 (0.010)	0.002 (0.018)	0.034 (0.014)	0.023 (0.017)	-0.011 (0.024)	0.013 (0.036)

Numbers in parentheses are standard errors.

*, **, and *** indicate significance levels at 10%, 5%, and 1%, respectively.

Source: Author’s calculations based on survey data.

Similarly, microcredit borrowers experience a positive employment growth over the period 2012 – 2014 (+0.2%), while non-borrowers have a negative growth (-1.1%). However, these differences are insignificant (columns 3 and 6 in Table 5). After controlling for the unobservable time-invariant effects, the microcredit has a positive

(+1.3%) but insignificant effect on SME employment. The findings on sale and employment growth using DID method are accordant with the PSM results.

4.4 Endogenous Switching Regression Method Results

Table 6 presents the impact of microcredit on SME sales growth using the ESR method. Table 6 shows that owner/manager characteristics, household characteristics, SME characteristics, and networking affect sales growth of microcredit borrowers and non-borrowers differently. Specifically, the sales growth of firms borrowing from microcredit programs is positively impacted by Household size, Size of enterprise, Ownership and Networking with MFI. Whereas, sales growth of microcredit non-borrowers is positively influenced by gender, Size of enterprise, and negatively affected by Financial training. This suggests the different impact of microcredit participation on SME sales growth.

Correlations ρ_1 and ρ_0 represent the effect of microcredit access on SMEs. Since ρ_1 is positive and significant at the 1% level, we can conclude that the microcredit access increases the sales of microcredit borrowing-SMEs more than the non-borrowers. The negative sign of ρ_0 suggests that the non-borrowers experience limited growth in their sales, but the coefficient is insignificant. This result is in conformity with those obtained from PSM and DID and highlights the importance of microcredit for SMEs' performance. The covariance σ_1 and σ_0 are significantly different from zero. Therefore, the ESR method is valid.

Table 6. Impact of Access to Microcredit on Sales Growth using the ESR Method

Variables	Sales Growth			
	Microcredit borrowers		Non-borrowers	
	Coefficient	S.E	Coefficient	S.E
Constant	-0.320	0.165	-0.247	0.242
<i>Owner/Manager Characteristics</i>				
Gender	0.046	0.039	0.146**	0.068
Age⁽²⁾	0.038	0.061	-0.013	0.071
Age⁽³⁾	0.033	0.073	-0.028	0.095
Married	0.136	0.083	-0.023	0.078
Ethnicity	0.010	0.043	0.005	0.069
Education	-0.010	0.033	0.006	0.058
Financial training	0.084**	0.038	-0.152**	0.075
Experience	0.042	0.040	0.086	0.061
<i>Household Characteristics</i>				

Variables	Sales Growth			
	Microcredit borrowers		Non-borrowers	
	Coefficient	S.E	Coefficient	S.E
Household size ⁽²⁾	0.120**	0.054	0.042	0.076
Household size ⁽³⁾	0.099**	0.059	-0.025	0.085
Income earner ⁽²⁾	0.001	0.047	-0.016	0.080
Income earner ⁽³⁾	0.058	0.053	-0.008	0.089
Household income	0.011	0.020	0.026	0.043
<i>SMEs' Characteristics</i>				
Age of enterprise	-0.001	0.004	-0.006	0.007
Manufacturing sector	-0.022	0.061	0.010	0.124
Service sector	0.002	0.058	0.065	0.116
Size of enterprise	0.016***	0.006	0.050***	0.012
Ownership	0.119**	0.053	-0.069	0.093
<i>Networking</i>				
Commercial bank	0.009	0.012	-0.005	0.021
NGOs	-0.002	0.008	-0.022	0.014
MFI	0.033***	0.011	-0.006	0.021
Business associations	-0.023	0.017	-0.030	0.022
ρ_1	0.369***	0.138		
ρ_0	-0.402	0.262		
Log likelihood	-275.720			
LR test of independent equations	4.840			
Number of observations	498			
Wald test	69.870			

*, **, and *** indicate significance levels at 10%, 5%, and 1%, respectively.

Source: Authors' calculations based on survey data.

Table 7 reports the impact of microcredit on SME employment growth using the ESR method. Table 7 reveals that financial training negatively influences the employment growth of non-microcredit SME borrowers (at 5% significant level), while exerts no influence on their counterparts. Similar effect is found for networking with commercial banks. In addition, while SME size has positive effect on

employment growth of both borrowers and non-borrowers, the effect on non-borrowers is larger (0.025 versus 0.009). The negative and significance of correlation ρ_0 suggests that non-borrower group has higher employment growth than randomly selected SMEs. Meanwhile, correlation ρ_1 is negative and insignificant. This suggests that microcredit borrowers do not have higher employment growth than randomly selected SMEs. Therefore, we can conclude that microcredit participation has no influence on SME employment growth.

Table 7. Impact of Access to Credit on Employment Growth Using the ESR Method

Variables	Employment Growth			
	Microcredit borrowers		Non-borrowers	
	Coefficient	Standard error	Coefficient	Standard Error
Constant	0.105	-0.278	-0.278	0.162
<i>Owner/Manager Characteristics</i>				
Gender	0.004	0.024	0.047	0.046
Age ⁽²⁾	-0.005	0.038	-0.009	0.048
Age ⁽³⁾	-0.022	0.045	0.068	0.064
Married	0.000	0.052	0.032	0.053
Ethnicity	0.022	0.027	-0.026	0.045
Education	0.009	0.021	0.045	0.038
Financial training	0.000	0.023	-0.117**	0.047
Experience	0.012	0.025	0.017	0.042
<i>Household Characteristics</i>				
Household size ⁽²⁾	-0.019	0.034	-0.011	0.052
Household size ⁽³⁾	-0.024	0.037	-0.088	0.057
Income earner ⁽²⁾	0.021	0.029	0.039	0.053
Income earner ⁽³⁾	-0.025	0.033	0.014	0.060
<i>Household income</i>				
<i>SMEs' Characteristics</i>				
Age of enterprise	0.000	0.003	-0.004	0.005
Manufacturing sector	-0.028	0.038	0.127	0.082
Service sector	-0.040	0.036	0.110	0.078
Size of enterprise	0.009**	0.003	0.025***	0.008
Ownership	-0.006	0.033	-0.082	0.064
<i>Networking</i>				
Commercial bank	-0.005	0.007	-0.052***	0.014
NGOs	-0.002	0.005	-0.013	0.009
MFI	0.003	0.007	0.003	0.013
Business associations	-0.009	0.010	-0.015	0.016
ρ_1	-0.056	0.146		
ρ_0	-0.870***	0.109		
Log likelihood	-41.541			
LR test of indep. Eqns	4.720			
Number of observations	498			
Wald test	18.1			

*, **, and *** indicate significance levels at 10%, 5%, and 1%, respectively.

Source: Author's calculations based on survey data.

5. Conclusion

This study examines the impact of microcredit on Malaysian SMEs' performance. The study used primary data from a semi-structured survey, which was administered between February and March 2016 on SMEs in Terengganu, Malaysia. Based on different estimation methods, the study came to the conclusion that borrowing from microcredit helped improve the SME sales, but had no effect on SME employment growth. Specifically, SMEs with microcredit borrowing had their sales 25.6% to 25.7% higher than non-microcredit borrowers. The magnitude was much larger (28.7%) when the selection bias from observable and unobservable characteristics (DID method) is controlled. There is also a possibility that SMEs use the credit to improve their technologies or production process, which consequently does not increase the employment. Given the higher sales turnover of participated SMEs compared to non-participants, this is very likely to happen. However, affirming this effect requires further effort and we leave it to future studies.

Given the benefit of microcredit, SMEs should take positive initiatives to improve their access to microcredit, and thus, promote their performance. The Malaysian government has created many SMEs supporting programs through a comprehensive set of financial assistance measures. Therefore, SME owners should take greater advantages of these assistances. In addition, SME owners/managers need to improve their skills, either through joining financial training or development programs, to be competitive in the market. Besides, the government should also ensure that the SME owners are aware of available microcredit programs and their features. For this purpose, SMEs associations meetings and the mass media would be helpful.

On the supplier side (microcredit providers), it is necessary for the policy makers to create a supportive and friendly regulatory environment for the sustainable development of the microfinance sector. The Malaysian government can consider allowing non-financial institutions (NFIs) such as NGOs to perform microcredit services. Such easing regulation can widen their ability to mobilize capital needed for microfinance businesses from various sources including customer deposits and financial support of the Central Bank. This eventually can enable these institutions to attain sustainable development.

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