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Is spin-off policy an effective way to strengthen the role of Islamic banks? Evidence from Indonesia

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Abstract

Indonesia adopts a dual banking system in which conventional and Islamic banks are in place, however most of Islamic banks are still operating Islamic windows within their conventional entity. To strengthen the role of Islamic banking in the intermediation system, the government issued the Islamic Banking Law. No.21/2008 to encourage Islamic windows of conventional banks to have a legal entity separately with their parent company. Because some Islamic windows have spun off in this fashion, we can employ a difference-in-difference approach to examine the effect of such a spin-off on Islamic banks' performance, efficiency, and risk. Our study covers all Islamic commercial banks (including Islamic windows of conventional banks) in Indonesia from 2008–2019. We find that the performance and efficiency of full-fledged Islamic banks are significantly lower compared with Islamic windows of conventional banks. Moreover, our results show that financing risk increases after the spin-off. The inferior performance of fullfledged Islamic banks persists for four years after the spin-off. We also find that a conversion strategy results in better outcomes, particularly for profitability and efficiency, than a pure spinoff strategy.

Keywords: Spin-off, Islamic banks, Consolidation, Competition, Performance, Risk

JEL Code: G21, G28

Keywords: *Spin-off, Islamic banks, Consolidation, Competition, Performance, Risk, Indonesia*

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1. Introduction

Over the last three decades, there has been a long debate on the issue of competition and consolidation in the banking industry not only in the academics but also in the policy makers. On the one hand, the pro-competition contends that the more competitive the industry, the more efficient the intermediation function (e.g. Trinugroho et al., 2014). On the other hand, some studies argue that banking consolidation, which could lead to increase market power of banks, is an effective way to achieve financial stability. For instance, Schaeck and Cihák (2014) suggest that bank size may increase stability through efficient distribution. Moreover, banks with larger size can have lower production costs. Likewise, Yusgiantoro et al. (2019) find that the greater the market power of a bank, the lower the risk and the more stable the financial system.

This competition vs. consolidation perspective could be an appropriate way to explain the current issue in the Indonesian banking which is the spin-off policy for Islamic windows of conventional banks. In order to support the development of Islamic banking, the Indonesian government issued the Law Number 21/2008 concerning Sharia (Islamic) Banking[1]. It mandates that in 2023, the Islamic windows of conventional banks (UUS) are required to be converted to independent business entities/ full-fledged Islamic Banks (BUS). This policy is generally called as “spin-off policy”. However, it is required that a BUS must have an equity of IDR500 billion[2] and should be increased to IDR1 trillion no later than 10 years after the BUS permit has issued by the banking regulator. If an Islamic window of a conventional bank is not ready to be separated from its conventional parent, the business license may be revoked.

The underlying reason behind this policy is that to strengthen the role of Islamic banking in the financial intermediation and development, Islamic financial institutions should have a greater flexibility in their operations. Therefore, full-fledged system may enable them to grow faster. It is, subsequently, expected to enlarge the market share of Islamic banks which is currently stuck at around 6%. Siswantoro (2014) contends that spin-off of Islamic windows of conventional banks could bring several opportunities such as increasing financial performance, expansion, rearrangement of financial structure and having independent management. Moreover, customers may be happier as an independent entity, full-fledged Islamic banks are perceived more ensured in the purity of sharia-compliant products and services.

However, the sceptical argue that although the capital would be increased following the spin-off, the newly separated BUS may not be able to reach economies of scale which subsequently create difficulties for them to compete with conventional banks. This is in line with the view of Garbois et al. (2012) mentioning that size is one of the main challenges for the Islamic banking industry which is so-called “too small to have economies of scale". According to Prasetyo et al. (2019), spin-off has several disadvantages, including the potential loss of joint

[1] It is usually called as “Indonesia Sharia Banking Law”
[2] Assuming an exchange rate of IDR16,000/USD1, it is about USD31.25 million.

revenues and disruption in the business/operations during and following the spinoff. Moreover, the parent may also lose the benefits of diversification.

This present study is therefore dedicated to clearly understand the net impact of spin-off policy by empirically investigating the implication of spin-off on performance, risk and efficiency of BUS. Despite the law has been enacted more than 10 years ago, only a small number of UUS have been converted to BUS which indicates the lack of enthusiasm of the industry. Therefore, a comprehensive study is strongly needed to empirically evaluate the impact of the spin-off on the performance and risk of BUS. With regards to this particular issue, to the best of our knowledge, there is no strong paper that specifically address the effect of changing from Islamic windows to full-fledged Islamic banks. Most literature in Islamic banking directly compare Islamic banks and conventional banks (Beck et al., 2013; Aysan, Disli, Duygun, & Ozturk, 2017; Kocaata, 2017).

This study empirically evaluates the impact of spin-off policy on performance, risk and efficiency employing difference-in-differences (DiD) panel data estimation strategy. Wooldridge's (2009) explains that this approach is applied when data comes from natural experiments such as change in government policy. The difference-in-difference analysis requires a group that have not yet implemented spin-off (control group) which must have the same characteristics as the treated group. However, due to the relatively small sample, propensity score matching (Schepens, 2016) could not be employed here.

We find evidence that performance and efficiency decline following the spin-off. Moreover, newly separated full-fledged Islamic banks are riskier. Our deeper analysis reveals that converting strategy results in better outcomes compared to pure spin-off strategy, particularly in profitability and efficiency. There is also evidence that the inferior performance of full-fledged Islamic banks is still found after four years of the spin-off.

The rest of this paper is structured as follows. Section 2 provide related literature. In Section 3, we present the institutional setting. Data, variables, and empirical strategy are provided in Section 4. In Section 5, we report the empirical results and robustness checks. Section 6 concludes key findings and provides policy implications.

2. Related Literature

2.1.Islamic Banking: Performance and Risk

Islamic banking is based on Sharia-derived key principles particularly *riba* prohibition and profit- loss sharing/ equity-based financing (Abedifar, Molyneux, & Tarazi, 2013). Islamic banks are also expected to provide an alternative medium for financial transactions (Hassan and Aliyu, 2018). Islamic banking was firstly growing in the Muslim-majority countries; however, it has now also been spreading in some Muslim-minority countries[3]. Even, in the UK,

[3] Islamic banks account for 80% of the global sharia compliant industry which is around USD 1.6 trillion in assets (Abedifar et al., 2015).

the government has recently championed the Islamic banking sector to underline London's position as the global center for Islamic investment (Riaz, Burton, & Monk, 2017). Weill (2011), therefore, argues that Islamic banks should have more dependable clients than conventional banks due to the religious beliefs. However, his empirical study does not show that Islamic banks have greater market power than conventional banks. Another common feature of Islamic banks is that they are typically better capitalized (e.g. (Ariss, 2010; Beck, Demirgüç-Kunt, & Merrouche, 2013).

Abedifar et al. (2015) summarize that there are three types of Islamic banks that exist in the world; 1) Islamic banks operate in countries with substantial and active government support, 2) Islamic banks operate in the private sector competing with conventional banks, 3) Islamic banking practiced by conventional commercial banks (via Islamic windows).

Many studies have then empirically examined the outcomes differences between conventional and Islamic banks. The first issue is related to the performance difference, mostly reflected by profitability or efficiency, between these two types of banks. The earlier studies tend to have inconclusive findings in this particular issue (e.g. Yudistira, 2004 – Islamic banks have less inefficiency; Mohamad et al., 2008 and Olson & Zoubi, 2008 – no significant difference; Johnes et al., 2009 and Srairi, 2010 – Islamic banks are less efficient). Recent studies highlight that the different results on this matter may come from the different angle of studies. For instance, a comprehensive study of Beck et al. (2013) concludes that Islamic banks are less efficient, however, they have better asset quality and better intermediation ratio. More recently, Rizvi et al. (2019) find evidence that loan growth and deposit growth of Islamic banks in Indonesia are significantly higher than conventional banks.

With regards to the risk of Islamic banks, there are two competing views (Abedifar et al., 2015). On the one hand, Islamic banking is characterized by the religious beliefs of clients which may lead to greater loyalty and lower loan default. Moreover, it may also lower deposit withdrawal risk. On the other hand, some argue that the complexity of the loan contract in the Islamic banking, along with the moral hazard incentive caused by the Profit and Loss Sharing (PLS) contract, may increase the risk.

Some empirical studies have been done to investigate whether there is a significant difference in risk between Islamic and conventional banks. Čihák and Hesse (2010) and Abedifar et al. (2013) conclude that Islamic banks with smaller size have lower default risk than their conventional counterparts. However, for larger Islamic banks, their default risk is higher than conventional banks. Some other studies find no significant difference in insolvency risk between these two (e.g. Beck et al., 2013). Yanikkaya et al. (2018) find that profitability of Islamic banks is more dynamics than that of conventional banks which is more stable. It means that Islamic banks are riskier than conventional banks in term of persistency of profit.

2.2.Banking Structure: Competition versus Consolidation

Literature on banking market structure is dominated by two perspectives. The competition-

fragility view postulates that the more competitive the market, the lower the bank market power which eventually will lead to higher risk taking (Berger, Klapper, & Turk-Ariss, 2009). On the other side, the competition-stability perspective argues that the larger the market power, the higher the risk taking of banks due to the incentives to aggressively channel high margin loans.

Banking market structure is therefore important for policy makers particularly on designing the competitiveness level of the industry. Hence, regulator should let the industry to be more competitive or consolidated, through merger and acquisitions, in order to have few banks with greater market power.

Several empirical studies have been done to address the issue of banking competitiveness versus banking consolidation. Majid and Sufian (2006) show that Malaysian banking is less competitive which result in higher market power of existing banks and creating a monopolistic industry. Shin and Kim (2013) reveal that the policy of the government in Korea to consolidate some banks have implied in lowering overall banking competitiveness. Likewise, Trinugroho et al. (2018) provide evidence that Islamic rural banks in Indonesia located in less competitive regions set a higher margin.

On the other side, however, some studies provide evidence on the benefits of banking consolidation. Chu (2015) concludes that banking efficiency is improved following the merger and acquisitions.[4] Similarly, Yusgiantoro et al. (2019) explain that banking consolidation may increase the market power of existing banks, however, the greater the market power is then translated into lower bank risk and more stable financial system. Specific on Islamic banks, Ibrahim and Rizvi (2017) document that by increasing the size, mostly through merger, initially it would make Islamic banks less stable. However, after passing a certain size threshold, it will increase the stability of the Islamic banks.

3. Overview of Islamic Banking in Indonesia

As explained earlier, we are motivated to study the implication of spin-off policy on the performance and risk of Islamic banks. Indonesia, the fourth most populated country and the largest Muslim population, has a dual banking system. The Indonesia banking law number 7/1992 is the basis of the dual banking system where conventional and sharia banks can provide banking services side by side.

According to this law, it is also mentioned that Islamic banking institutions can be Islamic commercial banks (BUS), Islamic rural banks (BPRS), and conventional commercial banks having Islamic windows (UUS).[5] Recently, the Islamic banking industry consists of 14 BUS, 20 UUS (owned by conventional commercial banks) and 164 BPRS. Specifically, BUS and UUS have total assets of IDR499.98 trillion (Otoritas Jasa Keuangan, 2019). Although there

[4] However, Behr and Heid (2011) criticize the previous studies on the impact of bank merger and acquisition on efficiency that might have a sample selection bias.

[5] There is also a form of Islamic microfinance in Indonesia which is *Baitul Maal Wat Tamwil* (BMT). However, the government categorizes BMT as a cooperative which implies that the supervisory of BMT is not with the IFSA (OJK) but with the Ministry of Cooperatives and Small and Medium Enterprises.

is a relatively large number of Islamic banks, the current market share of such type of banking is only 6.01% of the overall banking industry. According to Rizvi et al. (2019), Islamic banks in Indonesia have significant contribution to the overall banking system particularly through increasing lending and deposits.

As explained earlier, the Sharia banking law mandates that Islamic windows of conventional banks (UUS) should be converted into full-fledged Islamic banks (BUS) with the minimum capital of IDR500 billion. According to the previous study of the OJK,[6] ideally, the minimum capital for BUS is around IDR800 billion – IDR1.2 trillion. Moreover, the study also reveals that there are only 4 (of 20) UUSs are considered eligible to be converted to BUS (DPPS-OJK, 2018).

4. Research Method

4.1.Data

Our research focuses on how the spin-off policy could possibly impact on performance, risk and efficiency of Islamic banking windows. We use quarterly data over the 2008 to 2019 gathered from the quarterly financial reports of Indonesia Banking statistics provided by the Indonesia Financial Services Authority (OJK). Our data enables us to differentiate full-fledged Islamic banks and Islamic window of conventional banks. Our final sample is 33 Islamic banks consisting of 13 full- fledged Islamic banks[7] and 20 Islamic bank windows.

We consider several proxies to gauge the impact of spin off policy on Islamic banks. We measure performance with return on asset, credit growth and deposit growth. Non-performing financing is considered to measure bank risk, while cost to income is employed to proxy efficiency. Lastly, financing to deposit ratio is the measure of intermediation capability.

4.2.Empirical strategy

We create two different groups to compare consistently the impact of spin off policy on Islamic banks' performance, efficiency, and risk. Treated group is full-fledged Islamic banks that implement the spin-off policy from Islamic banking windows. On the other hand, control group is Islamic banks windows that have not implement the spin off policy for several reasons. Our setting enables us to use difference-in-differences to estimates the following specification:

$$Y_{i,t} = \alpha + \beta_1 Spinoff_i + \beta_2 Post_t + \beta_3 Post_t * Spinoff_i + \beta_4 BankFundamental_{i,t} + \beta_5 Control_t + \varepsilon_{i,t}$$

Where $Y_{i,t}$ is our dependent variables consisting of ROA, financing growth, deposit growth, cost to income ratio, non-performing financing ratio, and financing to deposit ratio, according

[6] Research conducted by the Directorate of Regulatory and Licencing of Islamic Banking (*Direktorat Pengaturan dan Perizinan Perbankan Syariah*/ DPPS) - OJK in 2018.
[7] We exclude Bank Muamalat because it is full-fledged of Islamic bank since it was established.

to the studies of Tan (2015), Ghani et al. (2016), Trinugroho et al. (2017) and Yanikkaya et al. (2018).

$Spinoff_i$ is a dummy that equals one for Islamic banks that have implemented spin off policy and become full-fledged Islamic banks, and zero otherwise. $Post_t$ is a dummy variable that equals to one in the time after banks implemented the spin-off policy. $BankFundamental_{i,t}$ and $Control_t$ are sets of control variable of bank fundamental and macroeconomic variables respectively that could affect the dependent variables.

$Post_t * Spinoff_i$ is the variable of interest. This variable indicates the direct impact of spin off policy on the dependent variables. The control variables are bank size which is measured by the natural logarithm of total asset; bank age; consumer price index as and quarterly GDP growth. Table 1 reports the descriptive statistics of the variables.

We then investigate the effect of Islamic bank's size on the relationship between spin-off policy and Islamic bank performance, risk and efficiency. We create the dummy variable *big* that represents Islamic banks that have asset higher than the median value of sample. The following is the estimation model

$$Y_{i,t} = \alpha + \beta_1 Spinoff_i + \beta_2 Post_t + \beta_3 Post_t * Spinoff_i + \beta_4 Post_t * Spinoff_i * big + \beta_5 BankFundamental_{i,t} + \beta_6 Control_t + \varepsilon_{i,t}$$

For a deeper investigation, we test the different impact of different strategy in the spin off process. Practically, spin off could be carried out by the following approaches: 1) creating full new Islamic banks, 2) taking over an existed conventional bank then convert the bank to full-fledged Islamic banks.

Finally, we also test the effect of the spin-off policy with lead of dependent variables to examine the policy's impact of the policy for several future periods.

5. Results

5.1. Treated and Control Groups

We select all Islamic banks both full-fledged Islamic bank and banks with Islamic windows that have available data from each quarter between 2008 and 2019. This corresponds to the period after the enactment of Indonesia Sharia Banking Law in 2008. From this date, Islamic windows of conventional banks could be separated from their conventional parents and be full-fledged Islamic banks if they pass several requirements.

We use difference-in-differences (DID) method to estimate the impact of spin-off policy. The DID requires a treated group and a control group. The treated banks are full-fledged Islamic banks both from converting and pure spin-off strategy. The control group is Islamic windows of conventional banks (UUS in Indonesia term). Treatment effect is the date when banks start/convert their operation according to sharia (full-fledged Islamic bank). The list of treated and control banks are provided in the appendix 1.

5.2.Descriptive Statistics of Variables and Correlation Matrix

Table 1 presents the descriptive statistics for all variables, while table 2 reports the correlation matrix between variables. The average return on assets is 2.39%, while the average financing growth and deposit growth is 8% and 9.7%, respectively. Cost to income ratio has average of 76.82%, while the average intermediation capability (financing to deposit ratio) is 121.6%. 39.6% of observations are belong to treated groups. Lastly, the average bank age is 9.1 year. We also provide the statistics of variables for treated and control banks (table 2). On average, return on assets, financing growth, and deposit growth of treated groups are lower than control groups. Moreover, the average cost to income ratio and non-performing financing of treated banks are higher than the control banks.

Table 3 exhibits the correlation matrix of variables. The dummy variable for treated banks (spinoff) is negatively correlated with return on asset, deposit growth, financing growth, and financing to deposit ratio. On the other hand, this variable is positively correlated with the non-performing financings and cost to income ratio.

Table 1. Descriptive Statistics of Variables – full sample

	Definition	Obs	Mean	Std. Dev.	Min	Max
ROA	Return on asset	1463	2.389	2.116	-0.730	7.060
NPF	Non-performing financing to total financing ratio	1148	0.029	0.0371047	0.0000102	0.1475
financinggrowth	The growth rate of financing	1449	0.080	0.109	-0.055	0.390
depgrowth	The growth rate of deposit	1471	0.097	0.165	-0.137	0.535
CIR	Cost to income ratio	1529	76.822	21.789	34.600	121.540
FDR	Financing deposit ratio	1450	1.216	0.525	0.686	2.742
spinoff	A dummy variable for treated banks. 1 for full-fledge Islamic bank from spinoff.	1577	0.396	0.489	0	1
post	A dummy variable for treatment effect. 1 for time after Islamic banks decide to spin-off from parent banks	1577	0.301	0.459	0	1
lnta	Natural logarithm of total asset	1476	14.477	1.753	9.493	18.537
age	Bank's age. We calculate age from the operation of Islamic bank window	835	9.102	5.757	0.000	24.000
CPI	Costumer price index	1584	4.603	2.000	2.650	11.960
gdp	Gdp growth rate quarterly	1584	5.401	0.600	4.140	6.810

Table 2. Descriptive Statistics of Variables – treated and control banks

Treated Banks = Full fledge Islamic Banks						Control banks = Banks with Islamic windows				
Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
ROA	563	1.640	1.902	-0.730	7.060	00	2.858	2.109	-0.730	7.060
NPF	406	0.0304	0.0296	0.0000102	0.1474	42	0.0282	0.0406	0.0000102	0.1474
financinggrowth	545	0.070	0.098	-0.055	0.390	04	0.086	0.114	-0.055	0.390
depgrowth	562	0.086	0.149	-0.137	0.535	09	0.103	0.175	-0.137	0.535
CIR	601	85.723	18.364	34.600	121.540	28	71.058	21.901	34.600	121.540
FDR	556	1.053	0.439	0.686	2.742	94	1.318	0.548	0.686	2.742
spinoff	624	1.000	0.000	1.000	1.000	53	0.000	0.000	0.000	0.000
post	624	0.761	0.427	0.000	1.000	53	0.000	0.000	0.000	0.000
lnta	595	15.300	1.770	9.720	18.537	81	13.922	1.507	9.493	17.566
age	246	9.646	5.096	0.000	20.000	89	8.874	6.001	0.000	24
CPI	624	4.603	2.001	2.650	11.960	53	4.573	1.967	2.650	11.960
gdp	624	5.401	0.600	4.140	6.810	53	5.402	0.597	4.140	6.810

Table 3. Correlation Matrix

	ROA	NPF	Financing growth	depgrowth	CIR	FDR	post	spinoff	lnta	age	CPI	gdp
ROA	1											
NPF	-0.3643	1										
financinggrowth	0.0149	-0.1544	1									
depgrowth	0.0373	-0.1246	0.3013	1								
CIR	-0.6978	0.3454	-0.0288	-0.0504	1							
FDR	0.2372	-0.1888	0.2438	0.0312	-0.3827	1						
post	-0.2092	0.5185	-0.1457	-0.1301	0.3346	-0.3014	1					
spinoff	-0.2092	0.5185	-0.1457	-0.1301	0.3346	-0.3014	1	1				
lnta	-0.2239	0.4147	-0.2377	-0.1917	0.2669	-0.4778	0.4812	0.4812	1			
age	-0.1268	0.3202	-0.1746	-0.137	0.1178	-0.4015	0.1415	0.1415	0.6682	1		
CPI	-0.0213	-0.0896	0.2033	0.0754	-0.1009	0.2898	-0.0687	-0.0687	-0.3767	-0.2863	1	
gdp	0.0298	-0.1024	0.263	0.1217	-0.0647	0.0816	-0.0846	-0.0846	-0.2981	-0.2244	0.1647	1

5.3.Empirical Results

We analyze the impact of spin-off policy on performance, efficiency and risk of Islamic banks in Indonesia by employing difference-in-difference method. Table 3 presents the results of baseline regression. Our variable of interest is the interaction between the dummy variable of treated banks and the dummy variable of treatment effect (post*spinoff). The dependent variables are bank performance which is measured by return on asset, deposit growth and financing growth; bank efficiency which is measured by cost to income ratio and bank risk which is proxied by the logarithm natural of non-performing financings.

As presented in table 4, we find negative and significant impact of spin-off policy on return on

assets. Similarly, the coefficients of the interaction variable on deposit growth and financing growth are negative and significant. These results imply that performance of full-fledged Islamic banks is lower than Islamic windows of conventional banks. When we change the dependent variable to cost to income ratio which is the measure of bank efficiency, we find positive and significant coefficient of the interaction variable. It indicates that the efficiency of full-fledged Islamic banks is lower than that of Islamic windows of conventional banks. Turn to the non- performing financings which is the proxy of bank risk, we find that the interaction variable has positive and significant coefficient which also indicates that full-fledged Islamic banks are riskier than Islamic windows of conventional banks. Financing to deposit ratio of full-fledged Islamic banks, as the measure of intermediation capability, is also found to be lower than that of Islamic windows of conventional banks.

As some Islamic banks are separated from their conventional parents before the Law no. 28/2008, we also conduct a regression by excluding Islamic banks that have been separated before the Law was enacted. As shown in table 5, with regards to our main variables, we still find similar coefficients when the dependent variables are non-performing financings, cost to income ratio and financing to deposit ratio. However, the coefficients of the interaction variable become insignificant when return on asset, financing growth and deposit growth are set as the dependent variables.

Then, we go deeper by disentangling the way spin-off is conducted. As explained earlier, there two spin-off strategies which are pure spin-off and converting strategy. Table 5 and 6 exhibit the regression results for pure spin-off and converting, respectively. For the pure spin-off policy, our results show that the coefficient of interaction variables are negative and significant when the dependent variable is return on assets. The coefficients are significant negative for financing growth and significant positive for non-performing financings and cost to income ratio. These results indicate that pure spin-off strategy results in lower profitability, financing growth and efficiency than the control group. Moreover, financing risk is also significantly higher than the control group. As presented in table 7, the converting strategy shows better outcomes in which profitability, efficiency and intermediation capability is significantly higher. Moreover, deposit growth is also found to be lower for full-fledged Islamic banks resulted from converting strategy.

We also investigate the effect of size on spin-off policy. We find that size does matter to support Islamic windows of conventional banks to do spin-off. We find that big full-fledge Islamic banks in our triple interaction has positive and significant effect on return on asset and cost to income ration. However, we find that big full-fledge Islamic banks have positive and significant effect on non-performing financing. Therefore, big full-fledge Islamic banks have higher profitability and better efficiency but higher risk than the small banks of full-fledge Islamic banks.

Some may argue that the poor performance of newly separated full-fledged Islamic banks is caused by the fixed-asset investment that they have to spend right after the separation.

Therefore, we go deeper by testing the impact of spin-off on performance, efficiency and risk until the fourth year since the establishment of full-fledged Islamic banks. In general, as exhibited in table 8-13, we find that performance of full-fledged Islamic banks is still found to be lower than that of Islamic windows of conventional banks. Similarly, the higher financing risk of full-fledged Islamic banks does not change until the four years after the spin-off. Likewise, higher cost inefficiency is found to be persistent from the first until fourth year following the spin-off.

Overall, our findings reveal the inferior performance and higher risk of full-fledged Islamic banks compared to Islamic windows of conventional banks. Perhaps, relatively small size of full-fledged Islamic banks hampers them to expand to larger market. It also leads to a higher average cost compared to conventional banks. Moreover, the higher financing risk of those banks may come from the complexity of the loan contract in the Islamic banking (Abedifar et al., 2015).

5.4.Robustness Checks

We perform a robustness check to ensure that our results are consistent by conducted incremental regression approach instead of directly include all variables in the empirical model. As presented in the appendix 2 (table A1-A6), with regards to our variables of interest, the results remain the same with baseline regression.

6. Conclusion and Policy Implications

We empirically investigate the effect of spin-off policy, separation of Islamic windows of conventional banks from their conventional parents to full-fledged Islamic banks, on the subsequent performance, efficiency and risk. We use the data of Islamic commercial banks in Indonesia over the 2008-2019 period. Our results reveal that performance and efficiency of full- fledged Islamic banks are lower than Islamic windows of conventional banks. It is also found that the latter are less risky. Moreover, the inferior performance of separated full-fledged Islamic banks is still found after four years of the spin-off. In addition, we find that converting strategy results in better outcomes compared to pure spin-off strategy.

These findings bring several policy implications. We find strong evidence that the spin-off policy, more specifically purely spin-off, does not lead to better performance even after four years. Therefore, the regulators should seek complementary policies to mitigate the negative effect of spin-off policy, otherwise postponing the mandatory to spin-off may be considered. Consolidation among newly separated full-fledged Islamic banks may help them to achieve economies of scale enabling them to be more competitive.

Table 4. Baseline regression results

	(1) ROA	(2) NPF	(3) Financing growth	(4) depgrowth	(5) CIR	(6) FDR	(7) ROA	(8) NPF	(9) Financing growth	(10) depgrowth	(11) CIR	(12) FDR
post	0.237	0.00481	0.0205	-0.121**	-6.853	0.106						
	(0.48)	(0.97)	(0.81)	(-2.39)	(-1.51)	(1.09)						
spinoff	-1.371***	0.0254***	-0.0408*	0.0920*	24.24***	-0.289***						
	(-2.91)	(5.83)	(-1.66)	(1.83)	(5.51)	(-3.02)						
Post*spinoff							-1.060***	0.0287***	-0.0182**	-0.0291**	16.11***	-0.167***
							(-5.54)	(6.55)	(-2.02)	(-2.28)	(10.34)	(-5.97)
lnta	-0.154**	0.000129	-0.00566	-0.00843*	0.0823	-0.0858***	-0.159**	0.000740	-0.00631*	-0.00992**	0.0730	0.0861***
	(-2.38)	(0.11)	(-1.59)	(-1.78)	(0.13)	(-6.08)	(-2.41)	(0.64)	(-1.78)	(-2.09)	(0.11)	(-6.00)
age	-0.0127	0.00123***	-0.00178**	-0.00315**	0.0727	-0.0112***	-0.00827	0.00117***	-0.00174**	-0.00335***	0.00211	0.0103***
	(-0.87)	(3.98)	(-2.07)	(-2.48)	(0.51)	(-3.70)	(-0.57)	(3.81)	(-2.03)	(-2.64)	(0.02)	(-3.52)
CPI	-0.129***	0.000119	0.0111***	0.00839**	-0.458	0.0399***	-0.156***	0.000986**	0.0102***	0.00844**	0.0817	0.0335***
	(-2.64)	(0.25)	(4.18)	(1.99)	(-0.98)	(3.48)	(-3.28)	(2.03)	(3.96)	(1.99)	(0.17)	(2.96)
gdp	-0.00718	-0.000274	0.0370***	0.0272**	-0.757	-0.0487	-0.0335	-0.000396	0.0374***	0.0286**	-0.614	-0.0512
	(-0.05)	(-0.24)	(4.93)	(2.33)	(-0.51)	(-1.58)	(-0.22)	(-0.32)	(5.01)	(2.47)	(-0.40)	(-1.65)
_cons	5.803***	-0.00104	-0.0667	0.0691	75.73***	2.697***	6.021***	-0.0113	-0.0568	0.0876	74.83***	2.716***
	(4.39)	(-0.06)	(-1.06)	(0.72)	(6.17)	(9.35)	(4.48)	(-0.66)	(-0.89)	(0.92)	(5.85)	(9.30)
N	788	679	792	799	832	833	788	679	792	799	832	833
N_g	33	33	33	33	33	33	33	33	33	33	33	33
r2	0.0875	0.299	0.172	0.108	0.140	0.281	0.0722	0.281	0.169	0.0997	0.0910	0.266

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5. Regression with exclusion of Islamic banks that have been separated before the Islamic banking Law No. 28/ 2008

	(1) ROA	(2) NPF	(3) Financing growth	(4) depgrowth	(5) CIR	(6) FDR	(7) ROA	(8) NPF	(9) Financing growth	(10) depgrowth	(11) CIR	(12) FFDR
post	1.009*	0.0148*	0.0532**	-0.0890*	-7.409	0.244**						
	(1.67)	(1.87)	(2.00)	(-1.70)	(-1.48)	(2.45)						
spinoff	-1.376***	0.0239***	-0.0492**	0.0874*	24.21***	-0.326***						
	(-2.93)	(5.67)	(-1.97)	(1.74)	(5.37)	(-3.39)						
Post*spinoff							-0.317	0.0376***	0.00581	-0.00136	16.00***	-0.0704**
							(-0.82)	(4.79)	(0.49)	(-0.08)	(6.96)	(-2.25)
Lnta	-0.119	0.000784	-0.00313	-0.00764	0.879	-0.0803***	-0.128*	0.00150	-0.00422	-0.00922*	0.976	-0.0821***
	(-1.61)	(0.78)	(-0.77)	(-1.38)	(1.20)	(-4.81)	(-1.71)	(1.52)	(-1.04)	(-1.67)	(1.27)	(-4.83)
Age	-0.0328*	0.00114***	-0.00235**	-0.00364***	0.0827	-0.0166***	-0.0268	0.00105***	-0.00227**	-0.00388***	-0.0203	-0.0152***
	(-1.92)	(4.18)	(-2.57)	(-2.67)	(0.54)	(-4.90)	(-1.57)	(3.92)	(-2.49)	(-2.86)	(-0.13)	(-4.67)
CPI	-0.132**	0.000510	0.0136***	0.00906*	-0.197	0.0524***	-0.164***	0.00146***	0.0122***	0.00908*	0.475	0.0434***
	(-2.42)	(1.14)	(4.43)	(1.75)	(-0.35)	(3.87)	(-3.10)	(3.13)	(4.12)	(1.75)	(0.85)	(3.25)
Gdp	-0.141	-0.0000842	0.0437***	0.0336**	0.876	-0.0602	-0.171	-0.000189	0.0443***	0.0351**	1.056	-0.0637*
	(-0.83)	(-0.06)	(5.11)	(2.44)	(0.50)	(-1.63)	(-0.99)	(-0.14)	(5.19)	(2.58)	(0.58)	(-1.70)
_cons	6.224***	-0.0121	-0.144*	0.0252	54.56***	2.674***	6.522***	-0.0241	-0.127*	0.0444	51.66***	2.725***
	(4.22)	(-0.80)	(-1.90)	(0.21)	(3.66)	(7.45)	(4.36)	(-1.59)	(-1.67)	(0.37)	(3.33)	(7.49)
N	672	585	653	661	691	692	672	585	653	661	691	692
N_g	29	29	29	29	29	29	29	29	29	29	29	29
r2	0.0414	0.274	0.178	0.0960	0.0970	0.245	0.0244	0.256	0.174	0.0883	0.0435	0.225

t statistics in parentheses

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

Table 6. Pure spin-off strategy

	(1) ROA	(2) NPF	(3) Financing growth	(4) CIR	(5) FDR	(6) ROA	(7) NPF	(8) Financing growth	(9) CIR	(10) FDR
post	-2.201***	0.0372***	0.0460	21.40***	-0.201					
	(-3.69)	(3.48)	(1.61)	(3.27)	(-1.31)					
spinoff_pure	-0.215	0.0226***	-0.0487*	3.968	0.214					
	(-0.37)	(5.74)	(-1.95)	(0.63)	(1.41)					
Post*spinoff_pure						-2.410***	0.0590***	-0.00120	25.24***	0.00546
						(-16.50)	(5.53)	(-0.08)	(13.43)	(0.15)
lnta	-0.370***	0.00270***	-0.00360	2.918***	-0.103***	-0.375***	0.00339***	-0.00470	3.011***	-0.0981***
	(-4.89)	(3.17)	(-0.87)	(3.86)	(-5.83)	(-5.06)	(3.92)	(-1.14)	(3.98)	(-5.53)
age	0.0281*	0.000495**	-0.00218**	-0.233	-0.0178***	0.0285*	0.000410**	-0.00209**	-0.240	-0.0182***
	(1.74)	(2.40)	(-2.25)	(-1.52)	(-4.93)	(1.77)	(1.98)	(-2.17)	(-1.57)	(-5.03)
CPI	-0.164***	0.000565	0.0135***	0.314	0.0351**	-0.170***	0.00147***	0.0121***	0.436	0.0417***
	(-2.89)	(1.33)	(4.40)	(0.52)	(2.50)	(-3.28)	(3.33)	(4.09)	(0.81)	(3.02)
gdp	0.0782	-0.00173	0.0443***	-0.203	-0.0662*	0.0792	-0.00185	0.0448***	-0.242	-0.0676*
	(0.45)	(-1.16)	(5.13)	(-0.11)	(-1.80)	(0.46)	(-1.20)	(5.22)	(-0.13)	(-1.83)
_cons	8.157***	-0.0243*	-0.141*	32.44**	3.118***	8.244***	-0.0357**	-0.124	30.97**	3.030***
	(5.24)	(-1.70)	(-1.86)	(2.10)	(8.64)	(5.37)	(-2.45)	(-1.63)	(2.01)	(8.39)
N	627	563	632	644	645	627	563	632	644	645
N_g	22	22	22	22	22	22	22	22	22	22
r2	0.124	0.373	0.179	0.103	0.268	0.124	0.358	0.175	0.102	0.265

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 7. Converting strategy

	(1) ROA	(4) depgrowth	(5) CIR	(6) FDR
post	-1.354***	-0.00639	5.751*	-0.00821
	(-5.79)	(-0.33)	(1.91)	(-0.16)
spinoff_convert	-1.951***	0.0902*	36.80***	-0.668***
	(-2.90)	(1.78)	(7.26)	(-10.34)
postXspinoff_convert	2.869***	-0.129**	-28.14***	0.410***
	(4.28)	(-2.46)	(-5.32)	(6.47)
lnta	-0.249***	-0.00890	1.623**	-0.0966***
	(-3.32)	(-1.63)	(2.19)	(-5.82)
age_w	0.0180	-0.00363***	-0.0741	-0.0164***
	(1.14)	(-2.63)	(-0.50)	(-4.91)
CPI	-0.175***	0.00766*	0.423	0.0215*
	(-3.40)	(1.76)	(0.85)	(1.83)
gdp	0.0784	0.0237*	-1.269	-0.0539*
	(0.50)	(1.96)	(-0.83)	(-1.81)
_cons	6.601***	0.102	54.35***	3.004***
	(4.52)	(0.95)	(3.90)	(9.47)
N	734	761	776	776
N_g	31	31	31	31
r2	0.0722	0.109	0.140	0.323

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 8. Triple interactions

	(1) ROA	(2) NPF	(3) financinggrowth	(4) depgrowth	(5) CIR	(6) FDR	(7) ROA	(8) NPF	(9) financinggrowth	(10) depgrowth	(11) CIR	(12) FDR
post	0.237	0.00481	0.0205	-0.121**	-6.853	0.106						
	(0.48)	(0.97)	(0.81)	(-2.39)	(-1.51)	(1.09)						
spinoff	-1.371***	-0.0254***	-0.0408*	0.0920*	24.24***	-0.289***						
	(-2.91)	(5.83)	(-1.66)	(1.83)	(5.51)	(-3.02)						
postXspinoff							-2.994***	0.00528***	0.0967	0.0243	44.25***	-0.258
							(-9.88)	(4.56)	(1.12)	(0.35)	(13.00)	(-0.98)
postXspinoffXbig							2.006***	0.0239***	-0.119	-0.0546	-29.15***	0.0946
							(5.91)	(5.49)	(-1.37)	(-0.79)	(-8.16)	(0.36)
lnta	-0.154**	0.000129	-0.00566	-0.00843*	0.0823	-0.0858***	-0.166**	0.000650	-0.00573	-0.00977**	0.195	-0.0865***
	(-2.38)	(0.11)	(-1.59)	(-1.78)	(0.13)	(-6.08)	(-2.51)	(0.56)	(-1.64)	(-2.05)	(0.29)	(-6.00)
age	-0.0127	0.00123***	-0.00178**	-0.00315**	0.0727	-0.0112***	-0.00913	0.00118***	-0.00170**	-0.00332***	0.0131	-0.0103***
	(-0.87)	(3.98)	(-2.07)	(-2.48)	(0.51)	(-3.70)	(-0.62)	(3.82)	(-1.99)	(-2.62)	(0.09)	(-3.53)
CPI	-0.129***	-0.000119	0.0111***	0.00839**	-0.458	0.0399***	-0.149***	0.000961*	0.00985***	0.00838**	0.00476	0.0337***
	(-2.64)	(0.25)	(4.18)	(1.99)	(-0.98)	(3.48)	(-3.12)	(1.96)	(3.76)	(1.97)	(0.01)	(2.97)
gdp	-0.00718	--0.000274	0.0370***	0.0272**	-0.757	-0.0487	-0.0482	-0.000228	0.0383***	0.0291**	-0.386	-0.0519*
	(-0.05)	(-0.24)	(4.93)	(2.33)	(-0.51)	(-1.58)	(-0.32)	(-0.18)	(5.15)	(2.50)	(-0.25)	(-1.66)
_cons	5.803***	-0.00104	-0.0667	0.0691	75.73***	2.697***	6.171***	-0.0110	-0.0687	0.0827	72.16***	2.725***
	(4.39)	(-0.06)	(-1.06)	(0.72)	(6.17)	(9.35)	(4.58)	(-0.64)	(-1.08)	(0.86)	(5.64)	(9.29)
N	788	679	792	799	832	833	788	679	792	799	832	833
N_g	33	33	33	33	33	33	33	33	33	33	33	33
r2	0.0875	0.299	0.172	0.108	0.140	0.281	0.0768	0.283	0.177	0.100	0.100	0.266

t statistics in parentheses

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

Table 9. Lead variable of ROA

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ROA_t1	ROA_t2	ROA_t3	ROA_t4	ROA_t1	ROA_t2	ROA_t3	ROA_t4
post	0.238	0.0148	-0.685	-1.213**				
	(0.51)	(0.03)	(-1.43)	(-2.42)				
spinoff	-1.265***	-1.022**	-0.289	0.214				
	(-2.87)	(-2.43)	(-0.64)	(0.47)				
Post*spinoff					-0.947***	-0.933***	-0.951***	-1.020***
					(-4.59)	(-4.22)	(-4.14)	(-4.33)
lnta	-0.208***	-0.260***	-0.330***	-0.349***	-0.214***	-0.264***	-0.332***	-0.347***
	(-3.26)	(-3.77)	(-4.72)	(-5.05)	(-3.26)	(-3.80)	(-4.78)	(-5.02)
age	-0.0110	-0.00924	0.0122	0.0242	-0.00628	-0.00513	0.0135	0.0231
	(-0.72)	(-0.59)	(0.79)	(1.52)	(-0.42)	(-0.34)	(0.88)	(1.43)
CPI	-0.130**	-0.171***	-0.161***	-0.0853	-0.158***	-0.196***	-0.169***	-0.0803
	(-2.50)	(-3.70)	(-3.13)	(-1.59)	(-3.11)	(-4.28)	(-3.40)	(-1.56)
gdp	0.0379	-0.0342	-0.184	-0.291**	0.0310	-0.0426	-0.187	-0.290**
	(0.27)	(-0.24)	(-1.32)	(-2.08)	(0.21)	(-0.29)	(-1.33)	(-2.08)
_cons	6.318***	7.588***	9.136***	9.454***	6.436***	7.699***	9.173***	9.430***
	(5.07)	(5.77)	(6.84)	(7.20)	(4.96)	(5.68)	(6.88)	(7.19)
N	728	663	596	531	728	663	596	531
N_g								
r2	0.0948	0.114	0.125	0.144	0.0797	0.103	0.124	0.143

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 10. Lead variable of NPF

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	NPFt1	NPFt2	NPFt3	NPFt4	NPFt1	NPFt2	NPFt3	NPFt4
post	0.0170***	0.0254***	0.0208***	0.0212***				
	(4.01)	(7.27)	(4.43)	(4.34)				
spinoff	0.0100***	0.00358**	0.00935***	0.0117***				
	(3.07)	(2.06)	(2.94)	(4.52)				
Post*spinoff					0.0264***	0.0288***	0.0296***	0.0321***
					(7.55)	(7.67)	(7.18)	(6.91)
lnta	0.00202**	0.00248***	0.00252***	0.00205**	0.00225***	0.00253***	0.00263***	0.00212**
	(2.33)	(2.78)	(2.76)	(2.06)	(2.62)	(2.89)	(2.92)	(2.15)
age	0.000871***	0.000720***	0.000615**	0.000656**	0.000847***	0.000711***	0.000588**	0.000621**
	(3.70)	(2.97)	(2.42)	(2.28)	(3.62)	(2.95)	(2.33)	(2.18)
CPI	0.00178***	0.00150***	0.00102***	0.000647*	0.00209***	0.00156***	0.00113***	0.000724*
	(4.21)	(3.55)	(3.01)	(1.65)	(4.87)	(3.77)	(3.38)	(1.67)
gdp	-0.000150	0.000642	0.000187	0.00284**	-0.000121	0.000662	0.000275	0.00304**
	(-0.14)	(0.57)	(0.14)	(2.26)	(-0.11)	(0.59)	(0.21)	(2.36)
_cons	-0.0311**	-0.0389***	-0.0335**	-0.0396***	-0.0354***	-0.0399***	-0.0353**	-0.0411***
	(-2.33)	(-2.92)	(-2.28)	(-2.94)	(-2.61)	(-3.02)	(-2.43)	(-3.00)
N	644	600	547	494	644	600	547	494
N_g								
r2	0.355	0.379	0.375	0.377	0.352	0.378	0.371	0.369

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 11. Lead variable of Financing growth

	(1) financinggrowth_t1	(2) financinggrowth_t2	(3) financinggrowth_t3	(4) financinggrowth_t4	(5) financinggrowth_t1	(6) financinggrowth_t2	(7) financinggrowth_t3	(8) financinggrowth_t4
post	-0.00916	-0.0255	-0.0327**	-0.0401***				
	(-0.33)	(-1.17)	(-2.02)	(-3.21)				
spinoff	0.000348	0.0218	0.0247	0.0195				
	(0.01)	(1.02)	(1.55)	(1.54)				
Post*spinoff					-0.00883	-0.00588	-0.0109	-0.0233***
					(-1.12)	(-0.72)	(-1.39)	(-3.07)
lnta	-0.0116***	-0.0134***	-0.0101***	-0.00627**	-0.0115***	-0.0127***	-0.00931***	-0.00564**
	(-3.24)	(-4.06)	(-3.30)	(-2.18)	(-3.34)	(-3.85)	(-3.04)	(-2.00)
age_w	-0.000000423	0.00123	0.000613	0.000588	-0.00000105	0.00116	0.000496	0.000480
	(-0.00)	(1.48)	(0.76)	(0.77)	(-0.00)	(1.40)	(0.62)	(0.63)
CPI	0.00259	0.00431*	0.00574**	0.0128***	0.00260	0.00483**	0.00628***	0.0132***
	(1.27)	(1.78)	(2.30)	(4.96)	(1.35)	(1.96)	(2.63)	(5.28)
gdp	0.0214***	0.0188***	-0.0113*	-0.00534	0.0214***	0.0187***	-0.0112*	-0.00508
	(2.86)	(2.65)	(-1.90)	(-1.09)	(2.84)	(2.65)	(-1.89)	(-1.03)
_cons	0.106	0.119*	0.229***	0.103*	0.106	0.109*	0.217***	0.0930*
	(1.49)	(1.86)	(4.10)	(1.85)	(1.55)	(1.69)	(3.90)	(1.71)
N	738	670	602	534	738	670	602	534
N_g								
r2	0.0972	0.0985	0.0808	0.173	0.0972	0.0967	0.0774	0.169

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 12. Lead variable of deposit growth

	(1) depgrowth_t1	(2) depgrowth_t2	(3) depgrowth_t3	(4) depgrowth_t4	(5) depgrowth_t1	(6) depgrowth_t2	(7) depgrowth_t3	(8) depgrowth_t4
post	-0.0998***	-0.117***	-0.110***	-0.0601***				
	(-2.62)	(-4.25)	(-4.27)	(-2.65)				
spinoff	0.0776**	0.103***	0.0979***	0.0452**				
	(2.04)	(3.68)	(3.86)	(2.00)				
Post*spinoff					-0.0237*	-0.0200	-0.0202	-0.0196
					(-1.90)	(-1.64)	(-1.54)	(-1.40)
lnta	-0.0131***	-0.0145***	-0.0162***	-0.0148***	-0.0142***	-0.0146***	-0.0157***	-0.0145***
	(-2.82)	(-3.22)	(-3.33)	(-3.04)	(-3.01)	(-3.16)	(-3.12)	(-2.95)
age_w	0.000182	0.000705	0.000937	0.000753	-0.0000350	0.000300	0.000488	0.000514
	(0.15)	(0.56)	(0.72)	(0.57)	(-0.03)	(0.24)	(0.38)	(0.39)
CPI	0.00982***	0.00109	0.00556*	0.00742**	0.00982***	0.00274	0.00768**	0.00836**
	(2.67)	(0.34)	(1.65)	(1.97)	(2.74)	(0.87)	(2.26)	(2.24)
gdp	0.0290***	0.00673	-0.00572	0.00999	0.0299***	0.00647	-0.00509	0.0102
	(3.02)	(0.69)	(-0.59)	(1.05)	(3.07)	(0.65)	(-0.51)	(1.07)
_cons	0.0727	0.230***	0.292***	0.174*	0.0885	0.237***	0.283***	0.170*
	(0.88)	(2.70)	(3.21)	(1.86)	(1.08)	(2.66)	(3.00)	(1.81)
N	749	685	617	545	749	685	617	545
N_g								
r2	0.100	0.0723	0.0892	0.0745	0.0917	0.0486	0.0640	0.0681

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 13. Lead variable of CIR

	(1) CIR_t1	(2) CIR_t2	(3) CIR_t3	(4) CIR_t4	(5) CIR_t1	(6) CIR_t2	(7) CIR_t3	(8) CIR_t4
post	-9.771**	-10.67***	-6.609**	-3.336				
	(-2.37)	(-3.14)	(-2.15)	(-1.18)				
spinoff	25.25***	24.22***	17.94***	13.81***				
	(6.41)	(7.37)	(6.14)	(5.53)				
Post*spinoff					13.97***	11.87***	9.772***	9.037***
					(8.51)	(6.69)	(5.20)	(4.70)
lnta	0.834	1.522**	2.604***	3.064***	0.844	1.562**	2.698***	3.169***
	(1.28)	(2.13)	(3.41)	(4.28)	(1.19)	(2.09)	(3.52)	(4.38)
age	0.0371	0.122	-0.0900	-0.133	-0.0440	0.0289	-0.172	-0.206
	(0.25)	(0.75)	(-0.55)	(-0.81)	(-0.30)	(0.18)	(-1.10)	(-1.30)
CPI	-0.425	0.406	0.528	-0.308	0.100	0.913*	0.918*	-0.0198
	(-0.87)	(0.91)	(0.99)	(-0.60)	(0.19)	(1.84)	(1.70)	(-0.04)
gdp	-3.170**	-2.451*	-0.395	3.156**	-2.892*	-2.330	-0.279	3.209**
	(-2.27)	(-1.74)	(-0.29)	(2.52)	(-1.91)	(-1.58)	(-0.20)	(2.51)
_cons	78.66***	61.41***	37.18***	16.97	77.03***	60.36***	35.51**	15.65
	(6.77)	(4.75)	(2.65)	(1.33)	(5.97)	(4.28)	(2.47)	(1.21)
N	760	688	617	545	760	688	617	545
N_g								
r2	0.159	0.169	0.158	0.183	0.0981	0.105	0.116	0.152

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 14. Lead variable of FDR

	(1) FDR_t1	(2) FDR_t2	(3) FDR_t3	(4) FDR_t4	(5) FDR_t1	(6) FDR_t2	(7) FDR_t3	(8) FDR_t4
post	0.147*	0.219***	0.274***	0.235***				
	(1.75)	(3.84)	(5.89)	(5.51)				
spinoff	-0.325***	-0.359***	-0.378***	-0.311***				
	(-3.92)	(-6.66)	(-8.71)	(-8.16)				
Post*spinoff					-0.157***	-0.114***	-0.0712***	-0.0435*
					(-6.22)	(-4.65)	(-2.98)	(-1.87)
lnta	-0.0724***	-0.0744***	-0.0818***	-0.0787***	-0.0730***	-0.0756***	-0.0837***	-0.0811***
	(-5.45)	(-5.70)	(-6.51)	(-6.37)	(-5.35)	(-5.60)	(-6.38)	(-6.28)
age	-0.0111***	-0.0123***	-0.00982***	-0.00772***	-0.0100***	-0.0108***	-0.00809***	-0.00608***
	(-3.84)	(-4.60)	(-3.73)	(-3.18)	(-3.61)	(-4.25)	(-3.22)	(-2.60)
CPI	0.00269	-0.0133*	-0.00170	-0.00286	-0.00449	-0.0213**	-0.00991	-0.00935
	(0.29)	(-1.66)	(-0.18)	(-0.32)	(-0.48)	(-2.57)	(-1.04)	(-1.01)
gdp	0.0647**	0.0158	0.0267	-0.0277	0.0621**	0.0131	0.0242	-0.0289
	(2.37)	(0.63)	(1.10)	(-1.26)	(2.24)	(0.50)	(0.95)	(-1.26)
_cons	2.005***	2.336***	2.270***	2.472***	2.028***	2.366***	2.305***	2.501***
	(7.91)	(9.04)	(9.00)	(10.48)	(7.89)	(8.83)	(8.75)	(10.14)
N	761	689	617	545	761	689	617	545
N_g								
r2	0.252	0.264	0.284	0.265	0.227	0.223	0.231	0.216

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

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Appendix 1. Treated and Control Banks

Treated banks are the following:

1 Bank Syariah Mandiri (BSM)
2 Bank Mega Syariah
3 Bank Rakyat Indonesia Syariah (BRIS)
4 Bukopin Syariah
5 Panin Dubai Syariah
6 Victoria Syariah
7 BCA Syariah
8 BPD Jabar & Banten Syariah
9 Bank Negara Indonesia Syariah (BNIS)
10 Bank Net Indonesia Syariah
11 BTPN Syariah
12 BPD Aceh Syariah
13 BPD NTB

Syariah Control banks are the following:
1. Bank sinarmas
2. BTN
3. CIMB NIAGA
4. MAYBANK
5. Permata
6. OCBC
7. Danamon
8. BPD JATIM
9. BPD JATENG
10. BPD JAMBI
11. BPD SUMBAR
12. BPD SULSEL & SULBAR
13. BPD SUMSEL & BABEL
14. BPD DKI
15. BPD RIAU DAN KEPRI
16. BPD KALSEL
17. BPD KALBAR
18. BPD KALTIM
19. BPD DIY
20. BPD SUMUT

Appendix 2. Robustness Check Tables

Tabel A.1.

	(1) ROA	(2) ROA	(3) ROA	(4) ROA	(5) ROA
postXspinoff	-1.889***	-1.839***	-1.257***	-1.218***	-1.221***
	(-7.28)	(-5.89)	(-3.05)	(-2.95)	(-2.96)
lnta		-0.0575	-0.0907	-0.162	-0.138
		(-0.58)	(-0.67)	(-1.05)	(-1.01)
age			-0.00648	-0.0113	-0.00307
			(-0.28)	(-0.49)	(-0.14)
CPI				-0.174*	-0.185*
				(-1.90)	(-1.83)
gdp					0.500
					(0.72)
_cons	3.002***	3.831**	4.473**	6.297**	3.249
	(15.97)	(2.55)	(2.20)	(2.42)	(1.08)
N	1509	1453	823	823	823
N_g					
r2	0.0258	0.0269	0.00894	0.0107	0.0123

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A.2

	(1) LnNPF	(2) LnNPF	(3) LnNPF	(4) LnNPF	(5) LnNPF
postXspinoff	3.270***	1.192***	3.294***	3.245***	3.243***
	(17.48)	(6.52)	(14.24)	(13.71)	(13.62)
lnta		1.282***	0.908***	1.045***	1.061***
		(24.42)	(7.92)	(8.98)	(9.09)
age			0.122***	0.129***	0.130***
			(4.68)	(5.10)	(5.12)
CPI				0.414***	0.407***
				(7.85)	(7.62)
gdp					0.180
					(0.99)
_cons	8.185***	-9.964***	-6.555***	-10.37***	-11.53***
	(61.30)	(-12.89)	(-4.61)	(-6.69)	(-6.12)
N	1223	1169	728	728	728
N_g					
r2	0.156	0.398	0.505	0.532	0.533

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A.3

	(1) fingrowth	(2) fingrowth	(3) fingrowth	(4) fingrowth	(5) fingrowth
postXspinoff	-1.327	0.520	2.503	2.708	2.619
	(-1.18)	(1.28)	(0.93)	(0.94)	(0.94)
lnta		-0.990	-3.006	-3.223	-3.126
		(-1.23)	(-1.04)	(-1.05)	(-1.05)
age			0.563	0.542	0.618
			(0.91)	(0.90)	(0.94)
CPI				-0.595	-0.699
				(-1.15)	(-1.16)
gdp					4.107
					(1.19)
_cons	1.451	15.25	39.26	45.14	21.50
	(1.29)	(1.24)	(1.07)	(1.09)	(0.98)
N	1501	1446	851	851	851
N_g					
r2	0.000470	0.00290	0.00808	0.00877	0.0123

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A.4

	(1) CIR	(2) CIR	(3) CIR	(4) CIR	(5) CIR
postXspinoff	18.94***	24.93***	21.71***	21.03***	20.99***
	(9.74)	(8.33)	(7.24)	(7.58)	(7.49)
lnta		-2.880***	-3.667**	-2.960**	-2.918**
		(-2.78)	(-2.56)	(-2.36)	(-2.37)
age			-0.0767	-0.0179	0.00690
			(-0.35)	(-0.08)	(0.03)
CPI				1.808	1.759
				(1.52)	(1.46)
gdp					1.414
					(0.55)
_cons	74.17***	113.9***	128.2***	109.6***	101.4***
	(64.49)	(7.62)	(6.36)	(6.26)	(5.64)
N	1577	1522	867	867	867
N_g					
r2	0.0548	0.0675	0.0514	0.0577	0.0581

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A.5

	(1) FDR	(2) FDR	(3) FDR	(4) FDR	(5) FDR
postXspinoff	21.39	38.94	79.06	82.33	82.67
	(1.57)	(1.61)	(1.62)	(1.63)	(1.63)
lnta		-8.431*	-20.81	-24.22	-24.59
		(-1.65)	(-1.63)	(-1.64)	(-1.64)
age			3.372	3.089	2.860
			(1.59)	(1.58)	(1.58)
CPI				-8.721	-8.273
				(-1.62)	(-1.61)
gdp					-12.95
					(-1.49)
_cons	1.458***	117.9*	261.4*	351.3*	426.3
	(37.97)	(1.67)	(1.65)	(1.65)	(1.64)
N	1498	1443	868	868	868
N_g					
r2	0.00335	0.00831	0.0182	0.0225	0.0235

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A.6

	(1) depositgrowth	(2) depositgrowth	(3) depositgrowth	(4) depositgrowth	(5) depositgrowth
postXspinoff	-0.0859*	0.0384	-0.0248	-0.0208	-0.0228
	(-1.67)	(1.16)	(-0.75)	(-0.58)	(-0.65)
lnta		-0.0669*	-0.0669	-0.0711	-0.0688
		(-1.94)	(-1.59)	(-1.36)	(-1.36)
age			-0.0136**	-0.0140**	-0.0122**
			(-2.28)	(-2.01)	(-2.09)
CPI				-0.0116	-0.0141
				(-0.36)	(-0.42)
gdp					0.0961
					(1.22)
_cons	0.174***	1.107**	1.267*	1.382	0.828
	(3.83)	(2.11)	(1.81)	(1.39)	(1.34)
N	1498	1443	851	851	851
N_g					
r2	0.00107	0.00727	0.0128	0.0129	0.0141

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A.3

	(1) fingrowth	(2) fingrowth	(3) fingrowth	(4) fingrowth	(5) fingrowth
postXspinoff	-1.327	0.520	2.503	2.708	2.619
	(-1.18)	(1.28)	(0.93)	(0.94)	(0.94)
lnta		-0.990	-3.006	-3.223	-3.126
		(-1.23)	(-1.04)	(-1.05)	(-1.05)
age			0.563	0.542	0.618
			(0.91)	(0.90)	(0.94)
CPI				-0.595	-0.699
				(-1.15)	(-1.16)
gdp					4.107
					(1.19)
_cons	1.451	15.25	39.26	45.14	21.50
	(1.29)	(1.24)	(1.07)	(1.09)	(0.98)
N	1501	1446	851	851	851
N_g					
r2	0.000470	0.00290	0.00808	0.00877	0.0123

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A.4

	(1) CIR	(2) CIR	(3) CIR	(4) CIR	(5) CIR
postXspinoff	18.94***	24.93***	21.71***	21.03***	20.99***
	(9.74)	(8.33)	(7.24)	(7.58)	(7.49)
lnta		-2.880***	-3.667**	-2.960**	-2.918**
		(-2.78)	(-2.56)	(-2.36)	(-2.37)
age			-0.0767	-0.0179	0.00690
			(-0.35)	(-0.08)	(0.03)
CPI				1.808	1.759
				(1.52)	(1.46)
gdp					1.414
					(0.55)
_cons	74.17***	113.9***	128.2***	109.6***	101.4***
	(64.49)	(7.62)	(6.36)	(6.26)	(5.64)
N	1577	1522	867	867	867
N_g					
r2	0.0548	0.0675	0.0514	0.0577	0.0581

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A.5

	(1) FDR	(2) FDR	(3) FDR	(4) FDR	(5) FDR
postXspinoff	21.39	38.94	79.06	82.33	82.67
	(1.57)	(1.61)	(1.62)	(1.63)	(1.63)
lnta		-8.431*	-20.81	-24.22	-24.59
		(-1.65)	(-1.63)	(-1.64)	(-1.64)
age			3.372	3.089	2.860
			(1.59)	(1.58)	(1.58)
CPI				-8.721	-8.273
				(-1.62)	(-1.61)
gdp					-12.95
					(-1.49)
_cons	1.458***	117.9*	261.4*	351.3*	426.3
	(37.97)	(1.67)	(1.65)	(1.65)	(1.64)
N	1498	1443	868	868	868
N_g					
r2	0.00335	0.00831	0.0182	0.0225	0.0235

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A.6

	(1) depositgrowth	(2) depositgrowth	(3) depositgrowth	(4) depositgrowth	(5) depositgrowth
postXspinoff	-0.0859*	0.0384	-0.0248	-0.0208	-0.0228
	(-1.67)	(1.16)	(-0.75)	(-0.58)	(-0.65)
lnta		-0.0669*	-0.0669	-0.0711	-0.0688
		(-1.94)	(-1.59)	(-1.36)	(-1.36)
age			-0.0136**	-0.0140**	-0.0122**
			(-2.28)	(-2.01)	(-2.09)
CPI				-0.0116	-0.0141
				(-0.36)	(-0.42)
gdp					0.0961
					(1.22)
_cons	0.174***	1.107**	1.267*	1.382	0.828
	(3.83)	(2.11)	(1.81)	(1.39)	(1.34)
N	1498	1443	851	851	851
N_g					
r2	0.00107	0.00727	0.0128	0.0129	0.0141

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

What determines the participation in the pension fund? Evidence from Indonesia

Sondang Martha Samosir, Muhamad Amin Rifai, Nunung Nuryantono, Syamsul Hidayat Pasaribu

Abstract

Indonesia's population is the 4th largest in the world. Population growth in Indonesia is predicted to increase every year followed by the increased proportion of the elderly population. The increase in the elderly population needs special concern, since the elderly population will be economically vulnerable in the future. Therefore, pension fund is important for the future. Various literatures show that financial literacy is one of important determinant factors of individuals' future planning, especially pension fund. This study aims to explain factors determines the participations in the pension fund program in Indonesia. The data used is financial literacy and financial inclusion survey from the OJK in 2016 and 2019. The method used in this research is logit and probit regressions. The result shows that pension funds participants are determines by financial literacy, income level, years of education, place of residence, savings account ownership, insurance ownership of, BPJS employment ownership, government employees, retirees, housewives, time deposit ownership, stock ownership, and ATM users. If pension fund is differentiated by the type of Defined Benefit (DB) Pension Funds and Defined Contribution (DC) Pension Funds, the affecting factors for defined contribution pension funds are more varied than defined benefit pension funds. However, since the most important factor determines pension fund ownership is financial literacy, improving financial literacy is required to increase the awareness of people to independently participate in pension fund program.

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Keywords: *Pension Fund, Logit, Probit, Financial Literacy.*

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1. Introduction

Indonesia currently has a population of 269 million or 3.49% of the world's total population. It is the 4th most populous country in the world after China, India and the United States (Worldometic, 2020). The proportion of the elderly is projected to be around 19% of the total population in 2045 (BPS, 2019). This projected high percentage poses a challenge to provide a decent life in retirement/through pension fund programs implemented by the Government or private companies.

The issue is encountered by all countries. United Nations (2019) states that the global population aged 65 years and over will reach 703 million people in 2019 and is expected to double to 1.5 billion people by 2050. Therefore, countries are starting to take steps to adequately address this issue. The retirement period is a condition of concern for some people since the elderly population is economically vulnerable in the future. Retirement is a period of changing roles, desires, views of life, and lifestyle for each individual (Schwartz, 1974; Kubicek et al. 2011; Hershey et al. 2010)

The basic principle of pension funds is the relationship between the company and employees, where the company collects contributions from each employee during the working period and provides pension funds when employees retire from the company (M'Lauchlan, 1907). Traditionally the pension fund system has been operated on the basis of "Pay as You Go (PAYG)", meaning that we pay pension contributions now and can enjoy future contributions after retirement. This system has continued in the last 4 decades because workers feel the benefits of pension funds in the elderly (Pecchenino and Pollard, 2005). In general, there are two types of pension plans, namely defined contributions and defined benefits (McGiil, 1984).

Retirement fund planning is important for the future. Moorthy et al. (2012) define pension fund planning as an action taken by individuals to achieve life goals in the future by preparing and setting aside some of the money they have. Individuals who do not prepare a pension plan from the earllly days, may not be able to achieve their expected retirement goals, and they will still need a job even though they have entered retirement to continue earning income (Asokumar and Jais, 2018).

Individuals in various countries are expected to be more responsible for their financial well-being in the elderly with pension funds. However, household surveys in various countries have revealed that most households are not able to manage finances well (Agarwal et al., 2009; Calvet et al., 2007), especially individual financial planning for retirement.

Financial literacy is an important part of achieving financial prosperity (Krause, 1991; Vosloo et al., 2014). This is because low financial literacy will have an impact on financial decision making based solely on perceptions and a lack of desire to receive financial advice (Anderson et al., 2017). Some literature suggests that financial literacy has an influence on household / individual decisions to plan finances for retirement. This is evident in developed countries such as the Netherlands (Van Roij, et al., 2011) and the United States (Lusardi and Mitchell, 2011).

The problem in developing countries is that households or individuals still have low levels of financial literacy. Based on research by Klapper et al. (2015) show that the Indonesian Financial Literacy Index is 32%, ranking 82 out of 131 countries. This shows that the level of individual financial literacy is still low. Households or individuals with low literacy will have an impact on their welfare in retirement, this is a threat in the future (Niu et al., 2020). Therefore, the aim of this study is to explain what factors determine the participation in the pension funds in Indonesia, particularly to seek the effect of financial literacy.

1.1 Overview of Demographic and Pension Fund In Indonesia

Demographic shift in Indonesia

The Inter-Census Population Survey (Supas) of the Central Statistics Agency (BPS) in 2015 showed that the projected value of Indonesia's population in 2015-2045 will reach 269.6 million people with 185.34 million people being the productive age group (15-62 years). The large proportion of the population of productive age has implications for the demographic bonus and economic prosperity.

This demographic bonus is predicted to end in 2036 and has implications for an increase in the number of elderly people by 19% until 2045 (BPS-Statistic Indonesia, 2018). The large proportion of the elderly population requires further handling, especially in relation to financial risks when entering retirement age and having a decent life at retirement / old age. The role of pension funds is very much needed in overcoming this problem.

Overview of Pension Fund Schemes in Indonesia

Pension fund schemes in Indonesia consist of two main schemes, namely the Defined Benefit Program and the Defined Contribution Program. The nomal retirement age in Indonesia is 56 years old in 2018 and gradually increases at the age of 65 in 2043, increasing for a year to the retirement age every three years. A pension benefit can be received by participants after 15 years of premium contribution. Pension fund schemes implemented in Indonesia are divided into two main schemes:

a. Defined Benefit (DB)
   Since July, 1 2015 employees in the private sector are covered by social insurance. The current pension benefit is actually 1%. Past income is assessed in line with inflation. The contribution value can be paid up to IDR 8.1 million per month. The minimum pension fund after 15 years of contribution is IDR 331 thousand, can have a pension benefit of IDR 3.97 million per month. Pension payments are indexed based on the rate of price inflation.

b. Defined Contribution (DC)
   Employees in the private sector can also receive a pension fund scheme with a defined contribution scheme. Since 1993-2013 BPJS Ketenagakerjaan (Manpower Social Security Administration) has organized an Jaminan Hari Tua-JHT (Old Age Security,

OAS) program. This program is open to all employees with defined monthly contributions and the pension funds received are the result of accumulation and development in contributions. However, the JHT program also has the option to exercise defined benefits with employee contributions of 2% of wages and the employer contributing 3.7% of the monthly wages. Pension funds can be paid on a lump-sum basis or all at once and can also be paid monthly until the participant dies.

Act of Pension Fund in Indonesia

As a form of social protection to ensure that all Indonesian people can fulfill their basic needs in a proper manner, based on Law Number 24 of 2011 concerning Social Security Administering Bodies, BPJS Ketenagakerjaan is a legal entity established to administer social security programs in the form of: accident insurance employment, life insurance, pension benefits, and pension benefits.

Based on Presidential Regulation Number 109 of 2013 concerning Staging of Social Security Program Participation, the obligation to participate in the social security program organized by BPJS Ketenagakerjaan is still being implemented gradually, the pension security program is only required for large and medium scale employers. and it is not yet compulsory for small and micro scale employers. In addition, groups of workers from the informal sector (other than employers) are only required to participate in work accident and death insurance programs, and are not yet obliged to participate in the pension security program.

In addition to the limitations in terms of membership, the benefits offered by the BPJS Ketenagakerjaan pension program are also relatively small to provide adequate livelihood security for workers who are about to undergo retirement age, with pension fund contributions paid only 3% of the wages received by participants (Government Regulation Number 45 of 2015, 2015).

2. Literature Review

2.1 Financial literacy of pension fund in Indonesia

Financial literacy is the ability to process information related to the economy, and make financial decisions related to financial planning, wealth accumulation, loans, and pensions (Lusardi & Mitchell, 2014). Meanwhile, according to Taft et al. (2013), financial literacy is the ability to understand and analyze financial choices, plan for the future, and be able to respond appropriately to events related to finance.

The level of financial literacy is divided into two, namely the basic level and the advanced level (Lusardi and Mitchell, 2007). Basic financial literacy includes an understanding of the calculation of bank interest, compound interest, inflation, the value of money against time, and money illusion. Meanwhile, advanced financial literacy includes understanding the calculation of risk factors, differences in stocks and bonds, stock market functions.

The literacy rate for pension funds is 14.13% and the financial inclusion index for pension funds is 6.18% even though the financial inclusion index has reached 76.19% (Financial Services Authority, 2019). This figure shows that only 6 out of 100 Indonesians use pension fund products. The low index of financial literacy and inclusion shows that there are still few Indonesians who understand and are interested in utilizing pension fund products.

2.2 Related Literature Factor Affecting Participant of Pension Fund

What are the factors that influence the planning / ownership of individual pension funds? Various empirical studies show that financial literacy has a significant effect on individual pension fund ownership. Nue *et al*. (2020) proved that financial literacy significantly affects individual retirement planning in China. Other literature shows that pension fund participation is influenced by individual characteristics such as the level of respondent's income, company size, worker motives, and years of service (Dumman, 2008; Hasan *et al*., 2007). Aside from using the Probit and Logit analysis approaches, the analysis method used to estimate the determining factors of planning / ownership of pension fund is a regression approach.

Various studies have shown that financial literacy, individual characteristics, and technology can affect pension fund ownership. Lazuardi and Mitchell (2007) reveal that financial literacy and individual characteristics such as age, education level and income level have a positive influence on pension fund planning in the United States. The same is evidenced by Onduko et al. (2015) in Kenya.

Sanderson et al. (2018) tried to develop factors that affect ownership of financial service products by including infrastructure aspects such as the internet and distance from the house. The results show that ownership of financial service products is positively influenced by financial literacy, age income, education level, and internet connection. Meanwhile, the distance from the house to financial service facilities has a negative relationship.

3. Methodology

3.1. Data Source

The data used in this study is financial literacy and financial inclusion surveys conducted by the Financial Services Authority (OJK) in 2016 and 2019.

3.2. Method of Analysis

The factors that are thought to influence pension fund participation include individual characteristics such as gender, education level, income, type of work, understanding of pension funds and retirement planning design (Njuguna and Otsola, 2011). Estimation of the factors that influence ownership of the pension fund program can use the logit and probit models.

Linear Probability Models often refer to Logit analysis, which is a combination of Multiple Regression and Multiple Discriminant Analysis (MDA). This technique is similar to multiple

regression analysis in one or more independent variables used to estimate single dependent variables (Hair et al, 1992). The odds in the probit model are calculated as follows:

$$p = P[Z \leq \beta_1 + \beta_2 x_i] = \Phi(\beta_1 + \beta_2 x_i) \quad (1)$$

Where is the probit function or cumulative distribution function used to calculate the normal probability density function$\Phi(z)$

The probit model was first introduced by Chester Bliss in 1934. This model is a cumulative distribution function model that fits to explain the qualitative response of the binary dependent variable (binary response) (Intriligator *et al*., 1996). The sample is calculated from one or two possibilities, namely the inclusion index or high and low literacy. The probit model used by Ibrahim and Bauer (2013) is as follows:

$$\Pr((Z = 1|\mathrm{w})) = \phi(\mathrm{w}'\alpha) \quad (2)$$

Pr = Probability of occurrence (P (1) = occurring; P (0) = not occurring)

Φ = Cumulative Distribution Function (*Cumulative Distribution Cumulative*)

α = Estimated parameter

The selection equations in this model are:

$$Z^* = \mathrm{X}'\alpha + \varepsilon_i \quad (3)$$

Where ~ N (0.1) and Y can be shown as indicators for hidden variables that are positive:

$$Z = \begin{cases} 1 & if\ Z^* > 0 \\ 0 & \text{is other} \end{cases} \quad (4)$$

To find out the factors that affect the level of participation in pension funds using probit and logit regression, it can be summarized in the following equation

$$Z^* = \alpha_0 + \beta_1 FLI_i + \beta_2 X3_i + \cdots + \beta_S XS_i + v_i \quad (5)$$

Z = opportunity to participate in the program pension funds (1 = participant; 0 = non-participant)

$\alpha_0\ \beta_s$ = estimated parameters

FLI = *Financial Literacy Index*

X3..XS = other variables that affect public participation in pension funds (income level, savings ownership, insurance ownership, BPJS employment ownership, type of work, education level, gender, education level, investment aspects, financial technology aspects, etc.)

v = error term.

i = individual.

4. Result and Discussion

4.1. Overview of Development of Pension Fund Participants in Indonesia

During the period of 2010 to 2018, number of pension fund participants have increased, even though in 2019 it experienced a slight decline (Figure 1).

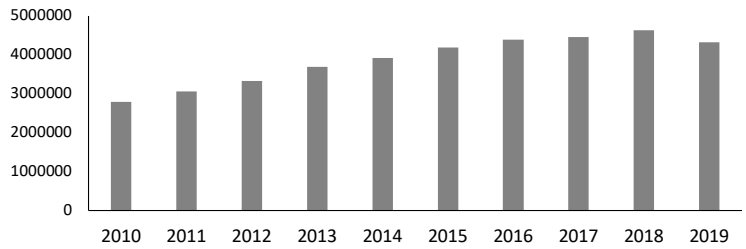

Figure 1. Number of Pension Fund Participants in Indonesia

Since pension funds in Indonesia are divided into 2 types; Defined Benefit Pension Fund and Defined Contribution. Figure 2 shows the number of participants of each type of pension fund. The number of participants in Indonesia is predominantly by the participants of Defined Contribution rather than the Defined Benefit. From 2010-2018, the number of Defined Benefit participants relatively stagnant, meanwhile, the number of Defined Contribution participants has been annually increased.

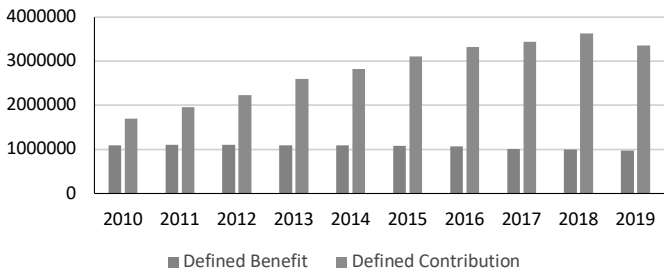

Figure 2. Development of Participants in Defined Contribution and Defined Benefit Indonesia

4.2. Factors affecting pension fund ownership in Indonesia

To analyze what factors affecting pension fund ownership in Indonesia, this study estimates 2 models; 1) pension fund participants in Indonesia in general; 2) pension fund participants by different type of pension fund. This study uses logit and probit regression models. Further explanation will be discussed in this chapter. Table 1 describes the factors determine pension fund ownership in general.

Table 1. The Determining Factors for Pension Fund Participants in Indonesia

Dep Variable: Pension Fund Ownership Dummy = 1		
Variable	Logit (Ods Ratio)	Probit (Marginal Effect)
Financial_Literation_Index	1.74 ***	0.0113 ***
Income Level	1.12 ***	0.0024 ***
Dummy_Women	1.13	0.0024
Savings ownership dummy = 1	1.63 ***	0.0081 ***
Dummy of insurance_ account ownership = 1	7.72 ***	0.0404 ***
Ownership dummy bpjs_ketenagakerjaan = 1	2.02 ***	0.0142 ***
Java Island Dummy == 1	1.15 **	0.0022 **
Years of Education	1.02 **	0.0002
Type of work		
UMKM Entrepreneurs	1.42	0.0037
Big Entrepreneur	1.08	-0.0011
Private employees	1.34	0.0025
Government officials	9.59 ***	0.098 ***
Retired	2.34 ***	0.013 ***
Other Work	1.72 *	0.0069 *
Housewife	-0.17 ***	-0.0085 ***
Investment Aspects		
Deposit Ownership Dummy = 1	1.04	0.0012 *
Share Investment Ownership Dummy = 1	-0.47	-0.0139 *
Gold Investment ownership dummy = 1	1.39	0.0072
Financial Technology Aspects		
ATM User Dummy = 1	1.26 *	0.0023
EDC User Dummy = 1	-0.85	-0.0023
Phone Banking User Dummy = 1	-0.92	-0.0009
Internal Banking User Dummy = 1	1.03	0.0007
Dummy User Online Transaction = 1	1.02	0.0002
Dummy of financial services institutions agent users = 1	1.18	0.0041
Cons	-0.001 ***	
Number of obs	22453	22453
LR chi2 (13)	2635.73	2647.99
Prob> chi2	0.000	0.000
Pseudo R2	0.304	0.306

Information: *) p <10%; **) p <5%; ***) p <1%

The results show that financial literacy is a significant factor affecting pension fund ownership for the probit and logit models. Individual characteristics explain that the level of income, years of education, place of residence, ownership of a savings account, ownership of insurance, and ownership of BPJS employment have a significant effect on ownership of pension funds. Based on the type of work, it shows that government employees, retirees, and other occupations have a positive influence on ownership of pension funds. Meanwhile, housewives have significantly influence pension fund ownership, with a negative relationship.

Based on the financial investment variables, it shows that no significant result in the logit model, but time deposit ownership and stock investment is significant at the 10 percent in the probit model. Individuals who have time deposits have probability to have pension funds. Individuals who invest in stock have negative relationship with ownership of pension funds. This shows that the individual prefers stock investment instruments over pension funds. In the aspect of financial technology, the factor affecting pension fund ownership is that ATM users

are significant at the 10 percent. This shows that individuals who use ATMs have probability of having pension funds.

The next analysis (Table 2) is to analyze the influencing factors to the ownership of pension funds based on their types.

Table 2. The Determinant of Defined Benefit and Defined Contibution Participants

Variable	Dep Variable: DEFINED BENEFIT Pension Fund Ownership Dummy = 1		Dep Variable: DEFINED CONTRIBUTION Pension Fund Ownership Dummy = 1	
	Logit (Ods Ratio)	Probit (Marginal Effect)	Logit (Ods Ratio)	Probit (Marginal Effect)
Financial_Literation_Index	1.54 ***	0.0056 ***	1.33 ***	0.0032 ***
Income Level	1.09 ***	0.0012 ***	1.15 ***	0.0012 ***
Dummy_Women	1.01	0.00001	1.5 ***	0.0034 ***
Savings ownership dummy = 1	2.4 ***	0.008 ***	1.08	0.001
Dummy of insurance_ account ownership = 1	7.46 ***	0.0241 ***	7.64 ***	0.0181 ***
Dummy bpjs_ketenagakerjaan = 1	1.79 ***	0.0069 *	1.94 ***	0.0065 ***
Java Island Dummy == 1	1.46 ***	0.0038 ***	0.64 ***	0.0039 ***
Years of Education	1.04 ***	0.0002 *	1.02	0.00002
Type of work				
UMKM Entrepreneurs	1.35	0.0016	2.10	0.0036 *
Big Entrepreneur	1.29	0.0005	1.63	0.0011
Private employees	1.31	0.0013	2.21 *	0.0036 *
Government officials	14.22 ***	0.0954 ***	7.11 ***	0.0252 ***
Retired	2.36 **	0.0081 ***	3.01 **	0.0067 ***
Other Work	1.89 *	0.0054 **	2.08	0.0035
Housewife	-0.08 **	-0.0054 **	-0.46	-0.0019
Investment Instruments				
Deposit Ownership Dummy = 1	1.11	0.0016	1	0.0002
Share Investment Ownership Dummy = 1	-0.15 *	-0.0213	-0.68	-0.0019
Gold Investment ownership dummy = 1	2.15 ***	0.0096 **	0.44 *	0.008 *
Financial Technology Instruments				
ATM User Dummy = 1	1.35 *	0.0024	1.74 **	0.0028 **
EDC User Dummy = 1	-0.79 *	-0.0019	-0.84	-0.0013
Phone Banking User Dummy = 1	0.99	0.0004	0.92	0.0006
Internal Banking User Dummy = 1	0.96	0.0004	1.48 ***	0.0036 ***
Dummy User Online Transaction =1	1.06	0.0007	1.08	0.0004
Dummy of financial services institutions agent users = 1	1.01	0.0003	1.3	0.0031 **
Cons	0.0005 ***		0.0005 ***	
Number of obs	22453	22453	22453	22453
LR chi2 (13)	2329.05	2326.67	947.2	961.44
Prob> chi2	0.000	0.000	0.000	0.000
Pseudo R2	0.3282	0.3279	0.2239	0.2273

Information: *) p <10%; **) p <5%; ***) p <1%

Based on the table above, it shows that financial literacy significantly affects pension fund ownership in the both types of pension fund, the Defined Contribution and the Defined Benefit.

Individual factors that significantly influence Defined Benefit pension fund ownership are the same variables as the previous model in general; income level, years of education, residence,

ownership of a savings account, ownership of insurance, and ownership of BPJS employment. The difference is in the type of Defined Contribution, the women has a significant effect on pension fund ownership.

The factors that influence pension fund ownership based on the type of work show that Defined Benefit are not different from pension fund ownership in general. Meanwhile, the Defined Contribution shows that jobs that have a greater chance of having pension funds are MSME Entrepreneurs, Private Employees, Government Employees, and Retirees.

The financial investment aspect in the Defined Benefit type shows that ownership of stock investment and investment in gold has a significant effect on ownership of pension funds. Whereas in the Defined Contribution, only gold investment has a significant effect on pension fund ownership.

The financial technology aspect shows the difference between Defined Benefit and Defined Contribution products. Types of Defined Benefit pension funds, the factors that influence pension fund ownership are ATM and EDC users, while in the type of Defined Contribution the factors that affect pension fund ownership are ATM users, internet banking users, and users of financial services institutions agents such as BRIlink.

5. Conclusion

The results show that the development of pension fund participants in Indonesia has increased starting 2010. Based on the types of pension funds in Indonesia, it shows that the type of Defined Contribution has a larger number of participants than the Defined Benefit. The growth of Defined Benefit pension fund participants is relatively stagnant, while Defined Contribution has increased every year.

In general, there are four influencing factors for pension fund ownership in Indonesia; financial literacy, individual characteristics (income level, years of education, place of residence, ownership of a savings account, ownership of insurance, and ownership of BPJS employment, government employees, retirees, housewives), financial investment aspects (time deposit ownership, stock investment), and technology financial aspects (ATM users). If the pension fund is differentiated by types, the factors affecting the participation of the Defined Contribution pension fund are relatively more varied than the Defined Benefit.

Since the most important factor in influencing pension fund ownership is improvement of financial literacy, it is required to increase the awareness of people to independently participate in pension fund program.

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The impacts of general mutual funds and macroeconomic factors on the performance of an infrastructure oriented mutual fund in Indonesia

Bayu Bandono, Syamsul Hidayat Pasaribu, Nunung Nuryantono

Abstract

The goal of this study to examine the dynamic relationship of general mutual funds and macroeconomic variables on the performance of a selected infrastructure oriented mutual fund, called the RDPT. Monthly time series data spanning the period of December 2014 to December 2019 have been used. The co-integration test and Engle-Granger's error correction mechanism (ECM) have been applied to analyse the dynamic behaviour of the RDPT performance. The results show that the RDPT performance is co-integrated to the performances of the general types of mutual funds and macroeconomic variables. From the ECM estimation, we find that the performance of the RDPT is negatively affected by the performances of the Exchange Trade Fund (ET) and the Fixed Income Fund (FI) but positively affected by the Capital Protected Fund (CP). The other types of general mutual funds are not significant such as the Equity Fund (EQ), the Index Fund (IF), the Mixed Asset Fund (MA), and the Money Market Fund (MM). From macroeconomic factors, the Consumer Price Index (CPI) has negative effect on the RDPT meanwhile the Real Gross Domestic Product (RGDP) and Indonesian Central Bank policy rate (BI Rate) have positive effects. The other macroeconomic variables, such as Indonesian exchange (IDX) composite index and exchange rate (ER) are not significant. The paper conclusively discovers that that some of the general type of mutual funds have substitution effects to the RDPT and the others have complementary effects. Moreover, the performance of the RDPT is depend on macroeconomic variables event though not all are statistically significant.

JEL Code: D25, E27 G11, H54, O16

Keywords: *Infrastructure investment, mutual fund, macroeconomic variables, Co-integration, Error Correction Model.*

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1. Introduction

During the first Jokowi's administration in 2014-2019, the construction of infrastructure such as toll roads, ports, airports and dams took place massively. In the second term of his administration, infrastructure development remains a priority for his policies to be carried out. Apart from coming from state financing through the central government budget as well as from foreign loans, infrastructure development financing support can be done through the development of various alternative financing products. Although this financial product can be categorized as mutual funds, the Indonesian Financial Services Authority, called Otoritas Jasa Keuangan (OJK) classifies this type of investment as other investments. It is hoped that investment products that support infrastructure development can become an alternative investment besides general mutual funds which have been the favourite among investors.

Several types of mutual fund investment products in Indonesia that specifically to support infrastructure financing are Limited Participation Mutual Funds (RDPT), Collective Investment Contracts of Asset-Backed Securities (CIC-ABS), Asset Backed Securities Collective Investment Contracts (KIK-EBA), EBA-SP, Real Estate Investment Trust, Real Estate Investment Fund (DIRE) and Infrastructure Fund (DINFRA).

The RDPT in Indonesia is one of the infrastructure supporting investment products that is different from other infrastructure supporting investment products aimed specifically at professional investors, so that the sales method is not offered in retail like the usual mutual funds. In the period December 2014 - April 9 2020, the average net asset value of the RDPT was higher (IDR 23.6 trillion) compared to other infrastructure supporting investment products, such as EBA IDR 5.1 trillion; EBA SP IDR 2.8 trillion; DIRE IDR 3.6 trillion; DINFRA IDR 4.8 Trillion). In line with this, the proportion of net asset value of the RDPT to total mutual funds during the 2014 to 2020 period shows fluctuation with range from 3.7% to 6.8%.

However, with the emergence of various investment alternatives for mutual funds to support the aforementioned infrastructure, it is interesting to analyse whether the performance of general types of mutual funds, such as Exchange Traded Fund (ET), Fix Income Fund (FI), Capital Protected Fund (CP), Equity Fund (EQ), Index Fund (IF), Mixed Asset Fund (MA), and Money Market Fund (MM) will affect the performance of the mutual funds supporting the infrastructure, in this case the performance of the RDPT.

Therefore, this paper intends to analyse the performance effect of general mutual funds and macroeconomic variables on the performance of one of the most developed infrastructures supporting mutual funds, namely: RDPT. This paper will then be further divided into four parts. The second part is the literature review. Section 3 describes the research methodology used in this analysis. Section 4 discusses the results and interpretations. The final section of this paper discusses the conclusions and managerial implications of the results obtained.

2. Literature Review

The empirical facts show that various macroeconomic variables such as gross domestic product (GDP), exchange rates, consumer price index, interest rates, and composite stock price index have significant effects on mutual fund performance (Pal and Ruhee, 2011, Monjazeb and Ramazanpour, 2013, Panigrahi et. al, 2019, Qureshi et. al, 2019). However, there is still limited studies that investigate the effects of one mutual fund performance to the performance of other type of mutual funds.

Pal and Mittal (2011) examine the long-run relationship between the Indian capital markets and key macroeconomic variables such as interest rates, inflation rate, exchange rates and gross domestic savings (GDS) of Indian economy. Their study use quarterly time series data from January 1995 to December 2008. The unit root test, the co-integration test and error correction mechanism (ECM) have been applied to derive the long run and short-term statistical dynamics. The findings of the study establish that there is co-integration between macroeconomic variables and Indian stock indices which is indicative of a long-run relationship. Their ECM regression shows that the rate of inflation has a significant impact on both the BSE Sensex and the S&P CNX Nifty. Interest rates on the other hand, have a significant impact on S&P CNX Nifty only. However, in case of foreign exchange rate, significant impact is seen only on BSE Sensex. The changing GDS is observed as insignificantly associated with both the BSE Sensex and the S&P CNX Nifty. The study reveals that the changes in stock markets are affected not only by change in few selected macroeconomic variables, but there are other macroeconomic dimensions affecting the Indian capital market.

In the other study, Panigrahi et al (2019) examine the impact of macroeconomic variables to Net Asset Value of Mutual Funds in India. In their hypothesis, mutual fund performance is also heavily influenced by the performance cycle and the intervention of macroeconomic variables within the industries or the ventures in which the funds invest. Using regression analysis, macroeconomic variables that used in the model is interest rate, inflation rate, and exchange rate. From the trend analysis and regression model, the study finds out that the macroeconomic variables influence the performances among mutual funds; they either affect it positively or negatively. If the interest rate in the future goes up by a certain percentage, then it will drastically affect the performance of the mutual fund in a negative way. In future with the current trend, the inflation expects to increase, resulting in higher prices. The risk increases with the increase in the inflation rate; the performance of the mutual fund tends to improve. Exchange rate plays a significant role while dealing with foreign investments, but in general, the contribution of the exchange rate in the mutual fund is meagre.

Qureshi et al. (2019) also exercise the relationship among mutual fund flows, stock market returns, and macroeconomic indicators for nine Asian developing economies, they are: China, India, Indonesia, Korea, Malaysia, Pakistan, Philipines, Taiwan and Thailand. The study employs a panel vector autoregressive model in the context of generalized method of moment

(GMM) estimation to identify the dynamic relationships. Macroeconomic variables that used in this study are CPI, GDP money supply (M1), exchange rate, and ratio of fiscal deficit to GDP. The findings show that GDP, money growth, unemployment and the ratio of fiscal deficit to GDP positive and significantly affect the equity flows and bond flows. The study also finds that causality between fund flows and macroeconomic variables is bi-directional in further support of the information hypothesis. This means that fund flows not only respond to past economic conditions, but they also foreshadow future economic conditions.

In the case of Indonesia, Hermawan and Wiagustini (2016) indicate that macroeconomic variables, such as inflation has a negative relationship on the performance of the mutual fund. In contrary, inflation has positive impact on mutual fund performance (Alexandri, 2013). However, Pasaribu and Kowanda (2014) reveal that there is no effect of inflation to the performance of mutual fund.

3. Methodology

3.1. Data Sources and Description

The main source of Indonesian mutual fund statistics come from Indonesia Financial Authority or Otoritas Jasa Keungan (OJK). The data for performances derive from net asset value (NAV) of general mutual fund products and the RDPT. Meanwhile, RGDP and CPI data come from Indonesia Statistics or Badang Pusat Statistik (BPS). The data for exchange rate and BI rate come from Indonesia Central Bank or Bank Indonesia (BI) and the last data, composite index arise from Indonesia Stock Exchange (IDX). To conduct the research objectives, the time series monthly data spanning from December 2014 to December 2019 comprising 61 time observations have been used for the empirical econometric analyses.

3.2. Econometric Model

In time-series analysis, it is required that the variables are stationary variables to prevent spurious regression. However, if the variables are not stationary but they have same degree of integration or I(1) and their linear combination is co-integrated or stationery, I(0), then one of the best model for estimation is the error correction mechanism (Engle and Granger, 1987). Therefore, first we perform the unit root tests according to Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1979, 1981). The ADF can be tested for all variables using following regression:

$$\Delta y_t = c_0 + c_1 y_{t-1} + \sum_{j=1}^{\rho} \gamma_j \Delta y_{t-\rho} + e_t \quad (1)$$

where: Δ is first difference and *y* refers to all variables that we use on the empirical model. This study applies Schwarz Information Criterion (SIC) to select suitable lag lengths of ADF test and the results are reported in Table 2.

Our empirical model in this study basically refers to the model developed by Pal and Ruhee (2011). Slightly different to their model, this study includes all types of general mutual funds in Indonesia that are theoretically considered as a substitution for RDPT. Thus, we develop an empirical econometric model as follows:

$$LRDPT_t = \alpha_0 + \alpha_1 LEQ_t + \alpha_2 LET_t + \alpha_3 LFI_t + \alpha_4 LIF_t + \alpha_5 LMX_t + \alpha_6 LMM_t + \alpha_7 LPF_t + \alpha_8 LCPI_t + \alpha_9 LIDX_t + \alpha_{10} LRGDP_t + \alpha_{11} LBIrate_t + \alpha_{12} LER_t + u_t \quad (2)$$

where: *L* refers to logarithms, net asset values for general type of mutual funds: Equity Fund (EQ), Exchange-Traded Fund (ET), Fixed Income Fund (FI), Index Fund (IF), Mixed Asset Fund (MX), Money Market Fund (MM), Capital Protected Fund (CP). For macroeconomic variables, we use Consumer Price Index (CPI), Indonesia Exchange Composite Index (IDX), Real Gross Domestic Product (RGDP), Central Bank policy rate (BI rate), and exchange rate IDR/US$ (ER).

To test for long-run effects of general mutual funds and macroeconomic variables, we use Engle and Granger (1987) procedure. The Engle-Granger method for co-integration test utilizes the Augmented Dickey-Fuller (ADF) test for the resulting residuals from equation (2).

Carried out the ADF test, performs co-integration test based on Engle-Granger, therefore is called Augmented Engle-Granger (AEG) test can be tested via following equation:

$$\Delta u_t = c_1 u_{t-1} + \sum_{j=1}^{\rho} \gamma_j \Delta u_{t-\rho} + \varepsilon_t \quad (3)$$

where u_t is residuals from equation (2).

After established the unit root and co-integrating tests, the study moves onto examining the error correction mechanisms that describe short-run dynamics on RDPT equation. The ECM model for the RDPT can be developed as follows:

$$\Delta LRDPT_t = b_1 \Delta LEQ_t + b_2 \Delta LET_t + b_3 \Delta LFI_t + b_4 \Delta LIF_t + b_5 \Delta LMX_t + b_6 \Delta LMM_t + b_7 \Delta LPF_t + b_8 LCPI_t + b_9 \Delta LIDX_t + b_{10} \Delta LRGDP_t + b_{11} \Delta LBIrete_t + b_{12} \Delta LER_t + b_{13} ECT_{t-1} + v_t \quad (4)$$

where ECT_{t-1} equal to u_{t-1} from equation (2).

4. Empirical Evidence

Table I describes the descriptive statistics for the thirteen variables used in this research. They are seven types of mutual funds and five macroeconomic variables. The values of skewness and kurtosis are useful to investigate normal distribution of the variables. We may also use JB statistics (Jarque and Bera, 1987) in order to test whether the distributions of the variables are symmetric or normal distribution. The null hypothesis for JB statistics is normal distribution, meaning that the values of Skewness and Kurtosis equal to zero. From the table, we find that most of the variables are normal distributions, except for LFI and LIF.

Table 1. Descriptive Statistics of All Variables

	Sample: December 2014 to December 2019												
	LRDPT	LEQ	LET	LFI	LIF	LMX	LMM	LPF	LCPI	LIDX	LGDP	LBIRATE	LER
Mean	3.076	4.856	1.965	4.341	0.525	3.218	3.768	4.529	4.858	8.628	14.717	1.737	9.522
Median	3.052	4.800	2.029	4.451	0.020	3.250	3.847	4.568	4.865	8.665	14.721	1.749	9.514
Maximum	3.335	5.107	2.743	4.796	2.168	3.484	4.273	5.050	4.935	8.796	14.852	2.048	9.629
Minimum	2.786	4.551	1.147	3.541	-0.713	2.938	3.198	3.802	4.773	8.349	14.585	1.447	9.428
Std. Dev.	0.162	0.160	0.505	0.395	0.957	0.152	0.313	0.390	0.050	0.117	0.077	0.203	0.041
Skewness	0.082	0.163	-0.161	-0.579	0.270	-0.139	-0.019	-0.303	-0.112	-0.525	-0.004	0.126	0.244
Kurtosis	1.559	1.594	1.649	1.928	1.336	1.695	1.553	1.727	1.799	2.261	1.944	1.656	2.792
Jarque-Bera (JB)	5.343	5.293	4.906	6.330	7.777	4.523	5.323	5.051	3.795	4.187	2.836	4.753	0.715
Prob (JB)	0.069	0.071	0.086	0.042	0.020	0.104	0.070	0.080	0.150	0.123	0.242	0.093	0.699
Observations	61	61	61	61	61	61	61	61	61	61	61	61	61

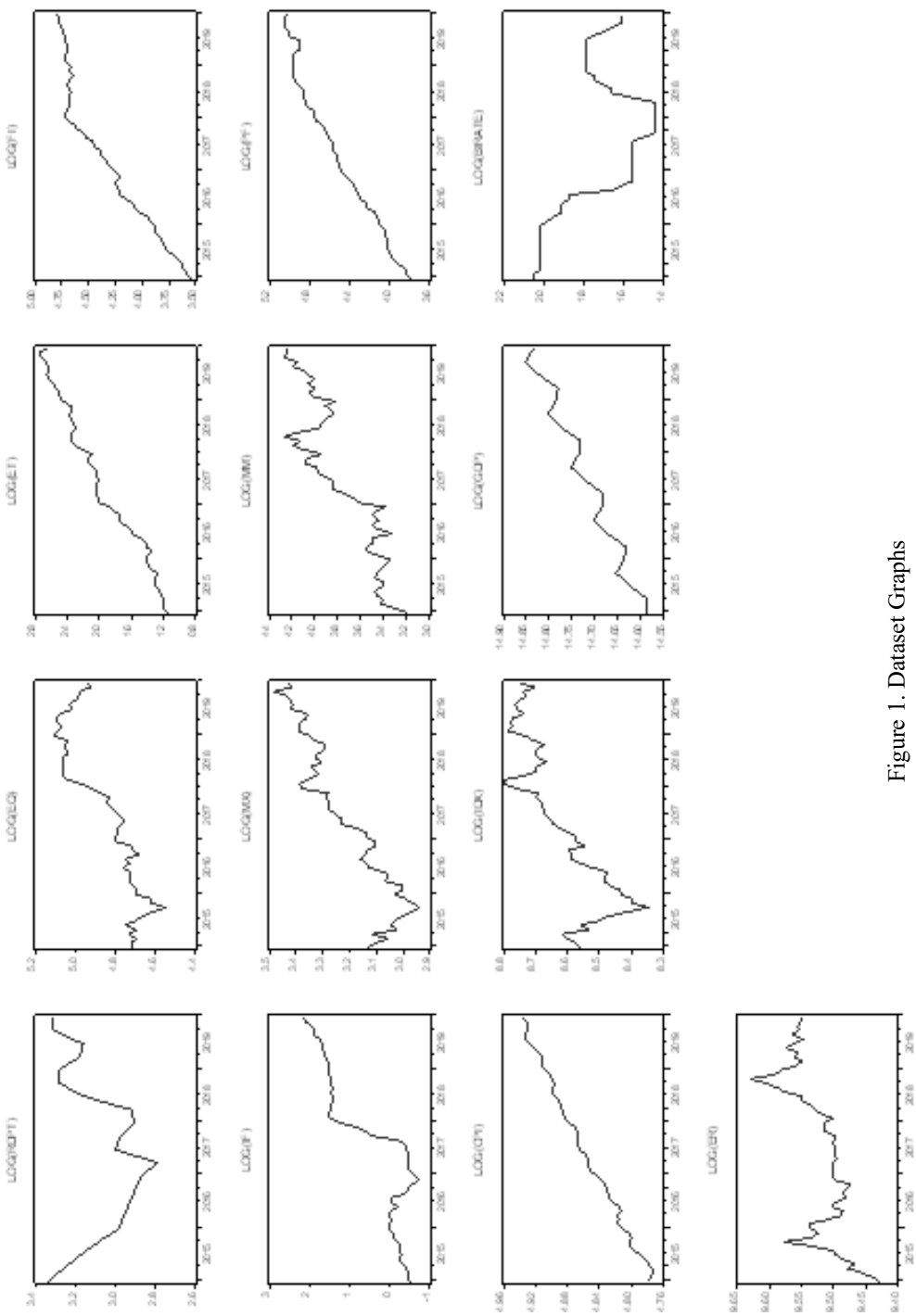

Figure 1. Dataset Graphs

To determine whether the time series is stationary or not, we may use graphical representation which is shown in Figure 1. The graphs observe the evidence of trend, mean, variance, and seasonality. Statistically, a time series data is said to be stationary if the mean, variance and covariance of these variables are entirely unaffected by time or in other words constant, therefore Yt~I(0). All variables seems to be non-stationary based on all graphs in Figure 1. For formal test, we employ ADF tests for all variables used on this study. The ADF tests results are presented on Table II. The tests indicate that all variables are non-stationery but have the same order of integration on first degree of I(1).

After it finds out that all the variables are non-stationary series, it may be interested in determining whether the series are co-integrated. Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary variables might be stationary. If such a stationary, or I(0), linear combination exists, the non-stationary, the variables are said to be co-integrated. The stationary linear combination is called the co-integrating equation and may be interpreted as a long-run equilibrium relationship among the variables.

Based on the ADF test of the resulting residuals from equation (2) or ut, we found significant test value at t-stat = -5.239. Therefore ut is stationary series or I(0). This concludes that there is co-integration or long-run linear effects from all independent variables on equation (2) to dependent variable, the RDPT.

Table 2. Unit Root and Co-Integration Tests

Variables	ADF test at Level	ADF test at First Difference	Order of integration
Unit root test			
LRDPT	-2.497	-3.045***	I(1)
LEQ	-1.452	-7.258***	I(1)
LET	-2.298	-6.214***	I(1)
LFI	0.158	-2.682**	I(1)
LIF	-2.154	-2.599**	I(1)
LMX	-2.468	-9.466***	I(1)
LMM	-2.544	-2.817***	I(1)
LPF	-1.193	-2.740***	I(1)
LCPI	-2.554	-6.562***	I(1)
LIDX	-2.207	-7.054***	I(1)
LGDP	-2.622	-13.497***	I(1)
LBIrate	-1.415	-5.592***	I(1)
LER	-2.454	-7.258***	I(1)
Co-integration test			
u	-5.239***		I(0)

Notes: *, * *, and * * * indicate rejection of null hypothesis of non-stationary at 10, 5, and 1 percent significant levels; the critical values at 1, 5 and 10 percent for the ADF test (level variables) are -4.094, -3.475, and -3.165. For first difference, critical values of the ADF test without constant and time-trend are -2.598, -1.945, and -1.614.

The results obtained from ECM specification as represented on equation (4) is shown on the Table III. From estimated ECM, it produces adjusted R2 = 0.454. We employ residual normality test by Jarque-Bera-stat = 0.659 (p-value = 0.719) which indicates the residuals of the ECM estimation are normal distribution. We employ heteroskedasticity test by Breusch-Pagan method (Breusch and Pagan (1979) and find insignificant test, therefore we conclude that the estimation are free from heteroscedasticity with F-stat=1.419 (p-value=0.187). However, from serial correlation LM-test (Breusch. 1978 and Godfrey, 1978), we find a significant F-stat = 6.832 (p-value= 0.000) which is latter on we use AR(1) in order to solve this problem.

From the estimation, we find the negative impacts of the exchange-traded fund (ET) and the fixed income fund (FI) on the RDPT in the short-run. It means that ET and FI seems to have substitution effects on the RDPT. Investors may have to choose to buy exchange traded fund or RDPT. They also may have to choose fixed income fund or RDPT. However, protected fund (PF) has a positive significant impact on RDPT meaning that these two mutual fund types are complementary. The investors who want to buy protected funds may also buy RDPT.

Moreover, consumer price index has negative impact on RDPT meanwhile real GDP and policy rate from the central bank have positive impacts. The massive infrastructure development in Indonesia have increase economic growth, therefore increase the demand for infrastructure oriented mutual funds such as the RDPT.

Table 3. The Estimation of Error Correction Model for the Net Asset Value of RDPT

Variables	Coefficient	Prob.
ΔLEQ	0.092	0.492
ΔLET	-0.125*	0.097
ΔLFI	-0.497***	0.002
ΔLIF	0.006	0.822
ΔLMX	0.181	0.187
ΔLMM	0.050	0.253
ΔLPF	0.218*	0.096
$\Delta LCPI$	-1.816*	0.080
$\Delta LIDX$	0.294	0.113
$\Delta LGDP$	2.287***	0.000
$\Delta LBIrate$	0.293***	0.003
ΔLER	0.122	0.625
ECT_{t-1}	-0.389***	0.001

Note: * , **, *** denote significance at the 10, 5 and 1 levels, respectively.

Lastly, the ECT shows the significant of speed adjustment from short-run to long-run equilibrium. The absolute value of the ECT is 0.389 is less than one indicates that the stable estimated RDPT finally converges to the long-run equilibrium position. The estimated model recommends that 39 percent of any previous disequilibrium in the long-run will be corrected in short-term.

5. Conclusion and Implications

The massive infrastructure development from five years ago and for the next five year in near future required huge financing. The financial sources might come from infrastructure oriented mutual funds. The paper has proved that there are significant impacts of some general types of mutual funds and macroeconomic factors on a selected infrastructure oriented mutual fund or the RDPT in Indonesia. This study reveals not all types of general mutual funds and macroeconomic factors have impacts on the performance of the RDPT.

The implications of this study can be for investors, investment managers, and the government. For investors and investment managers, in order to buy RDPT mutual fund, they must be aware to the trends of some types of general mutual funds, especially the mutual funds that have substitution effects to the RDPT. For government, they should promote RDPT and the other infrastructure oriented mutual funds in order to extent the sources of infrastructure financing.

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The influence of liberalization on innovation, performance, and competition level of insurance industry in Indonesia

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Abstract

This study aims to reveal the impact of liberalization on innovation, performance, and the level of competition for insurance industry players in Indonesia based on insurance data from 2006 to 2018. The research method used is quantitative with the support of panel data. The analysis technique to explain the findings uses an aggregate model and Threshold regression analysis. Descriptive and econometric research types chose to make it easier to explain the findings. From the results of data analysis using three experimental models, it shows three findings. First, in the aggregate, there is a significant negative relationship between liberalization and innovation. In the Threshold regression model, a negative impact occurs on companies with low premium income. Whereas in high premium income companies, the result is positive. Due to the availability of resources to large companies to optimize the adaptation of liberalization in terms of innovation. Second, the higher the liberalization can encourage insurance companies to perform more efficiently and increase net premium income. Third, the negative impact of liberalization on competition shows that the higher the deregulation, the lower the game. These findings indicate that in the aggregate, global insurance financial liberalization has had a significant impact on the development of the insurance industry sector in Indonesia. However, liberalization can be different for groups of small companies and groups of large companies. The expected implication is that the government needs to adopt a long-term policy strategy that can encourage the sustainability of insurance companies, both high-income companies and low-premium-income companies. Besides, it is hope that insurance companies pay more attention to innovation, significantly improving the quality of human resources as a competitive advantage in facing global competition.

Keywords: *Competition; Innovation; Insurance; Liberalization; Performance*

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1. Introduction

In terms of capital provisions, the Indonesian insurance industry is quite open to foreign investors. Based on the requirements of Government Regulation Number 14 of 2018 concerning Foreign Ownership in Insurance Companies. Which was later amended by Government Regulation Number 3 of 2020 regarding Amendments to Government Regulation Number 14 of 2018 relating to Foreign Ownership in Insurance Companies, the maximum limit of ownership of insurance companies by foreign parties is up to 80% of the paid-up capital. Also, this provision is exempt for public companies and insurance companies, which, at the time of stipulation, are owned by foreign parties with an ownership percentage of more than 80%. These provisions are still more lenient than similar conditions in other ASEAN countries such as Thailand and Malaysia. In this case, the two countries set the maximum foreign ownership requirement of 25% and 70%, respectively [1].

Insurance services have a central role in modern society. The empirical evaluation of competition among insurance companies also improved after deregulation [2]. After liberalization, the amount of insurance in the market began to increase, which led to a significant decrease in market concentration [3]. At the ideal level, liberalization adaptation can have a positive impact on the development of the insurance industry in a country [4],[5],[6],[7],[8]. The impact of liberalization is initially U-shaped during contraction and is linear, but in the second period, it seems that liberalization is superior to before it implemented [9].

Liberalization can provide benefits in supporting the special skills needed to encourage competency improvement of the insurance industry players whose development is still at an early stage [2]. The findings differ from previous studies, which revealed that financial liberalization has an inverse impact on the performance of insurance companies. The existence of liberalization has encouraged most insurance companies consisting of 1,324 companies registered with The Organization for Economic Co-operation and Development (OECD), to take more risks to survive [10]. The negative impact of liberalization is due to ineffective and inefficient ways of developing and government policies in the insurance sector [11]. The liberalization of policies in the insurance industry has increased the risk of using funds. And this is a significant difficulty facing the insurance industry [12].

In the insurance industry, board composition has a positive relationship with the overall risk-taking of a company [13]. Besides this, specific expertise support can obtain through the assignment of foreign workers with qualifications in actuarial and insurance management, which is possible due to foreign company owners who are more experienced in managing insurance companies in a relatively mature market [14]. Also, foreign participation can provide much-needed capital support for industry players to explore market potentials that have not optimal exploited.

Through technical support and capital capacity, liberalization expects to have a positive impact in the form of opportunities for innovation in the use of information technology aimed at increasing the effectiveness and efficiency of the insurance company's business processes. [7]. One example of innovation in information technology includes online marketing of insurance products, for example, by utilizing e-commerce platforms. Also, information technology can be used by insurance companies to provide convenience for consumers in the underwriting process and increase the speed of the claim process.

Meanwhile, from a customer perspective, liberalization can also provide benefits in developing a more competitive insurance market. The increase in the intensity of competition among insurance industry players expects a stimulus to increase the availability of quality insurance services to customers at affordable premium rates. Society wants an insurance liberalization that leads to continuous innovation and improvement [15].

However, the positive impact of liberalization on the development of the insurance industry in Indonesia is still not optimal. Insurance is currently not considered an essential indicator of a market economy, a source of investment, and economic stability required for its development[11]. There are indications that the level of liberalization of the insurance industry in Indonesia is not directly proportional to the performance of the sector, especially when compared to other countries, especially in the ASEAN region. As an illustration, the estimated value of Indonesia's insurance premiums in 2018, amounting to USD 20,383 million, is still behind when compared to the estimated premium value of Thailand in the same period, which is USD. Twenty-six thousand six hundred twenty-two million (Swiss Re Institute, 2019)[16]. If the stakeholders do not respond wisely and with the right strategy, liberalization becomes a challenge for stakeholders [6].

The main challenge for the insurance industry is increasing market competition [17]. Apart from that, Indonesia is still lagging behind the two countries regarding density and insurance penetration. Based on Swiss Re data, Indonesia's insurance density is ranked 72 (seventy-two) globally with a value of USD. Seventy-six per capita, while Malaysia and Thailand were respectively ranked 39 (thirty-nine) and 47 (forty-seven), with a much higher density value of USD. 518 and USD. 385. When viewed based on insurance penetration indicators, Indonesia also lags behind the two countries and even ranks lower than Vietnam[16].

It is related to the Generalized System Preferences Review (GSP Review) process, the impact of the negotiation process with the United States and the United Kingdom. Indonesia is faced with a difficult choice to implement a broader liberalization of international trade by imposing relaxation on mandatory arrangements. The minimum limit of self-retention and placement of domestic reinsurance has been enacted for domestic insurance companies. Thus, the future policy direction will open up more expansive space for domestic insurance companies in terms of managing their risks and in terms of organizing reinsurance transactions with reinsurance partners abroad.

Indonesia to continue to liberalize the insurance industry sector. Financial Services Authority (OJK) and the insurance industry players in Indonesia need to formulate a regulatory framework and business management strategy that can optimize the benefits of this liberalization trend. And at the same time, anticipate potential negative impacts due to the liberalization of the insurance industry on domestic industry players and the national economy.

Previous research analyzed the impact of liberalization through indicators of the marketing mix, service quality, and insurance awareness [8]. Other findings were made to see the development of the insurance market and the liberalization of the financial system on bank performance [18],[19],[20]. Financial liberalization has resulted in the fragility of the banking sector with a strong institutional environment [21]. Most of the research on insurance liberalization has carried out in India [22],[23],[24]. For example, in the analysis of the performance of insurance companies during the liberalization period in India [25]. Research on the impact of liberalization is also in Korea, Bangladesh, Nepal, the Philippines, Taiwan, Malaysia, and Thailand [26],[27]. Liberalization and capacity building for insurance services in Africa, excluding South Africa, was found to have the lowest regional insurance penetration in the world [28]. Few literature reviews examine the impact of insurance liberalization in Indonesia. Unlike previous studies, the main objective of this study is to determine the effect of liberalization using a research model consisting of innovation, performance, and competition that focuses on the following: 1) Innovation in the use of information technology in the fields of sales, staffing, and education. carried out by insurance companies; 2) Performance of insurance companies; 3) the intensity of the performance of the insurance company, and 4) produce recommendations and/or business management strategies that can optimize the use of liberalization to encourage industrial growth in Indonesia.

2. Materials and Methods

Quantitatif Méthode: This research was conduct using quantitative research methods. The analysis strategy used to answer the problem formulation is descriptive and econometric analysis. Threshold Autoregressive (TAR) analysis uses time-series data with the support of panel data from all insurance companies in Indonesia. Threshold Autoregressive (TAR) aims to deepen the study for various regimes for certain economic variables using the dummy method [29]. In conducting the panel data estimation method, the rule of thumb method used [30]. Regression analysis uses to identify the relationship between insurance liberalization and innovation. In the form of technology use in the insurance company process, insurance company performance, and the level of competition in the insurance industry sector on liberalization. The proposed econometric model is an innovation model influenced by liberalization. And the internal variables of Insurance (IntInsVar) and macroeconomic variables (MacVar) as control variables. The insurance financial liberalization index represents the liberalization variable. The methods and experiments in modeling are as follows:

Model I: Innovation

$Innovation_{jt}$ = f(liberalization$_{jt}$, IntInsVar1$_t$,MacVar1$_{it}$)

Model II: Competition

$Comp_{it}$ = f(liberalization$_{it}$, IntInsVar2$_{it}$,MacVar2$_{it}$)

Model III: Performance

$Performance_{it}$= f(liberalization$_{it}$, IntInsVar3$_{it}$,MacVar3$_{it}$)

*Variable IntInsVar$_t$ consists of sales innovation, worker innovation, and educational innovation.

a. Variable$MacVar_t$consists of:

1) VariableINF_t Wear the price of goods as measured by changes in the consumer index that can reflect changes in the prices of goods and services from people's needs, which uses as parameters for changes in economic activity.

2) Variable $gPDB_t$ (Gross Domestic Product growth) is the increase in the amount of added value generated by all business units in a particular country, or is the total value of final goods and services produced by all economic companies used as a parameter of changes in economic activity.

3) Variable Credit interest rates (SB_t) Are a policy interest rate that reflects the monetary policy stance or stance set by Bank Indonesia. Which uses as a parameter that leads to volatility in money market interest rates. Which then leads to changes in premiums. Especially for tips.

b. Variable $Lib_t$is the Liberalization Insurance index measure liberalization (ILI).

Literature Search: This research is supported by survey activities that aim to obtain an overview of the extent to which insurance companies use technology to support their business processes.

Research data: Secondary data is the primary data obtained from Insurance data from 2006 to 2018. Types of data include a. data on marketing and other operating expenses obtained from the income statement; b. computer hardware investment data obtained from the financial position; c. Technology use data (insurance company individual data) obtain from non-investment recapitulation data. Insurance group consolidation data select according to its type, consisting of 1) reinsurance; 2) Life Insurance; and 3) General Insurance. Data can be panel data where i = insurance company, t = 2006-2018, and j = insurance group.

Data analysis technique: In an empirical study, researchers separate different impacts for specific financial criteria without using dummy variables. The aim is to see the difference in the effect of insurance companies according to the level of profit, the amount of net premium income, and the net premium using Threshold regression analysis techniques. Threshold

regression use to select whether, at the high-profit level of the insurance company, the impact of LIB still shows the same direction as the company at a low-profit level likewise, whether a company with a high amount of net premium income will have the same impact as an insurance company with a low amount of net premium income.

a. **Variable *Innovation$_{jt}$*** is selected from table 1. to get the best and unbiased determinant variable. It needs to be done, considering the research must pay attention to adding variables and the omitted variable bias. It needs to is done considering that research must pay attention to adding variables and the omitted variable bias. Variable $Innovation_{jt}(Inn_{jt})$ consists of sales innovation, underwriter innovation, and Claims innovation. The notation j = insurance and t is 2015 to 2018 annual period.

$$InnSales_{jt} = \frac{Sales_{jt}}{Komp_{jt}}$$

$$InnPend_{jt} = \frac{Pend_{jt}}{Komp_{jt}}$$

$$InnPeg_{mt} = \frac{Peg_{jt}}{Komp_{jt}}$$

Table1.Variable Model I: Innovation

Label	List of Ratio Variables
RKP1	Premium adequacy ratio to claim payment Premium income (claims and benefits paid + unit redemption statement)
RKP2	The ratio of the premium adequacy to payment of claims and general expenses Premium income (claims and benefits paid + unit redemption claims + marketing expenses + personnel and management expenses + education and training expenses + education and training expenses + general and administrative expenses
RKP3	The ratio of the adequacy of premiums and investment returns to payment of claims and general expenses
RKP4	The ratio of the adequacy of premiums and investment returns to payment of claims and general expenses
RSA	Insurance session ratio
RI	The ratio of investment to technical reserves

b. **Variable *Comp$_{it}$*** is selected from table 2. to get the best and unbiased determining variable. HH measurement (Herfindahl-Hirschman index)

Table 2. Variable Model II: Competition

Label	Name
HH10	Competition based on 10 companies with dominant premium income
HH15	Competition based on 15 companies with dominant premium income
HH2	Competition based on 2 companies with dominant premium income
HH20	Competition based on 20 companies with dominant premium income
HH30	Competition based on 30 companies with dominant premium income
HH5	Competition based on 5 companies with dominant premium income

c. **Variable** $\boldsymbol{Performance_{it}}$ is selected from table 3.

Table 3. Variable Model III: Performance

Label	Name
PendPremNett	The ratio of the amount of net premium income
PremiNet	Net Premium Amount
ROE	Return On Equity

d. **Variable** $\boldsymbol{Lib_t}$ is selected from table 4.Liberalization is simplified based on 4 (four) modes of international trade according to the definition of the WTO (World Trade Organization), namely Mode 1: Cross-border, Mode 2: Consumption abroad, Mode 3: Commercial presence, and Mode 4: Movement of natural persons. The measurement result is a composite of all the components of the Mode variable.

Table 4. Variable Liberalization

Label	Name
Lib1	AIS11_2_Insurance indic_Density1_MODE3
Lib2	AIS9_1_Insurance business written abroad by brances Business written abroad_MODE1
Lib3	AIS8_1_Insurance business by domestic and foreign risks_MODE1
Lib4	AIS7_1_Gross operating expenses_MODE3
Lib5	AIS5_2_GIS_Insurance employees_MODE3
Lib6	AIS5_1_GIS_NumberofInsuranceUndertaking_MODE3
Lib7	BoP Business written in the reporting country_MODE3
Lib	Komposite

Review of Literature – Liberalization has resulted in the entry of the largest insurance companies in the insurance market and attracting more foreign companies, which has resulted in tighter competition with local industry players. The level of competition increases the number of insurance plans that are innovative and more attractive, better customer service, and increased awareness of the importance of insurance. The adaptation of insurance liberalization aims to regulate. And protect the interests of policyholders of the insurance industry [22]. Pope and Luen Ma (2008) explain that the interactive relationship divide by market concentration and liberalization related to profitability. In other words, the effect of market concentration on the profitability of the insurance market varies, and this depends on the degree of market liberalization. The high entry barrier for competitors facilitates the market's ability to concentrate on collusive behavior [31].

Innovation capability consists of four types of innovation: organizational innovation, process innovation, product and service innovation, and marketing innovation. By increasing innovation in the company, it can influence the innovation performance of the company itself [32]. Organizational innovation is implementing new organizational methods in company business practices, workplace organizations, or external relations. Corporate design can lead to improving business performance by reducing organizational management and transaction costs. Organizational innovation is related to administrative efforts. And including efforts to

update systems, procedures, and routines to encourage team cohesiveness, coordination, collaboration, information, and knowledge sharing practices [33]. The innovation process can reduce the productivity, business growth, and profitability of an organization [34]. Product or service innovation activities are ways of adapting to policies and changes in consumer culture. Work and service innovation activities take into account changes inline structure, legacy systems, and business processes aimed at boosting revenue growth, financial stability, and improving customer experience and facing business competition [35]. Marketing innovation is a form of applying new marketing methods that involve significant changes in design or packaging, product placement, and promotions and prices [32].

The impact of liberalization varies considerably in each organization or company. Especially in company performance [36]. Large companies were initially more productive to gain more from financial liberalization [37]. Profits earn through the encouragement it provides to improve service quality [38]. In China, most had little impact on increasing and improving the productivity of enterprises, but still significant on improving social welfare after the liberalization of the insurance market [39]. Liberalization is promoted with competition [26].

The organization will seek to improve its annual performance and its ability to survive in the face of business competition. Also, the game creates organizational efforts to improve customer service. One of them is with effective advertising and relationship management. The existence of opportunities and potential is one of the driving factors for improving organizational performance and competition [22]. Whereas in the sales sector, company behavior leads to three levels of decisions that pursued, namely reinsurance, sales efforts, and price [2].

3. Results

3.1.Results of the analysis of model I: Innovation

The main models of the innovation equation are:

$$Inn_{jt} = \alpha_i + \beta_1 Lib_t + \sum_{p=1}^{P} \delta_p IntVar1_{pjt} + \sum_{k=1}^{K} \theta_k MacVar1_{kjt} + \varepsilon_{1jt}$$

An alternative to deepening the analysis for various high and low regime levels of specific economic variables (variable threshold), in this research will use Threshold Regression. In particular, Threshold Autoregressive (TAR) first developed by Tong (Tsay, 2010). This TAR calls Self Existing Threshold Autoregressive (SETAR) because the method uses a dummy, where this dummy is determined first by setting a Threshold, then develops in several ways: Movement between regimes/states uses observable data where the typical TAR model is: TAR model. Model I above is developed into a non-linear equation SETAR with the Maximum Likelihood estimator. The research model will change to (Example for Model I):

$$Inn_{jt} = \alpha_i + \left[\beta_{11} Lib_{jt} + \sum_{p=1}^{P} \delta_{1p} IntVar1_{pjt} + \sum_{k=1}^{K} \theta_{1k} MacVar1_{kjt}\right] \prod\left(k_t \leq \tilde{k}\right) + \left[\beta_{21} Lib_{jt} + \sum_{p=1}^{P} \delta_{2p} IntVar1_{pjt} + \sum_{k=1}^{K} \theta_{2k} MacVar1_{kjt}\right] \prod\left(k_t > \tilde{k}\right) + \varepsilon_{1jt}$$

Where through this regression we can get the threshold value $(\tilde{k})$ there is a change in the parameter values β_{11} , δ_{1p} , θ_{1k} , β_{21} , δ_{2p} , θ_{2k} for each equation. Models II and III follow the same way of analysis.

3.1.1 Sales innovation - The regression results of the equation below are arranged based on model I, where the dependent variable is innovation. The formation of innovation variables with employee innovation indicators carried out through a measure consisting of the ratio of the amount of net premium income to marketing costs. Sales innovation measures the achievement or achievement of the amount of Net Premium Income made by marketing. The use of applications and technology will increase the amount of net premium income. This ratio, if it gets smaller, indicates that there is an innovation made by marketing so that marketing costs are cheaper. Designs can be in the form of using supporting applications, implementing communication through applications, and implementing candidate surveys through applications.

Table 5. Regression results for model I: Sales innovation

VD: LOG(INNSALES1)			VD: LOG(INNSALES1)			VD: LOG(INNSALES1)			VD: LOG(INNSALES1)		
	Coeff	t-stat		Coeff	t-stat		Coeff	t-stat		Coeff	t-stat
LIB	-0.465	-3.622									
			LIB1	-0.25	-3.189						
						LIB2	-0.098	-2.096	LIB3	-0.857	-4.85
RKP1	31.354	3.099	RKP1	19.371	2.5	RKP1	22.366	2.119	RKP1	50.24	3.867
RKP2	-37.104	-3.229	RKP2	-24.04	-2.703	RKP2	-26.961	-2.239	RKP2	-57.792	-3.925
RKP3	-33.102	-3.449	RKP3	-21.789	-2.959	RKP3	-24.631	-2.464	RKP3	-50.896	-4.145
RKP4	39.162	3.587	RKP4	26.823	3.167	RKP4	29.566	2.588	RKP4	58.683	4.206
ROE	0.01	1.21	ROE	0.011	1.265	ROE	0.018	2.346	ROE	0.005	0.724
ER	0	-0.393	ER	0	-1.612	ER	0	-0.368	ER	0	1.531
SB	0.1	1.623	SB	0.074	1.351	SB	0.117	2.059	SB	0.049	0.545
SBINTL	-0.174	-1.732	SBINTL	-0.129	-1.169	SBINTL	-0.317	-2.684	SBINTL	-0.221	-2.673
C	50.571	3.97	C	30.795	3.674	C	14.226	3.032	C	87.301	5.16
Adjusted R-squared		0.965			0.973			0.959			0.964
F-statistic		118.95			116.015			102.032			116.56
Sum squared resid		42.549			40.745			42.127			44.249
Periods included: 16											
Cross-sections included: 3											

Table 5 is the observational data for the period 2015: Q1 to Q4 2018. The top row shows the dependent variable model I, namely, innovation. At the same time, the second column is a list of the independent variables of each equation. This section lists several equations with variations in the dependent variable to reveal the impact of each of the World Insurance

Liberation Index (ILI) variables. The LIB variable is the ILI composite index, while the other LIB explains in the LIB Table. The bottom is the model identification row consisting of R2-Adj, F-stat, Sum square residual, and the amount of data available. A high LIB value indicates that the level of insurance liberalization is getting higher. The negative impact of liberalization on sales innovation shows that the higher the level of liberalization will encourage the use of sales innovations. It is thus reducing the insurance company's marketing costs.

Threshold Analysis – Sales Innovations. Following are the results of processing sales innovation data using Threshold analysis, which divided into three, namely high, medium, and low net premium income with a threshold value of 2. Dependent Variable: LOG (INNSALES1) with the Discrete Threshold Regression method. With the candidate Threshold variables, PENDPREMNETT PREMINET PROFIT, the most efficient PENDPREMNETT (net premium income) variable, is selected. Selection is made to determine the most appropriate variable as a threshold value for changes to occur.

Table 6. Threshold Analysis Results: Sales innovation

Variable	PENDPREMNETT < 1132305 (12 obs)		7530814 <= PREMINET < 3.490315E+07 -- 13 obs		3.490315E+07 <= PREMINET – 11 obs	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
LIB	-0.478849	0.0388	-0.390940	0.0677	-0.143463	0.3242
RKP1	33.22161	0.1011	421.5120	0.0000	3.312859	0.7788
RKP2	-36.21030	0.0847	-465.3388	0.0000	-3.314343	0.8072
RKP3	-33.28669	0.0822	-403.7938	0.0000	-6.530953	0.5600
RKP4	36.52106	0.0657	445.6719	0.0000	7.356553	0.5691
C	49.54377	0.0326	42.84268	0.0466	16.45196	0.2604
Non-Threshold Variables						
DEFL	0.081016	0.0381				
ER	0.000120	0.2050				
SB	0.034954	0.6832				
R-squared	0.992663					
Adjusted R-squared	0.987229					
S.E. of regression	0.114199					
Sum squared resid	0.352117					
Log likelihood	49.85075					
F-statistic	182.6601					
Prob (F-statistic)	0.000000					

From table 6, it can be summarized as follows:

Table 7. Sales Innovations: Net Premium Income

No	Threshold variable	Threshold value	Total Data
1	Low net premium income	value< 1132305	12
2	Medium net premium income	1132305 <value<7224292	12
3	High net premium income	Value > 7224292	24

Table 7 shows that companies with low and moderate net premium income have a threshold value lower than 722492. While high net premium income has a threshold value greater than 7224292, a sales innovation threshold value that is lower than 722492 indicates that the premium income is low and moderate. Requires sales innovation to improve work efficiency

and insurance services.

3.1.2 Employee innovation – In model I, the employee innovation indicator uses a measure consisting of the ratio of net premiums and employee costs. Employee innovation aims to measure the achievement or achievement of the net premium made by supporting or operational employees.

Table 8. Model I regression results: Employee innovation

VD: LOG(INNPEG2)			VD: LOG(INNPEG2)			VD: LOG(INNPEG2)			VD: LOG(INNPEG3)		
	Coeff	t-stat		Coeff	t-stat		Coeff	t-stat		Coeff	t-stat
LIB	-0.219	-2.691									
			LIB1	-0.118	-2.195						
						LIB2	-0.038	-1.551	LIB3	-0.106	-0.929
RKP1	-8.939	-1.965	RKP1	-13.01	-2.51	RKP1	-12.92	-2.488	RKP1	-14.263	-2.261
RKP2	9.121	1.715	RKP2	13.53	2.238	RKP2	13.599	2.242	RKP2	14.165	1.939
RKP3	5.921	1.391	RKP3	9.797	2.019	RKP3	9.707	2.002	RKP3	10.869	1.833
RKP4	-5.926	-1.184	RKP4	-10.12	-1.78	RKP4	-10.19	-1.792	RKP4	-10.607	-1.538
ROE	0.016	4.594	ROE	0.015	4.581	ROE	0.018	4.73	ROE	0.012	3.153
ER	0	2.218	ER	0	1.092	ER	0	2.07	ER	0	1.915
SB	0.175	5.514	SB	0.151	3.813	SB	0.175	5.04	SB	0.161	4.981
SBINTL	0.247	4.274	SBINTL	0.265	3.675	SBINTL	0.184	3.102	SBINTL	0.214	3.509
C	22.414	2.801	C	13.217	2.384	C	4.538	1.999	C	11.255	1.05
Adjusted R-squared		0.952			0.961			0.95			0.962
F-statistic		84.973			81.425			82.189			108.095
Sum squared resid		1.104			1.135			1.227			1.314
Periods included: 16											
Cross-sections included: 3											

Based on table 8, the F-stat has a value above 81, which indicates that employee innovation statistically meets the criteria as a predictor in this model. R-2 values above 95% suggest that employee innovation can be explained by at least 95% by insurance liberalization. The negative impact of liberalization on employee innovation suggests that the higher the liberalization will encourage the use of employee innovation, which in turn can reduce employee costs.

Similarly, it needs to prove that threshold regression analysis is more efficient than linear Panel Data analysis. Table 8 shows the SSRs of various independent variables in columns 1 to 4, which are 1.104, 1.135, 1.227, and 1.31. In Table 9, it obtains that the SSR is 0.334822. It proves that threshold regression is more efficient. The next analysis focus on Thresholds analysis

Threshold Analysis – Employee Innovation. Following are the results of employee innovation data processing using threshold analysis, which is divided into three, namely high, medium, and low net premium income with a threshold value of 2.Dependent Variable: LOG (INNPEG1) with the Discrete Threshold Regression method. With the candidate Threshold variables PENDPREMNETT PREMINET PROFIT, the PREMINET variable (net premium) is selected which is the most efficient. Selection is made to determine the most appropriate variable as a threshold value for changes to occur.

Table 9. Threshold Analysis Results: Employee Innovation

Variable	PREMINET < 7530814 -- 24 obs		7530814 <= PREMINET < 3.490315E+07 -- 13 obs		3.490315E+07 <= PREMINET – 11 obs	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
LIB	-0.325254	0.0652	-0.356924	0.0422	-0.326304	0.0574
RKP1	57.97205	0	-34.03584	0.0526	5.279284	0.4432
RKP2	-61.3785	0	36.63726	0.0752	-6.019823	0.4618
RKP3	-57.41476	0	31.07446	0.0615	-8.058089	0.2109
RKP4	60.75688	0	-32.13764	0.0992	9.411641	0.2065
Non-Threshold Variables						
DEFL	0.064766	0.1655				
ER	-1.88E-05	0.7613				
SB	0.291417	0.0002				
C	34.11152	0.0541				
R-squared	0.979475					
Adjusted R-squared	0.966735					
S.E. of regression	0.10745					
Sum squared resid	0.334822					
Log likelihood	51.05951					
F-statistic	76.88236					
Prob (F-statistic)	0					

From table 9, it can be summarized as follows:

Table 10. Employee Innovations: Net Premium Income

No	Threshold Variable	Threshold value	Total Data
1	Low Net Premiums	value< 7530814	12
2	Medium Net Premium	7530814 < value<3.490315E+07	12
3	High Net Premium	value> 3.490315E+07	24

Based on table 10 shows that companies with low and moderate net premium income have a threshold value lower than 7530814. Meanwhile, high net premium income has a threshold value greater than 3.490315E + 07. A sales innovation threshold value that is lower than 7530814 indicates that premium income is low and needs employee innovation to improve work efficiency and insurance services.

3.1.3 Educational innovation – The regression results of the equation in Table 3 are measured based on two measures: 1) the ratio of the total net premium income to employee costs (InnPend1) and 2) the rate of the net premium to employee costs (InnPend2) and education (InnPend). Educational innovation aims to measure the achievement or achievement of net premiums made through education in supporting insurance company operations.

Table 11. Regression results for model I: Educational innovation

VD: LOG(INNPEND1)			VD: LOG(INNPEND2)			VD: LOG(INNPEND)		
	Coeff	t-stat		Coeff	t-stat		Coeff	t-stat
LIB	-0.088	-1.306						
			LIB	-0.147	-2.32			
						LIB	-1.247	-2.666
RKP1	-14.91	-2.582	RKP1	-9.999	-1.827	RKP1	-280.846	-5.265
RKP2	15.442	2.301	RKP2	9.85	1.552	RKP2	314.864	5.165
RKP3	11.55	2.126	RKP3	6.894	1.335	RKP3	267.509	5.301
RKP4	-11.889	-1.874	RKP4	-6.548	-1.088	RKP4	-301.074	-5.205
ROE	0.001	0.208	ROE	-0.001	-0.258	ROE	0.043	1.184
ER	0	1.707	ER	0	1.674	ER	-0.002	-3
SB	0.106	1.41	SB	0.104	1.937	SB	-0.386	-0.739
SBINTL	0.313	8.638	SBINTL	0.316	9.294	SBINTL	1.509	4.01
C	12.4	1.788	C	18.593	2.974	C	150.265	3.493
R-squared		0.954			0.96			0.896
F-statistic		88.405			101.887			37.936
Sum squared resid		1.151			1.115			40.586
Periods included: 16								
Cross-sections included: 3								

Based on table 11 explains that the F-stat has a value above 37. It shows that statistical educational innovation can use as a predictor in the model. R-2 values above 89% indicate that educational invention can be explained by at least 89% by insurance liberalization. The negative impact of liberalization on educational innovation shows that the higher the liberalization can encourage the use of educational innovations, which in turn reduce the cost of education. Similarly, it needs to prove that threshold regression analysis is more efficient than linear Panel Data analysis. Table 11 shows the SSRs of various independent variables in columns 1 to 3, 1,151, 1,115, and 40,586. In Table 9, it obtained that the SSR is 0.938711. It proves that threshold regression is more efficient. The next analysis focus on Thresholds analysis

Threshold Analysis – Educational Innovation. The following are the results of processing education innovation data using threshold analysis, which is divided into three, namely high, medium, and low net premium income with a threshold value of 2.Dependent Variable: LOG (INNPEND) with the Discrete Threshold Regression method. With the candidate Threshold variables PENDPREMNETT PREMINET PROFIT, the PREMINET variable (the net premium) selected, which is the most efficient. Selection made to determine the most appropriate variable as a threshold value for changes to occur.

Table 12. Threshold Analysis Results: Educational Innovation

Variable	PREMINET < 1404683 -- 12 obs		1404683 <= PREMINET -- 36 obs	
	Coefficient	Prob.	Coefficient	Prob.
LIB	-2.62477	0	1.751394	0
RKP1	-11.7625	0.4139	15.70121	0.3849
RKP2	12.90081	0.3688	-22.1608	0.2868
RKP3	11.49344	0.3959	-13.0462	0.4443
RKP4	-12.9953	0.3343	16.77967	0.392
C	311.6062	0	-114.66	0.0129
Non-Threshold Variables				
DEFL	-0.12384	0.2303		
LOG(ER)	-4.49045	0.1631		
SB	-0.64214	0.0001		
R-squared	0.994602			
Adjusted R-squared	0.992312			
S.E. of regression	0.298416			
Sum squared resid	0.938711			
Log likelihood	-1.07153			
F-statistic	434.3275			
Prob (F-statistic)	0			

From table 12, it can be summarized as follows:

Table 13. Educational Innovation: Net Premium Income

No	Threshold Variable	Threshold Value	Total Data
1	Low Net Premiums	value< 1404683	12
2	Medium Net Premium	Value >= 1404683	
3	High Net Premium	value> 1404683	24

From the summary of the Threshold analysis for educational innovation in table 10, it shows that companies with low and moderate net premium income have a threshold value lower than 1404683. While high net premium income has a threshold value greater than 1404683, the sales innovation threshold value is lower than 1404683, indicates that premium income is low and needs educational innovation to improve work efficiency and insurance services.

3.2. Results of Model II Analysis: Competition

The main model of the competition equation is:

$$Comp_{jt} = \alpha_i + \beta_1 Lib_t + \sum_{p=1}^{P} \delta_p IntVar2_{pjt} + \sum_{k=1}^{K} \theta_k MacVar2_{kjt} + \varepsilon_{2jt}$$

Model II is developed into a non-linear equation SETAR with the Maximum Likelihood estimator.

$$Comp_{jt} = \alpha_i + \left[\beta_{11} Lib_{jt} + \sum_{p=1}^{P} \delta_{1p} IntVar1_{pjt} + \sum_{k=1}^{K} \theta_{1k} MacVar1_{kjt}\right] \prod\left(k_t \leq \tilde{k}\right) + \left[\beta_{21} Lib_{jt} + \sum_{p=1}^{P} \delta_{2p} IntVar1_{pjt} + \sum_{k=1}^{K} \theta_{2k} MacVar1_{kjt}\right] \prod\left(k_t > \tilde{k}\right) + \varepsilon_{1jt}$$

Competition based on 15 (HH15) Dominant Net Premium Income companies - The regression results of the equation table 11 are arranged based on model II where the dependent variable is competition measured by Herfindahl Hirschman. The data obtained from a group of companies that are members of the Life Insurance, General Insurance, and Reinsurance Companies.

Table 14. Results of Herfindahl Hirschman Analysis Model II: HH15

VD: HH10			VD: HH10			VD: HH10		
	Coeff	t-stat		Coeff	t-stat		Coeff	t-stat
LIB1	-2.888	-0.873						
LIB2			LIB2	8.262	4.665			
LIB3						LIB3	-47.821	-5.109
RKP1	-1988.52	-4.314	RKP1	-1659.9	-3.821	RKP1	-903.437	-2.783
RKP2	2228.043	4.224	RKP2	1857.177	3.756	RKP2	1033.753	2.835
RKP3	1875.89	4.311	RKP3	1568.917	3.809	RKP3	854.361	2.735
RKP4	-2107.86	-4.219	RKP4	-1760.35	-3.74	RKP4	-980.243	-2.788
ROE	1.306	3.719	ROE	0.857	2.537	ROE	1.021	3.731
DEFL	8.717	6.31	DEFL	2.661	1.084	DEFL	14.533	7.937
ER	0.005	0.75	ER	0.019	2.408	ER	0.014	2.903
SB	1.846	0.292	SB	0.455	0.081	SB	-2.572	-0.619
SBINTL	-0.717	-0.228	SBINTL	-2.182	-0.64	SBINTL	-6.885	-1.628
R-squared		0.873			0			0.925
Sum Squared Reside.		1.079			1.131			1.088
S.D. dependent var		65.723			20.9			62.025
Periods included: 16								
Cross-sections included: 3								

In table 14, the analysis results show that the F-stat has a value above 102, indicating that the insurance liberalization variable is statistically sufficient to use as a predictor in the model, and other variables are considered constant. The R-2 value above 90% indicates that the performance variable can be explained at least 90% by the variation of the insurance liberalization variable. Similarly, it needs to prove that threshold regression analysis is more efficient than linear Panel Data analysis. Table 8 shows the SSRs of various independent variables in columns 1 to 3, 1,079, 1,131, and 1,088. In Table 9, it obtained that the SSR is 0.002020. It proves that threshold regression is more efficient. The next analysis focuses on Thresholds analysis

Threshold Analysis – Competition based on 15 companies (HH15) Net Premium Income. The following are the results of processing education innovation data using threshold analysis, which is divided into three, namely high, medium, and low net premium income with a threshold value of 2.Dependent Variable: LOG (HH15) with the Discrete Threshold Regression method. With the candidate Threshold variables, PENDPREMNETT PREMINET PROFIT, the most efficient PENDPREMNET (net premium income) variable is selected. Selection made to determine the most appropriate variable as a threshold value for changes to occur.

Table 15. Threshold Analysis Results: HH15

Variable	PENDPREMNETT < 1641387 (13 obs)		1641387 <= PENDPREMNETT (35 obs)	
	Coefficient	Prob.	Coefficient	Prob.
LIB	-0.049896	0.0000	-0.001502	0.9156
RKP1	-0.480382	0.2423	0.539049	0.3778
RKP2	0.483563	0.2546	-0.640068	0.3653
RKP3	0.451161	0.2434	-0.508845	0.3794
RKP4	-0.452533	0.2569	0.608799	0.3624
C	11.72585	0.0000	6.942042	0.0000
Non-Threshold Variables				
DEFL	0.010260	0.0002		
ER	3.91E-07	0.9002		
SB	-0.007457	0.0536		
R-squared	0.906736			
Adjusted R-squared	0.867169			
S.E. of regression	0.007825			
Sum squared resid	0.002020			
Log likelihood	173.7073			
F-statistic	22.91667			
Prob (F-statistic)	0.000000			

From table 14, it can be summarized as follows:

Table 15. HH15 Competition: Net Premium Income

No	Threshold Variable	Threshold Value	Total Data
1	Low Net Premiums	value<1641387	12
2	Medium Net Premium	value>= 1641387	
3	High Net Premium	value>1641387	24

From the summary of the Threshold analysis for HH15 competition in table 11, it shows that companies with low and moderate net premium income have a threshold value lower than 1641387. While high net premium income has a threshold value greater than 1641367. The sales innovation threshold value is lower than 1641387 indicate that premium income is low and moderate need to increase competition to improve work efficiency and insurance services.

3.3. Model III: Performance

The main model used:

$$Kinerja_{jt} = \alpha_i + \beta_1 Lib_t + \sum_{p=1}^{P} \delta_p IntVar3_{pjt} + \sum_{k=1}^{K} \theta_k MacVar3_{kjt} + \varepsilon_{3jt}$$

Model III above is developed into a non-linear equation SETAR with the Maximum Likelihood estimator.

$$Kinerja_{jt} = \alpha_i + \left[\beta_{11} Lib_{jt} + \sum_{p=1}^{P} \delta_{1p} IntVar1_{pjt} + \sum_{k=1}^{K} \theta_{1k} MacVar1_{kjt}\right] \prod\left(k_t \le \tilde{k}\right) + \left[\beta_{21} Lib_{jt} + \sum_{p=1}^{P} \delta_{2p} IntVar1_{pjt} + \sum_{k=1}^{K} \theta_{2k} MacVar1_{kjt}\right] \prod\left(k_t > \tilde{k}\right) + \varepsilon_{1jt}$$

Performance: Net Premium Income - The regression results of the equation below are compiled based on model III, where the dependent variable is performance. The formation of Performance variables carries out through several measures. This model uses the size of the total net premium income and ROE.

Table 16. Regression Results Model III: Performance

VD: LOG(PENDPREMNETT)			VD: LOG(PENDPREMNETT)		
	Coeff	t-stat		Coeff	t-stat
LIB1	0.671	2.485			
LIB2			LIB2	0.259	2.394
LIB3					
RKP1	-245.825	-4.207	RKP1	-246.872	-4.419
RKP2	273.289	4.089	RKP2	274.185	4.294
RKP3	232.358	4.211	RKP3	233.29	4.422
RKP4	-259.432	-4.101	RKP4	-260.201	-4.304
DEFL	-0.576	-5.534	DEFL	-0.663	-4.332
ER	-0.001	-1.584	ER	-0.001	-1.605
SB	0.277	0.83	SB	0.214	0.56
SBINTL	0.891	2.447	SBINTL	1.474	6.291
C	-44.345	-1.628	C	-2.312	-0.194
Adjusted R2		0.93			0.935
F-statistic		58.105			47.362
Sum squared resid		40.119			42.242
Periods included: 16					
Cross-sections included: 3					

Based on table 16, it explained that the F-stat has a value above 47, indicating that all independent variables are statistically sufficient to be used as predictors in the model. The R-2 value above 93% means that the variation in performance can be explained by at least 93% by insurance liberalization. The impact of positive liberalization on Net Premium Income shows that the higher the liberalization can encourage insurance companies to increase business efficiency and increase net premium income.

ROE performance - The following Performance Measures are ROE. The results show agreement with the theory that increased liberalization will expand the business and increase profits.

Table 17. ROE Performance Analysis Results

VD: ROE			VD: ROE			VD: ROE		
	Coeff	t-stat		Coeff	t-stat		Coeff	t-stat
LIB2	2.809	4.252						
LIB2			LIB2	2.809	4.252			
LIB3						LIB2	2.809	4.252
RKP1	-16.926	-2.88	RKP1	-16.926	-2.88	RKP1	-16.926	-2.88
RKP2	-2.661	-0.906	RKP2	-2.661	-0.906	RKP2	-2.661	-0.906
RKP3	18.727	4.292	RKP3	18.727	4.292	RKP3	18.727	4.292
DEFL	-1.733	-2.367	DEFL	-1.733	-2.367	DEFL	-1.733	-2.367
ER	-0.005	-2.308	ER	-0.005	-2.308	ER	-0.005	-2.308
SB	-2.492	-1.288	SB	-2.492	-1.288	SB	-2.492	-1.288
C	-210.101	-3.101	C	-210.101	-3.101	C	-210.101	-3.101
R-squared		0.632			0.6259		R-squared	0.632
F-statistic		7.245			1.578		F-statistic	7.245
Sum squared resid		658.748			658.748			658.748
Periods included: 16								
Cross-sections included: 3								

From table 13 can be seen that the results of the analysis reveal that the F-stat value is above 1.578, indicating that the statistical performance variable is sufficient to be used as a predictor in the model. Apart from that, other variables are considered constant. The R-2 value above 63% indicates that the variation in the performance variable can be explained by at least 63% by the interpretation of the insurance liberalization variable

4. Discussion

Based on the results of the Model I analysis, it revealed that liberalization had brought changes to the innovation strategy in the insurance industry in Indonesia. Unfortunately, in the Threshold model, the impact of liberalization has a negative and significant effect on the development of innovation in low-premium companies. Market liberalization encourages innovation in sales, employees, and education has decreased. Similar findings were states by Lee and Lin (2016) that liberalization hurt insurance companies. Furthermore, this creates more risks that must be faced by insurance companies, especially in facing business competition and the global economy [10]. One reasonable strategy is to design contract agreements, determine fair pricing, and expand the market for insurance companies and the trend of changes in the insurance industry to be more efficient after liberalization so that industry players increase innovation, especially substantially positive technological changes. With market consolidation, increasing the scale of results resulting from the ability to innovate can increase company efficiency [4].

These findings complement the previous results which state that liberalization affects financial innovation [40]. In other words, not only financial innovation is affected by liberalization, but also sales innovation, employee innovation, and educational innovation.

It is essential to create innovative capabilities in insurance companies. With the right business strategy, companies can improve their innovation capabilities, be it sales innovation, employee innovation, or educational innovation. Design can carry out through influence in business [41]. It is due to the transformation of knowledge, employee ideas into practical innovation depending on the level of delegation, willingness to provide resources and support from the leadership. Liberalization has an impact on innovation capabilities. Therefore, there is a need for encouragement to change stuff and resources into competitive advantages. through the influence and practice of types of innovation in the company. Previous studies that support these findings reveal that business intelligence has a positive effect on knowledge sharing, innovation, and gaining competitive advantage [7].

The challenge for implementing innovation lies in training staff, integrating insurance products, and ensuring the best quality of service for customers. Apart from that, an insurance agent is also essential to achieve success and gain a competitive advantage [42]. Qualified and professional individuals are needed but interestingly, retaining an agent is a challenge in today's competitive insurance business. Furthermore, previous researchers stated that a market-oriented culture should lead to superior performance [43]. By strengthening liberalization, it hopes that a market-oriented culture will increase innovation and success for insurance companies, especially domestic insurance.

The future of insurance determines by the improved performance of protection products, a refreshing display of innovation, the launch of packages tailored to competition and market needs, and maximum service levels [42]. In facing various challenges of liberalization, a long-term policy strategy needs to develop markets. Pope and Luen Ma (2008) explain that after a shift in market structure due to the impact of liberalization, the market is institutionalized and is short-term due to the disruption of costs absorbed by the market [31]. What is clear, liberalization has made market changes where the market is difficult to predict but can still anticipate the future by developing appropriate strategic plans.

On the other hand, the findings reveal that liberalization has a positive impact on performance and competition, as shown in the aggregate models II and III. It indicates that liberalization is an essential indicator of the sustainability of the insurance industry. Insurance companies in the broad category have a positive and significant impact. Meanwhile, insurance companies in the small group category have a negative effect. This finding is in line with the research conducted by Almajali, Alamto, and Al-Soub (2012), which suggests that size has a significant impact on the financial performance of insurance companies. The giant company gets more profit. Therefore, large companies have more resources, more professional accounting staff, and have more sophisticated information systems capable of producing high performance [14].

If the liberalization is significant, then performance and competition will increase [44]. And vice versa, if the adaptation of liberalization does poorly, then the performance and competence will decrease. Also, can be exacerbated if companies in developing countries have limited access to international capital markets [45]. Not only liberalization but also the opportunity to improve better performance and healthier competition is to be in the competitive behavior in the growing insurance market [46].

The results of the study are consistent with the view that regulations to promote welfare improvement will be minimal if not followed by increased significant liberalization [47]. Liberalization increases economic activity in all sectors and increases the real returns to both capital and labor [48]. Although the impact will be different for each company with high, low, and medium premium income, globally, liberalization can encourage increased productivity [26],[49]. Taylor (2000) argues that in the future, the liberalization strategy needs to seriously rethought [50]. Itis did consider that external liberalization, economic performance, and distribution are still not optimal. We Ge (1999) explains that the establishment of special economic zones can support economic liberalization. The designation of special economic zones, as carried out by the Chinese economy, serves to provide trade facilities and financial liberalization, increase resources, and promote economic growth and structural change [51].

The risks and benefits of liberalization are issues that continue to debated today [52]. Liberalization must be approached with care where an organization is needed to ensure law and enforcement of contracts as well as effective regulation and prudential oversight [21]. As an adaptation effort to liberalization, innovation, performance, and competition in the development of the insurance sector made one of the priorities in Indonesia.

It is essential to design policy changes that can have a positive impact, namely: 1) creating the same market conditions for both private and state-owned insurance companies that lead to expanding market competition, growth in performance efficiency, and growth in the insurance market as a whole; 2) removing restrictions on state organizations to purchase state insurance products; 3) the choice of the insurance company must be made based on economic factors, not the type of ownership; expansion of the list of the kinds of voluntary insurance can include in the company's production costs; 4) creating a stimulus for capitalization growth in the insurance sector; 5) removing regulatory restrictions that delay the entry of foreign capital into the industry; 6) there is the integration of the insurance industry into the international market, and 7) democracy the national reinsurance system and give local insurance companies the right to choose reinsurance freely based on market factors [11]. What needs to agree upon is that the liberalization policy should lead to fair business competition, social justice, and protect local insurance companies from prospering the community as the values of Pancasila and the 1945 Constitution.

5. Conclusions

Based on the results of data analysis and discussion, it can conclude that three subjects. First that the aggregate model has a negative and significant relationship between liberalization and innovation. However, in the Threshold regression model, the impact of liberalization on design differs between low-premium firms and high-premium firms. In this case, the positive effects of adaptation liberalization are influenced by the availability of resources to large companies that are higher in optimizing innovation. Second, in the aggregate model, there is a negative and significant relationship between liberalization and competition.

Meanwhile, in the Threshold model, the relationship between the two is significant. It indicates that liberalization can create healthy business competition between domestic and global companies. Third, insurance liberalization has a positive impact on company performance. It means that liberalization contributes to the effectiveness of better company performance.

In general, these findings reveal that the liberalization of global insurance finance can have a positive and significant impact on the development of the industrial sector in Indonesia. However, liberalization can be different for groups of small companies and groups of large companies.

From the findings, the expected implication is that the Indonesian government can consider taking policies that focus on building a more effective and efficient adaptation of liberalization by prioritizing three indicators of the insurance industry, namely: innovation, competition, and the performance of insurance companies. Not only encouraging progress for large companies but also low-income insurance companies. By knowing that these three variables can boost the company's survival and competitive advantage, insurance companies pay more attention to innovation by improving the quality of human resources. In the future, further research can carry out by adding other variables and with a broader scope. So that the weaknesses of liberalization can identify and solutions found.

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Why cash waqf fails to meet the expectation: Evidence from Indonesia

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Abstract

The objective of this study is to assess some evidence to explain why the actual cash waqf collection is far below its potential value by assessing cash waqf governance in two institutions: Islamic banks and nazir of waqf institutions, and to compare with the standards and provisions of cash waqf governance in Indonesia. Primary data were collected from 17 Islamic banks and 11 nazirs licensed to receive cash waqf from waqif. The data were analyzed using partial least squares structural equation modelling (PLS-SEM) in SmartPLS 3.0 software. The result shows that cash waqf regulation discourages Islamic banks-nazir report and coordination behavior. Meanwhile, Islamic banks-nazir relationship and government support have positive effects on Islamic banks-nazir report-coordination behavior. To improve cash waqf collection, Islamic banks need to give proper attention to support cash waqf by establishing a cash waqf department and allocating more budget for cash waqf promotion, and nazir needs to practice cash waqf transparency by providing regular report. Furthermore, cash waqf regulation in Indonesia provides a lack of justifications in terms of cash waqf supervisory and governance. Those pieces of evidence enhance the facts that cash waqf fails to meet the stakeholders' expectation

JEL Codes: G21, G28, G29, L31
Keywords: *Cash Waqf, Governance, Islamic Banks, Nazir, PLS-SEM.*

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1. Introduction

As an emerging lower middle-income country, Indonesia is still faced with problems of poverty. Statistics Indonesia reported that in September 2019, the number of poor people in Indonesia was 24.79 million (9.2%). The number was decreased by 0.36 million people (0.19%) compared to that of March 2019 and decreased by 0.88 million people (0.44%) compared to that of September 2018. The problem of poverty is closely related to income inequality. The reduction in the level of inequality follows the goal of economic growth and it shows the effects of fair national development. Even though it has not shown a significant decrease, the level of inequality in Indonesia's population as measured by the Gini index was 0.382 in September 2019. This figure was decreased by 0.002 points compared to that of September 2018, which was 0.384, and was decreased by 0.007 points compared to that of March 2018, which was 0.389.

Waqf activities can ideally be used as a tool to achieve economic sustainability by reducing poverty and income inequality (Masyita, 2007; Nabi et al., 2019; Yakubu and Aziz, 2019). Cash waqf can be used as a financial instrument to increase the source of investment legally and then the profits are channeled into poverty reduction programs (Hosseini et al., 2014). Compared to zakat, waqf is considered more effective and flexible in assisting waqf beneficiaries or mauquf'alaih (Sadeq, 2002; Shaikh et al., 2017). This is due to the nature of waqf which is not bound by time (except for temporary waqf), where the benefits of zakat can be felt by 8 ashnaf which have a certain designation within a certain period, while the benefits of waqf can be more flexible to use in increasing individual productivity, thereby increasing the feasibility of waqf beneficiaries life.

Griffiths and Tan (2007) added that social assistance in the form of direct assistance has failed in reducing poverty and suggested waqf as an instrument of social assistance that is sustainable. In addition to the direct benefits of waqf assets being felt by mauquf'alaih, waqf funds also have indirect benefits, especially through the development of education and health facilities (Khan, 2010). This encourages an increase in human resources who are more productive, innovative, ready to work, and highly motivated. In this way, waqf is believed to reduce poverty in long term.

One potential source of waqf is cash waqf which has the advantage of being more flexible in management because it can be invested in various sectors, both real and financial sectors (Çizakça, 2011; Masyita et al., 2005; Nizar, 2014). The cash waqf model allows the participation of Muslims to have greater waqf fund, considering that the nominal cash waqf can be broken down into small amounts that can be reached by all groups. With the existence of waqf, it allows all people to give charity (Hilmi, 2012).

Cash waqf is expected to be one of the instruments in poverty alleviation in Indonesia (Masyita et al., 2005). The current poverty program requires a very large amount of funds and cannot be fully provided by the government. Therefore, new sources of funds are needed to boost poverty

alleviation. Cash waqf in the concept of Islamic economics plays a vital source of social funds that can be used further as a new source of funds, that it should be independent from economic and political interests. All profits from cash waqf should be channeled back to poverty alleviation programs, such as improvements in the lives of the poor, scholarships, health services, and other necessities (Masyita and Febrian, 2004). A nazir can distribute the benefit of cash waqf to the real sector (MSMEs) to support the program of economic empowerment.

The public hopes that Islamic banking plays an important role, especially because it prioritizes moral values rather than capitalism, can bring community banking values by providing services to the community, not just making the community a target market, has responsible finance by providing financial services which do not make people trapped in excessive debt, encourages ethical investment and corporate social responsibility initiatives, as well as creates stability by linking financial services to the real economy sector (Asutay, 2008).

The existence of Islamic social financial instruments (zakah, infaq, sadaqah) managed by Islamic banking increases public confidence that Islamic banking has more concern for the welfare of the community compared to conventional banking with profit-oriented motives. Besides, social financial instruments will increase public trust, in which people will be more secure with the professionalism of waqf management using standardized governance. The combination of social care with effective and efficient business professionalism will differentiate Islamic banking in the future, so that it can ward off the perception in the public that Islamic banking is substantially not different from conventional banking and it will further improve the good image of Islamic banking.

As part of a financial institution within the framework of the Islamic economy, Islamic banking is not only required to generate profits but also to carry out social functions as mandated by Law No. 21 of 2008 concerning Islamic banking based on the maqasid of sharia. Article 4 states that an Islamic bank can carry out social functions in the form of a baitul mal institution by receiving funds originating from zakat, infaq, alms, grants, or other social funds and collecting social funds from waqf. Furthermore, Islamic banks can channel these funds to zakat organizations and nazir as waqf managers.

To ensure the sustainability of the social fund, the efficiency of the governance of the funds must be supported by trust and supervisory functions (Das and Teng, 2000; Dyer and Chu, 2003). Information flow is then useful for building trust between governance structures and individuals, which has the impact of moderating the effectiveness of trust-based governance (Carson et al., 2003). Trust is often used to measure the strength of governance within an institution by creating economic value which in turn reduces transaction costs between various parties in business activity (Dyer and Chu, 2003) and encourages greater collaboration (Gulati and Nickerson, 2008). Ultimately, governance will create orderly conditions to ensure a common goal in which regulators become part of the system which must also be regulated (Stoker, 2018).

Trust is also one of the main manifestations of Islamic teachings that must be placed as social capital and guaranteed its sustainability as a mechanism that can keep waqf operating efficiently (Masyita and Asutay, 2016). Management of waqf that is not professional will be followed by a decrease in trust in the waqf institution by the community, which can cause waqf to be inefficient and ineffective. Trust in waqf institutions must be supported by a good governance system to maintain the trust of the waqf stakeholders, which must also be supported not ony by an understanding of fiqh, but also normal and Islamic ethics.

Trust will also produce a good reputation and will be achieved with consistent behavior (Stiglitz, 2000). One of the basic requirements of trust in a waqf institution is to maintain transparency and accountability. The absence of a transparent process will cause the public to make direct donations rather than leaving them to waqf institutions. Because building trust is something that cannot be done in a short period, this process can be disrupted by inconsistent actions from the waqf institution, such as opportunistic behavior or fraud in trusted relationships (Nooteboom, 1996) and insufficient supervision, so that it can pose a risk of long-term loss for an institution (Langfred, 2004).

According to Mas'udi et al., (2016), a bigger role is needed from the Islamic banks, so that the synergy with nazir can be maximized. Financial Services Authority in 2016 reported that Islamic banks had tremendous potential to participate in maximizing the collection and management of cash waqf based on Law No. 41 of 2004 on Waqf. This is mainly driven by the fact that Islamic banks have good credibility in terms of access to waqif, investment, and administrative capabilities as well as the ability to distribute investment returns. In addition, Islamic banking is the most equipped institution to follow waqf core principles because it is better trained in implementing Basel-style risk management, in which waqf core principles have principles based on prudential principles in financial institutions on both national and international scales. Waqf core principles have the ability to increase the level of waqf fund management in financial institutions on par with other financial instruments in the world in terms of good governance. Whereas Basel Core Principles become an instrument for banking supervision, waqf core principles become a waqf supervision instrument. This precautionary principle will create a trust for the community in the waqf management.

The practice of cash waqf that involves Islamic banks is a form of contemporary waqf financing and is commonly called the Deposit Product Model Cash Waqf. This model begins when waqif deposits money into a cash waqf-based account at Islamic Bank. Waqif can also specify nazir as manager of a cash waqf and then the benefits of investment to be channeled to certain mau'quf'alaih. Islamic banks, therefore, act to receive cash waqf and invest the cash waqf fund using mudarabah contracts. The profit or value of the benefits from the cash waqf management activities is then distributed to the agreed-upon programs for mau'quf'alaih coordinated by nazir.

Cash waqf has been a product of the banking sector in recent times. This provides new opportunities to invest in a variety of religious, educational, and social services programs. The

benefit generated from the cash waqf can be mobilized for benevolent purposes. This mechanism can popularize the role of waqf in the country, including cash waqf which can play a role in transferring the savings of the rich to the public in financing various religious, educational, and social services.

The Indonesian Waqf Board believes that potential cash waqf in Indonesia reaches Rp. 180 trillion. However, previous researches provide lower estimations on the value of cash waqf potential. Noor (2015) confirmed the amount of cash waqf potential was Rp. 120 trillion per year. Meanwhile, Nizar (2017) concluded that the estimated of cash waqf potential reached Rp. 985 billion per month or Rp. 11,82 trillion per year. Furthermore, using the assumption on potential wakif, the estimation of cash waqf by Nasution and Hasanah (2006) was Rp. 3 trillion per year.

Based on the above background, the collection and distribution of cash waqf in Indonesia have not been effective and efficient yet. This paper aims to assess cash waqf governance in Islamic banks and nazir and its comparison with the standards and provisions of cash waqf governance to support the cash waqf collection in Indonesia.

2. Literature Review and Hypotheses

2.1 The Development of Cash Waqf in Indonesia

The beginning of the development of cash waqf in Indonesia began when Islamic economists assessed that many waqf assets were no longer used productively and as many as 73.88% of the assets represented were in the form of places of worship for mosques and prayer rooms (Ministry of Religious Affairs, 2016). On May 11, 2002, the Indonesian Ulema Council (*Majelis Ulama Indonesia*) issued a fatwa that allowed cash waqf as a solution to increase the productivity of national waqf assets. This fatwa was later strengthened by the issuance of Law No. 41/2004 concerning Waqf and Government Regulation No. 42/2006 as a guideline for implementing the law on waqf, in which it further explains that money is part of the movable object that can be donated. Furthermore, cash waqf is an asset in the form of money that is used productively in the halal sector for the benefit of Muslims, especially *mauquf'alaih*. The corpus of the cash waqf must not decrease or be lost.

Then through Presidential Decree No. 75/M/2007, the government established the Indonesian Waqf Board as an independent institution in charge of managing waqf to make it more structured and overseeing the national waqf nazir. Candidates for nazir of cash waqf are required to register at Indonesian Waqf Board and meet the requirements according to Law No. 41/2004 on waqf and Government Regulation No. 42/2006 on the Implementation of Law no. 41/2004 regarding waqf. The registration of nazir is regulated in Regulation on Indonesian Waqf Board No. 2/2010. By October 2019, there are 224 cash waqf institutions registered at Indonesian Waqf Board.

In its implementation, cash waqf is carried out within several stages. The first stage of fundraising involves waqif participation to give in their waqf fund; the second stage, the management of cash waqf in Islamic banks that are suitable with the banks' investment decision; and the final one, the distribution of the benefits of cash waqf fund to *mauquf'alaih* through collaboration with nazir. In Indonesia, the Ministry of Religious Affairs has the authority to grant the cash waqf license for Islamic banks to receive and manage cash waqf. The cash waqf fund cannot be managed directly by nazir. Instead, it goes to the Islamic bank's waqf deposit fund using a *wadi'ah* contract in the nazir account designated by the waqif. Therefore, Islamic banks are significantly involved in the first and second stages of the cash waqf management. Until the end of 2019, even though 21 Islamic banks had been licensed with cash waqf management, only 17 of them were actively involved in collecting and managing cash waqf.

As mandated in Government Regulation No. 42/2006 Article 25, the main tasks of Islamic banks in cash waqf management are to announce their role to the public, to provide cash waqf certificate, to receive cash waqf from waqif on behalf of nazir, to put cash waqf into a *wadi'ah* deposit account in the name of nazir appointed by waqif, to receive a statement of the will of the waqif as outlined in waqif's will statement form, to issue cash waqf certificate, to submit the certificate to waqif as well as to nazir appointed by waqif, and to register the cash waqf to the Minister of Religious Affairs on behalf of nazir.

There are some obstacles to the practice of cash waqf. According to Furqon (2011), the distribution of cash waqf information is relatively limited compared to the median wealth and experience that banks have. Apart from that, cash waqf regulation is not very supportive of the realization of cash waqf as a mean of economic equality and empowerment in society (Hilmi, 2012). The lack of transparency and reporting is another challenge that poses obstacles to potential waqf contributing to waqf institutions (Nasir and Ihsan, 2017; Indonesian Waqf Board, 2009-2012). The waqf management institution must be regulated and comply with good governance. This will encourage the creation of a special entity within the waqf management institution that handles specific aspects related to waqf, such as the formation of a Sharia board to fulfill matters related to Islamic law, a risk management board that handles matters related to financial and investment risks, and courts to handle disputes and violations related to waqf assets (Rashid, 2011).

2.2 Conceptual Framework and Hypothesis Development

There have been many studies analyzing cash waqf, mainly from the topic of waqif awareness, intention, willingness, and the actual contribution of cash waqf (Hudzaifah, 2019; Iqbal *et al.,* 2019; Johari *et al.,* 2015; Osman *et al.,* 2014; Osman and Muhammed, 2017; Pitchay *et al.,* 2015; Razak *et al.,* 2019; Al-Harethi, 2019; Shukor *et al.,* 2016). The method of cash waqf collection and its online facility were also conducted by Isa et al. (2019) and Hafiz et al. (2019), as well as the strategy to increase the collection of cash waqf (Khairunisa *et al.,* 2017).

However, researches related to the governance of cash waqf are still very limited and only cover the efficiency of cash waqf management (Masyita and Asutay, 2016; Nil Firdaus *et al.,* 2019; Siswantoro *et al.,* 2018; Khamis and Che, 2018). Meanwhile, this research focuses on the governance of cash waqf which is proxied by reporting and coordination behavior from Islamic banks and nazir licensed to receive cash waqf. This topic is essential because reporting and coordination behavior from cash waqf institutions encourage the increase of trust from the public that will further encourage their participation in the development of cash waqf.

There are several obstacles to the development of cash waqf from the cash waqf institution's point of view, mainly from the aspects of human resources, trust, and supervisory system (Rusydiana *et al.,* 2017). Previous studies proposed that while the main factors that most likely encouraged the collection of cash waqf were promotion, human resources, documentation, and reporting strategy, these factors had not supported the development of cash waqf (Kamarudin *et al.,* 2016; Khamis *et al.,* 2018). In addition, most cash waqf institutions still had a low accountability index, so that cash waqf institutions must prepare an adequate information system (Siswantoro *et al.,* 2018). Experts and practitioners agreed on the importance of strong legal support to increase the role of Islamic banks in collecting cash waqf (Khairunisa, 2017). The key factor for the success of cash waqf is to resolve the following issues in sequence, namely human resources, regulations, products, and accountability. Furthermore, guidance is needed for nazir and socialization of cash waqf to the public (Firdaus *et al.,* 2019). Cordery and Baskerville (2007) confirmed that non-profits were exposed to 'minimum' regulation and 'underdeveloped' financial reporting requirements. In this case, cash waqf acts as a non-profit sector. Furthermore, Ihsan and Ayedh (2015) showed that waqf governance structure promoted waqf managers accountability when managing waqf. Their conclusion framework of good governance waqf institutions was *amanah* (accountability), *adalah* (fairness), and *syura* (collective or consultative decision making). According to Yasmin and Haniffa (2017), several factors are identified as crucial elements in governance reporting including waqf. This includes board background and composition, systems, procedures, objectives, and goals. Another research from Said *et al.,* (2013) said that a more comprehensive waqf reporting to ensure financial and other information communicated to the waqf stakeholders effectively and transparently was needed. This is due to a positive relationship between fundraising activities with performance and impact including waqf. Thus, the research hypotheses are as follows:

H1. The relationship between Islamic Bank and Nazir has a positive effect on reporting behavior and coordination of Islamic Bank-Nazir for cash waqf.

H2. Government support has a positive effect on the reporting behavior and coordination of Islamic Bank-Nazir of cash waqf.

H3. Cash waqf regulation has a positive effect on the reporting behavior and coordination of Islamic Bank-Nazir of cash waqf.

Summarizes the structural model in analyzing the reporting behavior and coordination of cash waqf by Islamic Bank and Nazir. Government support and regulation each use 5 indicators, while relations and reporting-communication have 3 indicators. These indicators are modifications from previous research of Hasim et al. (2016), Khairunisa et al. (2017), Siswantoro et al. (2018).

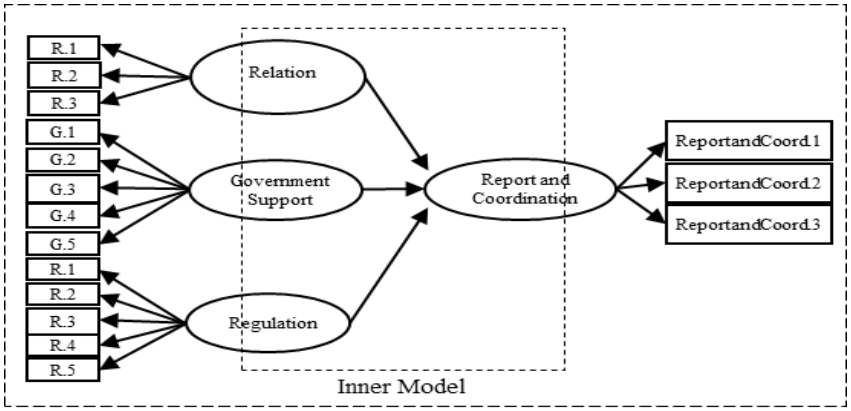

Figure 1. The Conceptual Framework of the Study

3. Methodology

This study used an online survey to investigate the determinants factors of reporting and coordination behavior of Islamic banks and nazir in Indonesia. The questionnaire was in Indonesian and the items were measured by a five-point Likert scale from strongly disagree to strongly agree. The questions in the survey were developed according to the operationalization of the research variables. The questionnaire was divided into the following two components: general statements related to respondents' institutional information and the second part containing six variables, namely report and coordination (three indicators), system information (seven indicators), relation (three indicators), government support (five indicators), regulation (five indicators), and public communications (five indicators). In total, 35 questions were used to investigate cash waqf governance in Indonesia.

The questionnaire was pre-tested for its reliability and validity before being used to the sample population. To assess the cash waqf governance, the respondents of this study are Islamic banks and nazir. In the primary data collection design, this study uses two approaches, namely the quantitative approach, which is used to test the hypothesis by conducting a survey using a questionnaire with respondents representing Islamic banks and nazir. A second approach is a qualitative approach to validate the model by conducting Focus Group Discussions with related stakeholders. By using these two approaches, it is hoped that the evaluation results will be more comprehensive and valid.

Islamic Bank as respondent is limited to Islamic Banks registered at the Ministry of Religious Affairs with cash waqf products. The online survey questionnaire was distributed to 21 Islamic banks and 244 nazirs registered at the Indonesian Waqf Board as of October 2019. However, only 17 questionnaires from Islamic banks were submitted because 4 other Islamic banks did not have cash waqf products. Meanwhile, only 11 nazirs who actively participated fulfilled the questionnaire. This condition was anticipated because, from focus group discussion with Indonesian Waqf Board, it recommended 14 nazirs as respondents.

Partial least squares (PLS) for structural question modeling is a useful and flexible tool for the construction of statistical models. PLS can be employed to address issues related to statistical power and minimum sample size requirements (Cohen, 1988, 1992; Goodhue *et al.,* 2012; Kock and Hadaya, 2018) and it is also suitable for weak theoretical foundation models and does not require normality of data assumption (Aguirre-Urreta and Rönkkö, 2015). The analytical method used to test the hypotheses was structural equation modeling (SEM). To obtain the results, PLS examines two types of models, the outer and inner models.

Table 1. Respondents from Islamic Banks

No.	Islamic Bank
1	Bank Muamalat Indonesia
2	BNI Syariah
3	Bank Syariah Mandiri
4	Bank Mega Syariah
5	Bank DKI Syariah
6	BTN Syariah
7	Bank Syariah Bukopin
8	BPD Jawa Tengah Syariah
9	BPD Kalimantan Barat Syariah
10	BPD Jawa Timur Syariah
11	BPD Sumatera Utara Syariah
12	Bank CIMB Niaga Syariah
13	Bank Panin Dubai Syariah
14	Bank Sumsel Babel Syariah
15	Bank BRI Syariah
16	BJB Syariah
17	Bank Kaltim Kaltara Unit Usaha Syariah

Source: Ministry of Religious Affairs

4. Results and Discussions

4.1 Respondents' Characteristics

Table 2 summarizes the institutional factors of Islamic banks and nazir that play an important role in encouraging the development of cash waqf. In the case of a special unit for cash waqf, 54.5% of nazirs and 23.5% of Islamic banks form a special unit for cash waqf. In terms of human resources, 45.5% of nazirs separated the HR of the admissions division, the management division, and the distribution division with other divisions and 72.7% of HR in the reporting division were also separated from other divisions. Meanwhile, around 23.5% to

35.3% of Islamic banks separated the human resources of the receiving, management, distribution, and reporting division of cash waqf with the human resources of other divisions.

Furthermore, from the aspect of financial report, the public accounting firms announced that 82.4% of Islamic banks had an unqualified opinion of their financial report and 11.8% of Islamic banks had a disclaimer of opinion predicate. Meanwhile, 36.4% of nazir's financial reports were not audited by the public accounting firm and 45.5% of nazirs were predicated as unqualified opinion. Meanwhile, the remaining 18.2% of nazir financial statements were predicated as a disclaimer of opinion.

Table 2. Respondents from Islamic Banks

	Not Exist (%)	Exist (%)	Merge with Other Divisions (%)	Separated from Other Divisions (%)	%
Institutional Factors					
Islamic Bank Expert Committee on Cash Waqf Management	88.2	11.8			
Islamic Bank Cash Waqf Department	76.5	23.5			
Nazir Cash Waqf Special Task Force	45.5	54.5			
Human Resources of Islamic Bank					
The human resource of Cash Waqf Collection			70.59	29.41	
The human resource of Cash Waqf Management			70.59	29.41	
The human resource of Cash Waqf Distribution			64.71	35.29	
The human resource of Cash Waqf Reporting			76.47	23.53	
Human Resources of Nazir					
The human resource of Cash Waqf Collection			54.5	45.5	
The human resource of Cash Waqf Management			54.5	45.5	
The human resource of Cash Waqf Distribution			54.5	45.5	
The human resource of Cash Waqf Reporting			27.3	72.7	
Islamic Bank Audited Financial Report on Cash Waqf					
Disclaimer of Opinion					11.8
Modified Unqualified Opinion					5.9
Unqualified Opinion					82.4
Nazir Financial Report on Cash Waqf					
Not Audited by Public Accounting Firm					36.4
Audited and Disclaimer of Opinion					18.2
Audited and Unqualified Opinion					45.5

4.2 Measurement Model Evaluation

When PLS estimates both the measurement model and the structural model simultaneously, the PLS involves a two-step process encompassing: First, the examination of the measurement model and second, the assessment of the structural model (Henseler *et al.,* 2009; Mehmetoglu, 2012). Whereas, the measurement model allows us to examine whether the constructs are measured with satisfactory accuracy and the structural model assesses the explanatory power of the model. The measurement model contains Composite Reliability (CR), Average Variance Extracted (AVE), item loading size significance, and discriminant validity (Liang *et al.,* 2007). This research uses the Factor Loading (FL), AVE, CR, and Cronbach's α to assess convergent validity. Ryu (2018) said that FLs and AVE to support convergent validity must be 0.5 or more.

On the other hand, CR and Cronbach's α value to support convergent validity are higher than 0.7 (Tenenhaus *et al.,* 2005). Table 4 explains that the FLs (>0.50), CR (>0.70), AVE (>0.50), and Cronbach's α (>0.70) for each latent variable and construct variable.

The discriminant validity test carried out by looking at the cross-loading value shows that the loading value of a latent variable is greater than the loading value of other latent variables. Table 5 shows results that are consistent with the standard discriminant validity testing.

4.3 Structural Model Evaluation

The hypothesized structural relationships are between report-coordination behavior and regulation, government support, and Islamic bank and nazir relationship. Hypotheses H1–H3 were assessed in Figure 2. To assess the statistical significance of the path coefficients, this study uses the path coefficient of the structural model and then performs bootstrap analysis (Table 3). Based on the results, relation and government support affect report-coordination behavior positively, i.e. relation has a value of b = 0.572 ($p < 0.01$) and government support b = 0.856 ($p < 0.01$). Meanwhile, regulation affects report-coordination negatively with b = -0.470 ($p < 0.05$). Thus, H1 and H2 are supported while H3 is proved to have the opposite effect (Figure 2). Therefore, Islamic banks and nazir relationship has a positive effect on the report-coordination behavior (H1), government support has a positive effect on the report-coordination behavior (H2), and cash waqf regulation harms the report-coordination behavior (H3). The results also show that H2 has the largest t-statistic value (5.032). Therefore, government support is the most important variable affecting Islamic banks and nazir report-coordination behavior.

The influence between variables can be seen from the coefficient value of the connection paths in the model. The relation variable shows a value of 0.572 on report-coordination behavior. This means that the relation variable has an effect of 57.2%. Meanwhile, the government support gives an effect of 0.856 or 85.6% on the model. The regulation variable shows a coefficient value of -0.470, meaning that cash waqf regulation harms Islamic banks and nazir report-coordination behavior.

Table 3. The Direct Relationships of The Structural Model

Hypothesized path	Estimate	t-statistic (sig. >1.96)	p-value	Result
H1. Relation --> Report and Coord	0.572	3.930	0.000	Supported
H2. Govt Support --> Report and Coord	0.856	5.032	0.000	Supported
H3. Regulation --> Report and Coord	-0.470	2.095	0.05	Supported

The R2 value for the report-coordination dependent variable is 0.758. This shows that the Islamic banks and nazir report-coordination behavior can be explained by all independent latent variables by 75.8% while the remaining 24.2% is explained by variables outside the model.

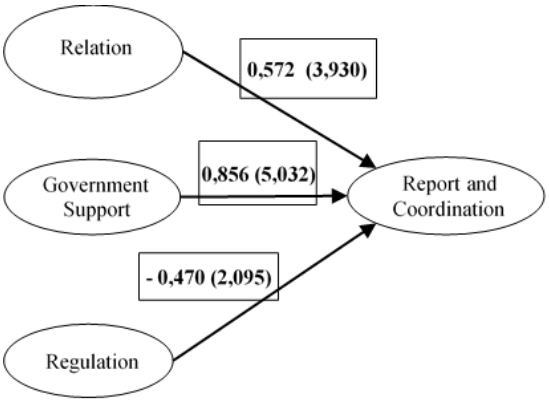

Figure 2. The SEM-PLS inner Model

4.4 Waqf Core Principles and the Implementation of Cash Waqf Regulation in Indonesia

To support the development of waqf in Indonesia, Indonesia Central Bank, Indonesian Waqf Board, and the Islamic Development Bank (IsDB) formulated Waqf Core Principles (WCP) in 2018 mainly to provide guidance and main principles in the process of cash waqf management and its supervisory function. The two main components of the WCP are the supervision of waqf and good governance of waqf. This section explains some details of waqf core principles regarding waqf supervisory and good nazir governance related to the discussion of cash waqf governance in Indonesia.

4.4.1 Cash Waqf Supervisory

The WCP-8 on Technique and Instruments for Waqf Supervisory justifies that waqf supervisory board needs to conduct a monitoring process to verify adjustments made by waqf institution on issues raised by waqf supervisory board.

The Regulation of the Minister of Religious Affairs No. 4/2009 Article 11 regulates how the Minister of Religious Affairs guides Islamic banks during the supervisory process. However, the regulation does not specifically explain how Indonesian Waqf Board has the authority to grant nazir with cash waqf management license and provide guidance to nazir.

Furthermore, WCP-8 also describes that waqf supervisory board can take over and restricts the license of cash waqf institution. However, cash waqf regulation in Indonesia does not specifically define consequences for cash waqf institutions that provide non-compliance reports. Hence, waqf supervisory board cannot implement this guidance in Indonesia.

Moreover, WCP-8 states that waqf supervisory board has to regularly assess waqf institutions covering these aspects: financial reports, waqf collection method, investment and distribution model, and the implementation of good waqf governance. Furthermore, waqf supervisor needs to evaluate the audit results of the waqf institution. In Indonesia, the Regulation of Minister of

Religious Affairs No. 4/2009 Article 8 states that Islamic bank is obliged to submit cash waqf financial reports at the end of each financial year to the Minister of Religious Affairs and Indonesian Waqf Board. The report includes the nominal cash waqf and the benefit of cash waqf management. The Regulation of Minister of Religious Affairs No. 4/2009 Article 9 explains: (1) nazir is required to submit a cash waqf report every 6 (six) months to the Indonesian Waqf Board and the Director-General of the Ministry of Religious Affairs; (2) reports include: the implementation of cash waqf management and investment activities, the utilization of cash waqf benefit, and investment activities plans for the following year. The Financial Services Authority Regulation, SEOJK No. 10/ SEOJK.03/2020 dictates that Islamic Banks are required to report their sources of zakah and waqf funds, the distribution, and their financial performance. In reality, the supervisory process to nazir showed unsatisfactory results mainly because from 224 nazirs registered in the Indonesian Waqf Board as of October 2019, only 14 of them regularly provided financial reports to IWB. Meanwhile, the regulation to ensure the cash waqf supervisory process to Islamic banks has only been exercised since July 2020, so that cash waqf report before the period was under the jurisdiction of the Ministry of Religious Affairs.

The WCP-9 on Reporting and Waqf Supervision rationalizes that waqf supervisory board must enquire waqf institutions to submit a report on important information regularly, such as waqf assets and waqf funds financial performance, in the process of waqf supervision enforcement. The Regulation of the Minister of the Religious Affairs No. 4/2009 Article 9 supports the waqf supervisory process by compelling nazir with cash waqf report. However, there are no detailed explanations on how waqf supervisory board enforces cash waqf regulation. Therefore, this aspect of the cash waqf supervisory process cannot be implemented yet in Indonesia.

Furthermore, WCP-9 also guides that waqf supervisory board has to provide waqf reporting guidelines that are compatible with the international accounting system. In Indonesia, the Regulation of Minister of Religious Affairs No. 4/2009 Article 9 (1) only states that a nazir is obliged to submit a cash waqf report every 6 (six) months to the Indonesian Waqf Board and the Ministry of Religious Affairs and it provides no guidelines for nazir to report waqf fund. Meanwhile, the regulation of Financial Services Authority, SEOJK No. 10/SEOJK.03/2020, already makes guidelines and the reporting format for Islamic banks regarding the sources and the distribution of zakat and waqf funds which have been effectively implemented since July 1st, 2020.

Moreover, WCP-9 mentions two other aspects: (1) waqf supervisory board has to share data and information with related authorities to ensure the implementation of macroprudential policies; and (2) waqf supervisory board has to obtain a detailed information database on waqf beneficiaries (*mauquf'alaih*) from nazir to optimize an effective distribution scheme. These two issues cannot be implemented in Indonesia because they are not synchronized in waqf regulation.

The WCP-10 on Corrective Actions and the Strength of Sanctions from Waqf Supervisory Board justifies that sanctions can be imposed on waqf institutions, both nazir and Islamic banks, after corrective measures taken do not provide decent results. The regulation of the Minister of Religious Affairs No. 4/2009 Article 11 (3) validates that administrative sanction for a different level of mistakes by waqf institution is allowed, particularly in the form of (1) warnings; (2) temporary suspension; and (3) revocation of the license of Islamic banks to receive cash waqf. However, the regulation has not mentioned Islamic banks that do not provide cash waqf products yet they are licensed to accept cash waqf.

Table 4. The Result of The SEM Outer Model

Item		FL	CR	AVE	α
Report and Coordination			**0.954**	**0.874**	**0.927**
RC 1	Islamic Bank and Nazir have coordinated and reported the development of Cash Waqf to the Ministry of Religious Affairs periodically.	0.897			
RC 2	Islamic Bank and Nazir have coordinated and reported the development of Cash Waqf to the Indonesian Waqf Board periodically.	0.915			
RC 3	Islamic Bank and Nazir have coordinated with the Ministry of Religious Affairs and the Indonesian Waqf Board to encourage the development of Cash Waqf.	0.990			
Regulation			**0.935**	**0.744**	**0.924**
Reg 1	Waqf Law No. 41 of 2004 concerning cash waqf facilitates the collection of cash waqf.	0.935			
Reg 2	Waqf Law No. 41 of 2004 concerning cash waqf encourages Islamic Bank and Nazir to provide services for distributing the benefits of cash waqf to beneficiaries (*mauquf'alaih*).	0.905			
Reg 3	The regulations that require the presence of waqif at the time of handing over cash waqf to the bank as Islamic Bank facilitate the collection of cash waqf.	0.755			
Reg 4	The regulations that require the witness's signature to validate the cash waqf certificate given to the wakif facilitate the collection of cash waqf.	0.843			
Reg 5	The regulations requiring a nazir signature to validate the cash waqf certificate given to the wakif facilitate the collection of cash waqf.	0.865			
Government Support			**0.916**	**0.688**	**0.887**
Gov 1	Existing government regulations have made it easier for Islamic Bank and Nazir to implement cash waqf.	0.717			
Gov 2	The Ministry of Religious Affairs has carried out the function of supervising the implementation of cash waqf properly.	0.805			
Gov 3	The Indonesian Waqf Board has performed the function of guiding Nazir well in the implementation of cash waqf.	0.821			
Gov 4	The Ministry of Religious Affairs provides training facilities to Islamic Bank and Nazir on cash waqf.	0.910			
Gov 5	The Ministry of Religious Affairs provides additional knowledge in the form of infographics, pocketbooks, and so on regarding cash waqf for Islamic Bank and Nazir human resources.	0.882			
Relation			**0.942**	**0.844**	**0.906**
Relation 1	Islamic Bank periodically conducts visitations to nazir.	0.843			
Relation 2	Islamic Bank and Nazir believe that the nazir/Islamic Bank is supported by professional human resources in managing and distributing the benefits of cash waqf to the wider community (*mau'quf'alaih*).	0.956			
Relation 3	The Islamic Bank has coordinated and collaborated well with nazir.	0.952			

Table 5. Discriminant Validity Test Result

	RC	Relation	Gov	Reg
RC 1	***0.897***	0.556	0.673	0.451
RC 2	***0.915***	0.574	0.712	0.491
RC 3	***0.99***	0.624	0.736	0.535
Relation 1	0.508	***0.843***	0.429	0.756
Relation 2	0.572	***0.956***	0.364	0.576
Relation 3	0.636	***0.952***	0.381	0.509
Gov 1	0.437	0.424	***0.717***	0.66
Gov 2	0.545	0.407	***0.805***	0.594
Gov 3	0.57	0.15	***0.821***	0.519
Gov 4	0.625	0.32	***0.91***	0.681
Gov 5	0.845	0.448	***0.882***	0.6
Reg 1	0.587	0.668	0.749	***0.935***
Reg 2	0.598	0.711	0.742	***0.905***
Reg 3	0.154	0.49	0.319	***0.755***
Reg 4	0.285	0.373	0.533	***0.843***
Reg 5	0.316	0.41	0.521	***0.865***

4.4.2 Cash Waqf Governance

The WCP-13 on Good Nazir Governance affirms that waqf management should possess competencies in 3 areas to support good nazir governance and effective management structure, namely risk management, auditing, and business. Indonesian Waqf Board Regulation No. 2/2010 Article 2 paragraph (4) explains that at least half of the total members of nazir are required to have competence and expertise in the management of cash waqf. However, this regulation does not specify nazir's competency requirements in the field of risk management and reporting.

Furthermore, WCP-13 also explains that waqf supervisory board needs to improve the quality of the waqf institutions by providing certification. This aspect has been regulated and implemented in Indonesia. Indonesian Waqf Board Regulation No. 2/2010 Article 2 paragraph (2) point J emphasizes that nazir should get certification from Indonesian Waqf Board and Government Regulation No. 42/2006 Article 58 paragraph 2 explains that Islamic banks are allowed to receive cash waqf after the Ministry of Religious Affairs approves their appeal to become Islamic bank with cash waqf product.

The WCP-27 on Financial Reporting and External Audit states that the waqf supervisor must inquire about the waqf institutions to prepare and document the financial reports, annual reports, and the results of external audits. In Indonesia, the Regulation of Minister of Religious Affairs No. 4/2009 Articles 11 and 12 paragraph (4) explains that Indonesian Waqf Board can appoint a public accountant to examine reports on the management, development, and utilization of cash waqf management results conducted by Islamic banks and nazir. The Regulation of Minister of Religious Affairs No. 4/2009 Article 12 paragraph (2) gives details about the supervisory process of the waqf institutions, which is carried out through annual reports, monitoring, and evaluation of the management and development of cash waqf by nazir. Regulation of Minister of Religious Affairs No. 4/2009 could be one of the factors that prevent nazir to audit the cash waqf report, mainly because of the misinterpretation that the Indonesian Waqf Board would appoint a public accountant to examine report provided by nazir as part of its supervisory duties. Based on this guidance, the waqf supervisor must ensure that the financial statements that are published to the public annually have been audited by an independent external auditor. However, this is not specified in regulations. As a result, most nazirs rarely publish their annual report nor appoint a public accounting firm to audit their financial reports.

The WCP-28 on Disclosure and Transparency asserts that the waqf supervisory board must ensure the waqf institutions to publish the information related to the financial condition, performance, risk exposure, and risk management strategy and make it easily accessible by the public. However, this is not stated yet in regulations. The regulation stipulates that the preparation of financial

reports, annual reports, and audit mechanisms by public accountants are carried out as the appointment by Indonesian Waqf Board.

Because of the lack of disclosure and transparency of cash waqf management in Indonesia, the annual collection of cash waqf in 2018 was Rp. 31.9 billion as reported by the Ministry of Religious Affairs which was still far below the estimation of its potential of Rp. 180 trillion as reported in 2019 by the Indonesian Waqf Board (Ministry of Finance, 2019).

5. Conclusion and Recommendations

The governance of cash waqf by Islamic banks and nazir has not been able to fully support the development of cash waqf products to help the problem of poverty and economic inequality in Indonesia. The cash waqf governance in Islamic banks has not fully assisted the collection of cash waqf. Islamic banks still have not given proper attention to support cash waqf by the absence of the cash waqf department which is fully in charge of developing cash waqf products and by not allocating a budget for cash waqf socialization and promotion. In addition, there are not many Islamic banks with human resources specialized in managing cash waqf. Moreover, prior to July 2020, there was no regulation for Islamic Banks to specifically submit an adequate report regarding cash waqf performance to Financial Services Authority (OJK).

Nazir has little awareness of the importance of cash waqf transparency, therefore only a small number of nazir provide annual and financial reports to Indonesian Waqf Board, the Ministry of Religious Affairs, as well as reports to the public. Furthermore, the human resources management of waqf institution does not function properly to improve the performance of its personnel and to encourage further achievement of cash waqf.

The regulations and governance standards of cash waqf in Indonesia are not fully adequate to support the collection, management, and development of cash waqf. Current laws and regulations have not provided sufficient firmness for the relevant authorities and institutions in the supervisory process and to develop a transparent implementation of cash waqf.

The guidance from Waqf Core Principles cannot be fully implemented to guarantee cash waqf governance in Indonesia, mainly because the cash waqf regulation provides lack justification in certain aspects, cash waqf supervisory, and governance.

For these reasons, it is necessary to improve the cash waqf regulations including Indonesian Waqf Board authority to evaluate nazir certification, the guidelines and standards for cash waqf reporting, the submission of a detailed database mau'quf'alaih from nazir to Indonesian Waqf Board, the detail requirements for staff of nazir in terms of risk management and reporting skills, as well as the requirement for Islamic Banks to receive cash waqf and nazir to submit an audited

financial report and publication. Moreover, the Ministry of Religious Affairs and Indonesian Waqf Board, as the waqf supervisors, coordinate with the Financial Services Authority and other relevant authorities in implementing cash waqf regulation as well as monitoring and enforcing the regulation.

Lack of transparency and lack of good governance practices in managing cash waqf reduce trust from waqifs to donate their money for developing waqf in Indonesia. Furthermore, it can cause an inefficient and ineffective cash waqf management in which the absence of a transparency process will cause the public to make direct donations rather than leaving them with waqf institutions. Being in line with principles of trust will also produce a good reputation and it will be achieved with consistent behavior by eliminating any inconsistent actions from the waqf institution and insufficient supervision that can pose a risk of long-term loss for an institution.

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How do banks fare after merger and acquisition? Evidence from Indonesia

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Abstract

This study examines the effects of mergers and acquisitions on bank profitability, efficiency, and intermediary capabilities using data from all conventional banks in Indonesia over 2004 – 2019 period. We employ difference-in-difference technique to evaluate various bank indicators before and after the mergers and acquisitions action. Our analysis shows that bank mergers and acquisitions have positive contribution on profitability, but no significant impact on cost efficiency and loan intermediation. Further analysis shows that regulatory-driven mergers and acquisitions result in better profitability and higher cost efficiency, but worsening intermediary capabilities than voluntary-driven action. Finally, foreign ownership brings new market to acquired banks and improve their financial intermediation, while large banks tend to perform better than small banks in post-mergers and acquisitions period.

JEL Classification: C33, G21, G34.

Keywords: Acquisition, Bank, Efficiency, Indonesia, Merger, Panel Data, Profitability.

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1. Introduction

Banking consolidation policy is generally taken to stabilize the financial system during crisis period. In the aftermath of the 1997-1998 Asia Financial Crisis, the banking industry across countries tends to be more consolidated (Hadad et al., 2013; Montgomery et al., 2014; Montes, 2014). In Indonesia, the number of commercial banks has declined from a total of 237 banks in 1997 to 151 banks in 2000. Since then, the number of banks has dwindled to 109 at the end of 2020.[1] Nevertheless, the current number of banks in Indonesia remains higher than its peer countries such as Malaysia, Thailand, and India, with only 26, 30, and 34 banks, respectively.[2] Furthermore, the landscape of the banking industry in Indonesia is dominated by small to mid-size banks with core capital less than IDR 5 trillion, comprising a total of 75 banks. Meanwhile, only seven largest banks have core capital more than IDR 30 trillion. In terms of market share, the four largest banks in the country control 50 percent of the total assets in the industry, while 105 banks share the rest, reflecting an enormous disparity in market power between large and small banks that will eventually impair competitiveness of the banking industry (Mulyaningsih and Daly, 2012; Osuagwu and Nwokoa, 2017).

Merger and acquisition activities in the banking industry are often viewed as a corporate strategy to induce better performance through the potential benefits of having larger market share, greater market power, better earning stability, and economies of scale (Peristiani, 1996; Du and Sim, 2016; Coccorese and Feri, 2020). In Indonesia, regulators have encouraged consolidation through mergers and acquisitions by issuing single presence policy and minimum capital requirement regulation. Considering most Indonesian banks are small to mid-size banks, further improvement of the market share distribution and banking capacities through mergers and acquisitions can be a way to enhance bank competitiveness, stability, and overall performance in the long run (Mulyaningsih and Daly, 2011; Shin and Kim, 2013; Kiefer, 2014; Abbas et al., 2014).

Although several studies have asserted the beneficial impact of mergers and acquisitions in banking industry, the findings that relate the corporate action to the bank's performance remains debatable. Studies related to the impact of banking consolidation through mergers and acquisitions are inconclusive due to different impacts of the consolidation policy across countries (Uhde and Heimeshoff; 2009; Sufian et al., 2012; Du and Sim, 2016). Hence, the mixed empirical findings from existing literature should render further examination on the impact of mergers and acquisitions in the banking industry across countries.

In this paper we focus on mergers and acquisitions action in the Indonesian banking industry over 2004 – 2019 period. The study particularly investigates the implication of mergers and acquisitions on bank profitability, efficiency, and intermediation capabilities after the completion date of the action. To the best of our knowledge, there is no existing literature that

[1]Indonesia Banking Statistics, Otoritas Jasa Keuangan, 2020.
[2]Data from the central bank authorities from each country, 2020.

has particularly examined the impact of regulatory-driven and voluntary-driven mergers and acquisitions action in the banking industry. Hence, our main interest in this study is to investigate the impact of mergers and acquisitions towards bank performance in Indonesia, particularly whether regulatory-driven mergers and acquisitions – a practice followed by banks to comply with existing regulations – will induce greater market power, better earning stability, and economies of scale. Furthermore, this study also considers bank-specific factors that may affect the analysis, such as bank ownership and size.

We employ difference-in-difference panel data estimation technique to empirically evaluates the impact of mergers and acquisitions towards bank profitability, efficiency, and loan intermediation. We use quarterly financial reports from all conventional banks in Indonesia from 2004 – 2019 period, in which we classify 30 banks that have been merged or acquired within the observation period as treatment group while the rest of 92 banks as control group.

We find evidence that merger and acquisition activity, particularly that has been triggered by banking consolidation regulation, lead to better profitability and cost efficiency of the bank, but weaker intermediary capabilities. Our deeper analysis reveals that foreign bank's acquisition to a domestic bank can lead to stronger financial intermediation. This improvement indicates that foreign banks can bring in new market for the acquired bank to expand their credit market. In terms of bank size, large banks tend to capture higher performance from implementing mergers and acquisitions action compare to small banks.

The rest of the paper is structured as follows. Section 2 presents theoretical background and an overview of the banking industry in Indonesia, followed by data and research methodology in Section 3. We present the empirical results and robustness checks in Section 4. Section 5 concludes the paper with some implications to policymakers.

2. Theoretical and Regulatory Framework

Bank performance post-implementation of mergers and acquisitions activity can be examined through the competing stability theory and bank charter value hypothesis (Keeley, 1990; Besanko and Thakor, 1993; Caminal and Matutes, 2002; Nicoló et al., 2006; Fiordelisi and Mare, 2014). The competing stability theory states that high competition within industry can enhance bank stability, thereby inducing banks to create efficiency, more optimal product mix, and further improve their performance by having advanced managerial in order to survive in the industry (Demsetz, 1973; Caminal and Matutes, 2002; Nicoló et al., 2006; Fiordelisi and Mare, 2014). This view argues that the reduction in competition and the establishment of immense size (too-big-too-fail) financial institutions will eventually induces risk taking behavior of banks due to inefficient regulation (Nagarajan and Sealey 1995).

On the contrary, some studies find that bank competition can lead to more fragility, in which firms are more willing to take enormous risks in a more competitive industry where there is more pressure to gain profits. The extreme competition will deteriorate the market power and profit margin of banks, and eventually induce them to take high risk strategies that can lead to

bank failure and instability in the industry (Marcus, 1984; Keeley 1990; Beck, 2008). Hence, bank charter value hypothesis supports a more regulated banking industry with limited competition, which can be achieved through mergers and acquisitions activities.

From perspectives of mergers and acquisitions, Trautwein (1990) and Sufian (2011) assert that efficiency motive is carried out by the firms to create operational synergies and managerial synergies. It can be achieved through better performing bank integrating with inadequately managed banks, in which more adept bank absorb bank with relatively lower capital ratio and lower profitability by combining operations of separate units, knowledge transfers, as well as conducting superior planning and monitoring abilities by the acquirer that can benefit the target's performance in order to become more scale efficient (Trautwein, 1990; Peristiani, 1996; Coccorese dan Ferri, 2020).

Furthermore, by creating synergies through mergers and acquisitions implementation, banks are expected to gain potential advantages of lowering production cost and enable to accomplished maximum production of various financial products/services mix that eventually lead to economies of scale in the long run (Demsetz, 1974; English et al., 1993; Leepsa and Mishra, 2014). Although some studies have concluded that economies of scale in the banking industry are found in small size banks (Peristiani, 1996; Hughes and Mester, 2013), other existing literatures state that the cost of producing an additional unit of output (for example, a loan or other products/services innovation) among the big banking firms fall as the quantity production of the firms increase (Hughes and Mester, 2013; Kovner et al., 2014; Wheelock and Wilson, 2017), implying evidence of scale economies in bigger size banking firms. If mergers and acquisitions induce economies of scale, it is safe to assume that post-merger profits would grow relative to pre-merger profits and the profits of other peers in the industry.

Another rationale of mergers and acquisitions strategy in term of banking firms' performance is the advantage of gaining more market power (Trautwein, 1990; Perisitani, 1996). In more concentrated banking industry structure, the surviving banks can implement specific conduct, e.g., creating innovation and/or new financial products, investing on more varied delivery channel, price taking, advertising, and gathering information (Akhavein et al., 1997; Fang, 2019). Thus, the banking conduct in turn will increase revenue, generate cost savings (in terms of marketing, sales and product distribution, and human resources), market expansion, and eventually will lead to obtaining profit gain (Du and Sim, 2015; Coccorese and Ferri, 2020).

On the banking regulatory front, Indonesia's financial services authority has encouraged consolidation through mergers and acquisitions by issuing a series of regulations since the 1997-1998 Asia Financial Crisis. The minimum capital adequacy requirement for commercial banks has first been introduced in 2005, in which banks are restricted in doing their business activities if they are not able to meet the minimum capital of IDR 80 billion in 2007 and IDR 100 billion in 2010.[3] In 2020, banks are again enforced to comply with the minimum capital

[3]Bank Indonesia Regulation No. 7/15/2005.

adequacy requirement of IDR 1 trillion in 2020, IDR 2 trillion in 2021, and IDR 3 trillion by the end of 2022.[4] Aside from this, another policy, namely Single Presence Policy, has been introduced in 2006.[5] This particular policy seeks to regulate the ownership structure for a banking firm, to which the main shareholders who are present in more than one bank are now only allowed to become controlling shareholder in one bank through transferring part or all of their shares ownership into single bank.

The reinforcement efforts undertaken by the financial services authority for banking consolidation through mergers and acquisitions has continued in 2019, which specify requirements and procedures for merger, consolidation, acquisition, and integration[6]. It is also asserted that the financial services authority can directly enforce the conduct of mergers and acquisitions between banks based on supervisory action.

3. Literature Review

Many studies have been conducted on the analysis of mergers and acquisitions and their impact on the banking industry performance. Shin and Kim (2013) conclude that there is an increase in bank competitiveness after mergers and acquisitions in South Korea, in line with the increasing market concentration in the country's banking industry. Khan et al. (2018) examine banks in the Southeast Asian countries and conclude that mergers and acquisitions are able to provide relatively higher profitability in a concentrated banking industry than in a less concentrated banking industry. Lastly, Sufian and Majid (2007) and Al-Khasawnah et al. (2020) conduct studies in Singapore and the United States to which they find an increase in bank efficiency after mergers have been implemented.

On the other hand, studies with contradictory conclusion can be found in the studies done by Kai and Sim (2016) for China, India, Indonesia, Malaysia, Russia, and Thailand, which conclude that the effect of mergers and acquisitions is generally weak on bank efficiency. Uhde and Heimeshoff (2009) conduct a study on mergers and acquisitions in European Union countries and conclude that the banking industry concentration from the result of mergers and acquisitions has a negative impact on the health of financial markets in the region. Sufian et al. (2012) in Malaysia analyze how post-forced mega merger in Malaysia's banking sector has impacted their revenue efficiency, to which later emphasize that the revenue efficiency of the banking sector has not significantly improved compare to the pre-merger period.

Another study by Montgomery et al. (2014) conclude that the result of banking mergers in Japan tend to reduce cost efficiency but do not have significant impact on profit efficiency. In addition, Shirasu (2018) examines the mergers and acquisitions in Asia Pacific countries and concludes that the corporate action contributes to an increase in new loans and stronger capital.

[4]Financial Services Authority Regulation No. 12/POJK.03/2020.
[5]Bank Indonesia Regulation No. 8/16/2006.
[6]Financial Services Authority Regulation 41/POJK.03/2019.

However, banks fail to obtain profitability because the increase has been accompanied by an increase in the number of bad loans.

In Indonesia, studies on mergers and acquisitions in the banking industry has so far produced mixed conclusions. Hadad et al. (2013) analyze the hypothetical mergers between banks in the industry and find that the merger as a consolidation step in Indonesia will be beneficial for state-owned banks and non-foreign exchange banks as the groups show scale inefficiencies above industry average. Yusgiantoro et al. (2019) concludes that bank consolidation that is proxied by market power will generally have a positive impact on financial stability, but more detailed analysis assert that the action can be detrimental for state-owned banks and small private-owned-banks. Yuanita (2019) examines competition in the banking industry and its impact on financial stability and conclude that in a more competitive banking industry, banks will gain from economies of scale that later will induce them to offer lower price of products and/or services. The study also states that higher concentration of banking industry is associated with higher profitability and thus recommend on the implementation of banking consolidation to be carried out in the industry.

4. Data and Methodology

This study uses data on a quarterly basis from the financial reports of 102 banking firms in Indonesia from 2004 to 2019 provided by the financial services authority. The sample is consisted of 33 banks that have completed a merger or acquisition activity within the observation period, while 69 banks have no prior history of the corporate action. The first group of banks are selected as the treatment group, while the later group of banks forms the control group. We decide to measure the impact of mergers and acquisitions on bank performance by using return on asset (ROA) and net interest margin (NIM) as proxies for profitability, cost to income ratio (CIR) as a proxy for efficiency, and loan to deposit ratio (LDR) as a proxy for intermediary capabilities. Furthermore, since macroeconomic condition may have effects on the performance of the banking industry (Pana et al., 2010; Shirasu, 2018), we use economic output (GDP) growth and consumer price index (CPI) data from Indonesia's Central Bureau of Statistics for additional control variables. Table 1 presents the descriptive statistics of the sample data, while table 2 shows the correlations between variables that are used in the model.

For our model framework, we adopt difference-in-difference technique that has been used in prior studies to analyze mergers and acquisitions (Hosken et al, 2017; Shirasu, 2018). The model applies a combination of cross-sectional treatment-control comparisons and before-after dummy variables to obtain a more robust estimation (Renneboog and Vansteenkiste, 2019).

In order to analyze the various estimations of the mergers and acquisition action, we attempt to create different treated group and control group for each estimation of the model that we use to analyze the data sample over 2004 – 2019 period. The first model is set up to analyze all bank mergers and acquisitions, as follows:

Model 1: All mergers and acquisitions

$$Y_{i,t} = \alpha + \beta_1 MnA_i + \beta_2 Post_t + \beta_3 Post_t * MnA_i + \beta_4 Control_{i,t} + \varepsilon_{i,t},$$

where $Y_{i,t}$ is the dependent variables for bank *i* performance in period *t*, MnA_i is a dummy treated variable for bank *i* that has completed a merger or acquisition action, $Post_t$ is a dummy time variable for post-merger or post-acquisition period *t*, and $Control_t$ is a set of control variables that may affect the dependent variables in period *t*.

For the dependent variables, we use common financial ratios ROA, NIM, BOPO, and LDR to measure the bank's performance. Both ROA and NIM are used in many existing literatures to measure bank profitability (Shin and Kim, 2013; Shirasu, 2018; Trinugroho et al., 2020). In model 1, higher estimated values of ROA and NIM will represent higher profitability obtained by the treated banks in post-merger and acquisition period.

Furthermore, we use another ratio of CIR to measure the level of efficiency in banking firms' business operations (Du Toit and Cuba, 2017; Aly et al., 2018; Trinugroho et al., 2020), in which the higher number of costs to income ratio will represent higher level of inefficiency in banks' performance. Lastly, LDR is used as a dependent variable to analyze the intermediation role of the banks in channeling their credit after mergers and acquisitions action (Ikpefan and Kazeem, 2013; Trinugroho et al., 2020).

For dummy treated variables, MnA_i is set to the value of one ('1') for banks that have completed a merger or acquisition action and the value of zero ('0') otherwise. Meanwhile, $Post_t$ is set to the value of one ('1') for periods after each bank completed the merger or acquisition action. The control variables, $Control_t$, are comprised of macroeconomic indicators (GDP growth and CPI), bank sizeas proxied by the natural logarithmic of the bank's total asset, and a dummy variable for bank ownership, which is set to the value of one ('1') for domestically owned bank and the value of zero ('0') otherwise. In this estimation, our variable of interest is the interaction variable of $Post_t * MnA_i$, which indicates the effect of mergers and acquisitions on respective dependent variables in post-merger and acquisition period.

We then investigate further the impact of mergers and acquisitions on banks' performance that are driven by regulatory enforcement and voluntary basis through the following two estimation models:

Model 2: Regulatory mergers and acquisitions

$$Y_{i,t} = \alpha + \beta_1 MnA\_Regulatory_i + \beta_2 Post_t + \beta_3 Post_t * MnA_{Regulatory_i} + \beta_4 Control_{i,t} + \varepsilon_{i,t},$$

Model 3: Voluntary mergers and acquisitions

$$Y_{i,t} = \alpha + \beta_1 MnA\_Voluntary_i + \beta_2 Post_t + \beta_3 Post_t * MnA\_Voluntary_i + \beta_4 Control_{i,t} + \varepsilon_{i,t},$$

For model 2 and 3, we assess the effects of regulatory mergers and acquisitions and voluntary mergers and acquisitions by using dummy variables of $MnA\_Regulatory_i$ and $MnA\_Voluntary_i$, respectively. $MnA\_Regulatory_i$ is set to the value of one ('1') for banks that have completed a merger or acquisition action due to regulatory enforcement by the financial services authority and the value of zero ('0') otherwise. Meanwhile, $MnA\_Voluntary_i$ is set to the value of one ('1') for banks that have completed a market-driven merger or acquisition action and the value of zero ('0') otherwise. In these two models, our variables of interest are $Post_t * MnA\_Regulatory_i$ and $Post_t * MnA\_Voluntary_i$, which indicate the impact of the regulatory and voluntarily mergers and acquisitions on respective dependent variables in post-merger and acquisition period.

Lastly, we conduct a deeper analysis on the relationship between mergers and acquisitions action and banks' performance based on bank-specific factors such as ownership and size, in which we employ triple interaction variables for $Post_t * MnA_i * Ownership_i$ and $Post_t * MnA_i * Size_i$, respectively.

Model 4: Mergers and acquisitions based on bank ownership

$$Y_{i,t} = \alpha + \beta_1 MnA_i + \beta_2 Post_t + \beta_3 Post_t * MnA_i + \beta_4 Post_t * MnA_i * Ownership_i + \beta_5 Control_{i,t} + \varepsilon_{i,t} ,$$

Model 5: Mergers and acquisitions based on bank size

$$Y_{i,t} = \alpha + \beta_1 MnA_i + \beta_2 Post_t + \beta_3 Post_t * MnA_i + \beta_4 Post_t * MnA_i * Size_i + \beta_5 Control_{i,t} + \varepsilon_{i,t} .$$

For model 4 and 5, we attempt to evaluate variation in our estimation results based on whether bank's ownership and size. $Ownership_i$ is set to the value of one ('1') for banks that have foreign controlling shareholder and the value of zero ('0') otherwise. Meanwhile, $Size_i$ is set to the value of one ('1') for banks that have above average total asset relative to the sample mean and the value of zero ('0') otherwise. In these two models, our variables of interest are $Post_t * MnA_i * Ownership_i$ and $Post_t * MnA_i * Size_i$, which evaluate the effects of mergers and acquisitions on respective dependent variables based on ownership type and bank size in post-merger and acquisition period.

5. Results

We examine the effects of mergers and acquisitions on banks' performance in Indonesia over 2004 – 2019 period. In our analysis, banks' performance is represented by ROA, NIM, CIR, and LDR to measure profitability, efficiency, and intermediary capabilities, respectively. All estimations are tested over 102 sample of conventional banks, in which we classify into treatment group and control group in each of the five difference-in-difference panel data models that we employ in this study.

Table 1. Descriptive Statistics

Variables	Definition	Obs.	Mean	Std. Dev.	Min	Max
ROA	Return on asset	6,359	2.2398	2.0309	-8.9640	14.220
NIM	Net interest margin	6,343	5.5298	2.9566	-9.5868	19.850
CIR	Cost to income ratio	6,390	82.241	15.703	31.060	188.71
LDR	Loan to deposit ratio	6,263	85.441	30.802	20.120	273.43
MnA	Dummy variable for treated banks. Value is set to '1' for banks that have completed a merger and acquisition action	6,464	0.3267	0.4690	0	1
post	Dummy variable for treatment effect. Value is set to '1' for time after completion of the merger and acquisition action	6,527	0.7230	0.4475	0	1
nplratio	The ratio of gross non-performing loan to total credit	6,011	3.169	3.0768	0.0520	34.715
lntotalasset	Natural logarithm of total asset	6,355	15.555	1.7455	9.486	20.483
Ownership	Dummy variable for bank ownership. Value is set to '1' for foreign-owned banks	6,464	0.3663	0.4818	0	1
Size	Dummy variable for bank size. Value is set to '1' for large-scale banks	6,464	0.2357	0.4245	0	1
CPI	Consumer price index	6,527	130.70	13.074	110.08	160.81
gdpgrowth	Growth rate of gross domestic product on quarterly basis	6,119	8.4032	2.7851	4.1357	14.978

Table 2. Correlation Matrix

	ROA	NIM	CIR	LDR	post	MnA	nplratio	ownership	lntotalasset	CPI	gdpgrowth
ROA	1										
NIM	0.5329	1									
CIR	-0.8589	-0.4179	1								
LDR	-0.0146	-0.1981	-0.0561	1							
post	-0.0975	-0.2628	0.0543	0.1448	1						
MnA	-0.273	-0.2389	0.2552	0.1169	-0.0444	1					
nplratio	-0.171	-0.0549	0.2373	-0.0264	-0.1664	0.0216	1				
ownership	0.0198	0.2351	-0.0119	-0.3062	0.0455	-0.2182	-0.0034	1			
lntotalasset	0.0417	-0.2378	-0.1	0.0982	0.3179	-0.0211	-0.0091	-0.1364	1		
CPI	-0.051	-0.0058	0.0246	-0.0264	-0.2958	0.0034	0.018	-0.0054	0.0265	1	
gdpgrowth	-0.0277	-0.1667	-0.0115	0.0626	0.4691	-0.0002	-0.1544	0.0036	0.1759	-0.0219	1

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Table 3 displays our baseline estimation results. The variable of interest, $Post_t * MnA_i$, shows positive outcomes on both ROA and NIM for banks that has undertaken a merger or acquisition after the corporate action period. However, the result reveals a negative effect on LDR and no significant impact on CIR from mergers and acquisitions action. This implies that the treated banks in post-merger and acquisition period have higher profitability compare to banks that has not undertaken the corporate action. On the contrary, the mergers and acquisitions action seems to have negative impact on bank intermediary function and no impact on efficiency. We argue that higher capitalization of the merged or acquired banks can generate higher revenues through the expansion of the banks' operational activities and higher market power to set interest rates, which can also result in higher operational costs. Hence, in post-mergers and acquisitions, banks can increase revenues but fail to improve their cost efficiency and achieve economies of scale (Montgomery et al., 2014).

Table 3. Baseline Estimation Result

Variables	(1) ROA	(2) NIM	(3) CIR	(4) LDR
post	-0.984***	-1.719***	5.632***	13.99***
	(0.0964)	(0.143)	(0.690)	(1.379)
MnA	-1.557***	-1.590***	10.19***	7.037***
	(0.114)	(0.156)	(0.888)	(2.148)
post*MnA	0.444***	0.678***	-1.325	-5.571**
	(0.124)	(0.171)	(0.976)	(2.218)
ownership	-0.0534	-1.528***	0.0882	20.32***
	(0.0570)	(0.0701)	(0.463)	(1.110)
nplratio	-0.142***	-0.0813***	1.367***	-0.310**
	(0.0139)	(0.0117)	(0.112)	(0.147)
lntotasset	0.0904***	-0.229***	-1.241***	-0.358
	(0.0166)	(0.0212)	(0.132)	(0.272)
CPI	-0.0147***	-0.0143***	0.0705***	0.0549*
	(0.00209)	(0.00270)	(0.0160)	(0.0318)
gdpgrowth	0.0107	-0.0557***	-0.0952	0.0153
	(0.00970)	(0.0126)	(0.0761)	(0.148)
Constant	4.265***	13.94***	81.60***	67.01***
	(0.366)	(0.510)	(2.834)	(5.420)
Observations	5,545	5,539	5,565	5,476
R-squared	0.156	0.238	0.172	0.128

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

Furthermore, in order to examine the impact of mergers and acquisitions on banks' performance based on regulatory enforcement and market-driven mechanism, we generate interaction between the dummy variable of regulatory-driven mergers and acquisitions with the treatment effect variables ($Post_t * MnA\_Regulatory_i$), while another interaction is constructed between the dummy variable of voluntary-driven mergers and acquisitions with

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the treatment effect variables ($Post_t * MnA\_Vountary_i$). Table 4 illustrates significant results for regulatory-driven mergers and acquisitions on all of the dependent variables. The estimation results of the interaction variable show positive associations on both ROA and NIM, but negative outcomes on CIR and LDR. Hence, regulatory-driven mergers and acquisitions for the treated banks yield better profits and efficiency gain in post-merger and acquisition period compare to the banks who have not undertaken the corporate action. In addition, the treated banks have lower financial intermediation compare to the banks that have not undertaken merger or acquisition action from regulatory enforcement.

Table 4. Estimation Result on Regulatory-Driven Mergers and Acquisitions

Variables	(1) ROA	(2) NIM	(3) CIR	(4) LDR
post	-0.841***	-1.572***	5.608***	12.35***
	(0.0819)	(0.109)	(0.610)	(1.236)
MnA_Regulatory	-1.269***	-1.261***	9.984***	3.678***
	(0.0649)	(0.0839)	(0.459)	(1.116)
post*MnA_Regulatory	0.254***	0.873***	-3.841***	-4.299***
	(0.0948)	(0.144)	(0.787)	(1.438)
ownership	-0.0755	-1.571***	0.224	20.64***
	(0.0572)	(0.0708)	(0.464)	(1.102)
nplratio	-0.142***	-0.0806***	1.360***	-0.313**
	(0.0141)	(0.0116)	(0.113)	(0.148)
lntotalasset	0.0975***	-0.213***	-1.282***	-0.448*
	(0.0166)	(0.0208)	(0.132)	(0.269)
CPI	-0.0145***	-0.0142***	0.0715***	0.0526*
	(0.00210)	(0.00268)	(0.0160)	(0.0319)
gdpgrowth	0.00865	-0.0586***	-0.0901	0.0415
	(0.00971)	(0.0125)	(0.0757)	(0.149)
Constant	4.026***	13.59***	82.10***	69.78***
	(0.361)	(0.484)	(2.831)	(5.365)
Observations	5,545	5,539	5,565	5,476
R-squared	0.154	0.241	0.175	0.128

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

These findings imply that banks undertaking merger or acquisition based on existing consolidation regulation generate higher profitability due to higher efficiency gain achieved by the banks. This performance is also improved by the economies of scale attained by the merged or acquired banks. Hence, the implementation of mergers and acquisitions as a result of the consolidation regulation of the financial services authority will be beneficial for small size banks to strengthen their performance. Meanwhile, the lower financial intermediation from the merged or acquired banks indicates that the relevant banks may have failed to seize the market from the bigger existing banks in the industry. Thus, it is best for the mid-size banks that have

been merged or acquired based on regulatory enforcement to maximize their efficiency gain and maintain their segments in the market (Yusgiantoro et al., 2019).

Table 5 displays contradictory result for voluntary-driven mergers and acquisitions. The estimation result of the interaction variable shows negative association on NIM, but no significance on ROA. Meanwhile, the result reveals positive outcome on CIR, indicating lower efficiency for the merged or acquired banks in post market-driven merger and acquisition period. The result also shows positive outcome on LDR, implying stronger intermediary role for the merged or acquired banks in post merger and acquisition period.

Hence, mergers and acquisitions result in lower profitability and efficiency for banks that have been merged or acquired by market-driven mechanism. Nevertheless, positive association of the LDR indicates that the merged or acquired banks can still benefit from higher market power as reflected by higher intermediary capabilities in post-merger and acquisition period.

Table 5. Estimation Result on Voluntary-Driven Mergers and Acquisitions

Variables	(1) ROA	(2) NIM	(3) CIR	(4) LDR
post	-0.824***	-1.384***	4.546***	11.81***
	(0.0842)	(0.119)	(0.630)	(1.229)
MnA_Voluntary	-1.252***	-0.922***	7.977***	2.788**
	(0.0735)	(0.110)	(0.599)	(1.315)
post*MnA_Voluntary	0.0666	-0.272**	2.156***	0.0315
	(0.0910)	(0.126)	(0.711)	(1.514)
ownership	-0.0653	-1.568***	0.268	20.53***
	(0.0569)	(0.0708)	(0.466)	(1.118)
nplratio	-0.142***	-0.0816***	1.365***	-0.302**
	(0.0140)	(0.0115)	(0.113)	(0.147)
lntotalasset	0.0945***	-0.215***	-1.298***	-0.423
	(0.0167)	(0.0209)	(0.132)	(0.268)
CPI	-0.0143***	-0.0135***	0.0687***	0.0500
	(0.00209)	(0.00269)	(0.0160)	(0.0319)
gdpgrowth	0.00888	-0.0602***	-0.0794	0.0424
	(0.00975)	(0.0126)	(0.0763)	(0.149)
Constant	4.038***	13.39***	83.46***	70.16***
	(0.364)	(0.493)	(2.840)	(5.300)
Observations	5,545	5,539	5,565	5,476
R-squared	0.153	0.236	0.173	0.127

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

Furthermore, we assess whether bank ownership has an impact on the bank's performance, particularly after the mergers and acquisitions action. Table 6 reveals positive outcome on LDR, but negative associations on ROA and CIR. This result implies that foreign banks that enter into acquiring domestic banks generate positive effects on the efficiency and financial intermediation of the acquired banks in post-mergers and acquisitions period. Hence, we

conclude that domestically owned banks have lower intermediary function in post-mergers and acquisitions period compare to the foreign banks. This finding is in line with previous study done by Yildirim et al. (2007) who conclude that bank ownership results in positive outcome for foreign participation in the banking industry.

Table 6. Estimation Result on Mergers and Acquisitions Based on Bank Ownership

Variables	(1) ROA	(2) NIM	(3) CIR	(4) LDR
post	-0.983***	-1.522***	5.566***	11.37***
	(0.0959)	(0.147)	(0.686)	(1.479)
MnA	-1.581***	-2.392***	10.26***	17.71***
	(0.110)	(0.156)	(0.867)	(2.067)
post*MnA	0.552***	1.034***	-0.543	-14.59***
	(0.144)	(0.212)	(1.030)	(2.215)
post*MnA*ownership	-0.178*	-0.207	-1.426*	10.39***
	(0.104)	(0.147)	(0.741)	(1.431)
nplratio	-0.143***	-0.0802***	1.363***	-0.353**
	(0.0139)	(0.0123)	(0.112)	(0.151)
lntotalasset	0.0908***	-0.347***	-1.195***	1.027***
	(0.0162)	(0.0216)	(0.127)	(0.279)
CPI	-0.0147***	-0.0116***	0.0696***	0.0203
	(0.00209)	(0.00280)	(0.0160)	(0.0327)
gdpgrowth	0.0105	-0.0587***	-0.0952	0.0568
	(0.00971)	(0.0132)	(0.0760)	(0.151)
Constant	4.245***	14.99***	81.07***	55.67***
	(0.362)	(0.532)	(2.801)	(5.562)
Observations	5,545	5,539	5,565	5,476
R-squared	0.156	0.185	0.172	0.058

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

In terms of bank size, table 7 indicates positive associations for ROA, CIR, and LDR, but no impact on NIM. This result implies that large size banks undertaking merger or acquisition generate positive effects on the profitability, efficiency, and intermediary capabilities of the merged or acquired banks in post-mergers and acquisitions period. Hence, large banks tend to capture more benefits from the implementation of mergers and acquisitions in the industry than small banks.

Table 7. Estimation Result on Mergers and Acquisitions Based on Bank Size

Variables	(1) ROA	(2) NIM	(3) CIR	(4) LDR
post	-0.870***	-1.966***	4.124***	13.10***
	(0.0924)	(0.142)	(0.656)	(1.362)
MnA	-1.638***	-1.284***	11.43***	7.126***
	(0.113)	(0.158)	(0.883)	(2.118)
post*MnA	0.393***	0.475***	-0.815	-7.770***
	(0.130)	(0.181)	(1.013)	(2.200)
post*MnA*size	0.354***	0.0606	-4.702***	7.318***
	(0.0818)	(0.116)	(0.738)	(2.117)
nplratio	-0.140***	-0.0853***	1.339***	-0.254*
	(0.0138)	(0.0122)	(0.111)	(0.144)
lntotalasset	0.00929	-1.715***	-0.743*	18.87***
	(0.0561)	(0.0706)	(0.449)	(1.132)
CPI	-0.0134***	-0.0175***	0.0527***	0.0360
	(0.00205)	(0.00273)	(0.0158)	(0.0309)
gdpgrowth	0.0124	-0.0599***	-0.125*	0.0457
	(0.00964)	(0.0128)	(0.0759)	(0.147)
Constant	5.389***	10.98***	66.01***	64.64***
	(0.302)	(0.420)	(2.290)	(4.369)
Observations	5,607	5,608	5,636	5,546
R-squared	0.153	0.215	0.163	0.125

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

Finally, we add robustness tests for all of the results above by conducting incremental estimation on ROA, NIM, CIR, and LDR for six subsequent post-merger and acquisition periods. The significance and direction of the resulting dependent variables remain the same, which are presented in the Appendix.

6. Conclusions

We empirically investigate the effect of the mergers and acquisitions on bank's profitability, efficiency, and intermediary capabilities. The results conclude that the profitability performance of merged or acquired banks are better than banks that have not implemented merger or acquisition. From efficiency and financial intermediary measures, we see no significant impacts from the merger and acquisition activities.

Furthermore, we find that mergers and acquisitions activities based on regulatory enforcement and market-driven mechanism render different effects in post-mergers and acquisitions period. Our deeper analysis reveals that regulatory-driven merged or acquired banks experience better profit and cost efficiency, but weaker performance in financial intermediation. Cost efficiency is worse for the merged or acquired banks based on market mechanism, while no significant impact is observed on profitability and intermediary capabilities. In addition, we find that financial globalization through foreign ownership in merger and acquisition activities have

shown positive impacts on financial intermediation. There is indication that a foreign bank's entry brings in new market from their pool of foreign clients to the acquired banks. Lastly, mergers and acquisitions action for the above average bank size can significantly improve profitability, efficiency, and financial intermediation.

All of these findings carry several policy implications. First, there is a strong evidence that bank mergers and acquisitions lead to better profitability, but less performance in efficiency and intermediary capabilities. Therefore, financial services regulator should seek complementary policies that can mitigate the negative effects of consolidation, particularly for merged or acquired banks to better manage their cost structure. Finally, mergers and acquisitions should distinguish market segmentation of the banking industry in Indonesia to ensure that merged or acquired banks are competing in the appropriate playing field.

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Appendix. Robustness Tests

Table A.1.

VARIABLES	(1) ROA	(2) ROA	(3) ROA	(4) ROA	(5) ROA	(6) ROA
post*MnA	0.528***	0.539***	0.454***	0.413***	0.424***	0.284**
	(0.130)	(0.130)	(0.117)	(0.119)	(0.118)	(0.125)
ownership		-0.252***	-0.191***	-0.136**	-0.124**	-0.0997*
		(0.0556)	(0.0551)	(0.0557)	(0.0555)	(0.0568)
nplratio			-0.132***	-0.134***	-0.137***	-0.136***
			(0.0136)	(0.0138)	(0.0136)	(0.0138)
lntotalasset				0.0806***	0.103***	0.103***
				(0.0157)	(0.0159)	(0.0162)
CPI					-0.0190***	-0.0168***
					(0.00195)	(0.00211)
gdpgrowth						0.0227**
						(0.00974)
Constant	3.168***	3.366***	3.932***	2.712***	4.915***	4.334***
	(0.0689)	(0.0834)	(0.0930)	(0.251)	(0.333)	(0.365)
Observations	6,423	6,423	6,012	5,950	5,950	5,601
R-squared	0.092	0.095	0.140	0.143	0.158	0.140

Table A.2.

VARIABLES	(1) NIM	(2) NIM	(3) NIM	(4) NIM	(5) NIM	(6) NIM
post*MnA	0.636***	0.574***	0.447**	0.608***	0.605***	0.472***
	(0.182)	(0.181)	(0.176)	(0.173)	(0.172)	(0.182)
ownership		1.619***	1.384***	1.257***	1.272***	1.203***
		(0.0676)	(0.0689)	(0.0649)	(0.0651)	(0.0653)
nplratio			-0.106***	-0.101***	-0.105***	-0.0884***
			(0.0126)	(0.0121)	(0.0122)	(0.0125)
lntotalasset				-0.260***	-0.234***	-0.223***
				(0.0205)	(0.0204)	(0.0205)
CPI					-0.0220***	-0.0159***
					(0.00263)	(0.00279)
gdpgrowth						-0.0424***
						(0.0133)
Constant	7.615***	6.340***	6.977***	10.94***	13.50***	12.55***
	(0.108)	(0.117)	(0.135)	(0.332)	(0.478)	(0.510)
Observations	6,406	6,406	5,985	5,916	5,916	5,594
R-squared	0.140	0.197	0.198	0.223	0.233	0.198

Table A.3.

VARIABLES	(1) BOPO	(2) BOPO	(3) BOPO	(4) BOPO	(5) BOPO	(6) BOPO
post*MnA	-2.082**	-2.211**	-1.312	-0.645	-0.688	0.553
	(1.036)	(1.028)	(0.901)	(0.910)	(0.909)	(0.967)
ownership		2.771***	3.035***	2.328***	2.259***	1.947***
		(0.450)	(0.463)	(0.465)	(0.464)	(0.473)
nplratio			1.193***	1.212***	1.234***	1.282***
			(0.105)	(0.106)	(0.105)	(0.109)
lntotalasset				-1.133***	-1.248***	-1.267***
				(0.117)	(0.118)	(0.121)
CPI					0.0955***	0.0898***
					(0.0144)	(0.0157)
gdpgrowth						-0.197***
						(0.0759)
Constant	77.32***	75.13***	69.48***	86.68***	75.59***	78.58***
	(0.454)	(0.584)	(0.705)	(1.835)	(2.507)	(2.704)
Observations	6,453	6,453	6,049	5,974	5,974	5,620
R-squared	0.072	0.078	0.140	0.152	0.159	0.155

Table A.4.

VARIABLES	(1) LDR	(2) LDR	(3) LDR	(4) LDR	(5) LDR	(6) LDR
post*MnA	-0.192	1.037	2.580	2.695	2.666	-0.464
	(1.956)	(1.939)	(1.997)	(2.013)	(2.008)	(2.303)
ownership		-18.85***	-19.68***	-20.15***	-20.22***	-21.15***
		(1.176)	(1.252)	(1.231)	(1.230)	(1.279)
nplratio			0.0483	0.0239	0.0416	-0.0556
			(0.153)	(0.155)	(0.155)	(0.165)
lntotalasset				-0.0257	-0.126	0.0940
				(0.242)	(0.247)	(0.258)
CPI					0.0853***	0.0500
					(0.0291)	(0.0317)
gdpgrowth						-0.172
						(0.149)
Constant	73.88***	89.14***	90.64***	91.14***	81.24***	85.05***
	(1.024)	(1.508)	(1.609)	(3.693)	(4.752)	(5.427)
Observations	6,332	6,332	5,962	5,888	5,888	5,536
R-squared	0.039	0.108	0.115	0.118	0.120	0.119

Regional banks' post-IPO performance: Empirical evidence from Indonesia

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Abstract

This paper investigates regional banks' post-Initial Public Offering (IPO) performance to achieve the objective of Indonesia's Regional Champion Program (RCP) in solvability, profitability, efficiency, interest income, intermediary capability, and loan risk. In 2010, Indonesia's banking authority launched the RCP to increase regional banks' institutional resilience, intermediary function, financial inclusion. We apply the Difference-in-Differences (DiD) approach to a panel data set of Indonesian monthly bank data from 2009 – 2019. The research finds that regional banks' profitability, efficiency, and interest income, increase after IPO; this result is consistent in the medium and long term. Inline, we also find that regional banks' capital increase after IPO. However, it only persists in the short-term period. Furthermore, our findings also show that regional banks' intermediary capability, reflected in Loan to Deposit Ratio (LDR) and loan growth, decreases after IPO. Finally, in line with Boubakri et al. (2005), our results show an insignificant association between IPO and regional banks' loan risk.

JEL Code: C23, G21, L25

Keywords: *Regional bank, Initial Public Offering, Capital Market, Performance, Risk, Indonesia*

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1. Introduction

Indonesia is predicted to become the fourth-largest economy in the world by 2050 (PWC, 2017). However, Indonesia's stock market capitalization is relatively low compared to other developing countries (WEF, 2019). Although the banking sector dominates Indonesia's stock market, only three regional banks have traded their shares on the Indonesia Stock Exchange (IDX).

Indonesian regional development banks (Bank Pembangunan Daerah/BPD) or regional banks are commercial banks owned by the province and district/city government. Since regional banks in Indonesia have their captive market in their respective provinces/area, regional banks have higher profitability than other commercial banks in Indonesia (Trinugroho et al., 2014). However, their solvency ratio still lower compares to the other banks in Indonesia. This phenomenon is because regional banks' dividend policy is still determined by the provincial government's political policy. Therefore, to increase regional banks' institutional resilience, intermediary capability, and financial inclusion, Indonesia's banking authority has launched BPD Regional Champion Program or Regional Champion Program (RCP) since 2010.

The impact of privatization, including Initial Public Offering (IPO) to banks' performance (e.g., La Porta et al., 2002, Boubakri et al., 2005), and regional banks' performance and risk (e.g., Trinugroho et al., 2018, Meslier et al., 2020) have been studied widely. However, there is still a research gap in the study of IPO and regional banks' performance. Therefore, this paper aims to elaborate on regional banks' after IPO performance regarding their solvency, profitability, efficiency, interest income, intermediary capability, and loan risk. To our best knowledge, this paper is the only research that focuses on this particular topic.

Although IPO is one of the predominant ways firms increase their capital, developing country banks' solvency tends to decrease after IPO (Boubakri et al., 2005). This result is in line with the insignificant evidence of the association between bank IPO and profitability (Boubakri et al., 2005; Haber, 2005). On the other hand, several studies that focus on a developing country find evidence that banks' profitability and efficiency increase after IPO (Di Patti & Hardy, 2005, Beck et al., 2005, Houge & Loughran, 1999, Lin & Zhang, 2009).

Since regional banks concentrate their services to a particular area, regional banks tend to have a higher competitive advantage and market share than other financial institutions (Dick, 2007, Trinugroho et al., 2018). Therefore, regional banks' service networks also a significant factor in increasing regional banks' profitability. Although firms tend to use their capital from IPO to invest in fixed assets, including new service offices, study about the association between regional banks networks and IPO is still relatively limited. However, this is important because regional banks' networks play a crucial role in their profit and intermediation capability (e.g., Harimaya & Kondo, 2016; Kondo, 2018). Regarding loan growth and risk, several studies find that public banks' loan growth and risk are better than private banks (e.g., Houge & Loughran, 1999, Beck et al., 2005, Lin & Zhang, 2009).

In addition, our research empirically investigates regional banks' solvency, profitability, efficiency, interest income, intermediary capability, and loan risk after IPO by using a difference-in-differences (DiD) approach. We consider regional banks that already go public as the treatment group and private regional banks as the control group.

Using more comprehensive monthly data for Indonesian banks from 2009 to 2019, we find robust evidence that the regional banks' profitability, efficiency, and interest income increase after IPO. Therefore, our findings consistent with Beck et al. (2005) and Di Patti and Hardy (2005). The results also show that regional banks' profitability still consistent three years after the IPO. Unlike other public banks in Indonesia, which show decreased solvability after IPO, we find that the solvability of the regional bank is increasing after the IPO. However, this is only consistent in the short-term. Furthermore, regional banks' intermediary capability, reflected in Loan to Deposito Ratio (LDR) and loan growth, decreases after IPO. Finally, consistent with Boubakri et al. (2005) and therefore different from Beck et al. (2005) and Lin and Zhang (2009), our results show an insignificant association between IPO and regional banks' loan risk.

The rest of the paper is organized as follows. In Section 2, we provide the related literature, followed by the institutional setting in Section 3. In Section 4 and 5, we present and discuss the research method and empirical results, respectively. Finally, section 6 provides concluding remarks and policy implications.

2. Related Literature

2.1. Bank Initial Public Offering

Banks' Initial Public Offering (IPO) cannot be separated from bank privatization since IPO is the foremost option of state-owned enterprise privatization. In the broader economic view, there are two main theories of government intervention in financial institutions. The development theory argues that government participation in the financial sector is essential for economic growth (e.g., Bai & Xu, 2005). On the other side, the political theory views that firms' government control is part of the political contribution to their supporters (e.g., La Porta et al., 2002). At the micro-level, Houge and Loughran (1999) states that there are four reasons for banks to go public, they are meeting mandatory capital requirements, selling overpriced shares, taking benefit of favorable market conditions, and attracting management with a stock option plan. They can show evidence that banks decide to go public to take advantage of the market's favorable condition. However, there is mixed evidence of IPO impact on banks' performance.

Despite the fact that Initial Public Offering (IPO) is one of the prominent options for firms to increase their capital, to our best knowledge, there is no empirical evidence that IPO increases banks' solvency. On the contrary, Boubakri et al. (2005), who study bank privatization in developing countries, find that after IPO, banks' capital adequacy tends to decrease. Besides, they also cannot find a significant association between IPO and banks' profitability. The finding

is consistent with Haber (2005), who cannot find evidence that privatization increases Mexican banks' profitability. Contrary, Lin and Zhang (2009) conduct a study by using Chinese bank data and find that public banks have high profitability. However, they argue their results because Governments tend to select banks with better performance to go public.

Furthermore, Di Patti and Hardy (2005) find that Pakistani banks' profitability increase just after the IPO. Inline, Beck et al. (2005) also find that banks' profitability increase after the privatization of Nigerian state-owned banks. Different from Lin and Zhang (2009), they argue that these findings because the government tends to privatize banks with poor performance.

Regarding efficiency, using the Cost to Income ratio as a proxy of efficiency, Lin and Zhang (2009) find that Chinese banks' efficiency improves after IPO. However, in line with Yin et al. (2015), Lin and Zhang (2009) argue that their findings are because the Chinese government tends to select higher-performing banks for public listing activities. Boubakri et al. (2005) find that banks' Net Interest Margin (NIM) increases after IPO, which implies that banks' efficiency decreases after IPO. However, using Net Interest Income (NII) to capture efficiency, Houge and Loughran (1999) find that US banks' efficiency increase after IPO. In Indonesia, Trinugroho et al. (2014) find that NIM is negatively associated with banks' efficiency. They also find that government-owned banks have higher NIM than other banks.

Concerning loan growth and risk, Houge and Loughran (1999) found that public banks' loan growth is higher than private banks. They cannot find significant evidence that banks increase their risk-taking activity after they become public. Inline, Boubakri et al. (2005) find insignificant evidence of the association between IPO and loan risk. On the other hand, Beck et al. (2005) find that banks' loan risk decreases after privatizing state-owned banks. Lin and Zhang (2009) find that public banks in China have lower loan risk. In Mexico, Haber (2005) mentions that a decrease in loan risk after privatization is because banks tend to become risk-averse and put their assets in government securities.

In addition to those studies, we focus on elaborating the impact of IPO on regional banks, a specific type of government bank whose operations centered on a particular area/region.

2.2. Regional Banks: Performance and Risk

Regional banks have a different character in each country. Nevertheless, regional banks are commonly identified as banks with regional ties, such as a service network that focuses only on one particular area/region. Since regional banks focus their operation in certain regions, they can customize their services to their specific customer, thus increase their competitive advantage (Dick, 2007). Kondo (2018) finds that Japanese regional banks with more branches positively correlated with higher loan growth. However, regional banks with a higher number of branches have lower profitability (Kondo, 2018) due to a particular network expansion level to achieve optimum efficiency (Harimaya & Kondo, 2016).

Regarding profitability, Liu and Wilson (2010) find that regional banks' income diversification strategy increases profitability. They also find that GDP growth and stock market development

significantly associated with regional banks' profitability. On the other hand, Meslier et al. (2020) cannot find a significant association between regional banks' profitability and short-term loan to Small Medium Enterprises. These two findings imply that regional banks' profitability has become more dependent on non-interest revenue. Since lower NIM is also associated with higher efficiency (e.g., Boubakri et al., 2005; Houge & Loughran, 1999), Liu and Wilson (2010) show regional banks with higher efficiency have more market share. Trinugroho et al. (2018) find that Indonesian regional banks have higher market power than other commercial banks.

In Indonesia, regional banks are owned by province and district/city governments; therefore, it is seen as banks with more capital access. Jiang et al. (2013) show that government-owned banks in China can adjust their capital faster than private-owned banks. They also find that local-government undercapitalized banks are more able to increase their capital than private-owned banks. This is crucial since capital requirement plays a crucial role in Chinese regional banks' loan growth (Jianzhong, 2017). Regarding public regional banks, Baba and Inada (2009) find that public regional banks are negatively associated with lower subordinated debts. They argue this can indicate the importance of regional banks increasing market-discipline to their stockholder. Yeh (2017) found that higher quality of accounting information can protect regional banks from default risk during the adverse period.

3. Overview of Capital Market and Regional Banks in Indonesia

As the country with the fourth-largest population globally, Indonesian Gross Domestic Product (GDP) is predicted to be ranked 4th in the world by 2045 (PWC, 2017). However, Indonesia's financial market deepening is still considered shallow. Indonesia's capital market capitalization at 46% of GDP places Indonesia in the 46th rank (WEF, 2019). The banking industry dominates the Indonesian Stock Exchange (IDX). However, there are only three regional banks from the 43 banks in the IDX, which is relatively limited compared to 27 regional banks in Indonesia. The government and the Indonesian Financial Services Authority made various efforts to increase domestic market capitalization, including reducing the minimum threshold of shares traded on the capital market and simplifying corporate prospectus in the Initial Public Offering process.

Indonesia's banking law divides banks into two main categories rural/community and commercial banks. A rural bank is a relatively small bank that only receives a deposit and provides loans, with a limited network and cannot participate in clearing transactions managed by the central bank. Meanwhile, a commercial bank is a bank with a larger scale of assets and operations that can provide the most modern bank functions. Regional development bank or regional bank is one type of Indonesia commercial bank which is owned by provincial and district/city governments. The regional bank's characteristic is unique because they have networks in areas that are generally inaccessible to other commercial banks. Therefore,

regional banks play an essential role in increasing financial inclusion and literacy in remote areas, especially in Indonesia, as one of the world's largest archipelago countries.

However, regional banks in Indonesia are considered less resilient, with lower progress in terms of services development than other types of banks. Therefore, the banking authority has issued Regional Champion Program (RCP) for regional banks since 2010. RCP is initiated with three main pillars: (i) resilience institution; (ii) intermediary capability; and (iii) capable human resources to increase financial inclusion. These pillars are designed to improve regional banks' profitability, which is supported by the lower loan interest rate, the loan portion of the productive sector and Small Medium Enterprise (SME), and public access to various financial products. There are only three regional banks with a capital of more than five trillion Rupiah or classified as BUKU 3 . In 2015, the banking authority set a new roadmap transformation road map of RCP.

Since IPO can improve firms' capital, and also banks' performance, including profitability, efficiency (Di Patti & Hardy, 2005, Beck et al., 2005, Houge & Loughran, Lin & Zhang, 2009), capital intermediary (Harimaya & Kondo, 2016; Kondo, 2018), and then market-discipline (Baba & Inada, 2009, Yeh, 2017), our research focuses on regional banks' performance after IPO to examine whether the IPO is the right decision for regional banks in Indonesia to achieve the RCP goals.

4. Research Method

4.1. Data

To examine regional banks' post-IPO performance on solvability, profitability, efficiency, interest income, intermediary capability, and loan risk. We use monthly bank data from 2009 to 2019 provided by Indonesia Financial Services Authority/Otoritas Jasa Keuangan (OJK). The bank data can be classified as regional and non-regional banks and also public and private banks. We can also identify the period before and after the bank go public. The final sample comprises 124 banks that consist of 27 regional banks (97 non-regional banks and 43 public banks (81 private banks). Seventeen banks go public in the sample period, including three regional banks.

We use the Capital Adequacy Ratio (CAR) provided by OJK as a proxy of banks' solvability. Following Trinugroho et al. (2020), Return of Assets (ROA), Operational Expenses to Operational Revenues Ratio (BOPO), and Net Interest Margin as a proxy of profitability, efficiency, and interest revenue. Furthermore, we also use Loan to Deposit Ratio (LDR), Loan Growth, and Deposit Growth to measure banks' intermediary capability. Lastly, we also use the Non-Performing Loan (NPL) ratio as a proxy of loan risk (Trinugorho et al., 2020).

4.2. Empirical Strategy

Our data specifications allow us to use the Difference-in-Differences (DiD) approach to examine regional banks' solvability, profitability, intermediary capability, and credit risk after

IPO. This approach is commonly used in a natural experiment setting to measure the impact of a particular intervention on a treatment group, and compare the intervention's impact in the treatment group with the non-treatment or control groups. The treatment group in our research consists of public regional banks. We use two layers of control groups. Our first control banks are private regional banks. Next, we compare our treatment group with non-regional banks, including all banks that go public in the sample period and all public banks. In the first model, we only estimate the model in the regional banks sample (3.417 observations). Therefore the DiD approach in our first model only use private regional banks as control banks as follows:

Model 1

$$Y_{b,t} = \alpha + \beta 1\ Post_t + \beta 2\ BPD_b + \beta 3\ Post_t * BPD_b + \beta 4\ BankSpesific_{b,t} + \beta 5\ Macro_t + \varepsilon_{b,t}$$

$Y_{b,t}$ is the dependent variables which are Capital Adequacy Ratio (CAR), Return on Assets (ROA), Operational Expenses to Operational Revenues Ratio (BOPO), Net Interest Income (NIM), Loan to Deposit Ratio (LDR), Loan Growth, Deposit Growth, and Non-Performing Loan (NPL) of a bank (b) at the time (t), consistently with Trinugroho et al. (2020). Post t is a dummy variable equal to one in time when the bank goes public. BPD b is a dummy variable equal to one if the regional bank is also a public bank. *BankSpecific b, t* is a control variable of bank fundamentals captured by the natural logarithm of total bank assets (lnTA). The interaction variable of BPD and Post (BPD b* IPO t) is the variable of interest. This variable represents the impact of the IPO on regional banks' solvability, profitability, efficiency, interest income, intermediary capability, and loan risk, as captured by the dependent variables. We also use *Macro t* to capture macro-economic variables that can impact the dependent variable. Following Pontines and Siregar (2020), we use monthly data of Inflation (CPI) from Indonesia Statistics (Badan Pusat Statistik/BPS) and the Industrial Production Index from CEIC Data as proxies for the macro-economic variables. Table 1 reports the descriptive statistics of the variables.

Next, we also use the non-regional banks as our control banks. This setting allows us to examine post-IPO performance on all the banks in Indonesia and compare it with regional banks' performance after IPO. In our second model, we employ the model to the sample that consists of all the banks (14.303 observations). The DiD approach as follows:

Model 2

$$Y_{b,t} = \alpha + \beta 1\ IPO_b + \beta 2\ Post_t + \beta 3\ BPD_b + \beta 4\ IPO_b * Post_t + \beta 5\ IPO_b * Post_t * BPD_b + 6\ BankSpesific_{b,t} + \beta 7\ Macro_t + \varepsilon_{b,t}$$

Regarding our first model, IPO b is a dummy variable equal to one if it is a public bank. The first interaction variable in the second model (*IPO b * Post t*) represents the impact of IPO on all public banks. The second interaction variable with triple interaction (*IPO b * Post t * BPD b)* is the variable of interest that captures the impact of IPO on public regional banks. The control group are private regional banks and also private and public non-regional banks. In

addition, we also test the impact of IPO on regional banks with the lead of dependent variables to examine post-IPO performance for several future periods.

5. Results

5.1. Descriptive Statistics of Variables and Correlation Matrix

Table 1 shows the descriptive statistics of the regional banks sample and all banks sample for all variables. The average regional banks' CAR is 20.01%, relatively lower than the average of all banks. However, regional banks have higher profitability, efficiency, and interest income than the industry, in line with Trinugroho et al. (2014). Nevertheless, the average intermediation performance of regional banks, reflected by LDR, is 75,85%, lower than all banks' average. Regional banks also have lower loan growth and deposit growth. Finally, the average NPL ratio of regional banks is 2,94%, still below the regulatory threshold.

We also provide the statistics of variables for treated and control banks in Table 2. On average, CAR and NIM of public regional banks in the treated group are lower than those in the control group, a private regional bank. However, the treated group has higher ROA and lower BOPO. Regarding the intermediation capability, the treated group has lower LDR, loan growth, and deposit growth than the control group. Nevertheless, the treated group has a lower NPL ratio than the control group.

Table 3 provides the correlation matrix of variables. The dummy variable for treated banks (BPD) is negatively correlated with CAR, ROA, NIM, LDR, loan growth, deposit growth, and NPL. On the other side, BPD is positively correlated with BOPO and lnTA.

Table 1. Descriptive Statistics of Variables – Regional Banks and All Banks

		Regional Banks					All Banks				
Variable	**Definition**	**Obs**	**mean**	**sd**	**min**	**max**	**Obs**	**mean**	**sd**	**min**	**max**
CAR	Capital Adequacy Ratio	3417	20.006	5.966	9.88	110.781	14275	24.023	13.879	9.88	119.446
ROA	Return on Assets	3417	4.139	6.998	-56.909	135.09	14275	2.4980	5.0351	-70.46	135.09
BOPO	Expense to Revenue Ratio	3417	73.82	14.514	29.666	235.092	14275	83.895	19.071	0	432.726
NIM	Net Interest Margin	3417	7.204	2.078	-.534	27.066	14275	4.749	2.8045	-67.92	27.066
LDR	Loan to Deposit Ratio	3417	75.85	12.802	42.57	128.434	14275	90.618	32.725	42.462	313.047
loangrowth	Loan Growth (yoy)	3417	9.433	30.907	-94.365	341.508	14275	14.059	39.681	-96.561	382.557
depositgrowth	Deposito Growth (yoy)	3417	8.958	30.625	-93.797	224.631	14275	12.225	35.854	-93.968	226.556
NPL	Non-Performing Loan Ratio	3417	2.943	3.1431	.089	45.46	14275	2.8058	2.8963	0	46.553
lnTA	Natural Logarithm	3417	16.15	.99504	11.351	18.559	14275	16.177	1.6846	9.641	20.927
IPI	Production Index	3417	4.305	3.5418	-7.120	14.260	14275	4.3261	3.5488	-7.121	14.260
CPI	Costumer Price Index	3417	4.674	1.6987	2.414	8.359	14275	4.7022	1.6950	2.414	8.3591

This table shows the summary statistics of the key variables.
We only use regional bank data in model 1. In addition, we also use all banks' data in model 2.

Table 2. Descriptive Statistics of Variables – Treated Regional Banks and Control Regional Banks (Model 1)

		Treated Regional Banks					Control Regional Banks				
Variable	Definition	Obs	mean	sd	min	max	Obs	mean	sd	min	max
CAR	Capital Adequacy Ratio	264	19.631	3.362	10.409	36.951	3153	20.037	6.134	9.88	110.782
ROA	Return on Assets	264	4.487	7.849	.851	89.949	3153	4.110	6.923	-56.909	135.09
BOPO	Expense to Revenue Ratio	264	72.979	9.509	49.18	92.181	3153	73.901	14.856	29.666	235.092
NIM	Net Interest Margin	264	6.828	.9838	3.66	14.663	3153	7.2361	2.142	-.534	27.066
LDR	Loan to Deposit Ratio	264	73.404	9.249	46.25	96.07	3153	76.056	13.037	42.57	128.434
loangrowth	Loan Growth (yoy)	264	7.465	30.732	-83.377	168.982	3153	9.598	30.920	-94.366	341.508
depositgrowth	Deposito Growth (yoy)	264	6.771	28.798	-72.529	155.623	3153	9.1420	30.770	-93.798	224.631
NPL	Non-Performing Loan Ratio	264	2.646	1.296	.648	4.94	3153	2.968	3.249	.0889	45.46
lnTA	Natural Logarithm	264	17.635	.672	14.274	18.559	3153	16.030	.914	11.352	18.092
IPI	Production Index	264	4.256	3.552	-7.121	14.260	3153	4.309	3.541	-7.121	14.260
CPI	Costumer Price Index	264	4.681	1.700	2.414	8.359	3153	4.674	1.699	2.414	8.359

This table shows the summary statistics of the key variables used in the DID analysis model 1.

Table 3. Correlation Matrix

	BPD	POST	CAR	ROA	BOPO	NOM	LDR	Loan gr	Deposit gr	NPL	lnTA	IPI	CPI
BPD	1												
POST	0.882	1											
CAR	-0.0600	-0.0520	1										
ROA	-0.0100	-0.0682	0.0521	1									
BOPO	0.0695	0.118	-0.188	-0.331	1								
NIM	-0.120	-0.150	0.0121	0.391	-0.366	1							
LDR	-0.0373	-0.00113	-0.0934	0.0133	0.0964	0.149	1						
Loan gr	-0.0292	0.0170	0.0509	0.120	-0.0467	0.0711	0.0173	1					
Deposit gr	-0.0294	0.0255	0.0538	0.0700	-0.0279	0.0101	-0.190	0.818	1				
NPL	-0.00448	0.0345	0.0838	-0.148	0.485	-0.0555	0.00186	-0.109	-0.0852	1			
lnTA	0.407	0.412	-0.146	-0.385	0.173	-0.417	0.124	0.0674	0.0604	0.0398	1		
IPI	-0.00255	0.0168	0.0201	0.0516	0.00176	0.0111	-0.0172	0.226	0.185	0.00803	0.0160	1	
CPI	-0.0224	-0.0252	-0.129	-0.0183	-0.112	0.167	-0.0758	0.0850	0.0897	-0.0243	-0.111	-0.0681	1

BPD is a treated group, a dummy variable, one for a public regional bank, 0 for a private regional bank. The post is the treatment event, a dummy for one after IPO, 0 otherwise. CAR is Capital Adequacy Ratio, ROA is return on asset, BOPO is operating expenses and revenues ratio, NIM is Net Interest Margin, LDR is Loan to Deposit Ratio, Loan gr is loan growth (year on year), Deposit gr is deposit growth (year on year), NPL is non-performing loan ratio. lnTA is natural logarithm of total asset. IPI is industrial production index. CPI is consumer price index

5.2 Empirical Results

We analyze the post-IPO of Indonesia regional banks' performance by employing the DiD approach. Table 4. presents the result of our first model. The variable of interest is the interaction between the dummy variable of treated banks and the dummy variable of post IPO decision (BPD*Post). The results show that the IPO has a positive and significant impact on ROA. However, it has a negative and significant impact on BOPO and LDR.

In Table 5, we exclude one of the regional banks from the treated group, which is Bank Banten Tbk. The exclusion because Bank Banten is a public bank before it has classified as a regional bank. We find a positive and significant impact of IPO on CAR, ROA, and NIM. On the other side, IPO has a negative and significant impact on BOPO and LDR. The results indicate that regional banks have higher solvency after the IPO, inconsistent with Boubakri et al. (2005). Regional banks' profitability also increases after becoming public banks, reflected in higher ROA, NIM, and lower BOPO, in line with Lin and Zhang (2009), Di Patti and Hardy (2005), and Beck et al. (2005). However, the results show that IPO decreases regional banks' intermediary capability, as reflected by the LDR. The empirical evidence shows no significant impact of IPO on regional banks' loan growth, deposit growth, and loan risk. This can be caused by regional banks' intermediation performance, which is more influenced by their particular market condition. The findings also imply that regional banks' higher profitability after IPO not because of the intermediary capability increase but from the improvement of regional banks' efficiency or interest income, or both.

Next, we compare our treated group with 17 banks that have become public in the sample period (2009-2019). In Table 6, the primary variable of interest is the interaction variable of IPO*POST*BPD. This triple interaction variable shows regional banks' after IPO performance, compared to all the banks that have become public in the sample period. In addition, we also provide the interaction variable of IPO*POST to show the post-IPO performance of all banks that have become public in the sample period. By providing the second interaction variable, we can compare regional banks after IPO performance with other banks. The results show that IPO has a positive and significant association with regional banks' CAR, ROA, and NIM.

Meanwhile, IPO has a negative and significant impact on regional banks' BOPO, LDR, loan growth, and deposit growth. The regional banks' results are opposite to the impact of all banks' IPO that has become public in the sample period. Different from regional banks, we argue that non-regional banks tend to increase their intermediary capability after IPO to meet their new shareholders' expectations. Inconsistent with Beck et al. (2005) and Lin and Zhang (2009), our results show that non-regional banks' NPL increases after IPO. However, there is no significant evidence that regional banks' NPL increases after IPO; this particular finding for regional banks is in line with Boubakri et al. (2005). The findings also implied that regional banks do not increase their risk-taking behavior after the IPO.

Furthermore, we also compare our treated group with all the public banks or include 26 banks that have become public before the sample period. The results in Table 7 in line with the findings in Table 6. Regional banks' solvency, profitability, efficiency, and interest income increase after IPO, as reflected by positive and significant CAR, ROA, NIM, and negative and significant BOPO. However, IPO has a negative and significant association with regional banks' intermediary capability, LDR, and loan growth.

To see the impact of IPO more detailed in several periods after the regional banks go public, we also show regional banks' solvability, profitability, efficiency, interest income, intermediary capability, and credit risk until the third year after the IPO. As presented in Table 8-15, the increase in regional banks' solvency only consistent in the short period after the IPO. On the other hand, regional banks' profitability increased persistently until three years after regional banks went public. Furthermore, after the IPO, regional banks' intermediary capability decrease until three years after the IPO.

5.3. Robustness Check

To confirm our results are consistent, we also execute a robustness check using an incremental regression approach by including all the empirical models' variables. As presented in Appendix 1. (Table A1-A8), the result of our variables of interest remains robust as the main findings.

6. Conclusion and Policy Implications

We empirically analyze regional banks' post- Initial Public Offering (IPO) performance insolvency, profitability, efficiency, interest income, intermediary capability, and loan risk. By using a treatment group and control group, and also prior and post IPO conditions, we use a natural experiment condition to investigate regional banks' after IPO performance. Our treatment banks are regional banks that perform IPO in the sample period (2009-2019). The treatment group already includes all public regional banks in Indonesia. Our findings show that public regional banks' solvency and profitability increase after the IPO. However, post-IPO public regional banks' intermediary capability tends to decrease. Furthermore, in line with Boubakri et al. (2005), we find insignificant evidence of the association between IPO and regional banks' loan risk.

In addition, compared to the other public banks, the public regional banks consistently have higher solvency and profitability after IPO. Nevertheless, public regional banks relatively have lower intermediary capability after IPO, as captured by the negative and significant LDR and loan growth. Elaborating regional banks' performance in several periods after the IPO, we find that regional banks' solvency only consistent in the short term period. However, regional banks' profitability reflected by higher ROA, NIM, and lower BOPO persist until the third year after the IPO. Therefore, our results support prior studies' findings showing that government-owned banks have higher profitability and more access to capital than other banks (e.g., Li & Zhang, 2009, Trinugoroho 2014, Trinugroho 2018).

Our findings implied several policy implications. First, since there is robust evidence that regional banks' solvency and profitability increase after IPO; therefore, it supports the Regional Champion Program (RCP) in increasing regional banks' institution resilience. Therefore, regulators can further encourage regional banks to become public because this is beneficial for the regional banks. Since regional banks show consistent and higher profitability compare to other banks, regional banks can also attract more capital and investors to the domestic capital market. Regulators can also provide more incentives for regional banks that intend to go public. For example, a reduction in registration fees, supervision levy, and also IPO preparation accompaniment. However, our results also imply that regulators need to focus more on the regional banks' intermediary capability after IPO.

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Table 4. Private Regional Banks as the Control Group (Include Bank Banten Tbk.[1] in the Treatment Group)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	CAR	**ROA**	**BOPO**	**NIM**	**LDR**	**loangr**	**depositgr**	**NPL**	**CAR**	**ROA**	**BOPO**	**NIM**	**LDR**	**loangr**	**depositgr**	**NPL**
BPD	-0.653	7.974***	-9.625***	1.040***	-8.948***	-22.036**	-25.811***	-1.850***								
	(-1.23)	(4.49)	(-9.49)	(6.36)	(-7.11)	(-3.05)	(-4.21)	(-19.34)								
Post	0.946	-4.558**	12.607***	-0.802***	5.431***	18.799**	24.181***	2.051***								
	(1.50)	(-2.67)	(7.72)	(-3.56)	(3.90)	(2.59)	(3.89)	(13.06)								
BPD*Post									0.321	3.078***	3.389*	0.193	-3.139***	-2.303	-0.537	0.279
									(0.74)	(5.35)	(2.32)	(1.07)	(-4.21)	(-1.92)	(-0.40)	(1.39)
lnTA	-0.998***	-3.197***	2.166***	-0.879***	1.971***	2.918***	2.574***	0.116	-1.008***	-3.080***	2.026***	-0.864***	1.840***	2.596***	2.197**	0.089
	(-6.26)	(-8.57)	(5.60)	(-16.43)	(7.76)	(4.14)	(3.68)	(0.95)	(-6.36)	(-8.36)	(5.27)	(-16.24)	(7.28)	(3.65)	(3.11)	(0.74)
CPI	-0.515***	-0.254***	-0.806***	0.150***	-0.470***	2.009***	2.008***	-0.036	-0.515***	-0.249***	-0.812***	0.150***	-0.475***	1.995***	1.992***	-0.037
	(-9.47)	(-4.28)	(-4.97)	(8.35)	(-3.52)	(6.38)	(6.30)	(-1.19)	(-9.48)	(-4.19)	(-4.99)	(8.36)	(-3.54)	(6.25)	(6.17)	(-1.22)
IPI	0.020	0.115***	-0.046	0.017	-0.095	1.998***	1.623***	0.003	0.021	0.104***	-0.033	0.015	-0.082	2.028***	1.659***	0.005
	(0.75)	(5.64)	(-0.70)	(1.74)	(-1.49)	(12.29)	(10.26)	(0.17)	(0.78)	(5.17)	(-0.50)	(1.59)	(-1.29)	(12.43)	(10.44)	(0.34)
constant	38.439***	56.104***	42.770***	20.603***	47.010***	-55.094***	-48.442***	1.239	38.578***	54.408***	44.817***	20.382***	48.913***	-50.402***	-42.953***	1.632
	(14.62)	(8.93)	(6.54)	(22.83)	(11.11)	(-4.50)	(-4.00)	(0.62)	(14.75)	(8.74)	(6.89)	(22.71)	(11.60)	(-4.10)	(-3.52)	(0.82)
R-sqr	0.043	0.187	0.049	0.194	0.031	0.076	0.062	0.008	0.043	0.165	0.042	0.190	0.023	0.067	0.050	0.002
N	3418	3418	3418	3418	3418	3417	3418	3418	3418	3418	3418	3418	3418	3417	3418	3418

This table presents the first model estimation using difference-in-difference analysis for panel data of the treated banks (include Bank Banten Tbk.). We employ regression with robust standard to estimate the following equation:

$$Y_{b,t} = \alpha + \beta 1\ Post_t + \beta 2\ BPD_b + \beta 3\ Post_t * BPD_b + \beta 4\ BankSpesific_{b,t} + \beta 5\ Macro_t + \varepsilon_{b,t}$$

BPD is a treated group, a dummy variable, one for a public regional bank, 0 for a private regional bank. Post is the treatment event, a dummy for one after IPO, 0 otherwise. CAR is Capital Adequacy Ratio, ROA is return on asset, BOPO is operating expenses to revenues ratio, NIM is Net Interest Margin, LDR is Loan to Deposit Ratio, Loangr is loan growth (year on year), Depositgr is deposit growth (year on year), NPL is non-performing loan ratio. lnTA is natural logarithm of total asset. IPI is industrial production index. CPI is consumer price index. *, **, *** indicate significance at the 5%, 1%, and 0,1% level, respectively.

[1]Bank Banten is a public bank before it has been classified as a regional bank since 2017.

Table 5. Private Regional Banks as the Control Group (exclude Bank Banten Tbk.[1] from the Treatment Group)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	CAR	**ROA**	**BOPO**	**NIM**	**LDR**	**loangr**	**depositgr**	**NPL**	**CAR**	**ROA**	**BOPO**	**NIM**	**LDR**	**loangr**	**depositgr**	**NPL**
BPD	-0.436	8.165***	-10.520***	1.152***	-9.139***	-21.867**	-25.667***	-1.899***								
	(-0.82)	(4.63)	(-10.21)	(7.05)	(-7.27)	(-3.03)	(-4.19)	(-19.35)								
Post	2.521***	-3.024	6.330***	0.019	3.894**	19.855**	25.136***	1.713***								
	(4.34)	(-1.81)	(5.18)	(0.11)	(2.79)	(2.73)	(4.03)	(9.68)								
BPD*Post									2.105***	4.760***	-3.700***	1.118***	-4.819***	-0.992	0.664	-0.098
									(6.15)	(7.84)	(-4.23)	(11.92)	(-6.31)	(-0.75)	(0.44)	(-0.43)
lnTA	-1.193***	-3.392***	2.934***	-0.981***	2.167***	2.794***	2.460***	0.158	-1.199***	-3.268***	2.774***	-0.963***	2.028***	2.462***	2.070**	0.129
	(-7.46)	(-8.86)	(7.83)	(-19.03)	(8.32)	(3.84)	(3.41)	(1.25)	(-7.55)	(-8.64)	(7.45)	(-18.80)	(7.83)	(3.35)	(2.84)	(1.03)
CPI	-0.529***	-0.280***	-0.767***	0.142***	-0.443***	2.013***	2.007***	-0.034	-0.529***	-0.273***	-0.775***	0.143***	-0.451***	1.995***	1.985***	-0.036
	(-9.81)	(-4.57)	(-4.73)	(8.01)	(-3.32)	(6.36)	(6.27)	(-1.11)	(-9.82)	(-4.46)	(-4.76)	(8.04)	(-3.36)	(6.23)	(6.12)	(-1.16)
IPI	0.019	0.114***	-0.041	0.016	-0.093	1.997***	1.623***	0.003	0.020	0.102***	-0.027	0.014	-0.081	2.027***	1.658***	0.005
	(0.71)	(5.58)	(-0.63)	(1.69)	(-1.47)	(12.28)	(10.25)	(0.19)	(0.74)	(5.09)	(-0.41)	(1.52)	(-1.27)	(12.42)	(10.43)	(0.36)
constant	41.542***	59.303***	30.635***	22.226***	43.798***	-53.206***	-46.663***	0.586	41.639***	57.484***	32.978***	21.970***	45.834***	-48.328***	-40.945**	1.009
	(15.79)	(9.19)	(4.85)	(25.65)	(10.08)	(-4.21)	(-3.73)	(0.28)	(15.91)	(9.00)	(5.24)	(25.47)	(10.60)	(-3.81)	(-3.25)	(0.49)
R-sqr	0.049	0.199	0.051	0.208	0.035	0.075	0.062	0.008	0.049	0.176	0.042	0.202	0.026	0.067	0.050	0.002
N	3418	3418	3418	3418	3418	3417	3418	3418	3418	3418	3418	3418	3418	3417	3418	3418

This table presents the first model estimation using difference-in-difference analysis for panel data of the treated banks (exclude Bank Banten Tbk.). We employ regression with robust standard to estimate the following equation:

$$Y\,b,t = \alpha + \beta 1\ Post\ t + \beta 2\ BPD\ b + \beta 3\ Post\ t * BPD\ b + \beta 4\ \ BankSpesific\ b,t + \beta 5\ Macro\ t + \varepsilon\ b,t$$

Post is the treatment event, a dummy for one after IPO, 0 otherwise. BPD is a treated group, a dummy variable, one for a public regional bank, 0 for a private regional bank. CAR is Capital Adequacy Ratio, ROA is return on asset, BOPO is operating expenses to revenues ratio, NIM is Net Interest Margin, LDR is Loan to Deposit Ratio, Loangr is loan growth (year on year), Depositgr is deposit growth (year on year), NPL is non-performing loan ratio. lnTA is natural logarithm of total asset. IPI is industrial production index. CPI is consumer price index. *, **, *** indicate significance at the 5%, 1%, and 0,1% level, respectively.

[1]Bank Banten is a public bank before it has been classified as a regional bank since 2017.

Table 6. All banks as the control group. IPO is a dummy variable, one for a go public bank in the sample period (2009-2019)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	CAR	**ROA**	**BOPO**	**NIM**	**LDR**	**loangr**	**depositgr**	**NPL**	**CAR**	**ROA**	**BOPO**	**NIM**	**LDR**	**loangr**	**depositgr**	**NPL**
IPO	-3.051***	-0.609*	-0.105	0.220*	-3.700***	-0.223	-0.092	-0.199*								
	(-4.96)	(-2.41)	(-0.19)	(2.33)	(-3.77)	(-0.11)	(-0.05)	(-2.20)								
Post	1.299*	-0.763**	5.398***	-0.285*	-7.980***	5.195*	6.127**	0.399***								
	(2.00)	(-3.13)	(7.67)	(-2.29)	(-7.62)	(2.48)	(3.18)	(4.03)								
BPD	-5.432***	2.144***	-13.560***	3.271***	-19.894***	-5.760***	-3.909***	0.151*								
	(-30.44)	(17.25)	(-44.04)	(76.87)	(-48.16)	(-8.81)	(-6.27)	(2.50)								
IPO*Post									-0.981*	-2.133***	9.397***	-0.925***	-5.791***	6.568***	7.338***	0.382***
									(-2.44)	(-20.33)	(13.56)	(-10.88)	(-11.17)	(5.75)	(7.73)	(4.71)
IPO*Post*BPD									1.372**	2.872***	-15.074***	2.956***	-13.537***	-7.436***	-6.476***	-0.107
									(3.01)	(19.59)	(-15.90)	(29.78)	(-16.47)	(-5.61)	(-4.82)	(-0.90)
lnTA	-2.749***	-0.253***	-1.615***	-0.096***	1.347***	-0.002	0.346	0.008	-2.655***	-0.265***	-1.444***	-0.139***	1.673***	0.077	0.404*	0.014
	(-32.58)	(-5.53)	(-16.49)	(-6.51)	(8.25)	(-0.01)	(1.84)	(0.48)	(-30.80)	(-5.78)	(-15.20)	(-9.75)	(10.06)	(0.37)	(2.12)	(0.96)
CPI	-0.700***	-0.108***	-0.588***	-0.028*	-0.014	2.456***	2.212***	-0.171***	-0.703***	-0.124***	-0.519***	-0.042**	0.070	2.483***	2.232***	-0.171***
	(-11.40)	(-5.63)	(-6.34)	(-2.17)	(-0.09)	(12.01)	(11.67)	(-12.75)	(-11.30)	(-6.20)	(-5.34)	(-2.88)	(0.42)	(12.08)	(11.68)	(-12.70)
IPI	-0.092**	0.059***	-0.108**	0.001	0.094	1.760***	1.573***	-0.017**	-0.090**	0.058***	-0.100*	-0.001	0.105	1.764***	1.576***	-0.017**
	(-2.95)	(8.42)	(-2.64)	(0.23)	(1.30)	(17.76)	(17.88)	(-2.75)	(-2.81)	(7.96)	(-2.33)	(-0.08)	(1.40)	(17.76)	(17.90)	(-2.76)
constant	73.763***	6.470***	116.042***	5.650***	74.355***	-4.062	-10.132**	3.519***	70.721***	7.250***	109.610***	7.238***	63.414***	-6.849	-12.094***	3.423***
	(48.76)	(7.80)	(63.48)	(21.80)	(26.67)	(-1.06)	(-2.92)	(12.01)	(46.27)	(8.59)	(62.31)	(28.49)	(22.16)	(-1.77)	(-3.46)	(12.19)
R-sqr	0.134	0.049	0.122	0.250	0.080	0.039	0.037	0.012	0.106	0.019	0.038	0.018	0.013	0.035	0.035	0.012
N	14282	14282	14282	14282	14282	14258	14262	14282	14282	14282	14282	14282	14282	14258	14262	14282

This table presents the second model estimation using difference-in-difference analysis for panel data of the treated banks (exclude Bank Banten Tbk.). We employ regression with robust standard to estimate the following equation:

$$Y\,b,t = \alpha + \beta 1\ IPO\ b + \beta 2\ Post\ t + \beta 3\ BPD\ b + \beta 4\ IPO\ b * Post\ t + \beta 5\ IPO\ b * Post\ t * BPD\ b + \beta 6\ BankSpesific\ b,t + \beta 7\ Macro\ t + \varepsilon\ b,t$$

IPO is a dummy variable, one for a public bank (IPO 2009-2019), 0 for a private bank. Post is the treatment event, a dummy for one after IPO, 0 otherwise. BPD is a treated group, a dummy variable, one for a public regional bank, 0 for a private regional bank. CAR is Capital Adequacy Ratio, ROA is return on asset, BOPO is operating expenses to revenues ratio, NIM is Net Interest Margin, LDR is Loan to Deposit Ratio, Loangr is loan growth (year on year), Depositgr is deposit growth (year on year), NPL is non-performing loan ratio. lnTA is natural logarithm of total asset. IPI is industrial production index. CPI is consumer price index. *, **, *** indicate significance at the 5%, 1%, and 0,1% level, respectively.

Table 7. All banks as the control group. IPO is a dummy variable, one for all go public banks

	(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	CAR	**ROA**	**BOPO**	**NIM**	**LDR**	**loangr**		**depositgr**	**NPL**	**CAR**	**ROA**	**BOPO**	**NIM**	**LDR**	**loangr**	**depositgr**	**NPL**
IPO		-3.694***	-0.399	0.327	0.520***	-7.636***	-1.128	-1.237	-0.126								
		(-6.00)	(-1.59)	(0.60)	(5.38)	(-7.65)	(-0.54)	(-0.63)	(-1.41)								
Post		0.006	0.170	5.187***	0.549***	-15.651***	1.425	1.421	0.544***								
		(0.01)	(0.69)	(8.61)	(5.29)	(-14.26)	(0.67)	(0.71)	(5.65)								
BPD		-6.658***	2.117***	-11.829***	3.649***	-27.618***	-5.848***	-4.078***	0.289***								
		(-30.47)	(15.29)	(-35.40)	(80.77)	(-47.24)	(-8.17)	(-5.98)	(4.45)								
IPO*Post										-1.262***	-0.982***	9.895***	-0.241***	-12.863***	2.165**	1.384*	0.386***
										(-4.61)	(-15.04)	(27.60)	(-5.14)	(-20.93)	(2.88)	(2.08)	(7.78)
IPO*Post*BPD										1.092***	1.340***	-11.244***	2.194***	-12.354***	-2.272**	-0.164	0.058
										(4.81)	(15.49)	(-15.81)	(37.92)	(-19.59)	(-2.74)	(-0.16)	(0.63)
lnTA	-2.393***	-0.213***	-2.186***	-0.191***	3.607***	-0.097		0.245	-0.033*	-2.519***	-0.141**	-2.530***	-0.103***	2.994***	-0.223	0.168	-0.028
	(-24.34)	(-4.44)	(-20.86)	(-13.41)	(17.94)	(-0.44)		(1.21)	(-2.02)	(-25.09)	(-3.02)	(-24.02)	(-7.05)	(14.75)	(-1.00)	(0.82)	(-1.79)
CPI	-0.697***	-0.096***	-0.620***	-0.023	0.014	2.408***		2.153***	-0.172***	-0.698***	-0.105***	-0.577***	-0.033*	0.075	2.420***	2.157***	-0.173***
	(-11.47)	(-5.09)	(-6.70)	(-1.83)	(0.09)	(11.86)		(11.42)	(-12.83)	(-11.31)	(-5.43)	(-6.05)	(-2.25)	(0.46)	(11.91)	(11.37)	(-12.95)
IPI	-0.095**	0.058***	-0.103*	0.002	0.075	1.762***		1.575***	-0.017**	-0.091**	0.057***	-0.093*	-0.001	0.097	1.766***	1.577***	-0.017**
	(-3.05)	(8.35)	(-2.53)	(0.36)	(1.08)	(17.78)		(17.89)	(-2.70)	(-2.84)	(7.91)	(-2.22)	(-0.12)	(1.31)	(17.78)	(17.91)	(-2.72)
constant	69.353***	5.725***	123.630***	6.716***	46.277***	-1.911		-7.700*	4.019***	68.837***	5.315***	124.963***	6.625***	45.660***	-1.940	-7.879*	4.027***
	(42.38)	(6.79)	(65.74)	(26.93)	(14.95)	(-0.49)		(-2.18)	(13.88)	(41.08)	(6.32)	(66.86)	(26.16)	(14.13)	(-0.49)	(-2.20)	(14.30)
R-sqr	0.145	0.044	0.131	0.274	0.154	0.037		0.035	0.015	0.107	0.016	0.073	0.013	0.040	0.034	0.033	0.014
N	14282	14282	14282	14282	14282	14258		14262	14282	14282	14282	14282	14282	14282	14258	14262	14282

This table presents the second model estimation using difference-in-difference analysis for panel data of the treated banks (exclude Bank Banten Tbk.).
We employ regression with robust standard to estimate the following equation:

$$Y\,b,t = \alpha + \beta 1\ IPO\,b + \beta 2\ Post\,t + \beta 3\ BPD\,b + \beta 4\ IPO\,b * Post\,t + \beta 5\ IPO\,b * Post\,t * BPD\,b + \beta 6\ BankSpesific\,b,t + \beta 7\ Macro\,t + \varepsilon\,b,t$$

IPO is a dummy variable, one for a public bank, 0 for a private bank. Post is the treatment event, a dummy for one after IPO, 0 otherwise. BPD is a treated group, a dummy variable, one for a public regional bank, 0 for a private regional bank. CAR is Capital Adequacy Ratio, ROA is return on asset, BOPO is operating expenses to revenues ratio, NIM is Net Interest Margin, LDR is Loan to Deposit Ratio, Loangr is loan growth (year on year), Depositgr is deposit growth (year on year), NPL is non-performing loan ratio. lnTA is natural logarithm of total asset. IPI is industrial production index. CPI is consumer price index. *, **, *** indicate significance at the 5%, 1%, and 0,1% level, respectively.

Table 8. Lead Variable of CAR

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	CARt1	**CARt2**	**CARt3**	**CARt6**	**CARt9**	**CARt12**	**CARt24**	**CARt36**	**CARt1**	**CARt2**	**CARt3**	**CARt6**	**CARt9**	**CARt12**	**CARt24**	**CARt36**
IPO	-3.707***	-3.921***	-4.071***	-4.078***	-4.333***	-4.524***	-5.486***	-5.879***								
	(-6.06)	(-6.54)	(-6.94)	(-7.24)	(-8.10)	(-8.75)	(-12.35)	(-16.21)								
Post	0.129	0.432	0.648	0.740	1.174	1.494*	2.695***	2.968***								
	(0.20)	(0.68)	(1.03)	(1.20)	(1.96)	(2.53)	(5.04)	(6.25)								
BPD	-6.620***	-6.595***	-6.573***	-6.532***	-6.512***	-6.503***	-6.470***	-6.524***								
	(-30.41)	(-30.38)	(-30.33)	(-30.07)	(-30.11)	(-30.05)	(-29.54)	(-29.72)								
IPO*Post									-1.151***	-1.045***	-0.963***	-0.859**	-0.641*	-0.472	-0.166	-0.218
									(-4.18)	(-3.77)	(-3.43)	(-2.93)	(-2.12)	(-1.52)	(-0.51)	(-0.66)
IPO*Post*BPD									1.035***	0.962***	0.838***	0.396	-0.189	-0.632*	-1.369***	-1.842***
									(4.48)	(4.14)	(3.57)	(1.34)	(-0.63)	(-2.07)	(-4.08)	(-4.90)
lnTA	-2.413***	-2.419***	-2.406***	-2.189***	-2.082***	-1.967***	-1.640***	-1.351***	-2.539***	-2.541***	-2.524***	-2.305***	-2.190***	-2.071***	-1.717***	-1.420***
	(-24.34)	(-24.18)	(-23.98)	(-21.91)	(-20.82)	(-19.70)	(-16.60)	(-14.66)	(-25.11)	(-24.97)	(-24.80)	(-22.83)	(-21.78)	(-20.68)	(-17.36)	(-15.48)
CPI	-0.740***	-0.753***	-0.788***	-0.854***	-0.864***	-0.734***	-0.601***	-0.306***	-0.741***	-0.756***	-0.791***	-0.857***	-0.867***	-0.737***	-0.608***	-0.314***
	(-11.95)	(-12.08)	(-12.54)	(-13.30)	(-13.48)	(-11.21)	(-9.05)	(-4.88)	(-11.79)	(-11.90)	(-12.34)	(-13.05)	(-13.22)	(-11.02)	(-8.97)	(-4.92)
IPI	-0.106***	-0.148***	-0.141***	-0.108***	-0.141***	-0.097***	-0.043	0.046	-0.102**	-0.143***	-0.136***	-0.103***	-0.136***	-0.091**	-0.037	0.052
	(-3.42)	(-4.80)	(-4.65)	(-3.59)	(-4.75)	(-3.30)	(-1.41)	(1.51)	(-3.20)	(-4.54)	(-4.39)	(-3.36)	(-4.49)	(-3.05)	(-1.19)	(1.68)
constant	69.884***	70.211***	70.106***	66.715***	65.117***	62.424***	56.236***	49.869***	69.372***	69.621***	69.458***	66.046***	64.313***	61.532***	54.895***	48.349***
	(42.10)	(41.68)	(41.54)	(39.83)	(38.92)	(37.58)	(34.02)	(32.46)	(40.89)	(40.60)	(40.55)	(38.98)	(38.16)	(36.86)	(33.02)	(31.52)
R-sqr	0.146	0.146	0.144	0.128	0.120	0.110	0.087	0.073	0.108	0.108	0.106	0.091	0.083	0.072	0.048	0.032
N	14280	14279	14278	14275	14272	14269	14257	14245	14280	14279	14278	14275	14272	14269	14257	14245

This table presents the second model regression results to test lead variables of dependent variables; t1-t36 is the lead variable of dependent variable one to 36 months after IPO using difference-in-difference analysis for panel data of the treated banks (exclude Bank Banten Tbk.) and control group banks. We employ regression with robust standard to estimate the following equation:

$$Y\,b,t = \alpha + \beta 1\ IPO\,b + \beta 2\ Post\,t + \beta 3\ BPD\,b + \beta 4\ IPO\,b * Post\,t + \beta 5\ IPO\,b * Post\,t * BPD\,b + \beta 6\ BankSpesific\,b,t + \beta 7\ Macro\,t + \varepsilon\,b,t$$

IPO is a dummy variable, one for a public bank, 0 for a private bank. Post is the treatment event, a dummy for one after IPO, 0 otherwise. BPD is a treated group, a dummy variable, one for a public regional bank, 0 for a private regional bank. CAR is Capital Adequacy Ratio. lnTA is natural logarithm of total asset. IPI is industrial production index. CPI is consumer price index. *, **, *** indicate significance at the 5%, 1%, and 0,1% level, respectively.

Table 9. Lead Variable of ROA

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	ROAt	ROAt2	ROAt3	ROAt6	ROAt9	ROAt12	ROAt24	ROAt36	ROAt1	ROAt2	ROAt3	ROAt6	ROAt9	ROAt12	ROAt24	ROAt36
IPO	-0.003	0.121	0.164	0.181	0.117	0.011	-0.304***	-0.400***								
	(-0.01)	(0.54)	(0.74)	(0.82)	(0.52)	(0.05)	(-3.53)	(-4.70)								
Post	-0.508*	-0.680**	-0.762***	-0.848***	-0.777***	-0.606**	-0.386***	-0.195								
	(-2.25)	(-3.00)	(-3.41)	(-3.76)	(-3.45)	(-2.76)	(-3.66)	(-1.83)								
BPD	2.042***	2.029***	2.014***	1.968***	1.969***	2.018***	1.935***	1.957***								
	(15.02)	(15.06)	(14.98)	(14.87)	(14.81)	(15.37)	(15.76)	(15.75)								
IPO*Post									-1.269***	-1.318***	-1.352***	-1.415***	-1.397***	-1.328***	-1.366***	-1.263***
									(-16.38)	(-16.28)	(-16.59)	(-17.21)	(-16.79)	(-15.75)	(-14.71)	(-13.32)
IPO*Post*BPD									1.345***	1.368***	1.367***	1.383***	1.279***	1.173***	1.673***	1.592***
									(8.23)	(7.55)	(7.27)	(6.78)	(6.27)	(5.56)	(4.27)	(4.04)
lnTA	-0.020	0.037	0.077**	0.156***	0.203***	0.226***	0.322***	0.311***	0.042	0.096***	0.134***	0.212***	0.261***	0.287***	0.382***	0.374***
	(-0.62)	(1.27)	(2.70)	(6.19)	(8.34)	(9.45)	(14.05)	(13.06)	(1.42)	(3.53)	(5.06)	(9.23)	(11.56)	(12.82)	(16.39)	(15.41)
CPI	-0.172***	-0.245***	-0.273***	-0.303***	-0.050*	0.211***	-0.349***	-0.234***	-0.179***	-0.252***	-0.279***	-0.309***	-0.056*	0.204***	-0.358***	-0.244***
	(-6.61)	(-8.30)	(-9.52)	(-10.39)	(-2.28)	(5.66)	(-14.38)	(-11.97)	(-6.79)	(-8.42)	(-9.61)	(-10.46)	(-2.53)	(5.43)	(-14.41)	(-12.16)
IPI	0.058***	0.004	0.005	-0.128***	-0.136***	-0.144***	-0.034***	0.014	0.056***	0.002	0.003	-0.130***	-0.138***	-0.145***	-0.035***	0.012
	(6.45)	(0.55)	(0.69)	(-9.89)	(-13.38)	(-10.66)	(-4.09)	(1.29)	(6.19)	(0.31)	(0.45)	(-9.86)	(-13.26)	(-10.62)	(-4.21)	(1.13)
constant	3.054***	2.725***	2.218***	1.692***	-0.225	-1.812***	-1.156***	-1.763***	2.792***	2.517***	2.032***	1.506**	-0.438	-2.069***	-1.452***	-2.094***
	(5.48)	(5.12)	(4.27)	(3.52)	(-0.56)	(-4.72)	(-3.30)	(-4.67)	(5.15)	(4.86)	(4.04)	(3.26)	(-1.16)	(-5.74)	(-4.22)	(-5.61)
R-sqr	0.043	0.044	0.046	0.056	0.049	0.056	0.062	0.052	0.018	0.020	0.022	0.033	0.026	0.032	0.038	0.028
N	14280	14279	14278	14275	14272	14269	14257	14245	14280	14279	14278	14275	14272	14269	14257	14245

This table presents the second model regression results to test lead variables of dependent variables, t1-t36 is lead variable of dependent variable one to 36 months after IPO using difference-in-difference analysis for panel data of the treated banks (exclude Bank Banten Tbk.) and control group banks. We employ regression with robust standard to estimate the following equation:

$$Y\,b,\,t = \alpha + \beta 1\ IPO\ b + \beta 2\ Post\ t + \beta 3\ BPD\ b + \beta 4\ IPO\ b * Post\ t + \beta 5\ IPO\ b * Post\ t * BPD\ b + \beta 6\ BankSpesific\ b,\,t + \beta 7\ Macro\ t + \varepsilon\, b,t$$

IPO is a dummy variable, one for a public bank, 0 for a private bank. Post is the treatment event, a dummy for one after IPO, 0 otherwise. BPD is a treated group, a dummy variable, one for a public regional bank, 0 for a private regional bank. ROA is return on asset. lnTA is natural logarithm of total asset. IPI is industrial production index. CPI is consumer price index. *, **, *** indicate significance at the 5%, 1%, and 0,1% level, respectively.

Table 10. Lead Variable of BOPO

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	BOPOt1	**BOPOt2**	**BOPOt3**	**BOPOt6**	**BOPOt9**	**BOPOt12**	**BOPOt24**	**BOPOt36**	**BOPOt1**	**BOPOt2**	**BOPOt3**	**BOPOt6**	**BOPOt9**	**BOPOt12**	**BOPOt24**	**BOPOt36**
IPO	0.354	0.395	0.391	0.427	0.670	0.857	0.514	0.950								
	(0.64)	(0.70)	(0.69)	(0.75)	(1.16)	(1.46)	(0.92)	(1.68)								
Post	5.130***	5.000***	4.922***	4.579***	4.006***	3.485***	3.004***	2.005**								
	(8.40)	(8.11)	(7.95)	(7.36)	(6.33)	(5.44)	(4.79)	(3.13)								
BPD	-11.861***	-11.884***	-11.915***	-12.013***	-12.078***	-12.239***	-12.361***	-12.468***								
	(-35.75)	(-35.79)	(-35.91)	(-36.17)	(-36.20)	(-37.00)	(-37.15)	(-37.31)								
IPO*Post									9.860***	9.753***	9.660***	9.334***	8.961***	8.628***	7.796***	7.251***
									(27.39)	(27.07)	(26.83)	(25.75)	(24.57)	(23.61)	(20.69)	(18.88)
IPO*Post*BPD									-11.273***	-11.265***	-11.228***	-11.036***	-10.537***	-10.147***	-10.112***	-9.911***
									(-15.85)	(-15.87)	(-15.83)	(-15.54)	(-14.96)	(-14.37)	(-12.77)	(-12.21)
lnTA	-2.130***	-2.075***	-2.047***	-1.967***	-1.872***	-1.779***	-1.640***	-1.620***	-2.474***	-2.418***	-2.389***	-2.309***	-2.221***	-2.135***	-1.984***	-1.979***
	(-20.94)	(-20.89)	(-20.74)	(-21.27)	(-21.15)	(-20.24)	(-17.94)	(-17.20)	(-24.22)	(-24.19)	(-24.04)	(-24.70)	(-24.59)	(-23.61)	(-21.22)	(-20.55)
CPI	-0.528***	-0.471***	-0.409***	-0.231*	-0.160	-0.014	0.169	0.168	-0.485***	-0.428***	-0.365***	-0.186	-0.114	0.034	0.218*	0.221*
	(-5.69)	(-5.18)	(-4.51)	(-2.47)	(-1.76)	(-0.15)	(1.84)	(1.95)	(-5.06)	(-4.55)	(-3.90)	(-1.93)	(-1.21)	(0.35)	(2.29)	(2.48)
IPI	-0.087*	-0.094*	-0.068	0.041	0.068	0.060	0.151***	0.210***	-0.077	-0.085*	-0.058	0.051	0.078*	0.069	0.161***	0.220***
	(-2.15)	(-2.42)	(-1.74)	(1.07)	(1.85)	(1.56)	(3.88)	(5.04)	(-1.85)	(-2.09)	(-1.44)	(1.27)	(2.04)	(1.74)	(3.96)	(5.09)
constant	122.246***	121.156***	120.335***	117.860***	116.008***	113.999***	110.800***	110.406***	123.570***	122.466***	121.622***	119.122***	117.356***	115.428***	111.981***	111.790***
	(66.83)	(67.60)	(68.19)	(70.56)	(73.26)	(72.46)	(70.74)	(70.83)	(68.03)	(68.73)	(69.28)	(71.49)	(73.64)	(72.21)	(70.56)	(70.60)
R-sqr	0.129	0.127	0.126	0.123	0.120	0.118	0.112	0.111	0.071	0.069	0.067	0.062	0.058	0.054	0.047	0.044
N	14280	14279	14278	14275	14272	14269	14257	14245	14280	14279	14278	14275	14272	14269	14257	14245

This table presents the second model regression results to test lead variables of dependent variables; t1-t36 is the lead variable of dependent variable one to 36 months after IPO using difference-in-difference analysis for panel data of the treated banks (exclude Bank Banten Tbk.) and control group banks. We employ regression with robust standard to estimate the following equation:

$$Y\,b,t = \alpha + \beta 1\ IPO\,b + \beta 2\ Post\,t + \beta 3\ BPD\,b + \beta 4\ IPO\,b * Post\,t + \beta 5\ IPO\,b * Post\,t * BPD\,b + \beta 6\ BankSpesific\,b,t + \beta 7\ Macro\,t + \varepsilon\,b,t$$

IPO is a dummy variable, one for a public bank, 0 for a private bank. Post is the treatment event, a dummy for one after IPO, 0 otherwise. BPD is a treated group, a dummy variable, one for a public regional bank, 0 for a private regional bank. BOPO is the operating expenses to revenues ratio. lnTA is natural logarithm of total asset. IPI is industrial production index. CPI is consumer price index. *, **, *** indicate significance at the 5%, 1%, and 0,1% level, respectively.

Table 11. Lead Variable of NIM

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	NIMt1	**NIMt2**	**NIMt3**	**NIMt6**	**NIMt9**	**NIMt12**	**NIMt24**	**NIMt36**	**NIMt1**	**NIMt2**	**NIMt3**	**NIMt6**	**NIMt9**	**NIMt12**	**NIMt24**	**NIMt36**
IPO	0.535***	0.541***	0.551***	0.605***	0.633***	0.658***	0.604***	0.576***								
	(5.81)	(6.00)	(6.23)	(7.24)	(8.04)	(8.87)	(10.25)	(9.76)								
Post	0.534***	0.523***	0.497***	0.395***	0.340***	0.286***	0.210**	0.144*								
	(5.34)	(5.33)	(5.15)	(4.31)	(3.92)	(3.48)	(3.14)	(2.12)								
BPD	3.647***	3.643***	3.637***	3.618***	3.606***	3.597***	3.515***	3.443***								
	(80.21)	(79.84)	(79.48)	(78.75)	(78.26)	(77.86)	(75.83)	(74.42)								
IPO*Post									-0.238***	-0.239***	-0.250***	-0.289***	-0.307***	-0.328***	-0.417***	-0.493***
									(-5.01)	(-4.99)	(-5.20)	(-5.94)	(-6.25)	(-6.59)	(-8.14)	(-9.40)
IPO*Post*BPD									2.206***	2.211***	2.214***	2.223***	2.203***	2.193***	2.187***	2.037***
									(38.06)	(38.08)	(37.95)	(36.29)	(36.08)	(35.68)	(22.13)	(20.03)
lnTA	-0.196***	-0.194***	-0.189***	-0.165***	-0.157***	-0.145***	-0.095***	-0.089***	-0.109***	-0.107***	-0.103***	-0.081***	-0.074***	-0.064***	-0.016	-0.009
	(-14.06)	(-14.08)	(-13.76)	(-12.63)	(-11.85)	(-10.77)	(-6.84)	(-6.28)	(-7.57)	(-7.56)	(-7.25)	(-6.00)	(-5.41)	(-4.54)	(-1.09)	(-0.61)
CPI	-0.031*	-0.030*	-0.030*	-0.040***	-0.050***	-0.041**	-0.037**	-0.042***	-0.041**	-0.040**	-0.040**	-0.050***	-0.060***	-0.050***	-0.047***	-0.052***
	(-2.45)	(-2.42)	(-2.45)	(-3.33)	(-4.13)	(-3.27)	(-3.07)	(-3.65)	(-2.77)	(-2.74)	(-2.76)	(-3.48)	(-4.18)	(-3.44)	(-3.39)	(-3.95)
IPI	-0.001	-0.011*	-0.011*	-0.021***	-0.026***	-0.021***	-0.017**	-0.008	-0.004	-0.014*	-0.014*	-0.024***	-0.029***	-0.024***	-0.020**	-0.010
	(-0.13)	(-2.01)	(-2.20)	(-4.23)	(-5.15)	(-4.18)	(-3.07)	(-1.47)	(-0.55)	(-2.15)	(-2.31)	(-3.96)	(-4.77)	(-3.95)	(-3.05)	(-1.70)
constant	6.838***	6.851***	6.772***	6.485***	6.436***	6.190***	5.413***	5.341***	6.759***	6.779***	6.709***	6.454***	6.425***	6.195***	5.415***	5.308***
	(27.07)	(26.98)	(26.76)	(26.65)	(26.29)	(25.07)	(21.64)	(21.13)	(26.21)	(26.09)	(25.88)	(25.93)	(25.56)	(24.36)	(21.05)	(20.46)
R-sqr	0.274	0.274	0.273	0.270	0.269	0.267	0.255	0.246	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.013
N	14280	14279	14278	14275	14272	14269	14257	14245	14280	14279	14278	14275	14272	14269	14257	14245

This table presents the second model regression results to test lead variables of dependent variables; t1-t36 is the lead variable of dependent variable one to 36 months after IPO using difference-in-difference analysis for panel data of the treated banks (exclude Bank Banten Tbk.) and control group banks. We employ regression with robust standard to estimate the following equation:

$$Y\,b,t = \alpha + \beta 1\ IPO\,b + \beta 2\ Post\,t + \beta 3\ BPD\,b + \beta 4\ IPO\,b * Post\,t + \beta 5\ IPO\,b * Post\,t * BPD\,b + \beta 6\ BankSpesific\,b,t + \beta 7\ Macro\,t + \varepsilon\,b,t$$

IPO is a dummy variable, one for a public bank, 0 for a private bank. Post is the treatment event, a dummy for one after IPO, 0 otherwise. BPD is a treated group, a dummy variable, one for a public regional bank, 0 for a private regional bank. NIM is Net Interest Margin. lnTA is natural logarithm of total asset. IPI is industrial production index. CPI is consumer price index. *, **, *** indicate significance at the 5%, 1%, and 0,1% level, respectively.

Table 12. Lead Variable of LDR

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	LDRt1	**LDRt2**	**LDRt3**	**LDRt6**	**LDRt9**	**LDRt12**	**LDRt24**	**LDRt36**	**LDRt1**	**LDRt2**	**LDRt3**	**LDRt6**	**LDRt9**	**LDRt12**	**LDRt24**	**LDRt36**
IPO	-7.845***	-8.122***	-8.448***	-9.301***	-9.798***	-10.000***	-10.414***	-10.214***								
	(-7.97)	(-8.41)	(-8.98)	(-10.81)	(-12.39)	(-13.32)	(-14.68)	(-15.04)								
Post	-15.155***	-14.575***	-13.963***	-12.262***	-10.799***	-9.666***	-6.145***	-3.511***								
	(-13.91)	(-13.55)	(-13.25)	(-12.35)	(-11.46)	(-10.57)	(-6.90)	(-4.02)								
BPD	-27.525***	-27.425***	-27.325***	-27.048***	-26.717***	-26.385***	-25.229***	-24.252***								
	(-47.14)	(-47.00)	(-46.88)	(-46.54)	(-46.21)	(-45.91)	(-44.77)	(-43.93)								
IPO*Post									-12.594***	-12.303***	-12.031***	-11.215***	-10.328***	-9.485***	-6.666***	-4.080***
									(-20.32)	(-19.72)	(-19.18)	(-17.61)	(-15.98)	(-14.51)	(-9.96)	(-5.96)
IPO*Post*BPD									-12.389***	-12.495***	-12.633***	-13.139***	-13.805***	-14.262***	-16.576***	-18.776***
									(-19.70)	(-19.78)	(-19.72)	(-19.40)	(-19.46)	(-19.46)	(-19.50)	(-21.79)
lnTA	3.530***	3.422***	3.332***	3.059***	2.826***	2.590***	1.737***	1.098***	2.924***	2.825***	2.746***	2.502***	2.293***	2.072***	1.269***	0.657***
	(17.46)	(16.79)	(16.27)	(14.86)	(13.86)	(12.77)	(8.88)	(5.68)	(14.34)	(13.77)	(13.33)	(12.14)	(11.29)	(10.27)	(6.53)	(3.42)
CPI	0.126	0.249	0.364*	0.466**	0.393*	0.308*	0.497**	1.042***	0.185	0.306	0.419*	0.518**	0.443**	0.356*	0.544***	1.089***
	(0.81)	(1.61)	(2.36)	(2.99)	(2.53)	(2.00)	(3.26)	(6.95)	(1.13)	(1.87)	(2.56)	(3.13)	(2.69)	(2.21)	(3.42)	(6.99)
IPI	0.129	0.147*	0.165*	0.127	0.260***	0.305***	0.047	0.033	0.151*	0.170*	0.188*	0.150	0.283***	0.328***	0.071	0.056
	(1.83)	(2.07)	(2.28)	(1.76)	(3.56)	(4.14)	(0.63)	(0.45)	(2.01)	(2.24)	(2.44)	(1.95)	(3.63)	(4.17)	(0.90)	(0.72)
constant	46.671***	47.640***	48.378***	52.188***	55.367***	59.028***	71.804***	78.478***	45.966***	46.816***	47.404***	50.819***	53.707***	57.235***	69.605***	76.192***
	(14.96)	(15.14)	(15.19)	(15.97)	(17.08)	(18.30)	(23.26)	(25.17)	(14.15)	(14.31)	(14.36)	(15.11)	(16.17)	(17.35)	(22.05)	(24.01)
R-sqr	0.152	0.150	0.148	0.141	0.134	0.128	0.108	0.096	0.038	0.037	0.035	0.031	0.028	0.024	0.014	0.012
N	14280	14279	14278	14275	14272	14269	14257	14245	14280	14279	14278	14275	14272	14269	14257	14245

This table presents the second model regression results to test lead variables of dependent variables; t1-t36 is the lead variable of dependent variable one to 36 months after IPO using difference-in-difference analysis for panel data of the treated banks (exclude Bank Banten Tbk.) and control group banks. We employ regression with robust standard to estimate the following equation:

$$Y\,b,t = \alpha + \beta 1\ IPO\,b + \beta 2\ Post\,t + \beta 3\ BPD\,b + \beta 4\ IPO\,b * Post\,t + \beta 5\ IPO\,b * Post\,t * BPD\,b + \beta 6\ BankSpesific\,b,t + \beta 7\ Macro\,t + \varepsilon\,b,t$$

IPO is a dummy variable, one for a public bank, 0 for a private bank. Post is the treatment event, a dummy for one after IPO, 0 otherwise. BPD is a treated group, a dummy variable, one for a public regional bank, 0 for a private regional bank. LDR is Loan to Deposit Ratio. lnTA is natural logarithm of total asset. IPI is industrial production index. CPI is consumer price index. *, **, *** indicate significance at the 5%, 1%, and 0,1% level, respectively.

Table 13. Lead Variable of Loan Growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	loangrt1	**loangrt2**	**loangrt3**	**loangrt6**	**loangrt9**	**loangrt12**	**loangrt24**	**loangrt36**	**loangrt1**	**loangrt2**	**loangrt3**	**loangrt6**	**loangrt9**	**loangrt12**	**loangrt24**	**loangrt36**
IPO	-0.063	0.160	0.781	2.601	4.115*	4.660**	3.642*	1.796								
	(-0.03)	(0.08)	(0.39)	(1.37)	(2.28)	(2.71)	(2.39)	(1.27)								
Post	0.932	1.258	0.998	-0.583	-1.201	-1.022	0.926	4.250**								
	(0.44)	(0.60)	(0.48)	(-0.30)	(-0.63)	(-0.55)	(0.56)	(2.71)								
BPD	-5.625***	-5.434***	-5.306***	-5.195***	-4.909***	-4.628***	-4.900***	-4.906***								
	(-7.89)	(-7.63)	(-7.41)	(-7.24)	(-6.90)	(-6.67)	(-7.09)	(-7.04)								
IPO*Post									2.624***	3.126***	3.453***	3.472***	4.071***	4.547***	5.868***	7.699***
									(3.47)	(4.07)	(4.47)	(4.48)	(5.19)	(5.82)	(7.20)	(9.34)
IPO*Post*BPD									-1.963*	-1.825	-1.559	-1.124	-1.793	-2.407	-3.624	-4.940*
									(-2.03)	(-1.71)	(-1.32)	(-0.75)	(-1.02)	(-1.29)	(-1.80)	(-2.37)
lnTA	-0.771***	-1.382***	-1.932***	-2.782***	-3.825***	-4.493***	-4.503***	-4.345***	-0.921***	-1.536***	-2.104***	-2.988***	-4.041***	-4.697***	-4.709***	-4.526***
	(-3.38)	(-5.87)	(-8.03)	(-11.87)	(-16.11)	(-19.04)	(-19.61)	(-18.68)	(-3.97)	(-6.45)	(-8.65)	(-12.71)	(-17.18)	(-20.23)	(-20.67)	(-19.72)
CPI	2.139***	1.965***	1.653***	1.337***	1.463***	3.378***	0.664***	-0.368*	2.155***	1.982***	1.673***	1.366***	1.500***	3.417***	0.700***	-0.341*
	(10.34)	(9.58)	(8.08)	(6.51)	(7.01)	(17.13)	(3.61)	(-2.15)	(10.42)	(9.66)	(8.17)	(6.65)	(7.16)	(17.25)	(3.79)	(-1.99)
IPI	1.871***	1.781***	1.430***	0.933***	0.455***	-0.051	-0.144	-0.273***	1.875***	1.785***	1.433***	0.936***	0.458***	-0.049	-0.141	-0.270***
	(18.86)	(18.76)	(15.27)	(10.83)	(5.45)	(-0.64)	(-1.58)	(-3.47)	(18.85)	(18.74)	(15.26)	(10.84)	(5.46)	(-0.62)	(-1.55)	(-3.42)
constant	9.507*	20.364***	32.081***	49.295***	67.210***	70.879***	83.907***	86.374***	9.968*	20.971***	33.027***	50.925***	69.211***	72.851***	85.712***	87.654***
	(2.38)	(4.96)	(7.66)	(12.30)	(16.60)	(17.37)	(21.78)	(22.59)	(2.45)	(5.05)	(7.81)	(12.73)	(17.33)	(18.23)	(22.57)	(23.37)
R-sqr	0.040	0.038	0.031	0.028	0.037	0.065	0.040	0.036	0.036	0.035	0.028	0.025	0.033	0.061	0.037	0.033
N	14258	14257	14257	14257	14257	14257	14245	14233	14258	14257	14257	14257	14257	14257	14245	14233

This table presents the second model regression results to test lead variables of dependent variables; t1-t36 is the lead variable of dependent variable one to 36 months after IPO using difference-in-difference analysis for panel data of the treated banks (exclude Bank Banten Tbk.) and control group banks. We employ regression with robust standard to estimate the following equation:

$$Y\,b,t = \alpha + \beta 1\ IPO\,b + \beta 2\ Post\,t + \beta 3\ BPD\,b + \beta 4\ IPO\,b * Post\,t + \beta 5\ IPO\,b * Post\,t * BPD\,b + \beta 6\ BankSpesific\,b,t + \beta 7\ Macro\,t + \varepsilon\,b,t$$

IPO is a dummy variable, one for a public bank, 0 for a private bank. Post is the treatment event, a dummy for one after IPO, 0 otherwise. BPD is a treated group, a dummy variable, one for a public regional bank, 0 for a private regional bank. Loangr is loan growth (year on year). lnTA is natural logarithm of total asset. IPI is industrial production index. CPI is consumer price index. *, **, *** indicate significance at the 5%, 1%, and 0,1% level, respectively.

Table 14. Lead Variable of Deposit Growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	depgrt1	**depgrt2**	**depgrt3**	**depgrt6**	**depgrt9**	**depgrt12**	**depgrt24**	**depgrt36**	**depgrt1**	**depgrt2**	**depgrt3**	**depgrt6**	**depgrt9**	**depgrt12**	**depgrt24**	**depgrt36**
IPO	-0.218	0.385	1.345	4.621*	6.952***	8.094***	8.005***	5.748***								
	(-0.11)	(0.20)	(0.71)	(2.54)	(4.09)	(5.18)	(6.10)	(4.77)								
Post	0.752	0.538	-0.118	-3.066	-4.564**	-4.999**	-3.232*	0.712								
	(0.38)	(0.28)	(-0.06)	(-1.64)	(-2.60)	(-3.09)	(-2.31)	(0.55)								
BPD	-3.937***	-3.797***	-3.689***	-3.520***	-3.249***	-2.990***	-2.869***	-2.726***								
	(-5.78)	(-5.58)	(-5.40)	(-5.17)	(-4.82)	(-4.57)	(-4.39)	(-4.15)								
IPO*Post									1.689*	2.057**	2.332***	2.477***	3.150***	3.747***	5.523***	7.452***
									(2.53)	(3.04)	(3.42)	(3.61)	(4.52)	(5.42)	(7.40)	(9.83)
IPO*Post*BPD									0.038	0.178	0.435	0.877	0.860	1.008	1.021	-0.760
									(0.03)	(0.15)	(0.33)	(0.53)	(0.46)	(0.50)	(0.47)	(-0.35)
lnTA	-0.364	-0.906***	-1.396***	-2.135***	-3.113***	-3.699***	-3.849***	-3.862***	-0.468*	-1.028***	-1.546***	-2.364***	-3.395***	-4.006***	-4.168***	-4.131***
	(-1.77)	(-4.32)	(-6.50)	(-10.60)	(-15.26)	(-18.66)	(-19.02)	(-18.80)	(-2.24)	(-4.83)	(-7.09)	(-11.50)	(-16.29)	(-19.64)	(-20.05)	(-19.59)
CPI	1.875***	1.684***	1.416***	1.152***	1.596***	3.818***	1.077***	-0.724***	1.885***	1.696***	1.433***	1.187***	1.645***	3.872***	1.130***	-0.683***
	(9.79)	(8.87)	(7.47)	(6.14)	(8.40)	(21.42)	(6.32)	(-4.89)	(9.79)	(8.90)	(7.54)	(6.32)	(8.66)	(21.71)	(6.64)	(-4.61)
IPI	1.657***	1.579***	1.268***	0.905***	0.294***	-0.242***	0.123	-0.285***	1.659***	1.582***	1.270***	0.906***	0.294***	-0.243***	0.122	-0.285***
	(18.63)	(18.47)	(15.23)	(11.62)	(3.91)	(-3.36)	(1.45)	(-3.89)	(18.63)	(18.47)	(15.23)	(11.61)	(3.90)	(-3.36)	(1.44)	(-3.88)
constant	2.924	12.758***	23.147***	37.639***	53.584***	54.612***	67.685***	77.658***	3.253	13.426***	24.312***	40.252***	57.212***	58.766***	72.042***	81.143***
	(0.82)	(3.49)	(6.20)	(11.05)	(15.59)	(16.22)	(19.90)	(22.63)	(0.89)	(3.62)	(6.42)	(11.58)	(16.28)	(16.98)	(20.65)	(23.14)
R-sqr	0.036	0.034	0.026	0.025	0.034	0.075	0.041	0.036	0.034	0.032	0.024	0.022	0.031	0.071	0.038	0.034
N	14262	14261	14261	14261	14261	14261	14249	14237	14262	14261	14261	14261	14261	14261	14249	14237

This table presents the second model regression results to test lead variables of dependent variables; t1-t36 is the lead variable of dependent variable one to 36 months after IPO using difference-in-difference analysis for panel data of the treated banks (exclude Bank Banten Tbk.) and control group banks. We employ regression with robust standard to estimate the following equation:

$$Y\,b,t = \alpha + \beta 1\ IPO\ b + \beta 2\ Post\ t + \beta 3\ BPD\ b + \beta 4\ IPO\ b * Post\ t + \beta 5\ IPO\ b * Post\ t * BPD\ b + \beta 6\ BankSpesific\ b,t + \beta 7\ Macro\ t + \varepsilon\ b,t$$

IPO is a dummy variable, one for a public bank, 0 for a private bank. Post is the treatment event, a dummy for one after IPO, 0 otherwise. BPD is a treated group, a dummy variable, one for a public regional bank, 0 for a private regional bank. Depgr is deposit growth (year on year). lnTA is natural logarithm of total asset. IPI is industrial production index. CPI is consumer price index. *, **, *** indicate significance at the 5%, 1%, and 0,1% level, respectively.

Table 15. Lead Variable of NPL

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	NPLt1	**NPLt2**	**NPLt3**	**NPLt6**	**NPLt9**	**NPLt12**	**NPLt24**	**NPLt36**	**NPLt1**	**NPLt2**	**NPLt3**	**NPLt6**	**NPLt9**	**NPLt12**	**NPLt24**	**NPLt36**
IPO	-0.136	-0.146	-0.162	-0.222*	-0.263**	-0.293***	-0.451***	-0.243**								
	(-1.52)	(-1.64)	(-1.83)	(-2.56)	(-3.08)	(-3.55)	(-5.53)	(-2.79)								
Post	0.543***	0.541***	0.541***	0.571***	0.569***	0.559***	0.651***	0.305***								
	(5.66)	(5.64)	(5.67)	(6.12)	(6.28)	(6.38)	(7.56)	(3.34)								
BPD	0.286***	0.280***	0.270***	0.236***	0.192**	0.138*	0.075	0.004								
	(4.38)	(4.28)	(4.13)	(3.69)	(3.10)	(2.33)	(1.30)	(0.08)								
IPO*Post									0.375***	0.361***	0.345***	0.320***	0.284***	0.255***	0.176***	0.027
									(7.57)	(7.31)	(7.01)	(6.42)	(5.65)	(5.01)	(3.45)	(0.54)
IPO*Post*BPD									0.059	0.052	0.047	0.025	0.005	-0.015	-0.036	-0.047
									(0.64)	(0.56)	(0.50)	(0.26)	(0.05)	(-0.15)	(-0.33)	(-0.41)
lnTA	-0.029	-0.023	-0.016	0.003	0.025	0.045***	0.065***	0.067***	-0.024	-0.018	-0.010	0.011	0.033*	0.054***	0.080***	0.077***
	(-1.74)	(-1.40)	(-0.97)	(0.19)	(1.72)	(3.34)	(4.90)	(4.84)	(-1.48)	(-1.11)	(-0.62)	(0.69)	(2.36)	(4.01)	(6.09)	(5.68)
CPI	-0.163***	-0.153***	-0.142***	-0.108***	-0.062***	-0.018	0.076***	0.124***	-0.165***	-0.155***	-0.144***	-0.110***	-0.065***	-0.020	0.073***	0.123***
	(-12.03)	(-11.06)	(-10.18)	(-7.34)	(-4.15)	(-1.18)	(4.84)	(8.01)	(-12.14)	(-11.18)	(-10.29)	(-7.48)	(-4.30)	(-1.33)	(4.66)	(7.93)
IPI	-0.020**	-0.020**	-0.018**	-0.012*	-0.010	-0.004	0.021**	0.034***	-0.020**	-0.020**	-0.018**	-0.012*	-0.010	-0.004	0.021**	0.034***
	(-3.13)	(-3.24)	(-2.91)	(-1.96)	(-1.59)	(-0.65)	(3.19)	(5.14)	(-3.15)	(-3.26)	(-2.93)	(-1.97)	(-1.60)	(-0.65)	(3.20)	(5.15)
constant	3.928***	3.802***	3.635***	3.154***	2.608***	2.069***	1.250***	0.986***	3.928***	3.793***	3.615***	3.096***	2.524***	1.965***	1.029***	0.824***
	(13.38)	(12.76)	(12.17)	(10.88)	(10.09)	(8.64)	(5.60)	(4.17)	(13.75)	(13.07)	(12.43)	(10.97)	(10.01)	(8.41)	(4.75)	(3.60)
R-sqr	0.014	0.013	0.012	0.009	0.006	0.005	0.007	0.009	0.013	0.012	0.011	0.008	0.005	0.004	0.006	0.008
N	14280	14279	14278	14275	14272	14269	14257	14245	14280	14279	14278	14275	14272	14269	14257	14245

This table presents the second model regression results to test lead variables of dependent variables; t1-t36 is the lead variable of dependent variable one to 36 months after IPO using difference-in-difference analysis for panel data of the treated banks (exclude Bank Banten Tbk.) and control group banks. We employ regression with robust standard to estimate the following equation:

$$Y\,b,t = \alpha + \beta 1\ IPO\,b + \beta 2\ Post\,t + \beta 3\ BPD\,b + \beta 4\ IPO\,b * Post\,t + \beta 5\ IPO\,b * Post\,t * BPD\,b + \beta 6\ BankSpesific\,b,t + \beta 7\ Macro\,t + \varepsilon\,b,t$$

IPO is a dummy variable, one for a public bank, 0 for a private bank. Post is the treatment event, a dummy for one after IPO, 0 otherwise. BPD is a treated group, a dummy variable, one for a public regional bank, 0 for a private regional bank. NPL is non-performing loan ratio. lnTA is natural logarithm of total asset. IPI is industrial production index. CPI is consumer price index. *, **, *** indicate significance at the 5%, 1%, and 0,1% level, respectively.

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Appendix 2. Robustness Check Tables

Table A1. CAR

	(1)	(2)	(3)	(4)	(5)
	CAR	**CAR**	**CAR**	**CAR**	**CAR**
	b/t	b/t	b/t	b/t	b/t
IPO*POST	-4.450***	-4.397***	-1.211***	-1.259***	-1.262***
	(-20.12)	(-19.39)	(-4.39)	(-4.59)	(-4.61)
IPO*POST*BPD		-1.151***	0.952***	1.072***	1.092***
		(-4.13)	(4.16)	(4.75)	(4.81)
lnTA			-2.462***	-2.519***	-2.519***
			(-24.48)	(-25.08)	(-25.09)
CPI				-0.685***	-0.698***
				(-11.09)	(-11.31)
IPI					-0.091**
					(-2.84)
constant	25.438***	25.436***	64.224***	68.389***	68.837***
	(169.19)	(168.93)	(39.68)	(41.18)	(41.08)
R-sqr	0.022	0.022	0.099	0.106	0.107
N	14302	14285	14282	14282	14282

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A2. ROA

	(1)	(2)	(3)	(4)	(5)
	ROA	**ROA**	**ROA**	**ROA**	**ROA**
	b/t	b/t	b/t	b/t	b/t
IPO*POST	-1.091***	-1.145***	-0.976***	-0.984***	-0.982***
	(-15.11)	(-15.60)	(-14.94)	(-15.05)	(-15.04)
IPO*POST*BPD		1.221***	1.333***	1.353***	1.340***
		(15.72)	(16.24)	(15.82)	(15.49)
lnTA			-0.131**	-0.140**	-0.141**
			(-2.87)	(-3.02)	(-3.02)
CPI				-0.114***	-0.105***
				(-5.78)	(-5.43)
IPI					0.057***
					(7.91)
constant	2.844***	2.842***	4.905***	5.596***	5.315***
	(49.11)	(49.00)	(6.41)	(6.60)	(6.32)
R-sqr	0.010	0.011	0.013	0.014	0.016
N	14302	14285	14282	14282	14282

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A3. BOPO

	(1)	(2)	(3)	(4)	(5)
	BOPO	**BOPO**	**BOPO**	**BOPO**	**BOPO**
	b/t	b/t	b/t	b/t	b/t
IPO*POST	6.119***	6.723***	9.938***	9.898***	9.895***
	(18.41)	(19.83)	(27.52)	(27.61)	(27.60)
IPO*POST*BPD		-13.485***	-11.364***	-11.265***	-11.244***
		(-19.95)	(-16.03)	(-15.84)	(-15.81)
lnTA			-2.483***	-2.530***	-2.530***
			(-23.68)	(-24.01)	(-24.02)
CPI				-0.564***	-0.577***
				(-5.88)	(-6.05)
IPI					-0.093*
					(-2.22)
constant	81.955***	81.958***	121.074***	124.503***	124.963***
	(423.12)	(422.40)	(70.16)	(67.93)	(66.86)
R-sqr	0.022	0.029	0.071	0.073	0.073
N	14302	14285	14282	14282	14282

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A4. NIM

	(1)	(2)	(3)	(4)	(5)
	NIM	**NIM**	**NIM**	**NIM**	**NIM**
	b/t	b/t	b/t	b/t	b/t
IPO*POST	-0.271***	-0.367***	-0.238***	-0.241***	-0.241***
	(-6.01)	(-8.02)	(-5.08)	(-5.14)	(-5.14)
IPO*POST*BPD		2.103***	2.188***	2.194***	2.194***
		(36.59)	(38.25)	(37.99)	(37.92)
lnTA			-0.100***	-0.103***	-0.103***
			(-6.80)	(-7.05)	(-7.05)
CPI				-0.033*	-0.033*
				(-2.22)	(-2.25)
IPI					-0.001
					(-0.12)
constant	4.837***	4.838***	6.419***	6.621***	6.625***
	(157.71)	(157.48)	(26.23)	(26.68)	(26.16)
R-sqr	0.002	0.010	0.013	0.013	0.013
N	14302	14285	14282	14282	14282

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A5. LDR

	(1)	(2)	(3)	(4)	(5)
	LDR	**LDR**	**LDR**	**LDR**	**LDR**
	b/t	b/t	b/t	b/t	b/t
IPO*POST	-9.424***	-9.006***	-12.871***	-12.866***	-12.863***
	(-21.12)	(-20.00)	(-20.93)	(-20.93)	(-20.93)
IPO*POST*BPD		-9.767***	-12.322***	-12.333***	-12.354***
		(-15.14)	(-19.55)	(-19.58)	(-19.59)
lnTA			2.990***	2.995***	2.994***
			(14.75)	(14.75)	(14.75)
CPI				0.061	0.075
				(0.37)	(0.46)
IPI					0.097
					(1.31)
constant	93.598***	93.620***	46.511***	46.141***	45.660***
	(244.79)	(244.45)	(15.25)	(14.45)	(14.13)
R-sqr	0.018	0.019	0.040	0.040	0.040
N	14302	14285	14282	14282	14282

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A6. Loan Growth

	(1)	(2)	(3)	(4)	(5)
	loangr	**loangr**	**loangr**	**loangr**	**loangr**
	b/t	b/t	b/t	b/t	b/t
IPO*POST	1.468*	1.462*	1.968*	2.121**	2.165**
	(2.17)	(2.10)	(2.57)	(2.79)	(2.88)
IPO*POST*BPD		-1.862*	-1.522	-1.901*	-2.272**
		(-2.28)	(-1.91)	(-2.45)	(-2.74)
lnTA			-0.397	-0.214	-0.223
			(-1.74)	(-0.94)	(-1.00)
CPI				2.166***	2.420***
				(10.39)	(11.91)
IPI					1.766***
					(17.78)
constant	13.591***	13.681***	19.940***	6.749	-1.940
	(32.43)	(32.64)	(5.29)	(1.69)	(-0.49)
R-sqr	0.000	0.000	0.001	0.009	0.034
N	14278	14261	14258	14258	14258

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A7. Deposit Growth

	(1)	(2)	(3)	(4)	(5)
	depgr	**depgr**	**depgr**	**depgr**	**depgr**
	b/t	b/t	b/t	b/t	b/t
IPO*POST	1.256*	1.226*	1.205	1.339*	1.384*
	(2.10)	(2.00)	(1.78)	(1.99)	(2.08)
IPO*POST*BPD		0.519	0.507	0.171	-0.164
		(0.53)	(0.52)	(0.18)	(-0.16)
lnTA			0.014	0.178	0.168
			(0.07)	(0.85)	(0.82)
CPI				1.929***	2.157***
				(9.92)	(11.37)
IPI					1.577***
					(17.91)
constant	11.842***	11.849***	11.632***	-0.125	-7.879*
	(30.77)	(30.77)	(3.37)	(-0.03)	(-2.20)
R-sqr	0.000	0.000	0.000	0.008	0.033
N	14282	14265	14262	14262	14262

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A8. NPL

	(1)	(2)	(3)	(4)	(5)
	NPL	NPL	NPL	NPL	NPL
	b/t	b/t	b/t	b/t	b/t
IPO*POST	0.381***	0.381***	0.399***	0.387***	0.386***
	(8.29)	(8.09)	(7.95)	(7.79)	(7.78)
IPO*POST*BPD		0.012	0.024	0.054	0.058
		(0.14)	(0.28)	(0.59)	(0.63)
lnTA			-0.014	-0.028	-0.028
			(-0.89)	(-1.80)	(-1.79)
CPI				-0.171***	-0.173***
				(-12.75)	(-12.95)
IPI					-0.017**
					(-2.72)
constant	2.685***	2.685***	2.904***	3.944***	4.027***
	(84.39)	(84.25)	(11.18)	(13.97)	(14.30)
R-sqr	0.004	0.004	0.004	0.014	0.014
N	14302	14285	14282	14282	14282

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Effects of information and communication technology on financial inclusion: Evidence across emerging and developing countries

Ida Rumondang, Inka Yusgiantoro, Jelita Sarah

Abstract

This study assesses the impact of information and communication technologies (ICT) on financial inclusion across countries. Panel data of 35 emerging and developing countries from 2009 to 2018 is gathered and analyzed with a two-step system GMM estimator. The results highlight the significance of ICT development, particularly mobile phones, internet users, and ATMs, to promote financial inclusion across countries. As more people join the financial system, bank accounts and deposits will increase to support their economic activities. Hence, while the banking industry has generally utilized the ICT to serve the well-off customers, it can be expanded to reach the unbanked population. Furthermore, we test the effects of macroeconomic and socioeconomic variations on the estimation results. We find that both factors play an essential role in increasing financial inclusion. Hence, it is important for emerging and developing countries to construct specific policies that can facilitate better access and usage of financial products and services, as well as enhance macroeconomic and socioeconomic development to further accelerate financial inclusion efforts. Finally, it is of utmost importance for the public sector to provide the basic infrastructure needed to facilitate secure and sustainable ICT growth for a more inclusive financial sector.

JEL Classification: C33, G21, O33.

Keywords: Bank, Financial Inclusion, Panel Data, Technological Impact.

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1. Introduction

Information and communication technology (ICT) is prevalent in many socio-economic activities, from households to office and government activities. Those activities include the financial services sector, which has increasingly use ICT in providing various financial products and services. In the banking industry, ICT is particularly used as a delivery channel that can be accessed anytime and anywhere to fulfill customers need. The use of ICT in banking has broad characteristics in which customers can access all banking services and products from one location through e-banking (digital branch) or a bank/customer device (omnichannel). With e-banking, customers can obtain information, communicate, and make transactions through various electronic media, such as Automated Teller Machines (ATM), SMS banking, electronic fund transfers, internet banking, and mobile banking, in a multichannel manner.

Technology-based product and service innovations in banking is seen as an innovative technology to provide financial products and services for existing customers. However, it is also important to expand banking products and services to those who do not have a bank account (unbanked). According to McKinsey Global Institute (Manyika et al., 2016), digital finance is used in various financial inclusion programs by providers of financial services that are not only banks, but other non-bank financial institutions, payment providers, telecoms companies, financial technology (fintech) start-ups, retailers, and other businesses.

The ability to access financial products and services easily (accessibility) is one of the main drivers for financial inclusion. Hence, accessibility is reflected when people are close to access points – branches, agents, ATMs, outlets, or other devices – so that it enables them to easily select and use various financial products and services to meet their needs. Ozili (2018) illustrates that digitalization, when applied to the lives of low income and/or poor people, can increase their access to basic financial products and services, leading to greater financial inclusion. Kanobe et al. (2017) finds digitalization particularly beneficial in rural areas because mobile devices are becoming an essential tool for financial inclusion in developing countries.

The McKinsey Asia Personal Financial Services survey in 2017 shows that approximately 55 to 80% of customers in Asia consider opening an account with a branchless digital-only bank. In addition, customers will be willing to shift between 35 to 40% of their money to digital accounts (Barquin et al., 2019). Their finding implies that the more accounts opened in a branchless digital-only bank, the more opportunities for saving, borrowing, and transferring money can be executed through branchless banking services. The benefits of increasing financial inclusion are not only significant for individuals or societies but also the economy as a whole. Many studies confirm that one of the positive impacts of financial inclusion is on economic growth. Loukoianova et al. (2018) illustrates that an increase of 1% in the financial inclusion index in low income developing countries can raise GDP per capita growth by 0.14%. Hariharan and Marktanner (2012) find an increase of 10% in financial inclusion has the potentials to raise income per worker by 1.34% on average.

Beyene Fanta and Makina (2019) conclude that the most significant driver for financial inclusion is the technology in which ATMs and internet technology affect financial access and use for financial services. Mushtaq and Bruneau (2019) specify that using information and technology as an instrument to increase financial inclusion can accelerate economic growth and reduce poverty as well as inequality. The increase in financial inclusion will also positively contribute to sustainable economic development at local and national level, as well as support the stability of the financial system (Robert et al., 2014).

This study contributes to examine the relationship between ICT and financial inclusion in banking in emerging countries. The analysis particularly assesses the impact of ICT, socio-economic, and bank network related factors towards two indicators that are commonly used to measure financial inclusion, i.e., access and usage.

The rest of the paper is organized as follows. Section 2 discusses some literature reviews on ICT in the banking industry and financial inclusion. Section 3 explains the theoretical framework for the basis of the study, followed by data and methodology in section 4. Section 5 discusses the results, and section 6 concludes the paper.

2. Literature Review

2.1 ICT in Banking

ICT is consisted of two aspects: (1) information technology that covers all matters relating to information processing; and (2) communication technology that is related to tools for processing data and transferring data from one device to another. Both aspects cannot run properly without the support of ICT infrastructure, including telecommunication network. In banking industry, the ICT infrastructure plays a vital role as the backbone in data and information processing and delivery with the customers.

The use of technology in socio-economic activities can facilitate the exchange of data and information. The most visible development in the use of information technology is processing the data into information in a fast and accurate way. Tcheng et al. (2007) illustrates that ICT development is increasingly considered as an engine for growth, in which the technology is omnipresent in most business sectors for continuous improvement process, cost reduction, as well as new product and processes innovation.

The needs for digital devices and their penetration in various aspects of human life have created large technology industries around the world with their business values increasing significantly over time. People can now shop anywhere at any time without leaving home by using electronic commerce (e-commerce) platform. For purchase and selling products through e-commerce platforms, the payment system has its origin in the banking sector. Over the last three decades, banks have transformed their business from paper-based system to fully integrated ICT-enabled system to serve various customers' need, including payment services. Since e-commerce has become so ubiquitous in some countries, cash has now become almost superfluous.

In a cashless ecosystem where people purchase goods and send money from their bank accounts to the recipients' accounts through various delivery channels, money is used for only the smallest transactions. Even the small money cash transactions are poised to be replaced by a micropayment service in some countries where consumers pay for small items through their mobile phone or a value-carrying smart card. Consequently, ICT has been positively associated with higher productivity growth, as previous studies conclude in both developed (Dedrick et al., 2013; Yousefi, 2011) and emerging economies (Sassi and Goaied, 2013).

European Banking Federation (2015) finds that the rapid uptake of digitalization in the banking industry has led banks to accelerate the rethinking of their traditional business model, including their brick-and-mortar branches. IT systems have become more important, and it is clear that banks need to respond quickly and efficiently to customer demands while keeping services safe and simple to use. The development of digitization in many areas has brought banks to understand that banking is no longer about saving and lending, but about data and keeping it secure for customers' protection while satisfying their need. However, there is clearly a need to define certain effects of the use of technology on the products and services used by customers as well as potential customers.

IT system has become more important for banks to align their goals with the way they operate their businesses. ICT is no longer a supporting factor for bank's going concern. Banks are enhancing their application platforms to enable customers to do their financial transactions independently through mobile and internet banking. Some of them even create online onboarding system to grab potential customers. The end state is to give customers and potential customers complete autonomy for actions, allowing customers and potential customers to provide services for themselves, increase perceptions of control, and increase the speed of access to available services.

The front-end experiences provided by either the bank, or its third-party partners can be used by both customers and potential customers to increase access to services and save costs incurred while using the services. At the same time, banks using integrated technology within their bank-wide operation can reduce labor costs and/or the ability to move employees to more productive activities, reduce branch network costs and expand market share even in remote areas. This expansion can be done through an electronic delivery channel used by customers and potential customers, or by the bank's agents.

For some banks, by implementing new technology in their IT architecture, more parties are involved in servicing their customers and potential customers. For example, an application programming interface (API) will allow the bank to acquire new customers from people who registered through the e-commerce platform. Collaborations between bank and fintech start-ups in electronic know-your-customer (e-KYC) and digital signature will bring down cost and time through a more simplified authentication phase. At the same time, it will increase the ability of customers and potential customers to grasp access and obtain faster transactions processing.

Due to the democratization of financial services and collaborations with fintech start-ups, banks have performed better in reducing the cost of transactions and fostering the development of innovative services. Unfortunately, most banks tend to have only one channel, which is a branch network. The ATM, call center, mobile channels, and internet channels are all built as additions while the physical bank branch has remained the foundation (Skinner, 2014). This condition brings difficulty to some countries that obliged to accommodate their citizens who live in remote and isolated areas, which can lead to high cost for the bank to have a physical branch in those areas. Ultimately, it is crucial to build the right framework to facilitate financial inclusion and innovation in banking, while ensuring that consumer protection, trust, security, and competition are maintained in the industry.

2.2 Financial Inclusion

Being excluded from the formal financial system means that individuals and businesses who do not have bank accounts need to rely on informal mechanisms, such as saving money under their pillow/bed mattress, sending money through a remittance company or relatives, and borrowing money from pawnbrokers or loan sharks that are often unsafe, unreliable, and extremely expensive. Moreover, their socio-economic activities might be hampered by their positions, which are outside the formal financial system. This condition depicts what is actually occurring in today's world: the people with the most limited resources pay the highest fees for financial products and services. Therefore, providing access to affordable financial products and services to unbanked and underbanked people will have a tremendous impact for them to conduct financial transactions that support their socio-economic activities. Studies show that when people participate in the financial system, they can better start and expand the business, invest in education, manage risk, and absorb economic shocks (Demirguc-Kunt et al., 2015).

According to the World Bank Global Findex Survey in 2011 and 2014, financial inclusion has been measured in many countries based on account ownership by adult population (above 15 years old), in which the account that can be used to store money and receive payments (Demirguc-Kunt et al., 2015). From survey questions, it is known that accounts should be within formal institutions, which is different from one country to another depending on the laws and regulations for the formal institutions. Using this definition, approximately 2 billion adults in 2014 and 1.7 billion adults in 2017 remain unbanked, or without an account at any financial institution nor mobile money provider. In terms of global financial inclusion rate (Findex), the World Bank's surveys have shown an increase from 51% of adults owning an account in 2011 to 62% in 2014 and 69% in 2017.

Many countries have their own definition of financial inclusion and specific goal to increase inclusion. Each has attempted to expand account ownerships among the unbanked to increase financial inclusion rate. Hence, in 2018 the World Bank has improved the Findex approach to measure financial inclusion using access to financial products and services that are useful and affordable in meeting the consumers' need, such as transactions, payments, savings, credit, and insurance that are used responsibly and sustainably (World Bank, 2018). The purpose of

financial inclusion is to include all consumers of the country's financial system to enable all financial transactions to be carried out quickly and accurately. The consumers' ability to easily access financial products and services (accessibility) is one of the main drivers of financial inclusion.

Consequently, financial inclusion is a key enabler to reduce poverty and boost prosperity. The World Bank study shows that an inclusive financial system can help increase economic capacity and pave the way out of poverty and reduce economic inequality. In most emerging and developing countries, financial inclusion is intended to provide financial services to people who do not have access. It can be done by opening accounts in formal financial institutions so that individuals can carry out financial activities that ultimately eradicate poverty and accelerate economic growth (Beck et al., 2007a). This means an inclusive financial system can be achieved by increasing access as well as usage to financial services. Thus, the increasing financial inclusion is an essential component in social inclusion and economic inclusion that plays a role in promoting economic growth, creating financial system stability, supporting poverty reduction programs, and reducing gaps between individuals and regions.

An inclusive financial system has several merits. It facilitates the efficient allocation of productive resources and can potentially reduce the cost of capital. Besides, access to appropriate financial services can significantly improve the day-to-day management of finances. It helps reduce the growth of informal credit sources, e.g., money lenders, which are often to be exploitative (Sarma and Pais, 2008). Massey (2010) concludes that financial institutions in a developing country are vital in promoting financial inclusion.

As emerging and developing countries reveal potential development benefits from financial inclusion, governments implement many of their public policies through the use of account ownership as a vehicle to deliver their programs, such as digitizing cash transfers in government assistant program to poor people among others. Hence, there are two broad categories of opportunities for expanding financial inclusion. First, expanding account ownership among the unbanked; secondly, increasing the use of accounts among those who already have one.

Using the Word Bank Findex data, account ownerships in some emerging and developing countries have increased significantly, but stagnated in others. For example, the Findex for India and Indonesia in 2011, 2014, and 2017 are 35, 53, 80% and 20, 36, 49%, respectively. Meanwhile, the Findex for Pakistan and Philippines are 12, 13, 21% and 26, 31, 34% for the same respective years. Based on Patwardhan et al. (2018), the common limitations and frictions in expanding financial inclusion are as follow:

1. Access, where the availability of financial services can be limited by basic problems in access. For example, services are only distributed through branches that are not available in rural areas.

2. Product market fit, where existing and available financial products do not address the need of the large segments of consumer demography.
3. Affordability, where prices need to be affordable; hence, the cost to the providers must be sufficiently low so that services can be offered at a profit despite limited revenues.

2.3 Banking ICT for Financial Inclusion

The advancement in ICT has revolutionized the business of commercial banks, particularly in delivering financial products and services. Technology has allowed banks to provide existing customers with easy access to financial services while expanding product supplies and banking services to the unbanked population. Technology can help overcome barriers that prevent them from accessing financial services. Demirgüç-Kunt et al. (2018) concludes that a well-developed payments system, good physical infrastructure, appropriate regulations, and vigorous consumer protection safeguards are required to ensure benefits from the digital financial services.

Koivo (2002) states that appropriate banking environment must be considered as a key pillar and enabler for financial inclusivity. Internet and mobile banking have made possible for financial institutions to provide online banking products and services for their customers through mobile phone. Garg and Pandey (2006) views an increase in the adoption of ATMs, EFT, smart cards, electronic home, office banking and telephone banking. He concludes that the adoption of ICT improves bank's image that can lead to broader, faster, and more efficient market. Jenkins (2008) shows that reduced transaction costs from highly innovated ICT can enhance trade, which provides opportunities for emerging and developing countries to tap into global markets and remittances that can increase their financial inclusion landscape.

Kendall et al. (2010) investigate the relationships between deposit, loan, and bank branch penetration with other variables. He finds significant associations for deposits and loan penetration with per capita income, physical and financial infrastructure, and macro-economic stability. However, he finds no significant relationship with policies that have financial inclusion as a central goal. Oruo (2013) finds that economic growth is strongly correlated with financial inclusion, especially through bank branch networks, mobile money accounts, and customers as users. Mushtaq and Bruneau (2019) illustrate a positive association of ICT diffusion with financial inclusion, but a negative one with poverty and inequality. The result of the study also indicates poverty-reducing effects of the financial inclusion.

Andrianaivo and Kpodar (2012) confirm that mobile phone development contributes significantly to the economic growth of the African countries. Part of the positive effect of mobile phone penetration on growth comes from greater financial inclusion. Musango (2015) finds that mobile money transfer services have a positive impact on financial inclusion in Kenya. The study further finds that mobile banking services have contributed significantly to the deepening of financial markets, mostly from financial products related to mobile money. Mobile banking services have also been found to have contributed significantly to financial access in Kenya. As reported by the World Bank (2012), three-quarters of the world population

have access to mobile phones, which have been widely accessed by the poor population in emerging and developing countries.

Besides mobile phones, there are many other electronic devices that banks can use to expand their services in reaching unbanked and underserved people, such as "EDC mini-ATM" and web site or internet banking. With electronic devices, banks – directly or through bank agents – are able to serve people in remote, isolated areas that have not been reached previously with existing physical branches. The utilization of ICT has enhanced the bank's ability to conduct financial transactions anytime and anywhere using computer or mobile device that can save both time and money by eliminating the need to visit a physical branch (Lenka and Barik, 2018).

Initiatives to accelerate financial inclusion in emerging and developing countries have increasingly relied on the use of technology, e.g., mobile banking, electronic payments, or financial technology start-ups (De Koker and Jentzsch, 2013). According to Mushtaq and Bruneau (2019), a growing literature in ICT and economic development has indicated the significance role of ICT in social and economic uplifting in the last decade. The study concludes that the ICT can accelerate economic growth and reduce poverty as well as inequality when used as instruments for financial inclusion.

The result of Beyene Fanta and Makina (2019) study shows the impact of ATM and internet technologies on the access and usage of financial services. The study concludes a significant positive relationship between financial inclusion and technology. Andrianaivo and Kpodar (2012) utilizes only one dimension of financial inclusion, which is usage. They find that the combination of IT and mobile telephone have emerged as a viable solution for greater financial inclusion because they minimize the need to set up physical bank branches. Higher mobile phone penetration increases financial access, while better ICT infrastructure favors financial markets, economic growth, and poverty reduction (Alter, 2015).

Furthermore, in some countries banks are not the sole provider for financial transactions. Fintech companies have now played an increasing role in the financial sector. Digital finance terminology is used for financial inclusion instead of digital banking. Manyika et al. (2016) define digital finance as financial services delivered over digital infrastructure—including mobile phones and the internet—with low use of cash and traditional bank branches. Mobile phones, computers, or cards used over point-of-sale (POS) devices connect individuals and businesses to a digitized national payments infrastructure, enabling seamless transactions across all parties. Based on many reports on the implementation of financial inclusion program in various countries, the utilization of ICT favors financial inclusion through better access and higher usage of financial services, which can eventually drive economic growth and poverty reduction.

Asare and Sakoe (2015) examine the effects of electronic banking on the financial services in Ghana using qualitative research method. The study finds that the advent of electronic banking

in the country has enhanced accessibility to a wide range of banking products. The delivery of banking services has been done more rapidly to cover a wide range of existing as well as new customers. The study also reveals that the availability of electronic banking facilities – the ATM, online banking, and telephone banking – does not influence customers' bank choice decision significantly.

The McKinsey Global Institute study illustrates that financial inclusion can boost the output of emerging economies by $3.7 trillion in 2025 and cut the costs of financial services by 80 to 90 percent (Manyika et al., 2016). However, some constraints have remained and hampered the efforts of banks and fintech companies to utilize technologies as an enabler in their broad-based financial inclusion program. Digital finance needs to be supported by a sustainable business environment that includes banks, other financial institutions, telecom companies, fintech start-ups, and other businesses such as retailers. Better collaboration between government, telecommunication providers, and institutions in the financial sector will likely improve digital/mobile banking (Ozili, 2018). Digital finance can be enhanced through promoting policies that increases the use of ICT in providing various financial products and services in emerging and developing countries.

3. Variables, Data, and Methodology

3.1 Dependent Variables

Sarma and Pais (2008) refers financial inclusion to a process that ensures the ease of access, availability, and usage of the formal financial system for the whole population within the economy. The World Bank Global Financial Index in 2014 confirms three main types of indicators for measuring financial inclusion. The first indicator is access, which reflects the depth of outreach of financial services, e.g., the penetration of bank branches, point of sale (POS) devices in rural areas, and demand-side barriers that customers face to access financial institutions such as cost or information. The second indicator is usage, which measures how clients use financial services, such as the regularity and duration of the financial product and services over time. The third indicator is quality, which describes whether financial products and services match the need of the customers, such as the range of options available to customers and their awareness and understanding of the financial products (Demirgüç-Kunt et al., 2015). Similarly, the Consultative Group to Assist the Poor (CGAP) defines the three measurements of financial inclusion through access, usage, and quality. Accessibility to financial services can be measured by the percentage of adults with an account at a formal financial institution. Thus, the usage for financial services can be measured by the percentage of adults who have used mobile phone to make a payment. Finally, the quality of financial services can be measured by the average monthly cost to have a basic bank account, based on the official minimum wage.

Following Beyene et al. (2019), this paper measures financial inclusion with two indicators, that is, access and usage. Both indicators will serve as the dependent variables in our estimation

model. Access will be measured by the number of bank deposit accounts, while usage will be measured by the ratio of deposits to the country's output (GDP) since electronic fund transfers (EFT) data is very limited in many emerging and developing countries.

3.2 Independent Variables

3.2.1 Socio-economic Variables

Social welfare determines the way people behave and make decisions on financial markets (Robert et al., 2014). The socio-demographic characteristics of the less developed countries' population is more likely to avoid using financial services and prefer old-fashioned cash, or even barter. The number of people with bank account will be small (Kabakova and Plaksenkov, 2018).

Furthermore, many studies have shown empirical evidences of significant causal relationships between financial development and economic growth. Social welfare influences the depth of usage of financial services, which can affect the demand side of financial inclusion and hamper its development (Dev, 2006). Many financial inclusion reports find that financial products and services that can put people at ease in making payment of their transactions can eventually boost economic growth. As a result, growth can stimulate financial development, and vice versa (Beck and Levine, 2002). Empirical study done by Ardic et al. (2011) confirms that higher deposit and/or loan correlation is significantly associated with higher economic and financial development as measured by GDP per capita, the amount of electricity use, the availability of explicit deposit insurance, and better credit environment. Oruo (2013) has investigated the relationship between financial inclusion and economic growth in Kenya and finds that growth has a strong positive association with the financial inclusion, especially through the bank branch networks, mobile money accounts, and bank customers as users.

Furthermore, Chithra and Selvam (2013) have identified the determinants of financial inclusion and find that socio-economic factors such as income, literacy, and population have significant associations with the level of financial inclusion. Kelly and Rhyne (2013) state that higher-income population can cause people to demand and utilize financial services. Hence, GDP per capita can drive financial inclusion (Evans and Alenoghena, 2017). Meanwhile, Iqbal and Sami (2017) find that factors such as population density (i.e., the number of individuals per unit of geographic area), rural and remote areas, and mobility of the population (i.e., highly mobile people with no fixed or formal address) can affect financial access services.

At the aggregate level, the index of financial inclusion and the human development index (HDI) are positively associated, as found by Gupta et al. (2014). The HDI summarizes the measurement of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable, and have a decent standard of living (Morse and Morse, 2019). World Bank (2018) states that population density and per capita income are two key factors that are systematically correlated with financial inclusion.

Following previous findings in literature, this study will first focus on the socio-economic impact population density, the country's aggregate output, and Human Development Index on financial inclusion across emerging and developing countries (Ali Said and Rihab Grassa, 2013; Beyene et. al., 2019; Kendall et. al., 2010; Musango, 2015; Mushtaq and Bruneau, 2019; Ozili, 2018; Sarma and Pais, 2008). Our first hypothesis in this study is that socio-economic variables have a positive impact on financial inclusion.

3.2.2 Banking ICT Variables

ATMs and mobile phone transactions have been in existence for some time to facilitate electronic banking. Nevertheless, electronic banking has been transformed by the internet— a new delivery channel that has facilitated banking transactions for both banks and their customers. E-banking implies the provision of banking products and services through electronic delivery channels (Nitsure, 2003). In this study, instead of classifying ATM as the independent variable that proxies banking information technology, it has frequently been treated as an independent variable to represent banks' network. This treatment controls and maintains the availability and readiness of the ATMs to be used by customers at banks' discretion, but not in customers' choice.

Furthermore, existing and potential customers can use mobile phone if relevant application to open bank account with mobile phone is made available. The use of the mobile application is relatively easy for targeted people. The wider prevalence of mobile phones in some emerging and developing countries can explain that people in those countries have no access to alternative communication modes such as the internet and fixed-line telephones. Hence, using mobile phones and the internet to provide financial services have become a new way to offer unbanked people more opportunities to participate in the formal financial system. Jenkins (2008) shows that the reduced transaction costs from highly innovated ICT favor trade because it can give emerging and developing countries the opportunities to tap into global markets and remittances, as well as increase the country's financial inclusion landscape. Many empirical studies indicate that if efficient way of transactions continues, increasing access and usage to finance will help poverty reduction and economic growth. This study will focus on ICT diffusion as measured by mobile cellular subscriptions, internet users, and fixed telephone line subscriptions (Andrianaivo and Kpodar, 2012; Beyene Fanta and Makina, 2019; Sarma and Pais, 2008; Sassi and Goaied, 2013). Our second hypothesis in this study is that ICT has a positive impact on financial inclusion.

3.2.3 Bank Network Variables

While new technologies in principle are available globally, their adoption and use for financial inclusion may have been uneven across countries. There has also been significant variation in whether technologies have been pioneered by the traditional financial sector or other players. Financial access can surely improve the financial condition and living standards of the poor

and the deprived section. Hence, the banking sector has continued to extend its network by setting up new branches and installing new ATMs (Dangi and Kumar, 2013).

In a cross country study, World Bank (2018) finds that financial inclusion that is measured in terms of access to bank accounts is an increasing function of the country's per capita income. Economies of scale has largely explained the findings in countries such as Bangladesh, India, and Indonesia. High population densities have also been an enabling condition for financial inclusion through traditional bank branches despite low per capita income levels. Nkuna et al. (2018) finds some suggestive evidence that transaction costs and distance barriers limit the usage of banking accounts in Malawi. Meanwhile, in exploiting reasons for dormancy in a no-frills account, distance is a major barrier for financial inclusion in which respondents are more willing to pay for convenient banking services closer to their homes in Tamil Nadu (Alphina et al., 2011). Hence, in developing countries people still feel more convenient to go to a bank's channel that can reveal the bank's identity in a real form to facilitate their financial transactions.

The measurement of financial inclusion worldwide has focused on density indicators, such as the number of bank branches, or ATMs per capita (Beck et al., 2007). In addition, the Global Partnership for Financial Inclusion (GPFI) has a basic set of financial inclusion indicators to assist countries in setting up the financial inclusion targets and monitoring progress (World Bank, 2015). For example, bank branches can measure geographical access to formal financial providers, such as the average number of people having access to financial services as counted from each bank's physical outlet. This gives reason to why ATMs and bank branches are among the factors surveyed periodically by the IMF Financial Access Survey (FAS). Two FAS indicators – the number of commercial bank branches per 100,000 adults and the number of ATMs per 100,000 adults – have been adopted to monitor Target 8.10 of the United Nations Sustainable Development Goals (SDG) for 2030. The SDG Target 8.10 strengthens the capacity of domestic financial institutions to encourage and expand access to banking, insurance, and financial services for all. In specifics, the indicators 8.10.1 are comprised of the number of commercial bank branches per 100,000 adults and number of ATMs per 100,000 adults. Hence, bank's network is measured through the number of bank branches and ATMs (Beyene Fanta and Makina, 2019; Demirgüç-Kunt et al., 2015; Demirgüç-Kunt et al., 2018; Nkuna et al., 2018). Our third hypothesis in this study is that bank's network variables have a positive impact on financial inclusion.

4. Data and Methodology

The sample data in this study is comprised of 35 emerging and developing countries from the S&P Dow Jones Index and the IMF World Economic Outlook as shown in table 1. The countries are Argentina, Bangladesh, Brazil, Brunei Darussalam, Chile, China, Colombia, Czech Rep, Egypt, Greece, Haiti, Hungary, India, Indonesia, Kenya, Malaysia, Mexico, Morocco, Mozambique, Myanmar, Nigeria, Pakistan, Peru, Philippines, Poland, Qatar, Rwanda, Saudi Arabia, South Africa, Thailand, Turkey, Uganda, Ukraine, United Arab

Emirates, and Vietnam. Two panel data are constructed to determine the effects of ICT and macro-socioeconomic development on financial inclusion through two indicators, i.e., financial access and financial usage. The first indicator uses bank account as a measurement for access, while the latter uses financial deposits-to-GDP ratio as a measurement for usage. A complete list of the variables and their respective definitions and data sources is shown in table 2. A summary of the linkage between all of variables is summarized in figure 1.

We conduct our analysis using annual data from 2009 to 2018 in the first model to estimate the effects of ICT as well as macroeconomic and socioeconomic conditions on financial access. To analyze the effects on financial usage in our second model, we use the observation data from 2009 to 2017.

Following Beyene Fanta and Makina (2019) with some modifications of the variables, our study employs two panel data models to assess the impact of ICT on financial inclusion. We eliminate secondary school enrolment and inflation in the model, but add new independent variables consisting of the gross domestic product and human development index to further analyze the impact of macroeconomic and socioeconomic conditions. The specification of the two panel data models used in this study is as follows:

Model 1 for Financial Access:

$$LnBankACC_{i,t} = \alpha_0 + \beta_1 \text{LnBankACC}_{i,t-1} + \beta_2 TELE_{i,t} + \beta_3 MOB_{i,t} + \beta_4 INT_{i,t} + \beta_5 DENS_{i,t} + \beta_6 ATM_{i,t} + \beta_7 LnGDP_{i,t} + \beta_8 HDI_{i,t} + \varepsilon_{i,t}$$

Model 2 for Financial Usage:

$$DEPtoGDP_{i,t} = \alpha_0 + \beta_1 DEPtoGDP_{i,t-1} + \beta_2 TELE_{i,t} + \beta_3 MOB_{i,t} + \beta_4 INT_{i,t} + \beta_5 DENS_{i,t} + \beta_6 ATM_{i,t} + \beta_7 LnGDP_{i,t} + \beta_8 HDI_{i,t} + \beta_9 BBRANCHES_{i,t} + \varepsilon_{i,t}$$

where LnBankACC denotes the number of bank deposit accounts per 1.000 adults, and DEPtoGDP is the ratio of the number of financial deposits (i.e., demand, time, and saving deposits) with respect to the gross domestic product of the respective country i at year t. For independent variables, TELE denotes the number of fixed-telephone lines per 100 people, MOB is the rate of mobile cellular subscription per 100 people, INT is the number of internet users as a percentage of the population, DENS is the number of people per square kilometer of land area, ATM is the number of ATMs per 100.000 people, BBRANCHES is the number of bank branches per 100,000 adults, LnGDP denotes the annual growth rate of the gross domestic product, and HDI represents the human development index of the respective country. Note that BBRANCHES variable is not used in model 1 since the number of bank branches can be used as an indicator to measure financial access and bank account (World Bank, 2015).

The two panel data models use the two-step system generalized method of moments (GMM) approach. According to Arellano and Bond (1991) and Blundell and Bond (1998), dynamic panel GMM is better than conventional estimators (i.e., multiple regression estimator) due to its ability to correct potential endogeneity, heteroscedasticity, and autocorrelation problem in

a panel data. The model is appropriate to analyze the problem in this study since the relationship between the variables used in the model is dynamic. Hall (2007) states that by minimizing the criterion function through a weighted matrix, GMM is the right methodology used in a study when the time dimension is characterized by the use of time-series data and cross-sectional data.

Furthermore, efficiency is one of the most critical problem in econometrics. Hence, in a GMM framework, the standard practice is to employ two-step procedure to improve the GMM estimator's efficiency and the associated tests' power (Hwang and Sun, 2018). Based on finite-sample correction to the reported standard of errors in two-step estimation, the two-step system GMM introduces adequate control over the instrument matrix (Windmeijer, 2005). It offers automatic difference in Sargan/Hansen testing for the validity of the instrument subsets and supports for observation weights and the forward orthogonal deviations transform, which is an alternative to differencing proposed by Arellano and Bover (1995) that preserves sample size in panels with gap. To overcome the estimator's potential downward bias, our study use the two-step robust standard error system GMM by Windmeijer (2005).

5. Results

Table 3 shows the descriptive statistics of the data. We note the relatively high standard deviation for density (DENS) due to the broad sample of 35 emerging and developing countries that show large variations in their geographical size and population base. Bhattacharyay (2012) states that countries with different characteristics generate very high data distribution. Table 4 and table 5 exhibit the correlations of the variables in the model, none of which exceed |0.9| as a rule of thumb to detect problem of multi-collinearity following Gujarati (2009). Meanwhile, the results of the two-step system GMM estimation for both financial access and financial usage are presented in table 6 and summarized in table 7, in which all variables show robust standards of error.

The estimation results indicate that fixed-line telephone has no significant impact on financial access across countries, but has a negative effect on financial usage. These results are in line with Beyene Fanta and Makina (2019), in which higher penetration for fixed-line telephone over mobile telephone in emerging and developing countries tend to have lower use of financial products and services and, therefore, less financial inclusion. It follows that population with higher mobile telephone penetration can conduct more frequent financial transactions from various locations at their own convenient time. The results indicate that mobile telephone penetration has a strong positive relationship on both financial access and financial usage. Higher penetration of mobile telephone corresponds to higher bank account ownership and usage of financial services. Hence, the shift of monetary transactions in society from cash payments to cashless through the banking services represents an enormous opportunity for emerging and developing countries to increase the use of online bank accounts and payments

for their customers. The use of ICT such as mobile telephones, or point-of-sale terminals can increase payments' efficiency on both sides (Demirgüç-Kunt et al., 2015).

Internet use penetration has a positive impact on financial access, indicating that higher internet user activities can increase bank's outreach to the unbanked population so they are able to open bank accounts without visiting the physical branch of the bank. However, the internet user penetration shows a negative effect on financial usage. Using financial deposits-to-GDP ratio as a measurement for usage, it is reasonable that higher internet user penetration will lead to higher internet activities and financial transactions from existing bank customers which, subsequently, can result in higher aggregate economic output. Sabater and Garrity (2011) have illustrated in the Global Information Technology Report that as more citizens in emerging economies go online and connectivity levels become closer to the advanced economies' standard, the global share of the internet activities and transactions will gradually shift towards emerging and developing economies.

Furthermore, the number of ATM in a bank network indicate positive effect on a country's financial access. This implies that a well-functioning ATM network has the ability to increase financial inclusion by encouraging unbanked population to open up a bank account and obtain access of the bank's financial products and services through the ATMs located near home or workplaces. On the other hand, the number of physical branches of the bank has failed to affect the financial inclusion in the banking industry. The result indicates that the presence of bank branches may no longer be the main channel for customers to do their transactions in the digitalization era.

In terms of population size, the result of the study shows a positive impact on financial access, in which higher population density in the emerging and developing countries corresponds to higher bank account ownership. From macroeconomic front, the country's aggregate output indicates positive effect on financial access, implying that higher GDP corresponds to higher number of bank accounts. This result confirms the IMF study that a 1 percent increase in Findex can increase the country's GDP per capita by 0.14% (Loukoianova et al., 2018). In addition, Demirguc-Kunt et al. (2015) illustrate some factors that can influence consumer's choice to own savings account, which depend on individual and country characteristics across 123 countries. They conclude that higher level of income and education is positively associated with greater financial inclusion.

Finally, HDI as a measure for the country's welfare and development shows a strong positive impact on financial access as well as financial usage. The higher the HDI level, the greater the opportunity to increase financial inclusion and, therefore, the better access to educational and health opportunities that can make people aware for availing the benefits of financial extension facilities (Datta and Singh, 2019).

6. Conclusions

This study examines the impact of ICT on financial inclusion in the banking industry across emerging and developing countries. Although the direct linkage between banking technology and financial inclusion is somewhat hard to determine, this study is able to identify significant associations between technological and socio-economic variables with financial access and financial usage. The findings highlight some conclusions for emerging and developing countries to accelerate financial inclusion through the use of ICT in the banking industry.

First, we conclude that it is imperative for emerging and developing countries to build an economy-wide ecosystem that can accelerate technology adoption, particularly in mobile technologies, in order to enhance financial inclusion. Mobile phone penetration in particular can increase both financial access and financial usage in the banking industry. This result implies the need for a more progressive banking policy to facilitate banking products and services to be delivered through mobile app channel. As higher proportion of the population use mobile devices and improvement in digital connectivity continues, the ICT development in the banking industry will provide an enormous opportunity for emerging and developing countries to accelerate their financial inclusion.

Furthermore, access to banking should be extended to the unbanked population in rural areas. A more suitable products and services can be designed to allow better fit to the lower segment of the population. Banks can accelerate their outreach by expanding their digital channels as well as the banking ATM network to facilitate their marketing of the products and services. For instance, the presence of ATMs in rural areas will instill trust and confidence among the unbanked people to start using the bank's products and services. Although internet penetration may not contribute to the increase of financial deposits significantly, the digital connectivity will play an important role for emerging and developing countries in facilitating branchless banking in their rural areas.

From socioeconomic front, better quality of life can improve financial inclusion in emerging and developing countries. Hence, the government in emerging and developing countries should formulate public policies that can improve social welfare, health, and education to achieve higher standards of living and, consequently, better inclusivity of the financial system.

Improvement in the society's awareness about banking ICT is also equally an important task for the financial sector in the emerging and developing countries. In order to use technology as an enabler, emerging and developing countries need to implement policies that can enhance the ICT infrastructure. Banks must be able to provide secure and sustainable technology for their existing as well as new customers. Hence, deeper collaboration between financial institutions, telecommunication providers, and the government is needed to improve digital banking services.

Lastly, since this study only focuses on the supply side of financial inclusion, additional analysis is needed to cover the demand side, i.e., the quality of financial products and services,

to measure whether they match existing as well as potential customers' needs. Further exploration can be conducted to explore the demand side associated with the customers' use of technology, such as the consumers' readiness, products fitness, and pricing, particularly for the unbanked population.

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Appendix

Table 1. Emerging Countries

No.	Country	Financial Inclusion Index*	Emerging markets**	Emerging market and developing economies***
1.	Argentina	49 %	O	V
2.	Bangladesh	50 %	-	V
3.	Brazil	70 %	V X O	V
4.	Brunei Darussalam	-	-	V
5.	Czech Rep.	-	X O	-
6.	Chile	74 %	V X O	V
7.	China	80 %	V X O	V
8.	Colombia	46 %	V X O	V
9.	Egypt	33 %	V X O	V
10.	Greece	85%	X O	-
11.	Haiti	33%	-	V
12.	Hungary	75 %	V X	V
13.	India	80 %	V X O	V
14.	Indonesia	49 %	V X O	V
15.	Kenya	82 %	-	V
16.	Malaysia	85 %	V X	V
17.	Mexico	37 %	V X O	V
18.	Morocco	29%	O	V
19.	Mozambique	42%	-	V
20.	Myanmar	26 %	-	V
21.	Nigeria	40 %	O	V
22.	Pakistan	21 %	V X	-
23.	Peru	43 %	V X O	V
24.	Philippines	34 %	V X O	V
25.	Poland	87%	X O	V
26.	Qatar	-	X O	V
27.	Rwanda	50 %	-	V
28.	Saudi Arabia	72%	-	V
29.	South Africa	69 %	V X O	V
30.	Thailand	82 %	V X O	V
31.	Turkey	69%	X O	V
32.	Uganda	59%	-	V
33.	Ukraine	63 %	-	V
34.	United Arab Emirates	88%	X O	V
35.	Vietnam	31 %	-	V

Note:

*Based on World Bank Survey, 2017.

**V: based on Global S&P Dow Jones Index; S&P Emerging BMI Equity; Fact sheet as of October 30, 2020.
X: based on Morgan Stanley Capital International Emerging Market Index.
O: based on Emerging Market Economies Economic Outlook 2019, Focus-Economics.com.

*Based on World Economic Outlook: Global Manufacturing, Downturn, Rising Trade Barriers, Table A.4. Emerging Market and Developing Economies: Real GDP, IMF, October 2019.

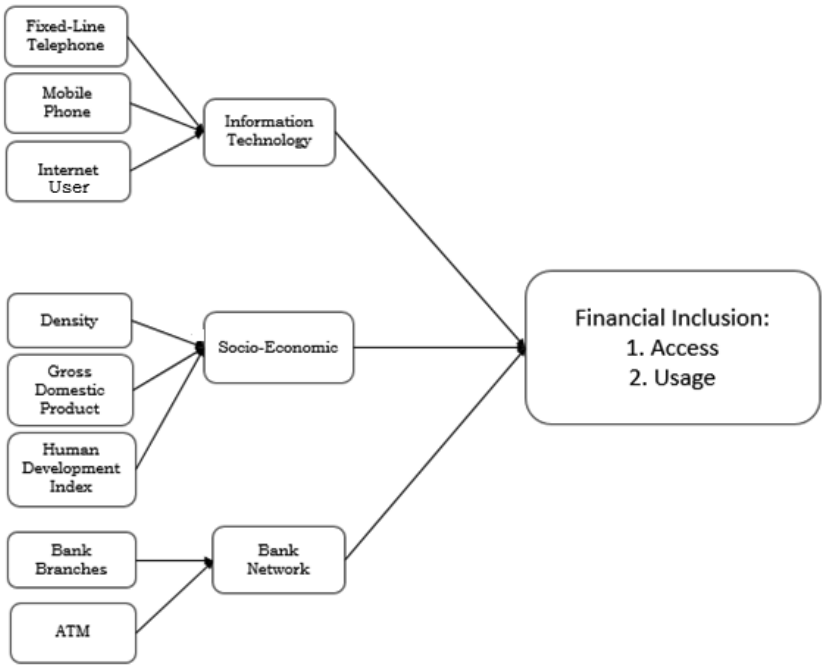

Figure 1. Variables Linkage

Table 2. Variable Definition

Variable	Notation	Definition	Source
Bank Account	LnBankACC	Number of deposit accounts with commercial banks per 1.000 adults in natural logarithmic	International Monetary Fund
Financial system deposits to GDP	DEPtoGDP	Demand, time, and saving deposits in banks and other deposit taking financial institutions as a share of gross domestic product	World Bank
Fixed-line Subscription	TELE	Fixed-telephone lines per 100 people	International Monetary Fund
Mobile Subscription	MOB	Mobile cellular subscription per 100 people	International Monetary Fund
Internet	INT	Individuals using the internet in percentage of population	World Bank
Density	DENS	Population density, number of people per square kilometer of land area	World Bank
ATM	ATM	Automated teller machines (ATM) per 100.000 adults	World Bank
Bank Branches	BBRANCHES	Commercial bank branches per 100.000 adults	World Bank
Gross domestic product	LnGDP	Gross domestic product in natural logarithmic	World Bank
Human Development Index	HDI	An index that summarizes the measure of average achievement in key dimensions of human development	UNDP

Table 3. Descriptive Statistics

Variable	Observation	Mean	Std. Dev.	Min	Max
LnBankACC	341	6.728569	1.028106	2.773205	9.17871
DEPtoGDP	315	49.17168	27.52856	7.260910	128.8390
TELE	347	12.59289	11.00197	0 .0525094	54.75146
MOB	349	105.1718	37.52420	0.9990076	212.6390
INT	346	43.13296	25.23514	0.22000	99.65285
DENS	350	167.0859	208.5757	12.38797	1239.579
ATM	342	43.27658	31.57890	0.0906179	122.7815
BBRANCHES	347	11.93158	7.893641	0.4337687	42.28505
LnGDP	350	26.09403	1.529104	22.4627	30.26254
HDI	350	0 .6961257	0.1384493	0.1384493	0.89100

4. Correlation Matrix for Model 1 – Access

Variables	LnBankACC	TELE	MOB	INT	DENS	ATM	LnGDP	HDI
LnBankACC	1.0000							
TELE	0.4622	1.0000						
MOB	0.5237	0.4881	1.0000					
INT	0.4518	0.6261	0.7350	1.0000				
DENS	-0.1770	-0.3847	-0.2983	-0.3594	1.0000			
ATM	0.5117	0.5913	0.6318	0.5995	-0.4053	1.0000		
LnGDP	0.0580	0.2846	0.3265	0.2344	-0.1114	0.3708	1.0000	
HDI	0.5383	0.7676	0.7459	0.8251	-0.3323	0.7035	0.3775	1.0000

5. Correlation Matrix for Model 2 – Usage

Variables	DEPtoGDP	TELE	MOB	INT	DENS	ATM	BBRANCHES	LnGDP	HDI
DEPtoGDP	1.0000								
TELE	0.2644	1.0000							
MOB	0.4171	0.5213	1.0000						
INT	0.3467	0.6324	0.7420	1.0000					
DENS	-0.0865	-0.3836	-0.3190	-0.3719	1.0000				
ATM	0.3925	0.6027	0.6274	0.5971	-0.415	1.0000			
BBRANCHES	0.4220	0.6394	0.3601	0.5133	-0.2047	0.4506	1.0000		
LnGDP	0.2067	0.2833	0.3611	0.2589	-0.1217	0.4057	0.2795	1.0000	
HDI	0.3914	0.7682	0.7572	0.8239	-0.3356	0.6887	0.5997	0.3810	1.0000

Table 6. Estimation Results from the Two-Step System GMM.

Variable	LnBankACC	DEPtoGDP
TELE	-0.0009838	-0.47439***
	(-0.000598)	(0.062195)
MOB	0.0004527***	0.142197***
	(-0.0001447)	(0.00931)
INT	0.0059014***	-0.18655***
	(-0.0002175)	(0.023558)
DENS	0.0003001**	-0.02077
	(-0.0001579)	(0.015093)
ATM	0.0045079***	-0.01942
	(-0.0006204)	(0.033619)
BBRANCHES		-0.09565
		(0.083353)
LnGDP	0.0385637***	-0.55738
	(-0.0092388)	(0.619085)
HDI	3.105002***	42.99833***
	(-0.2418799)	(10.15268)
Constant	2.9564***	-5.850205
	(-0.1929112)	(11.18829)
Prob(F-statistic)	0.000000	0.000000

Note: (***), (**), and (*) represent significance at 1%, 5% and 10%, respectively.

Table 7. Summary of the Estimation Results.

Variable	LnBankACC	DEPtoGDP
TELE	Not Significant	(-)
MOB	(+)	(+)
INT	(+)	(-)
DENS	(+)	Not Significant
ATM	(+)	Not Significant
BBRANCHES		Not Significant
LnGDP	(+)	Not Significant
HDI	(+)	(+)

How effective is microlending program to improve responsible and sustainable financial inclusion of micro, small, and medium enterprises? Evidence from Indonesia

Saut Simanjuntak, Rosnita Wirdiyanti, Milan Malinda Mardiyyah

Abstract

Research on government micro-lending program and micro, small, and medium enterprises (MSMEs) from different perspectives are widely scrutinized, yet there is lack evidence of its impact on MSME's financial inclusion level. This paper uses principal components analysis to measure financial inclusion index of MSME with government microlending program and MSME without, then employ difference in differencetechniques to evaluate the effect of the program to MSMEs. Our study uses survey data from 6,341 MSMEs from 7 provinces in Indonesia. We find that the financial inclusions of MSMEs with the program are better than MSMEs without, and digital finance channel can accelerate the financial inclusion among MSMEs. However, strong evidence also reveals that the program mostly serve the underbanked people while the target is the unbanked.

JEL Code: C38, D22, G28, I38, L26
Keywords: *Micro lending, SME, Financial inclusion, Entrepreneurship*

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1. Introduction

Financial inclusion, defined as fair access and usage of affordable formal financial services that potentially bring welfare for everyone (Chakravarty dan Pal, 2013; Allen et al., 2016; World Bank, 2018; Kabakova dan Plaksenkov, 2018). Empirical evidence shows that access and usage of formal financial services by individuals who are financially excluded unlocked opportunities for a better education and entrepreneurships, contribute to poverty reduction, and eventually lead to the sustainable development of the economy (Loayza and Ranciere, 2006; Beck, Demirguc-Kunt and Levine, 2007; Bruhn and Love, 2014; Fungáčová and Weill, 2015; Magnani, 2014; Pomeroy et al., 2020).

While many countries have embraced financial inclusions in their economic development strategy, there is no single recipe for developing an inclusive financial system. Various methods have adopted to bridge the gap between formal financial institutions and the needs of financially excluded individuals. Some countries applied specific policies towards financial inclusions, which mostly focus on increasing access to financial services.

For example, social banking policies in India mandated banks to open branches in four unbanked areas to get permit to open one branch in already banked areas (Chakravarty dan Pal, 2013). Africa uses technology such as mobile banking and mobile money account to increase access to financial services (Demirguc-Kunt et al., 2018; Mbiti dan Weil, 2011; Zins dan Weill, 2016). Meanwhile, social banking policies in Indonesia granted relaxation in branches permit rule for banks with minimum 20% of its loan portfolio distribute to micro, small, and medium enterprises (MSMEs) or 10% of its loan portfolio distribute to micro and small enterprises. Generally, support from government and private money is necessary to open wide access to finance and reduce poverty (E. Costa et al., 2016; Moro et al., 2020; Yoshino N et al., 2018).

Access to financing is critical to small and medium enterprises (SMEs) that depend on external finance rather than internal finance for its survival and growth (De la Torre et al., 2010). Particularly during the crisis period, business become more dependent on external finance while banks tend to be more prudent in lending money (Zubair et al., 2020). As a result, loan to SMEs have higher interest rate, shorter maturity time, and riskier due to macroeconomic instability compared to large firms (De la Torre et al., 2010).

Although many studies concluded the importance of access to financing for unbanked people or SMEs to foster economic growth, employment creation, and alleviate poverty (Ayyagari et al., 2007; Quartey et al., 2017; Kersten et al., 2017), financial constraint is the major problem of MSMEs development in developing countries (Carbó-Valverde et al., 2009; Holton and McCann, 2017; Ma et al., 2018). Consistent with those findings, in Indonesia context, a 2018 Survey of Entrepreneurs and MSMEs in Indonesia by Asia Pacific Foundation of Canada discover that 70 percent of respondent answer lack access to financing as barrier to expanding their business.

Generally, informal financing (owner's savings, money lenders/loan sharks, and family and friends) and government schemes/intervention (De la Torre et al., 2010; Kersten et al., 2017; Hajilee et.al., 2017) become main source of finance for SMEs (Kent Baker et al., 2017). Microlending commonly use as intervention tool by government to bridge SME opaqueness by combining subsidize interest rate and willingness to lend to the unbanked and make the loan price and transaction cost more affordable and reasonable for SMEs (Banerjee, 2013; Yoshino N et al., 2018).

Research on microlending and government intervention widely scrutinized, yet the debate on its effectiveness from different perspectives is an interesting subject for many scholars. Some empirical evidence show that microcredit open the access to finance for more than 100 million people per year (Cull et al., 2007). On the other hand, Banerjee (2013) concluded that in the long run, the increased in consumption or income gains because of business creation resulting from microcredit, did not sustain. Moreover, other studies find microcredit failure to reach the poorest of the poor (Amin et al., 2003; Navajas et al., 2000). SMEs opaqueness leading to high acquisition cost per borrower, information asymmetry that leads to credit rationing, and higher risk is the main natural factors of its financing (Stiglitz and Weiss, 1981; Bhatt and Tang, 1998; Navajas et al., 2000; Henock, 2018; Wang et al., 2019). This opaqueness make microcredit mostly serve individuals that near the poverty line.

In Indonesia over the past 10 years microlending program namely People Business Credit (PBC), uses as institutional mechanism to improve financing access to the micro, small and medium enterprises (MSMEs)[1] . This government program main purpose is to improve the inclusiveness of financial system by improving formal financial services' outreach for the unbanked. Inclusive financial systems may become solution to reduce the unbanked and poverty. However, financial inclusion is more than just an access to the formal financial services, it is also about integration of inclusive financial services to the people daily activities, particularly the unbanked, that will bring welfare. Moreover, all the effort has been made is to reach a responsible and sustainable financial inclusion, which allow the unbanked to actively use formal savings and eventually will lead to other and more complex financial services—bank loan, non bank financing, insurance, pension fund, investment, and many more. The more attachment people to the financial systems will encourage entrepreneurships, better education and health access, risk management, buffer to financial shock, improve welfare and sustainable economic development (Cull at al., 2007; Santana Felix and Belo, 2019).

[1] Indonesian Law no. 20 of 2008 Article 6 on Micro, Small, and Medium Enterprises (MSMEs) defines micro firm as enterprise with annual sales of at most IDR 300 million or net asset (land and building excluded) less than IDR 50 million, small firm as enterprise with annual sales of more than IDR 300 million up to a maximum of IDR2.5 billion or nest asset (land and building excluded) of IDR 50 million - IDR 500 million, medium firms as enterprise with annual sales of more than IDR 2.5 billion up to a maximum of IDR 50 billion or net asset (land and building excluded) amounted from more than IDR 500 juta to IDR 10 billion

In this paper we focus on government microlending program in Indonesia as a case study. Indonesia is an emerging economy where government microlending program has been globally acknowledged (Banerjee, 2013) and MSMEs play important role as backbone of the economy. This study therefore dedicated to examine the net impact of government PBC program from financial inclusion perspectives by empirically measuring the improvement in responsible and sustainable financial inclusion level of MSMEs after joining the PBC program. To the best our knowledge, this is the first study that specifically the impact of government microlending program by measuring the increase in financial inclusion index of user's program.

We will use two stage Principal Component Analysis (PCA) measure the responsible and sustainable financial inclusion index of two different groups: MSMEs with PBC program and MSMEs without PBC program. Then we apply difference in differencetechniques to empirically evaluate the impact of government microlending program on the responsible and sustainable financial inclusion of both groups.

We find evidence that financial inclusion of MSMEs with PBC program is higher than of MSMEs without PBC program. Our deeper analysis reveals that digital finance channel accelerate the financial inclusion and MSMEs with PBC program become more attach to the financial systems by actively using not only savings, but also loan, financing, insurance, and investments. However, we also find there is migration from high interest rate loan customer to low interest rate loan (PBC program). This indicate that PBC program mostly reach the underbanked people, not the targeted unbanked people.

The rest of this paper is structured as follows. Section 2 introduces the microlending program and provides theoretical background, followed by data, variables, and methodology in Section 3. We present the empirical results and robustness checks in Section 4. Section 5 concludes our presentation with some implications to policy makers.

2. Theoretical Background

This section begins by introducing the government microlending program in Indonesia. Then, some studies financial inclusion and all other control variabels are presented to provide support for our theoretical framework as well as our hypothesis about the impact of government microlending program on responsible and sustainable financial inclusion.

2.1 Government microlending program

In order to MSMEs empowerment, job creation, and poverty reduction, Indonesia government launched a set of policies in 2007 focusing on improvement of the access to finance, entrepreneurships, MSMEs product markets, and reformation of MSME regulation. In responding to this new policies, a government microlending program namely People Business Credit (PBC) initiated with main objectives to open wide access to finance. PBC program is a business loan facilities (working capital or investment loan) with maximum

limit to IDR500 million (approx. USD35,000) to productive but unbanked individual/firms because of no sufficient collateral. The PBC credit term is maximum 3 years for working capital loan and 5 years for investment loan. However, source of funds for business loan facilities with PBC program is the third-party funds of the participated financial institutions, while government funds allocate to the subsidy scheme cost.

Since its launching, PBC program design has been evolving from a guarantee service fee scheme in 2007 to interest rate subsidy scheme in 2015. With low interest rate, microlending is expected to be more affordable for the unbanked. Over the years, the interest rate set for PBC program is continuously decreasing from 12% in 2015 to 6% in 2020. Furthermore, more financial institutions engaged in PBC program from 7 banks and 2 loan guarantees companies to 41 financial institutions and 11 loan guarantees companies. The program's credit limit for micro business is also continuously increasing from IDR 5 million (approx. USD 360) to IDR 50 million in (approx. USD3,500) in 2020.

2.2 Financial inclusion

Issues related to financial inclusion has gained considerable attention from academics and policymakers in recent years. Previous studied have shown that financial inclusion is an effective tools against the poverty alleviation, welfare improvement, and eventually sustainable economic development. However, only a few focused on how to measure the index of financial inclusion (Demirguc-kunt and Klapper, 2013; Cámara and Tuesta, 2014; Turvey and Xiong, 2017; Datta and Singh, 2019).

Measuring financial inclusion index can be draw from supply-side and demand-side datasets. Sarma (2008) and Chakravarty and Pal (2013) demonstrated measuring financial inclusion indexs from supply-side datasets. However, supply-side indicators, usually numbers of savings or loan accounts, may result in overestimation of financial inclusion index because one person may have more than one accounts (Cámara and Tuesta, 2014). Thus, Camara and Tuesta (2014) provides construction of multidimensional index of financial inclusion by employing two-stage Principal Component Analysis (PCA) on all the indicators that represent three dimensions of financial inclusion: supply-side country level indicators for access and demand-side individual indicators for usage and barriers. The authors argued that using PCA avoid the problem of weight assignment on financial inclusion dimensions that will be lead to inaccurate readings of the index.

Demirguc-kunt and Klapper (2013) measures global financial index from demand-side individual datasets focuses on two dimensions: usage and barriers. This study provides the largest database from survey data from more than 150,000 random adults (age more than 15 years old) in 148 countries.

Datta and Singh (2019) applies PCA method on three dimensions: availability, access, and usage. The study uses G20 financial inclusions indicators for availability and the global financial inclusion database 2011 and 2014 for access and usage.

Most studies focus on measuring the index agree that financial inclusion is not only about access to financial services. It have multidimensional aspects to considered, thus how to measure the index of financial inclusion is not straightforward. Cámara and Tuesta (2014), Demirguc-Kunt and Klapper (2013), and Datta and Singh (2019) commonly use dimensions access and usage in their index. For the barriers, we conclude that it is the same dimensions as access, as people have lack of access due to some barriers. Therefore, in ths study, we integrate some barriers face by people in access dimensions.

Furthermore, for more comprehensive measurements of financial inclusion index, we add more dimensions of financial inclusion adopted from Alliance for Financial Inclusion policy paper (2010). The policy paper introduced four dimensions of financial inclusion that subtracted from commonly used lenses on how people define the financial inclusion:

1. Access as the ability to use available formal financial products and services
2. Quality as a measure of the available formal financial products and services match to the needs of consumers. Quality dimensions use to capture the nature and the depth relationships between financial institutions and its consumers with assumptions that the consumers know what product options are available and the implications of their choices.
3. Usage as the consumers habit towards formal financial products and services: the regularity, frequency, and duration of use over time.
4. Impact on users that bring by formal financial products and services to the consumers life, including changes in consumption, welfare, and business activity.

We follow the two-stage PCA techniques applied by Cámara and Tuesta (2014) on those four dimensions of financial inclusions.

2.3 Control Variables

2.3.1 Structural and institutional context of financial system

Structural and institutional context of financial system may create substitutions or complements to the formal financial products and services and play as enhancers or inhibitors to the formal financial systems (Fu, 2020). Previous studies identify bank and MSME opaqueness may encourage some parties to take advantage to target uninformed customers to demand higher price and purchase costly insurance (Behr and Sonnekalb, 2012; Bauchet, et al., 2018). This information asymmetry and security issues will be reduced when longer relationships between institution and customers that will lead to lower interest rate and less collateral (Behr et al., 2011). Thus, microlending needs intervention from the government to bridge this opaqueness and security issue by providing incentives such as subsidies (De la Torre et al., 2010; Kersten et al., 2017; Hajilee et.al., 2017).

On the other hand, structural and institutional context of financial system cause inflexibility of financial institutions in responding to customer needs (Field et al.,, 2011). Most formal financial institutions have little flexibility in loan structures such as credit term, payment frequency, collateral, and processing speed. Meanwhile many MSMEs particularly micro

business needs the loan to be processed in one day, payment term in days, and with no collateral but only with gentlement's agreement. This inflexibility cause an advantage for more flexible non formal institutions like moneylenders, to take over this opportunity by offering substitute or complementary products.

2.3.2 Financial Literacy

Financial literacy is concerned as a significant variable affecting financial inclusion. A study conduct by Sahrawat R (2010) found that financial inclusion of MSMEs is affected by financial literacy, lack of collateral, inadequate credit history, low and cyclical income, absence of formal and verifiable identity, understanding bureaucracy, and the credit that mainly used for personal consumption. The entrepreneur is encouraged to make financial decisions (e.g., savings, investment, financing) to be able to run their business properly. Therefore, financial literacy becomes pivotal in firms' financing decisions and their business performance (Miller et al., 2009). In addition, Adomako and Danso (2104) argue that financial literacy plays a crucial role in determining business performance and should be considered as an integral part of firm activities.

On the other hand, Scott and Pam (1991) point out a "small business finance gap" as the problems experienced by MSMEs in operating their finance. This gap consists of their limited knowledge of the availability of funds and the higher costs of financing. Hence, these two factors become the biggest constrain for MSMEs in accessing finance. The knowledge gap emerges as a direct consequence of their limited awareness of the suitable source of finance and the relevant advantages and disadvantages of various financial products and services. Kumar and Rao (2015) identified a knowledge gap as a lack of awareness regarding accessibility towards potential financial resources.

The knowledge gap experienced by MSMEs, therefore, lead to MSMEs' opaqueness in financial information. The MSMEs opaque financial information is the natural barrier to financing (Stiglitz and Weiss, 1981). This opaqueness comes from both sides: the financial institution and the consumers themselves. From financial institutions perspective, lack of information about the business lead to inaccurate assessments of loan risk and result in a higher loan rate that unaffordable for MSMEs. From the consumer perspective, a low level of financial understanding can contribute to a bad financial decision (Grohmann et al., 2018) and discourage a business owner from using formal financial services (Cole et al., 2011).

SMEs opaqueness leading to high acquisition cost per borrower, information asymmetry that leads to credit rationing, and higher risk are the main natural factors of its financing (Stiglitz and Weiss, 1981; Bhatt and Tang, 1998; Navajas et al., 2000; Henock, 2018; Wang et al., 2019). This opaqueness makes microcredit mostly serve individuals near the poverty line. Hong and Gu (2004) argue that asymmetry information can severely impact MSME in accessing external financial resources, especially from the formal financial industry.

Concerning the relationship to financial inclusion, some studies found the positive relationships between financial literacy and financial inclusion, from increase demand in bank saving accounts (Cole et al., 2011), the likelihood of holding bank loans (Xu et al., 2019), and robust in any income levels and several subgroups across countries (Grohmann et al., 2018).

2.3.3 Entrepreneurship Level

The relationship between entrepreneurial orientation and financing can be described by behavioral finance theory, which explains the influence of an individual's psychology in making financial decisions (Baker and Ricciardi, 2015). According to Van Der Wijst (2012), a high entrepreneurial spirit tends to have behavioral bias related to cognition, emotions, and social psychology. Regarding MSMEs' access to finance, an entrepreneur with entrepreneurial orientation will have a higher intention to increase their access to finance, especially in the financing, by builds a connection with the fund supplier, as results causing improvement to their business' performance (Sidek et al., 2016). The entrepreneurial orientation is expressed by the risk-taking behavior, innovative and proactive in developing the firm (Miller, 2011). Therefore, an entrepreneur who is not afraid to take the risk; being innovative and proactive will motivate them to access additional financing to increase the firm's growth (Lumpkin and Dess, 2001).

Moreover, empirical works of literature also suggest that technology adoption promotes financial inclusion through entrepreneurship. This is because access to external finance significantly affects firm innovation (Hajivassiliou and Savignac, 2008). Information communication and technology are seen as the gap-bridging between the previously unbanked individual and financial services providers (Diniz et al., 2012). Hence, information communication and technology lead to higher financial inclusion (Wellalage et al., 2020), a primary driver of communication and technology's network in the financial services sector (Lapukeni, 2015), especially facilitating access to credit. Furthermore, Mushtaq and Bruneau (2019) find that financial inclusion is positively affected by diffusion in information and technology but negatively influences poverty and inequality.

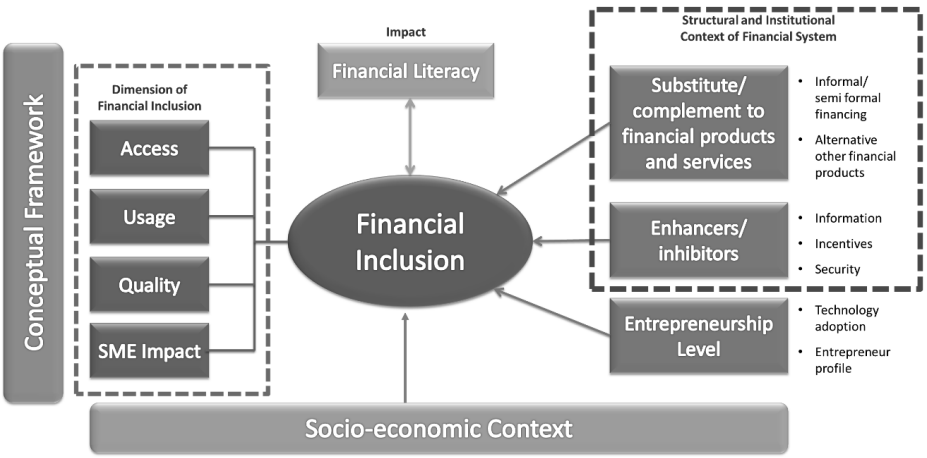

Figure 1. Conceptual Framework of Responsible and Sustainable Financial Inclusion - MSME

3. Method

3.1 Data

We conduct a survey to obtain a nationally representative dataset to examine the impact of people's business credit (PBC) on MSMEs financial inclusion. The data was collected through an MSMEs survey, which was personally conducted between July 2020 and October 2020 in 7 provinces in Indonesia (presented in Table 8). The MSMEs respondents in this study are those engaged in the agriculture, fisheries, and tourism sector.

The year in which the Indonesian government began to implement the people's business credit (PBC) program with interest subsidy is 2015. Therefore, we use 2014 as the pre-program and choose 2016 as the post-program period. Notably, we use a two-year (2014/2016) panel data in the difference in difference(DiD) model for financial inclusion impact analysis, with financial inclusion dimensions and the financial inclusion index to measure the inclusive finance among MSMEs. The interaction between post-program and the MSMEs' involvement in people's business credit (PBC) is the primary independent variable of interest in this study.

The sampling framework consists of two groups of MSMEs: a group who have and still borrowed from people's business credit (PBC) program, referred to as the PBC group; and a group of MSMEs who have never borrowed from people's business credit (PBC) program or the application has been rejected, referred as a non-PBC group. To obtain the sample, we draw a multistage stratified random sampling method. Overall, there are 6.341 MSMEs included in this study, with 2.646 of them are the PBC group, and 3.695 remaining are the non-PBC group.

3.2 Type of Data

We input the collected data into the table to classify them as variables recognized in the framework. There are four categories for data tabulation; they are 1) table of basic coding, 2) table of multistage coding, 3) table of data processing, and 4) table of data processing results displayed in the discussion section. To analyze the data, we use Stata 14 software.

The analysis of our free-text survey questions was established by the inductive approach of grounded theory (Strauss, 1987). That study utilizes open coding related to grounded theory to derive categories from the free-text answers that tend to be qualitative by reading them carefully and aggregating categories. Following that method, we divide the respondents' statements into categories regarding our variables used in this study (see Table 1). Each response was assigned one or multiple categories to quickly outline the relevant topics (Reuter and Spielhofer, 2016). We use the previously collected literature review to increase the theoretical sensitivity in the coding process.

3.3 Operationalization of Construct and Measurements

To avoid information bias and errors in drawing the research conclusions, we develop an operational definition of the variables to acquire accurate measurement results.

Table 1. Operationalization of Construct and The Measurements

Component	Definition	Variable	Measurement Description	Indicator	Data Scale
Financial Inclusion	The process ensures the ease of access, availability, and usage of the formal financial system for all members of the economy (Sarma, 2008).	Access	Saving access to formal or semiformal financial institutions.	access 1	Ratio
			Saving access to informal financial institutions.	access 2	
			Financing access to formal or semiformal financial institutions.	access 3	
			Financing access to informal financial institutions.	access 4	
			Access to digital finance channel.	access 5	
		Usage	Credit ownership except for people's business credit (PBC).	usage 1	
			Ownership of formal or semiformal financial products.	usage 2	
			Frequency of digital finance usage.	usage 3	
			Insurance ownership.	usage 4	
		Quality	Ownership of various financial products.	quality 1	
			Saving habit to formal or semiformal financial products.	quality 2	
			Saving habit to nonformal financial products.	quality 3	
			Financing habit to formal or semiformal financial products.	quality 4	
			Financing habit to nonformal financial products.	quality 5	
			Ownership of digital financial products.	quality 6	
			Frequency of digital finance usage.	quality 7	
		Impact	Additional non-PBC loan ownership related to business.	impact 1	
			Ownership of financial products related to business.	impact 2	

			Ownership of loan products relevant to welfare.	impact 3	
			Ownership of financial products related to welfare.	impact 4	
			Nonformal financial products' usage.	impact 5	
Entrepreneurship Level	Entrepreneurial behavior is influenced by the factors of needs, values, desires, habits, and beliefs (Lee and Wong, 2004)	Technology Adoption	Use of technology in financial records, payments with suppliers and consumers, interactions with suppliers and consumers, internet usage in business, and online store ownership.	techadpt	Ordinal
		Ambition	Intention to develop the business and have an online store.	entambi	
Financial System	Factors that accelerate the penetration of financial products and services due to the higher prevalence of information resources, the availability of additional financial service options, and various forms of semiformal and informal finance (Fu, 2020).	Institutional	The availability of products and services from informal and semiformal financial institutions at a lower cost, easier access, speed, and adaptability to individual needs.	finsysin	Ratio
		Structural	Availability of free information resources regarding financial products and services, the incentives, and the financial services system's security.	finsysstrk	
Financial Literacy	The process by which financial consumers/investors improve their understanding of financial products and concepts, and through information, instruction, or objective advice (Lusardi and Mitchell, 2007)	Knowledge	General knowledge of finance, the security of financial products, and insurance products	litknow	Ratio
		Self-awareness	Financial attitudes towards digital payments	litself	Ratio

3.4 Methodology for Indexing Financial Inclusion

An inclusive financial system contains specific dimensions and cannot be directly measured quantitatively. Nonetheless, this variable is determined by the interaction of a set of variables that caused each other. Behind those set of correlated variables, we can identify the underlying latent structure as the context of financial inclusion. In estimating the latent variables, it is essential to consider these crucial issues: the choice of relevant causal variables and the weighting or estimating the parameters. In selecting the relevant variables, reducing information criterion in a standard way is not possible to perform. Also, since financial inclusion is unobserved, it is impossible to estimate the parameters using standard regression techniques (Camara and Tuesta, 2014). To overcome the issues stated above, we use two-stage principal components analysis as our indexing strategy.

The dataset consisted of indicators correlated with each other, which summarize our respondents' financial inclusion degree. Each correlated variable refers to different dimensions of financial inclusion. We divide those indicators into four sub-indices, namely Access, Usage, Quality, and Impact to MSME. Because the sub-indices consist of highly correlated indicators within the dimension, it is necessary to estimate the sub-indices rather than estimating the complete index using all the indicators. Mishra (2007) argues that this strategy can prevent weight biases among indicators that show the highest correlation. We follow Camara and Tuesta (2014) in applying the two-stage PCA to construct a multidimensional index of financial inclusion. The first stage estimates the four sub-indices: access, usage, quality, and impact, as the dimensions of financial inclusion. The next stage is to estimate each dimension's weights and construct the overall financial inclusion index by putting the dimensions as explanatory variables.

Financial inclusion is considered to be linearly determined and formulated as follows:

$$FI_i = w_1 A_i^u + w_2 U_i^c + w_3 Q_i^b + w_4 I_i^a + e_i \qquad (1)$$

where the subscript i denotes the respondent, and $(A_i^u, U_i^c, Q_i^b, I_i^a)$ represents the access, usage, quality, and impact to MSME's dimension, respectively. Therefore, the total variation in financial inclusion is explained by two orthogonal factors: causal variables variation and the error term (e_i) variation.

Table 1 exhibits our variables with different scales. Some of our variables also contain large variance while other variables have small variance (see Appendix 2, tables A6). Therefore, we have to standardize the selected indicators to normalize the variables and generate normal distribution. The standardization is necessary before estimating the sub-indices because the result of PCA is sensitive to the initial variables' variance. Specifically, if the ranges of initial variables have considerable differences, they will dominate those with small ranges. In this research, we employ z-score as transformation techniques, where we base the scaling on deviation from the mean. The result of our normalized variables for financial inclusion indicators is shown in Table 2.

We calculate standardization using z-score normalization as follows.

$$Z = \frac{X_i - \bar{X}}{\sigma} \quad (2)$$

where,

$\bar{X}$=group average
σ=standard deviation

In the next stage, we processed the normalized data to construct sub-indices using PCA, a standard technique to simplify a dataset by extracting data for hidden features and relationships, and removing the data containing excessive information. Therefore it reduces the data's dimension for the analysis (Le et al., 2019).

Table 2. Descriptive Statistics of Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
techadpt	12682	8.609	2.417	5	19
entambi	12682	55.602	7.044	20	75
finsysin	12682	1.055	5.067	0	41
finsysstrk	12682	7.51	2.084	0	20
litknow	12682	2.791	2.526	0	10
litself	12682	2.058	4.412	0	58
access	12682	0	1.293	-8.595	1.691
usage	12682	0	1.353	-.875	12.264
quality	12682	0	1.435	-1.675	9.698
impact	12682	0	1.292	-.654	12.555
fiindex	12682	0	1.415	-1.487	12.99

This table shows the summary statistics for all data samples of the DiD analysis's key variables. The normalized variables are access, quality, impact, and FI_index.

Many researchers have used the PCA technique in explanatory data analysis. Jollife and Cadima (2016) mentioned that PCA discloses the data structure and explains the variation in the projections. Although PCA is not often used to quantify financial inclusion, some studies have employed PCA as the analysis tool in examining financial variables (see Le et al., 2019; Camara and Tuesta, 2014; Le et al., 2016; Adu et al., 2013; Hye, 2011; Ang and McKibbin, 2007). In particular, Le et al., (2019) constructs financial inclusion in Asia using PCA to examine its impact on financial efficiency and sustainability. Ang and McKibbin (2007) also performing PCA to formulate the financial depth index and financial repression index in Malaysia.

To determine the outcome variable, PCA assigns weight to each input variable in the index construction. The first principal component represents selected input variables best; therefore, it determines the newly established index. The weights implied the degree of correlation between a given input variable and the outcome index (Radovanović et al., 2018). Thus, we can discover the essential variables in explaining the index. The standardization resulting in all the principal components have zero mean value. Every component's standard deviation is the eigenvalue's square root (Radovanović et al., 2018).

Before we begin the estimation using PCA, Bartlett's test of sphericity and Kaiser-Meyer-Olkin (KMO) test were performed to examine the data suitability for factor analysis. The purpose of Bartlett's test of sphericity is to analyze whether the correlation matrix in the PCA is an identity matrix. Therefore, to be suitable for factor analysis, the value should be significant with $p < 0.05$ (Hair et al., 2006; Tabachnick et al., 2007). Then, we conduct the Kaiser- Meyer-Olkin (KMO) test to examine the sampling adequacy. Yoshina and Taghizadeh-Hesary (2015) explain that the KMO test's value indicates the proportion of common variance that is potentially caused by underlying factors. The index range is between 0 and 1, and the factor is suitable if it has an index greater than 0.5 (Hair et al., 2006; Tabachnick et al., 2007). Table 3 shows the results of Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) test. The KMO value is higher than 0.5, and Bartlett's test of sphericity results p-value lower than the significance level alpha = 0.01. It indicates that we reject the null hypothesis, which means that the variables we used in PCA are correlated. Thus, the PCA method is appropriate in this study.

Table 3. Results of Bartlett's test of sphericity and the Kaiser-Meyer-Olkin Measure of Sampling Adequacy

	Bartlett's test of sphericity			Kaiser-Meyer-Olkin Measure of Sampling Adequacy
	Chi-square	dof	p-value	
Financial Inclusion				
z-score normalization	95573.187***	190	0.000	0.69

Note: Bartlett test of sphericity: H0: variables are not intercorrelated. *** indicates statistical significance at 1% level.

Later, we perform the first stage of PCA that estimates the dimensions, which is the four unobserved endogenous variables ($A_i^u, U_i^c, Q_i^b, I_i^a$) and formulated as follow:

$$A_i^u = \beta_1 \text{access } 1 + \beta_2 \text{access } 2 + \beta_3 \text{access } 3 + \beta_4 \text{access } 4 + \beta_5 \text{access } 5 \quad (3)$$

$$U_i^c = \theta_1 \text{usage } 1 + \theta_2 \text{usage } 2 + \theta_3 \text{usage } 3 + \theta_4 \text{usage } 4 \quad (4)$$

$$Q_i^b = \gamma_1 \text{quality } 1 + \gamma_2 \text{quality } 2 + \gamma_3 \text{quality } 3 + \gamma_4 \text{quality } 4 + \gamma_5 \text{quality } 5 + \gamma_6 \text{quality } 6 + \gamma_7 \text{quality } 7 \quad (5)$$

$$I_i^a = \delta_1 \text{impact } 1 + \delta_2 \text{impact } 2 + \delta_3 \text{impact } 3 + \delta_4 \text{impact } 4 \quad (6)$$

The variables used in each dimension are described in table 1. Remember that the endogenous variables are unobserved, so they are estimated jointly with the unknown parameters: β, θ, γ, and δ. Usually, the principal component is used to decide the number of components contains in the estimation. In general practice, people tend to use the first few principal components to replace all causal variables because it captures a significant proportion of all the samples' total variation. In this research, we acknowledge the whole components as the explanatory variables. Because we avoid eliminating the relevant information that might affect the estimation; thus, we did not reduce the data dimension to estimate financial inclusion accurately.

Next, the second stage of principal component analysis calculates the overall financial inclusion index by replacing $A_i^u, U_i^c, Q_i^b,$ and I_i^a in Eq.(1) and employ the exact process with the first stage to measure the vectors of parameters λ.

The formula of financial inclusion index is expressed as follows:

$$FI_i = \frac{\sum_{j=1}^{4} \lambda_j (\varphi_{j1} A_i^u + \varphi_{j2} U_i^c + \varphi_{j3} Q_i^b + \varphi_{j4} I_i^a)}{\sum_{j=1}^{4} \lambda_j} \quad (7)$$

The highest weight λ_1 is belongs to the first principal components due to its largest proportion of the total variation in all causal variables. Accordingly, λ_2 represents the second-highest weight of the principal component and so on.

3.5 Methodology for Measuring The Impact of People's Business Credit Program (PBC) on the Financial Inclusion

To consistently compare the impact of people's business credit (PBC) on financial inclusion, we establish two different groups consisting of treatment and control groups. The treatment group is MSMEs, which receives people's business credit (PBC). The control group is MSMEs that do not apply for people's business credit, or they have applied. However, for several reasons, the application was rejected.

We estimate the model by applying difference in difference(DiD) method with the following equation:

$$\begin{aligned} Y_{i,t} = {} & \alpha + \beta_1 PBC_i + \beta_2 Post_t + \beta_3 Post_t * PBC_i + \beta_4 TechnologyAdoption_i + \\ & \beta_5 EntrepreneurAmbition_i + \beta_6 FinancialSystemInstitutional_i + \\ & \beta_7 FinancialSystemStructural_i + \beta_8 FinancialKnowledge_i + \\ & \beta_9 FinancialSelfAwareness_i + \beta_{10} SocioEconomy_i + \varepsilon_{i,t} \end{aligned} \quad (8)$$

where $Y_{i,t}$ is our dependent variables consist of the dimensions of the financial inclusion index (which are access, usage, quality, and impact) and the financial inclusion index as a whole. PBC_i is a dummy variable that equals one for respondents or MSMEs that receive people's business credit (PBC) and zero otherwise. $Post_t$ is a dummy variable that consists of one for the time after the MSMEs implemented people's business credit (PBC) with interest subsidy scheme.

$Post_t * PBC_i$ as the variable of interest, which specifies the direct impact of people's business credit (PBC) program on the dependent variables. Our sets of the control variables that might affect the dependent variables consist of $TechnologyAdoption_i$, $EntrepreneurAmbition_i$, $FinancialSystemInstitutional_i$, $FinancialSystemStructural_i$, $FinancialKnowledge_i$, $FinancialSelfAwareness_i$, and $SocioEconomy_i$.

4. Results

4.1 Financial Inclusion Dimensions

This section presents our estimation of financial inclusion indices for 6.341 MSMEs, both those who receive the people's business credit (PBC) and those who did not. We apply two-stage PCA for periods before and after Indonesia's governments implement people's business credit (PBC) with interest subsidy. Table 6 presents the correlation matrix of the causal variables that we use to measure financial inclusion.

The first stage of PCA measures the weight for each sub-index's causal variables and compute the latent variables: access, usage, quality, and the impact that serve as the dimensions of the financial inclusion index.

Table 4. Cumulative Variance Explained by Component

	Eigenvalue	**Difference**	**Proportion**	**Cumulative**
Access				
PC 1	1.672422	0.3751933	0.3345	0.3345
PC 2	1.297229	0.3061119	0.2594	0.5939
PC 3	0.9911166	0.1840787	0.1982	0.7922
PC 4	0.807038	0.5748429	0.1614	0.9536
PC 5	0.232195	.	0.0464	1
Usage				
PC 1	1.831089	0.8434538	0.4578	0.4578
PC 2	0.9876355	0.101253	0.2469	0.7047
PC 3	0.8863825	0.5914897	0.2216	0.9263
PC 4	0.2948928	.	0.0737	1
Quality				
PC 1	1.838677	0.6919131	0.2627	0.2627
PC 2	1.146764	0.1454603	0.1638	0.4265
PC 3	1.001303	0.0021122	0.143	0.5695
PC 4	0.9991911	0.0823559	0.1427	0.7123
PC 5	0.9168352	0.0777649	0.131	0.8433
PC 6	0.8390702	0.5809105	0.1199	0.9631
PC 7	0.2581598	.	0.0369	1
Impact				
PC 1	1.66898	0.66817	0.3338	0.3338
PC 2	1.00082	0.08385	0.2002	0.534
PC 3	0.91697	0.05093	0.1834	0.7174
PC 4	0.86603	0.31883	0.1732	0.8906
PC 5	0.5472	.	0.1094	1

Table 5. Principal Components Estimates

	PC 1	PC 2	PC 3	Unexplained
Access				
Access 1	-0.1864449	0.7037276	-0.3317294	0
Access 2	0.5817417	-0.1471882	0.4876662	0
Access 3	-0.4878153	0.0417678	0.5880426	0
Access 4	0.6209346	0.4321639	-0.0435372	0
Access 5	-0.0573704	0.5427641	0.5517678	0
Usage				
Usage 1	0.2021453	0.865695	-0.4563362	0
Usage 2	0.3263731	0.3812342	0.8632609	0
Usage 3	0.6501156	-0.2218499	-0.1917073	0
Usage 4	0.6557191	-0.2366756	-0.098925	0
Quality				
Quality 1	0.3088687	-0.2275265	0.0593583	0
Quality 2	0.0146195	0.0251472	0.7598109	0
Quality 3	0.0180986	-0.0150218	-0.6466637	0
Quality 4	0.1496019	-0.6685271	0.0092291	0
Quality 5	-0.0110316	0.6813973	-0.0082746	0
Quality 6	0.6564962	0.1451107	0.0003058	0
Quality 7	0.6712445	0.1228245	-0.028918	0
Impact				
Impact 1	0.3769914	0.0592137	0.6561085	0
Impact 2	0.5277668	-0.1558878	-0.5160793	0
Impact 3	0.4543215	0.0651031	0.4468414	0
Impact 4	0.6077236	-0.0470956	-0.2766503	0
Impact 5	0.0600301	0.9827188	-0.1642594	0

We present the estimated factors and each financial inclusion dimension's eigenvalues in Table 4. Because our purpose is to estimate the financial inclusion accurately, therefore we consider all components as the explanatory variables. The estimated principal components for access, usage, quality, and impact are presented in Table 5. Note that because of the standardization, therefore, all the principal components have zero mean. Also, the correlation between the principal components is zero.

To explain the principal components, we need to recognize the variables with a strong correlation with each component. In this case, the large numbers of magnitude or the farthest from zero in both directions indicate that variables are strongly correlated with each component. Following Le (2019), we consider a correlation of 0.5 and above as a threshold for essential variables.

For the component access, we find that the first principal component is strongly and positively correlated with access 2 and access 4. This component can be viewed as savings to nonformal financial institutions and financing to nonformal financial institutions. The second principal component increases with access 1 and access 5. This component can be viewed as a measure of savings to formal or nonformal financial institutions and digital channel finance. The third principal component increases with an increase in access 3 and access 5. Therefore this component can be viewed as financing to formal or nonformal financial institutions and digital channel finance.

For the component usage, we find that the first principal component is strongly and positively correlated with usage 3 and usage 4. These two variables measure the frequency of using digital finance and insurance ownership. The positive correlation indicates that they vary together. For example, if digital finance usage is increasing, insurance ownership will likely to rise. The second principal component increases with usage 1, which measures credit ownership other than people's business credit (PBC). On the other hand, the third principal component increases with an increase in usage 2, explaining formal or semiformal financial product ownership.

For the component quality, the first principal component is strongly and positively correlated with quality 6 and quality 7. This component can be viewed as ownership of digital financial products and the frequency of using digital finance. The second principal component is strongly and positively correlated with quality 5 while significantly and negatively correlated with quality 4. This finding suggests that these variables move together in a reversed direction. For instance, if quality 5 (financing habit from informal financial institutions) increases, quality 4 (financing habit from formal or informal financial institutions) will likely fall. Moreover, the third principal component increases with quality 2 (saving habit to formal or semiformal financial institutions) and decreases with quality 3 (saving habit to informal financial institutions).

For the component impact, we find that the first principal component is strongly and positively correlated with impact 2 and impact 4. Those variables represent the ownership of financial products related to business (e.g., leasing, fire insurance, and property insurance) and the ownership of financial products related to their welfare (e.g., vehicle ownership credit, homeownership credit, and credit card). The second principal component increases with impact 5, a measure of nonformal financial products' usage. Meanwhile, the third principal component increases with the increase in impact 1, which assesses the additional non-PBC loan ownership related to business.

Table 6. Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	access1	**access2**	**access3**	**access4**	**access5**	**usage1**	**usage2**	**usage3**	**usage4**	**quality1**	**quality2**
access1	1										
access2	-0.299***	1									
access3	0.145***	-0.0865***	1								
access4	0.204***	0.467***	-0.392***	1							
access5	0.131***	-0.0584***	0.123***	0.129***	1						
usage1	0.0494***	-0.0257**	0.157***	-0.0645***	0.128***	1					
usage2	0.162***	-0.0564***	-0.0959***	0.240***	0.211***	0.0970***	1				
usage3	0.0472***	-0.0378***	0.128***	0.0769***	0.815***	0.121***	0.169***	1			
usage4	0.0174*	0.00161	-0.0371***	0.193***	0.587***	0.0884***	0.216***	0.702***	1		
quality1	0.129***	-0.0664***	0.238***	-0.0459***	0.222***	0.188***	0.167***	0.202***	0.121***	1	
quality2	0.0251**	0.0112	-0.00446	0.00696	0.0170	0.0331***	0.0178*	0.00462	0.00615	0.00649	1
quality3	0.0127	-0.00625	0.00945	0.00385	0.0126	0.00345	0.00801	0.00940	0.00879	-0.000313	-0.000678
quality4	0.0861***	-0.0254**	0.339***	-0.0118	0.0633***	0.249***	0.0894***	0.0645***	0.0634***	0.101***	-0.00231
quality5	-0.0165	0.0232**	-0.0972***	0.122***	0.0168	-0.0573***	0.0181*	0.0234**	0.0168	-0.0215*	0.00160
quality6	0.122***	-0.0682***	0.0882***	0.0883***	0.823***	0.111***	0.130***	0.681***	0.482***	0.152***	0.0231**
quality7	0.0700***	-0.0508***	0.109***	0.162***	0.873***	0.120***	0.243***	0.866***	0.659***	0.215***	-0.00672
impact1	-0.00803	-0.0267**	-0.0866***	0.235***	0.174***	0.290***	0.196***	0.149***	0.176***	0.0907***	0.0164
impact2	0.0464***	-0.0573***	0.0446***	0.0142	0.196***	0.175***	0.342***	0.167***	0.181***	0.599***	0.0113
impact3	0.0474***	-0.0181*	0.142***	-0.0380***	0.116***	0.833***	0.0919***	0.117***	0.0861***	0.169***	0.0319***
impact4	0.0907***	-0.0815***	0.0797***	0.0413***	0.207***	0.259***	0.402***	0.185***	0.161***	0.538***	-0.00337
impact5	0.0543***	-0.0315***	0.116***	-0.0736***	-0.0103	0.0347***	0.00634	-0.00581	0.0161	0.00476	-0.000343
N	12682										

Table 6. Correlation Matrix (Cont.)

Variables	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
	quality3	**quality4**	**quality5**	**quality6**	**quality7**	**impact1**	**impact2**	**impact3**	**impact4**	**impact5**
access1										
access2										
access3										
access4										
access5										
usage1										
usage2										
usage3										
usage4										
quality1										
quality2										
quality3	1									
quality4	0.00452	1								
quality5	-0.00312	-0.137***	1							
quality6	0.00878	0.0553***	0.00252	1						
quality7	0.0131	0.0842***	0.0243**	0.737***	1					
impact1	0.00844	0.121***	0.0106	0.109***	0.224***	1				
impact2	-0.0121	0.0916***	-0.0138	0.0595***	0.165***	0.158***	1			
impact3	0.00236	0.213***	-0.0419***	0.106***	0.120***	0.163***	0.112***	1		
impact4	-0.00273	0.140***	-0.0227*	0.181***	0.218***	0.154***	0.399***	0.299***	1	
impact5	0.000678	0.142***	-0.262***	-0.000890	-0.00467	0.0216*	0.00206	0.0223*	0.0342***	1
N	12682									

4.2 The Impact of People's Business Credit Program (PBC) on the Financial Inclusion

4.2.1 Treatment and Control Groups

To examine the impact of people's business program (PBC) on MSMEs' financial inclusion, we employ DiD method, which requires a treatment group and a control group. The treatment group is the MSMEs that receive a loan from people's business credit (PBC), while the control group consists of MSMEs that did not join the PBC program. The treatment effect is the year when the Indonesian government started to implement interest subsidies for the loan.

4.2.2 Empirical Results

Table 7 presents the characteristic of respondents. Nearly half of the surveys were conducted in Central Java Province (47.44%), with the majority of respondents belong to the MSMEs' owner with male gender (72.48%), married (86.52%), on average, 40 – 54 years old. Regarding the business sector, 79.64% of MSMEs are engaged in the agriculture sector. Concerning the financial characteristics, 39.35% have an average monthly income slightly above the regional minimum wage (Rp 1.700.000 - Rp 3.800.000). Regarding the education degree, 40.58% have completed senior high school. A significant portion reported having been running their business for more than ten years (67.64%). Also, it was found that 49.57% of respondents stated that their distance to the nearest financial institution is less than 5 Km. Regarding engagement to the internet, half of the respondents (50.95%) have at least a cellular phone, email, or internet access. Besides, only 6.37% of respondents have an online store, and the majority of them (73.32%) are documenting their business finances.

We examine the impact of people's business credit program (PBC) on Indonesia's financial inclusion using the DiD method. Table 9 shows the results of our baseline regression. The variable of interest is the interaction between the treatment respondents' dummy variable and the treatment effect dummy variable (post*PBC), which presents the consecutive impact of people's business credit program (PBC) on the dependent variables. We employ access, usage, quality, credit impact on MSME, and the financial inclusion index as our dependent variables.

From table 8, we find several findings. Firstly, the impact of people's business credit program (PBC) on the financial access dimension, namely access, usage, quality, and impact, is positive and significant. The financial inclusion index, as a whole, also implies a positive and significant effect. Furthermore, the coefficients of the interaction variable on the dependent variables also present similar results. These findings imply that respondents who tie with people's business credit program (PBC) have better financial inclusion than those who do not.

Table 7. Characteristics of Respondents

Characteristic	Full Sample		PBC Group		Non-PBC Group	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
Province						
DI. Yogyakarta	281	4.43	109	4.12	172	4.65
Central Java	3008	47.44	972	36.73	2036	55.10
Lampung	940	14.82	283	10.70	657	17.78
West Nusa Tenggara	455	7.18	306	11.56	149	4.03
East Nusa Tenggara	176	2.78	138	5.22	38	1.03
South Sulawesi	788	12.43	478	18.07	310	8.39
West Sumatera	693	10.93	360	13.61	333	9.01
Gender						
Male	4596	72.48	1722	65.08	2874	77.78
Female	1745	27.52	924	34.92	821	22.22
Age						
Under 24	221	3.49	52	1.97	169	4.57
24-39 years old	2088	32.93	1241	46.90	847	22.92
40-54 years old	2685	42.34	1083	40.93	1602	43.36
55-65 years old	1050	16.56	249	9.41	801	21.68
Over 65 years old	297	4.68	21	0.79	276	7.47
Education						
Not attend formal school	242	3.82	43	1.63	199	5.39
Elementary	1462	23.06	380	14.36	1082	29.28
Middle school	1110	17.51	406	15.34	704	19.05
High school	2573	40.58	1289	48.72	1284	34.75
Diploma	247	3.90	146	5.52	101	2.73
Bachelors	669	10.55	366	13.83	303	8.20
Master degree	38	0.60	16	0.60	22	0.60
Marital Status						
Not married	579	9.13	234	8.84	345	9.34
Divorced	276	4.35	103	3.89	173	4.68
Married	5486	86.52	2309	87.26	3177	85.98
Monthly Income						
Less than Rp 1.700.000	2315	36.51	458	17.31	1857	50.26
Rp 1.700.000 - Rp 3.800.000	2495	39.35	1021	38.59	1474	39.89
Rp 3.800.001 - Rp 7.000.000	1002	15.80	732	27.66	270	7.31
Rp 7.000.001 - Rp 10.000.000	300	4.73	249	9.41	51	1.38

Rp 10.000.001 - Rp 17.500.000	150	2.37		125	4.72		25	0.68
More than Rp 17.500.000	79	1.25		61	2.31		18	0.49
Business Age								
Less than 1 years	92	1.45		20	0.76		72	1.95
1-5 years	1960	30.91		1066	40.29		894	24.19
More than 10 years	4289	67.64		1560	58.96		2729	73.86
Sector								
Tourism	592	9.34		447	16.89		145	3.92
Agriculture	5050	79.64		1715	64.81		3335	90.26
Fisheries	699	11.02		484	18.29		215	5.82
Engagement to Internet								
Very low	3110	49.05		1570	59.33		1661	44.95
(Do not have a cellphone, email address, and internet access)								
Medium	3231	50.95		1076	40.67		2034	55.05
(Have a cellphone and email address, and or internet access)								
Having an Online Store								
Yes	404	6.37		217	8.20		187	5.06
No	5937	93.63		2429	91.80		3508	94.94
Having a Business Financial Record								
Yes	1692	26.68		879	33.22		813	22
No	4649	73.32		1767	66.78		2882	78
Distance to Finance Institution	3142	49.55		1315	49.70		1827	49.45
Less than 5 Km	2435	38.40		918	34.69		1517	41.06
5 Km - 10 Km	587	9.26		288	10.88		299	8.09
10 Km - 20 Km	177	2.79		125	4.72		52	1.41
More than 20 Km								
Total	6341	100		2646	100.00		3695	100

Then we look more profound at the indicator of the financial inclusion dimension presented in table 9. People's business credit program (PBC) enables the respondents to have greater access to formal and semiformal finance institutions for savings (access 1). They also experienced better access to digital finance (access 5). Also, the interaction variables (PBC*post) exhibit a positive and significant impact on access saving to nonformal financial institutions (access 2) and financing access to informal financial institutions (access 4). These results indicate that the PBC program succeeded in migrating PBC respondents from nonformal financial access to the use of formal or semiformal financial access. In contrast, the PBC program with subsidized interest resulted in a migration from users of expensive financing products to low-cost financing products. This result is supported by the negative and significant impact on financing access to formal or semiformal financial institutions (access 3).

Next, for the usage dimension, respondents who join the people's business credit program (PBC) own more financial products (usage 2) but use digital finance channels (usage 3) less frequently than non-PBC users for usage dimension. The relationship of PBC with loan ownership other than PBC (usage 1) and insurance ownership (usage 4) demonstrates a negative and significant direction. But the interation variables (PBC*post) exhibit a positive and significant relationship with the nonbasic financial product and services such as insurance (usage 4) and digital finance (usage 3). In conclusion, MSMEs who join PBC are less active in exploring non-subsidized financing than non-PBC MSMEs.

The examination in quality dimension finds that interaction variable (PBC*post) positive and significant affecting ownership of various financial products (quality 1), financing habit to nonformal financial institutions (quality 5), and frequency of using digital finance channel (quality 7). Oppositely, the effects on financing habits to formal or semiformal financial institutions (quality 4) and digital finance ownership (quality 6) are negative significant. These findings indicate that after the government applied an interest subsidy policy, MSMEs who participate in PBC have a higher understanding of choosing financial products and services according to their needs, compared to non-PBC MSMEs. In terms of the wideness of financial products and services usage such as savings, financing, insurance, investment, and digital finance (quality 1), the PBC MSMEs group has a much more varied range of financial products and financial services, compared to the non-PBC MSMEs.

Additionally, the finding also indicates that PBC MSMEs are faster to leave nonformal financing products (in this case, it refers to loan sharks) than non-PBC MSMEs. The MSMEs who join PBC also much more selective in choosing digital financial products according to their needs. We can see the evidence of the decrease in ownership of various digital financial products (quality 7) and the increase in digital financial products' usage frequency (quality 6). On the other hand, consistent with the access and usage dimension results, after the implication on interest subsidy, the PBC MSMEs tend to be less active in exploring financing products and services other than PBC compared to non-PBC MSMEs.

Regarding to the relationship on impact dimensions, the coefficients of people's business credit (PBC) are positive and significant with business performance (impact 1), personal welfare (impact 4), and the usage of nonformal financial products (impact 5). Also, the interaction variable (PBC*post) shows positive and significant results on impact 2. However, the interaction variable coefficients (PBC*post) become negative significant with business performance (impact 1) and nonformal financial products usage (impact 5). From this finding, it indicates that the PBC program has successfully accelerated the development of PBC MSMEs. The result demonstrates that PBC MSMEs have become more active in using financial products and services related to their business's progress (such as working capital credit, leasing, and micro or fire insurance) than the non-PBC MSMEs. However, further analysis is consistent with the other three dimensions. It shows that PBC MSMEs tend to be less active in using non-subsidized financing products than non-PBC MSMEs (impact1). Furthermore, the PBC program impacts accelerating MSMEs to leave nonformal financial products and services (such as loan sharks), as shown in impact 5.

Later, we examine the control variables' impact on financial inclusion. As shown in table 8, technology adoption positively and significantly impacts the quality and financial inclusion index. The results imply that MSMEs who adopt technology in their daily transaction (such as computerized bookkeeping systems, online shops, and electronic transactions), both with suppliers or consumers, have a higher financial inclusion level. Similarly, entrepreneur ambition has a positive and significant impact on access. It implies that MSMEs with a higher entrepreneurship level have the intention to develop their business. Hence these MSMEs will need access and active use of formal financial products and services to get a capital injection.

The financial system institutional impact is positive and significant for the usage, quality, impact, and financial inclusion index. However, the coefficient is negative significant for the access dimension. It indicates that better institutional quality will increase people's trust in the financial system, hence reinforcing financial inclusion (Rojas-Suarez, 2010; Honohan, 2008). In contrast, the control variable of a financial system in structural have a negative and significant impact on the access, usage, quality, and financial inclusion. The result implies that the structure of the financial system cannot support the availability of free information resources regarding financial products and services, the incentives, and the financial services system's security. Therefore this situation leads to the failure in boosting financial inclusion.

Table 8 also shows that respondents' financial knowledge and financial self-awareness are positively correlated with financial product usage and quality. Moreover, the higher financial literacy is, the higher its impact on business performance. As a result, the overall financial inclusion index will also positively affected. In addition, education and income have a positive and significant effect on the financial inclusion index. However, we find that marital status does not affect the financial inclusion index.

4.3 Robustness Checks

Instead of directly regressing all variables in the empirical model, we employ an incremental regression to provide consistent results. Concerning our variables of interest, the result is persistent with the baseline regression (see Appendix 1, tables A1-A5).

Table 8. Baseline Regression Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	**access**	**usage**	**quality**	**impact**	**FI_index**	**Access**	**usage**	**quality**	**impact**	**FI_index**
post	-0.0432**	0.570***	0.400***	0.366***	0.581***					
	(0.0211)	(0.0172)	(0.0178)	(0.0212)	(0.0182)					
PBC	1.032***	0.260***	0.207***	0.293***	0.255***					
	(0.0248)	(0.0210)	(0.0222)	(0.0278)	(0.0229)					
PBC*post						0.622***	0.790***	0.404***	0.537***	0.704***
						(0.0243)	(0.0304)	(0.0263)	(0.0318)	(0.0286)
techadpt	-0.0493***	0.00773	0.0584***	0.00380	0.0348***	-0.0544***	0.00867*	0.0583***	0.00363	0.0355***
	(0.00552)	(0.00500)	(0.00547)	(0.00591)	(0.00530)	(0.00578)	(0.00501)	(0.00556)	(0.00592)	(0.00538)
entambi	0.00434***	-0.000369	0.000740	0.00252	0.000806	0.00947***	-0.00133	0.000778	0.00270	0.000115
	(0.00157)	(0.00144)	(0.00141)	(0.00170)	(0.00149)	(0.00164)	(0.00142)	(0.00141)	(0.00168)	(0.00149)
finsysin	-0.0395***	0.0111***	0.0162***	0.0187***	0.0218***	-0.0401***	0.0112***	0.0162***	0.0186***	0.0219***
	(0.00347)	(0.00221)	(0.00207)	(0.00283)	(0.00230)	(0.00329)	(0.00220)	(0.00208)	(0.00286)	(0.00233)
finsysstrk	-0.0353***	-0.0968***	-0.0753***	0.0161**	-0.0710***	-0.0317***	-0.0974***	-0.0753***	0.0162**	-0.0715***
	(0.00637)	(0.00664)	(0.00650)	(0.00673)	(0.00651)	(0.00664)	(0.00668)	(0.00656)	(0.00677)	(0.00662)
litknow	-0.0263***	0.148***	0.0757***	0.0556***	0.125***	0.0187***	0.140***	0.0761***	0.0571***	0.119***
	(0.00547)	(0.00495)	(0.00521)	(0.00618)	(0.00526)	(0.00556)	(0.00502)	(0.00523)	(0.00600)	(0.00524)
litself	-0.0182***	0.136***	0.131***	0.0441***	0.140***	-0.0144***	0.135***	0.131***	0.0442***	0.139***
	(0.00304)	(0.00646)	(0.00611)	(0.00493)	(0.00626)	(0.00322)	(0.00641)	(0.00615)	(0.00493)	(0.00627)
educ	-0.0415***	0.00375	0.0926***	0.0306***	0.0578***	-0.0378***	0.00305	0.0926***	0.0307***	0.0573***
	(0.00897)	(0.00754)	(0.00792)	(0.00946)	(0.00810)	(0.00945)	(0.00757)	(0.00800)	(0.00948)	(0.00820)
marital	-0.0384	0.00234	-0.0688**	0.0257	-0.0187	-0.0272	-0.00106	-0.0694**	0.0253	-0.0214
	(0.0320)	(0.0265)	(0.0288)	(0.0315)	(0.0280)	(0.0330)	(0.0265)	(0.0294)	(0.0314)	(0.0285)
income	-0.0341***	0.0584***	0.0668***	0.106***	0.0982***	0.0557***	0.0416***	0.0675***	0.109***	0.0862***
	(0.0108)	(0.0118)	(0.0113)	(0.0144)	(0.0122)	(0.0112)	(0.0113)	(0.0110)	(0.0138)	(0.0118)
Constant	0.440***	-0.550***	-1.164***	-1.208***	-1.252***	0.115	-0.207**	-0.965***	-1.035***	-0.920***
	(0.106)	(0.0968)	(0.0941)	(0.118)	(0.101)	(0.110)	(0.0954)	(0.0937)	(0.117)	(0.101)
Observations	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682
R-squared	0.159	0.488	0.455	0.149	0.493	0.083	0.488	0.442	0.146	0.482

This table presents the baseline regression results employing the difference-in-difference method for panel data of 3.095 treated MSMEs and 3.704 control group MSMEs.

We estimate the following equation using regression with robust standard:

$$Y_{i,t} = \alpha + \beta_1 PBC_i + \beta_2 Post_t + \beta_3 Post_t * PBC_i + \beta_4 TechnologyAdoption_i + \beta_5 EntrepreneurAmbition_i + \beta_6 FinancialSystemInstitutional_i + \beta_7 FinancialSystemStructural_i + \beta_8 FinancialKnowledge_i + \beta_9 FinancialSelfAwareness_i + \beta_{10} SocioEconomy_i + \varepsilon_{i,t}$$

Standard errors are shown in parentheses. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 9. Regression with Each Financial Inclusion Indicators

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
VARIABLES	access 1	access 2	access 3	access 4	access 5	usage 1	usage 2	usage 3	usage 4	quality 1	quality 2
Post	0.0387***	-0.0170	0.0906***	-0.0190	0.344***	0.186***	0.0503***	0.288***	0.138***	0.284***	0.00113
	(0.0105)	(0.0201)	(0.0216)	(0.0226)	(0.0138)	(0.0212)	(0.0145)	(0.0133)	(0.0121)	(0.0254)	(0.00120)
PBC	0.888***	-0.162***	-0.925***	1.263***	0.0538**	-0.169***	0.504***	-0.162***	-0.0770***	-0.239***	-0.0232
	(0.0318)	(0.0284)	(0.0242)	(0.0193)	(0.0226)	(0.0256)	(0.0264)	(0.0214)	(0.0223)	(0.0226)	(0.0233)
PBC*post	0.0687*	0.110***	-0.122***	0.0442*	0.336***	-0.0945***	0.291***	0.275***	0.481***	0.0936***	0.0414
	(0.0367)	(0.0374)	(0.0309)	(0.0243)	(0.0298)	(0.0359)	(0.0355)	(0.0290)	(0.0314)	(0.0322)	(0.0425)
techadpt	0.00836**	-0.0242***	0.0404***	-0.0186***	0.0432***	0.000709	-0.00327	0.0223***	-0.00891**	0.0210***	-0.000860
	(0.00418)	(0.00448)	(0.00414)	(0.00348)	(0.00405)	(0.00508)	(0.00424)	(0.00400)	(0.00403)	(0.00424)	(0.000738)
entambi	-0.00593***	0.00277**	-0.00114	0.00166	-0.000660	0.00269*	0.000923	0.000997	-0.00284**	-0.000279	0.00202
	(0.00120)	(0.00138)	(0.00116)	(0.00101)	(0.00113)	(0.00156)	(0.00135)	(0.00105)	(0.00115)	(0.00114)	(0.00203)
finsysin	0.00672***	-0.00957***	0.0319***	-0.0271***	0.00423***	0.0163***	0.000421	0.00328**	0.00845***	0.00956***	-0.000339
	(0.00178)	(0.00182)	(0.00353)	(0.00218)	(0.00148)	(0.00270)	(0.00123)	(0.00157)	(0.00185)	(0.00229)	(0.000327)
finsysstrk	0.0339***	-0.0265***	0.0117**	-0.0190***	-0.0688***	0.0321***	0.00292	-0.0763***	-0.0833***	0.000669	-0.00324
	(0.00499)	(0.00528)	(0.00542)	(0.00369)	(0.00485)	(0.00564)	(0.00487)	(0.00507)	(0.00539)	(0.00469)	(0.00318)
litknow	-0.0178***	-0.00183	0.0579***	0.00462	0.0564***	0.0164***	0.0173***	0.0632***	0.150***	0.0558***	0.00871
	(0.00450)	(0.00430)	(0.00420)	(0.00359)	(0.00387)	(0.00486)	(0.00485)	(0.00391)	(0.00423)	(0.00470)	(0.00868)
litself	0.00389*	-0.00863***	0.00751***	-0.00692***	0.0785***	0.0308***	0.0342***	0.107***	0.0743***	0.0124***	-0.00462
	(0.00228)	(0.00280)	(0.00251)	(0.00157)	(0.00420)	(0.00516)	(0.00362)	(0.00507)	(0.00475)	(0.00219)	(0.00461)
Constant	-0.378***	0.297***	-0.708***	-0.255***	-0.611***	-0.788***	-0.586***	-0.353***	0.227***	-0.747***	-0.158
	(0.0795)	(0.0894)	(0.0814)	(0.0676)	(0.0729)	(0.103)	(0.0916)	(0.0699)	(0.0773)	(0.0782)	(0.152)
Observations	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682
R-squared	0.199	0.018	0.228	0.407	0.409	0.055	0.196	0.444	0.377	0.090	0.001

This table presents the baseline regression results employing the difference-in-difference method for panel data of 3.095 treated MSMEs and 3.704 control group MSMEs.

We estimate the following equation using regression with robust standard:

$$Y_{i,t} = \alpha + \beta_1 PBC_i + \beta_2 Post_t + \beta_3 Post_t * PBC_i + \beta_4 TechnologyAdoption_i + \beta_5 EntrepreneurAmbition_i + \beta_6 FinancialSystemInstitutional_i + \beta_7 FinancialSystemStructural_i + \beta_8 FinancialKnowledge_i + \beta_9 FinancialSelfAwareness_i + \beta_{10} SocioEconomy_i + \varepsilon_{i,t}$$

Standard errors are shown in parentheses. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 9. Regression with Each Financial Inclusion Indicators (Cont.)

	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
VARIABLES	**quality 3**	**quality 4**	**quality 5**	**quality 6**	**quality 7**	**impact 1**	**impact 2**	**impact 3**	**impact 4**	**impact 5**
Post	0.00941	0.0459**	-0.0213	0.133***	0.325***	0.119***	0.164***	0.122***	0.117***	0.00592
	(0.0305)	(0.0183)	(0.0176)	(0.0135)	(0.0131)	(0.0119)	(0.0208)	(0.0215)	(0.0185)	(0.00562)
PBC	0.0562	0.0670**	-0.0262	0.194***	0.213***	0.749***	-0.220***	-0.157***	0.101***	0.131***
	(0.0380)	(0.0287)	(0.0213)	(0.0256)	(0.0203)	(0.0266)	(0.0201)	(0.0265)	(0.0263)	(0.0382)
PBC*post	-0.00943	-0.0981***	0.1000***	-0.104***	0.0805***	-0.101***	0.577***	-0.0427	0.0289	-0.122***
	(0.0305)	(0.0361)	(0.0261)	(0.0332)	(0.0270)	(0.0364)	(0.0350)	(0.0359)	(0.0367)	(0.0414)
techadpt	0.000646	0.0115**	-0.00369	0.0388***	0.0367***	0.00174	-8.02e-06	0.00257	0.00355	-0.00285
	(0.00206)	(0.00455)	(0.00335)	(0.00471)	(0.00377)	(0.00418)	(0.00437)	(0.00530)	(0.00468)	(0.00372)
entambi	-0.00244	0.00416***	0.00237*	-8.36e-05	0.000446	0.00322***	0.000155	0.00296**	-9.71e-05	-0.000966
	(0.00155)	(0.00152)	(0.00131)	(0.00127)	(0.000973)	(0.00120)	(0.00126)	(0.00131)	(0.00139)	(0.00228)
finsysin	0.000756*	0.0440***	-0.134***	0.00551***	0.00227	0.00218	0.01000***	0.0120***	0.00819***	0.0358***
	(0.000457)	(0.00350)	(0.00544)	(0.00170)	(0.00139)	(0.00172)	(0.00210)	(0.00252)	(0.00191)	(0.00863)
finsysstrk	-0.00424	0.0733***	-0.00144	-0.0558***	-0.0741***	0.00623	0.0112**	0.0203***	-0.00145	-0.00870
	(0.00508)	(0.00674)	(0.00579)	(0.00545)	(0.00466)	(0.00519)	(0.00499)	(0.00563)	(0.00526)	(0.00725)
litknow	0.00569	0.00383	0.00582*	0.0307***	0.0560***	0.0269***	0.0437***	0.0157***	0.0238***	0.0126
	(0.00521)	(0.00487)	(0.00346)	(0.00423)	(0.00368)	(0.00392)	(0.00475)	(0.00504)	(0.00477)	(0.00935)
litself	0.00183**	0.0204***	0.00111	0.0854***	0.102***	0.00511*	0.0122***	0.0291***	0.0371***	-0.000490
	(0.000924)	(0.00350)	(0.00165)	(0.00495)	(0.00443)	(0.00303)	(0.00297)	(0.00488)	(0.00370)	(0.00152)
Constant	0.00569	0.00334	-0.00287	0.0584***	0.0499***	-0.00969	-0.00552	0.0361***	0.0348***	-0.00582
	(0.00437)	(0.00744)	(0.00569)	(0.00677)	(0.00559)	(0.00721)	(0.00683)	(0.00858)	(0.00758)	(0.00421)
Observations	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682
R-squared	0.002	0.107	0.463	0.296	0.508	0.196	0.096	0.045	0.080	0.036

This table presents the baseline regression results employing the difference-in-difference method for panel data of 3.095 treated MSMEs and 3.704 control group MSMEs.

We estimate the following equation using regression with robust standard:

$$Y_{i,t} = \alpha + \beta_1 PBC_i + \beta_2 Post_t + \beta_3 Post_t * PBC_i + \beta_4 TechnologyAdoption_i + \beta_5 EntrepreneurAmbition_i + \beta_6 FinancialSystemInstitutional_i + \beta_7 FinancialSystemStructural_i + \beta_8 FinancialKnowledge_i + \beta_9 FinancialSelfAwareness_i + \beta_{10} SocioEconomy_i + \varepsilon_{i,t}$$

Standard errors are shown in parentheses. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

5. Conclusion and Policy Recommendation

This research empirically investigates the impact of the PBC program on responsible and sustainable financial inclusion level of MSMEs. We collect 6,341 respondents consist of 2,646 MSMEs with PBC program as treatment group and 3,695 MSMEs without PBC Program as control group. Our results reveal that financial inclusion index of MSMEs with PBC program is higher than of its control group. MSMEs with PBC program is more active in using the access to formal or semiformal financial products and services, higher migrate level from nonformal financial products and services, and higher frequency of transactions through formal financial products and services than MSMEs without.

We also find that MSMEs with PBC program gain a higher understanding level of their needs for financial products and services. Thus, MSMEs with PBC program have capabilities to take advantage of any formal financial products and services offered including benefit of financial diversification, not only around savings and financing products but also in investment products, insurance, pension funds, and other additional products. Consequently, this higher level of inclusiveness in the financial system impact positively to their business development and encourage them to use more diverse financial products and services related to the business compare to MSMEs without PBC program.

On the other hand, our findings indicate PBC program cause a migration from high interest loan users to low interest loan users. This is a drawback for MSMEs business development since PBC program loan credit plafond is up to amounted of IDR500 million (approx. USD 4,500). Our results shows that reduce in diversity of financing products and services range (access3, usage2, and impact1) owned by MSMEs with PBC program compare to those owned by its control group.

Our deeper analysis also reveals that the application of digital technology, which is measured by access, the use, and frequency of digital finance usage, can accelerate financial inclusion in MSME sector. The impact of PBC program is significantly positive to access5 (access to digital finance), usage3 (frequency of use in digital channel), and quality7 (frequency of use digital finance). This findings is consistent with PCA estimation results used for measuring index of financial inclusion, which reveals that the largest weight of Principal Component for Access, Usage, and Quality is from access, ownerships, and frequency of digital channel usage.

This research proves that the positive impact of PBC program on financial inclusion is not only access to formal finance but also utilization of those access by MSMEs which will bring welfare. The level of responsible and sustainable financial inclusion is reflected in the frequency and diversity of financial product and services usage—not only savings, but also loan, financing, insurance, pension funds, investments, and other products—by MSMEs.

Eventually, those will encourage business development and ultimately increase the quality of life and sustainable economic development.

These findings carry substantial contributions to policy implication for PBC program and financial inclusion. We find strong evidence that PBC program cause migration of high-cost or commercial financing to subsidized financing (PBC program loan) indicate that the PBC program is mostly enjoyed by the underbanked, not its target: the unbanked communities. Therefore, to expand PBC program outreach for unbanked communities, it is necessary to add source of funds from central government and municipal. Currently, source of funds for the PBC program loan is banks'third-party funds thus it limit the outreach of the program. Central government and municipal funds placement in bank will expand the program outreach. This action may encourage banking industry to prioritize MSMEs sector particularly in finding the unbanked in their business strategy and target achievement. Thus, the program will successfully achieve its target, the unbanked. Furthermore, expansion of outreach and availability of PBC program may create more opportunities for the unbanked to enjoy affordable loan. This will, eventually, drive banks to decrease the commercial interest rate.

Furthermore, we find strong evidence that digital technology have a substantial impact on encouraging entrepreneurship and accelerating financial inclusion. Hence, it is necessary to consider the digitization of MSMEs from downstream to upstream, starting from value chain, the distribution process from suppliers (raw materials) to consumers, daily operational, and capital needs (digitalized financial transaction processes). In short, MSMEs needs to be ready for digitally onboarding, thus technical assistance is important to scale up MSMEs' capabilities and compatibility. Moreover, integration of PBC program and digital technology may improve loan features to be matched to MSMEs' needs.

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Appendix 1. Robustness Check Tables

Table A.1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	**access**	**access**	**access**	**access**	**access**	**access**	**access**	**access**	**access**	**access**
PBC*post	0.621***	0.666***	0.651***	0.643***	0.650***	0.633***	0.639***	0.642***	0.642***	0.622***
	(0.0235)	(0.0241)	(0.0242)	(0.0233)	(0.0233)	(0.0240)	(0.0241)	(0.0242)	(0.0242)	(0.0243)
techadpt		-0.0561***	-0.0614***	-0.0611***	-0.0606***	-0.0650***	-0.0562***	-0.0517***	-0.0518***	-0.0544***
		(0.00489)	(0.00499)	(0.00491)	(0.00491)	(0.00523)	(0.00556)	(0.00574)	(0.00574)	(0.00578)
entambi			0.00771***	0.00903***	0.00930***	0.00867***	0.00920***	0.00983***	0.00982***	0.00947***
			(0.00163)	(0.00160)	(0.00160)	(0.00162)	(0.00162)	(0.00164)	(0.00164)	(0.00164)
finsysin				-0.0422***	-0.0413***	-0.0410***	-0.0406***	-0.0408***	-0.0408***	-0.0401***
				(0.00325)	(0.00327)	(0.00327)	(0.00326)	(0.00326)	(0.00327)	(0.00329)
finsysstrk					-0.0158***	-0.0217***	-0.0310***	-0.0317***	-0.0316***	-0.0317***
					(0.00587)	(0.00638)	(0.00666)	(0.00666)	(0.00665)	(0.00664)
litknow						0.0144***	0.0209***	0.0232***	0.0233***	0.0187***
						(0.00534)	(0.00551)	(0.00553)	(0.00553)	(0.00556)
litself							-0.0142***	-0.0128***	-0.0128***	-0.0144***
							(0.00319)	(0.00321)	(0.00321)	(0.00322)
educ								-0.0313***	-0.0314***	-0.0378***
								(0.00935)	(0.00935)	(0.00945)
marital									-0.0221	-0.0272
									(0.0329)	(0.0330)
income										0.0557***
										(0.0112)
Constant	-0.130***	0.344***	-0.0357	-0.0658	0.0317	0.112	0.0857	0.117	0.137	0.115
	(0.0133)	(0.0413)	(0.0912)	(0.0899)	(0.0984)	(0.105)	(0.104)	(0.104)	(0.110)	(0.110)
Observations	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682
R-squared	0.038	0.049	0.051	0.078	0.078	0.079	0.081	0.081	0.081	0.083

Standard errors are shown in parentheses. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table A.2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	**usage**	**usage**	**usage**	**usage**	**usage**	**usage**	**usage**	**usage**	**usage**	**usage**
PBC*post	1.215***	1.083***	1.060***	1.061***	1.106***	0.867***	0.806***	0.805***	0.805***	0.790***
	(0.0406)	(0.0377)	(0.0379)	(0.0379)	(0.0379)	(0.0353)	(0.0302)	(0.0301)	(0.0302)	(0.0304)
techadpt		0.165***	0.157***	0.157***	0.160***	0.0965***	0.0118**	0.0106**	0.0106**	0.00867*
		(0.00533)	(0.00552)	(0.00552)	(0.00547)	(0.00523)	(0.00494)	(0.00504)	(0.00503)	(0.00501)
entambi			0.0116***	0.0115***	0.0132***	0.00421***	-0.000913	-0.00107	-0.00107	-0.00133
			(0.00178)	(0.00178)	(0.00174)	(0.00162)	(0.00141)	(0.00142)	(0.00142)	(0.00142)
finsysin				0.00421*	0.00982***	0.0144***	0.0107***	0.0107***	0.0107***	0.0112***
				(0.00236)	(0.00238)	(0.00222)	(0.00220)	(0.00220)	(0.00220)	(0.00220)
finsysstrk					-0.101***	-0.187***	-0.0975***	-0.0974***	-0.0974***	-0.0974***
					(0.00688)	(0.00786)	(0.00669)	(0.00669)	(0.00669)	(0.00668)
litknow						0.207***	0.144***	0.143***	0.143***	0.140***
						(0.00543)	(0.00497)	(0.00497)	(0.00497)	(0.00502)
litself							0.137***	0.136***	0.136***	0.135***
							(0.00631)	(0.00638)	(0.00638)	(0.00641)
educ								0.00783	0.00784	0.00305
								(0.00750)	(0.00751)	(0.00757)
marital									0.00279	-0.00106
									(0.0265)	(0.0265)
income										0.0416***
										(0.0113)
Constant	-0.254***	-1.648***	-2.222***	-2.219***	-1.594***	-0.436***	-0.180**	-0.188**	-0.190**	-0.207**
	(0.00956)	(0.0429)	(0.0957)	(0.0957)	(0.101)	(0.105)	(0.0914)	(0.0915)	(0.0952)	(0.0954)
Observations	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682
R-squared	0.133	0.219	0.222	0.222	0.246	0.348	0.487	0.487	0.487	0.488

Standard errors are shown in parentheses. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table A.3

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	quality	quality	quality	quality	quality	quality	quality	quality	quality	quality
PBC*post	0.825***	0.653***	0.626***	0.628***	0.674***	0.498***	0.437***	0.428***	0.429***	0.404***
	(0.0350)	(0.0320)	(0.0322)	(0.0321)	(0.0317)	(0.0307)	(0.0262)	(0.0260)	(0.0260)	(0.0263)
techadpt		0.215***	0.206***	0.206***	0.209***	0.162***	0.0766***	0.0618***	0.0615***	0.0583***
		(0.00561)	(0.00576)	(0.00576)	(0.00566)	(0.00572)	(0.00548)	(0.00556)	(0.00555)	(0.00556)
entambi			0.0136***	0.0133***	0.0151***	0.00841***	0.00324**	0.00123	0.00121	0.000778
			(0.00170)	(0.00170)	(0.00167)	(0.00160)	(0.00141)	(0.00141)	(0.00141)	(0.00141)
finsysin				0.00936***	0.0152***	0.0186***	0.0148***	0.0153***	0.0153***	0.0162***
				(0.00225)	(0.00229)	(0.00224)	(0.00210)	(0.00208)	(0.00208)	(0.00208)
finsysstrk					-0.105***	-0.168***	-0.0776***	-0.0754***	-0.0752***	-0.0753***
					(0.00670)	(0.00785)	(0.00663)	(0.00657)	(0.00657)	(0.00656)
litknow						0.152***	0.0887***	0.0814***	0.0816***	0.0761***
						(0.00595)	(0.00519)	(0.00517)	(0.00517)	(0.00523)
litself							0.138***	0.134***	0.133***	0.131***
							(0.00616)	(0.00613)	(0.00613)	(0.00615)
educ								0.101***	0.100***	0.0926***
								(0.00791)	(0.00791)	(0.00800)
marital									-0.0632**	-0.0694**
									(0.0294)	(0.0294)
income										0.0675***
										(0.0110)
Constant	-0.172***	-1.989***	-2.658***	-2.651***	-2.006***	-1.153***	-0.895***	-0.996***	-0.938***	-0.965***
	(0.0119)	(0.0438)	(0.0927)	(0.0927)	(0.0973)	(0.105)	(0.0914)	(0.0903)	(0.0937)	(0.0937)
Observations	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682
R-squared	0.061	0.206	0.210	0.211	0.236	0.291	0.433	0.440	0.440	0.442

Standard errors are shown in parentheses. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table A.4

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	**impact**	**impact**	**impact**	**impact**	**impact**	**impact**	**impact**	**impact**	**impact**	**impact**
PBC*post	0.802***	0.737***	0.715***	0.719***	0.709***	0.603***	0.581***	0.577***	0.577***	0.537***
	(0.0316)	(0.0312)	(0.0314)	(0.0313)	(0.0316)	(0.0318)	(0.0314)	(0.0314)	(0.0314)	(0.0318)
techadpt		0.0820***	0.0744***	0.0743***	0.0737***	0.0454***	0.0150***	0.00863	0.00880	0.00363
		(0.00502)	(0.00508)	(0.00507)	(0.00509)	(0.00529)	(0.00568)	(0.00592)	(0.00592)	(0.00592)
entambi			0.0110***	0.0105***	0.0101***	0.00609***	0.00425**	0.00338**	0.00340**	0.00270
			(0.00173)	(0.00173)	(0.00172)	(0.00171)	(0.00168)	(0.00169)	(0.00169)	(0.00168)
finsysin				0.0176***	0.0165***	0.0185***	0.0172***	0.0174***	0.0173***	0.0186***
				(0.00290)	(0.00288)	(0.00289)	(0.00287)	(0.00287)	(0.00287)	(0.00286)
finsysstrk					0.0214***	-0.0166**	0.0155**	0.0164**	0.0163**	0.0162**
					(0.00588)	(0.00672)	(0.00683)	(0.00681)	(0.00680)	(0.00677)
litknow						0.0920***	0.0693***	0.0662***	0.0660***	0.0571***
						(0.00613)	(0.00603)	(0.00600)	(0.00600)	(0.00600)
litself							0.0491***	0.0472***	0.0473***	0.0442***
							(0.00497)	(0.00497)	(0.00497)	(0.00493)
educ								0.0432***	0.0433***	0.0307***
								(0.00935)	(0.00935)	(0.00948)
marital									0.0355	0.0253
									(0.0316)	(0.0314)
income										0.109***
										(0.0138)
Constant	-0.167***	-0.860***	-1.403***	-1.390***	-1.522***	-1.007***	-0.915***	-0.958***	-0.991***	-1.035***
	(0.0117)	(0.0412)	(0.0963)	(0.0961)	(0.105)	(0.112)	(0.111)	(0.110)	(0.117)	(0.117)
Observations	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682
R-squared	0.064	0.087	0.090	0.095	0.096	0.118	0.138	0.139	0.139	0.146

Standard errors are shown in parentheses. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table A.5

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	FI_index	FI_index	FI_index	FI_index	FI_index	FI_index	FI_index	FI_index	FI_index	FI_index
PBC*post	1.189***	1.022***	0.993***	0.996***	1.034***	0.805***	0.741***	0.735***	0.735***	0.704***
	(0.0389)	(0.0355)	(0.0358)	(0.0357)	(0.0357)	(0.0336)	(0.0286)	(0.0285)	(0.0285)	(0.0286)
techadpt		0.208***	0.198***	0.197***	0.200***	0.139***	0.0495***	0.0396***	0.0396***	0.0355***
		(0.00556)	(0.00573)	(0.00572)	(0.00569)	(0.00555)	(0.00531)	(0.00542)	(0.00541)	(0.00538)
entambi			0.0151***	0.0146***	0.0161***	0.00744***	0.00202	0.000666	0.000661	0.000115
			(0.00185)	(0.00185)	(0.00182)	(0.00170)	(0.00148)	(0.00149)	(0.00149)	(0.00149)
finsysin				0.0153***	0.0201***	0.0245***	0.0205***	0.0208***	0.0208***	0.0219***
				(0.00248)	(0.00255)	(0.00245)	(0.00234)	(0.00234)	(0.00234)	(0.00233)
finsysstrk					-0.0859***	-0.167***	-0.0729***	-0.0714***	-0.0714***	-0.0715***
					(0.00687)	(0.00795)	(0.00667)	(0.00664)	(0.00663)	(0.00662)
litknow						0.198***	0.131***	0.126***	0.126***	0.119***
						(0.00600)	(0.00526)	(0.00522)	(0.00522)	(0.00524)
litself							0.145***	0.142***	0.142***	0.139***
							(0.00625)	(0.00626)	(0.00627)	(0.00627)
educ								0.0673***	0.0673***	0.0573***
								(0.00812)	(0.00812)	(0.00820)
marital									-0.0134	-0.0214
									(0.0285)	(0.0285)
income										0.0862***
										(0.0118)
Constant	-0.248***	-2.004***	-2.747***	-2.736***	-2.206***	-1.100***	-0.830***	-0.897***	-0.885***	-0.920***
	(0.0116)	(0.0444)	(0.0997)	(0.0996)	(0.106)	(0.111)	(0.0970)	(0.0963)	(0.101)	(0.101)
Observations	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682	12,682
R-squared	0.113	0.233	0.238	0.241	0.256	0.338	0.476	0.479	0.479	0.482

Standard errors are shown in parentheses. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Appendix 2. Descriptive Statistics of Financial Inclusion Indicators

Table A.6

	Full Sample					Treatment Group = PBC MSMEs					Control Group = Non PBC MSMEs				
	Obs	Mean	Std. Dev.	min	max	Obs	Mean	Std. Dev.	min	max	Obs	Mean	Std. Dev.	min	max
access 1	12682	20.708	28.236	0	100	5292	34.705	36.991	0	100	7390	10.685	12.15	0	100
access 2	12682	-30.2	24.32	-100	0	5292	-32.343	27.954	-100	0	7390	-28.666	21.211	-100	0
access 3	12682	7.362	12.124	0	100	5292	2.695	10.306	0	100	7390	10.704	12.224	0	100
access 4	12682	-17.299	21.741	-100	0	5292	-1.427	8.494	-100	0	7390	-28.666	21.211	-100	0
access 5	12682	11.771	16.219	0	100	5292	17.147	18.505	0	100	7390	7.922	13.066	0	100
usage 1	12682	1.263	5.692	0	100	5292	1.205	6.117	0	100	7390	1.305	5.367	0	100
usage 2	12682	3.559	8.101	0	100	5292	7.309	9.932	0	100	7390	.873	4.97	0	100
usage 3	12682	7.287	13.23	0	100	5292	10.15	15.487	0	100	7390	5.237	10.888	0	100
usage 4	12682	6.031	12.022	0	100	5292	10.083	15.869	0	100	7390	3.13	6.894	0	85.714
quality 1	12682	13.745	16.636	0	100	5292	15.918	17.363	0	100	7390	12.189	15.916	0	100
quality 2	12682	30.016	34.091	0	100	5292	38.99	35.7	0	100	7390	23.589	31.352	0	100
quality 3	12682	-33.454	39.216	-100	0	5292	-43.361	36.931	-100	0	7390	-26.36	39.269	-100	0
quality 4	12682	5.438	21.627	0	100	5292	7.87	25.796	0	100	7390	3.697	17.86	0	100
quality 5	12682	-2.366	13.602	-100	0	5292	-1.838	11.207	-100	0	7390	-2.744	15.075	-100	0
quality 6	12682	10.099	18.665	0	100	5292	14.636	22.36	0	100	7390	6.85	14.648	0	100
quality 7	12682	11.896	15.715	0	100	5292	17.961	17.873	0	100	7390	7.553	12.244	0	100
impact 1	12682	6.746	14.633	0	100	5292	14.04	18.502	0	100	7390	1.523	7.547	0	100
impact 2	12682	3.487	10.72	0	100	5292	4.913	11.809	0	100	7390	2.465	9.74	0	100
impact 3	12682	1.714	8.843	0	100	5292	1.801	9.442	0	100	7390	1.651	8.388	0	100
impact 4	12682	5.672	15.766	0	100	5292	8.56	18.738	0	100	7390	3.604	12.841	0	100
impact 5	12682	.067	1.813	0	100	5292	.15	2.777	0	100	7390	.008	.329	0	20
techadpt	12682	8.609	2.417	5	19	5292	9.243	2.341	5	18	7390	8.156	2.368	6	19
entambi	12682	55.602	7.044	20	75	5292	57.579	7.005	20	75	7390	54.186	6.724	25	74
finsysin	12682	1.055	5.067	0	41	5292	.971	4.904	0	40	7390	1.115	5.179	0	41
finsysstrk	12682	7.51	2.084	0	20	5292	7.907	2.293	0	19	7390	7.227	1.87	0	20
litknow	12682	2.791	2.526	0	10	5292	4.153	1.898	0	10	7390	1.816	2.469	0	10
litself	12682	2.058	4.412	0	58	5292	3.243	5.545	0	58	7390	1.209	3.109	0	43

Appendix 3. Correlation Matrix Pre Treatment

Tabel A.7

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	access1	**access2**	**access3**	**access4**	**access5**	**usage1**	**usage2**	**usage3**	**usage4**	**quality1**	**quality2**
access1	1										
access2	-0.289***	1									
access3	0.182***	-0.0948***	1								
access4	0.186***	0.463***	-0.367***	1							
access5	0.0703***	-0.0665***	0.112***	0.118***	1						
usage1	0.0492***	-0.0338**	0.145***	-0.0487***	0.0355**	1					
usage2	0.162***	-0.106***	-0.0489***	0.200***	0.0270*	0.154***	1				
usage3	0.0139	-0.0456***	0.108***	0.0697***	0.779***	0.0412**	0.0169	1			
usage4	-0.0365**	-0.00994	-0.0562***	0.157***	0.500***	0.00537	0.0361**	0.657***	1		
quality1	0.203***	-0.119***	0.337***	-0.0417***	0.174***	0.245***	0.255***	0.165***	0.00688	1	
quality2	0.335***	0.113***	0.399***	0.179***	0.141***	0.0714***	0.137***	0.139***	0.0287*	0.342***	1
quality3	-0.0337**	0.285***	0.180***	-0.0807***	-0.0531***	0.0141	-0.0575***	-0.0309*	-0.0932***	0.0765***	0.251***
quality4	0.101***	-0.0362**	0.348***	0.00699	0.0332**	0.222***	0.141***	0.0432***	0.0230	0.155***	0.146***
quality5	-0.0339**	0.0349**	-0.0961***	0.123***	-0.00625	-0.0353**	-0.00268	0.00241	0.00467	-0.0258*	-0.0226
quality6	0.0448***	-0.0662***	0.0395**	0.168***	0.855***	0.0162	0.0619***	0.650***	0.525***	0.137***	0.112***
quality7	0.0253*	-0.0651***	0.0830***	0.205***	0.817***	0.0546***	0.149***	0.809***	0.554***	0.230***	0.237***
impact1	-0.0401**	-0.0230	-0.108***	0.271***	0.147***	0.198***	0.200***	0.123***	0.147***	0.108***	0.0632***
impact2	0.0656***	-0.0624***	0.0682***	-0.0738***	-0.00990	0.134***	0.193***	-0.000912	-0.0281*	0.308***	0.0191
impact3	0.0415***	-0.0260*	0.141***	-0.0324**	0.0292*	0.836***	0.129***	0.0418***	-0.00170	0.229***	0.0774***
impact4	0.0929***	-0.123***	0.0690***	0.0411**	0.0607***	0.231***	0.503***	0.0586***	0.0304*	0.427***	0.0885***
impact5	0.0773***	-0.0419***	0.116***	-0.0766***	-0.00527	0.0562***	0.0116	0.00137	0.0402**	0.0253*	0.0254*
N	6341										

Tabel A.7 (Cont.)

Variables	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
	quality3	**quality4**	**quality5**	**quality6**	**quality7**	**impact1**	**impact2**	**impact3**	**impact4**	**impact5**
access1										
access2										
access3										
access4										
access5										
usage1										
usage2										
usage3										
usage4										
quality1										
quality2										
quality3	1									
quality4	0.0110	1								
quality5	-0.00662	-0.0916***	1							
quality6	-0.0841***	0.0516***	-0.0181	1						
quality7	-0.0696***	0.0854***	0.00461	0.709***	1					
impact1	-0.125***	0.0938***	0.0202	0.181***	0.262***	1				
impact2	0.0336**	0.0629***	-0.0234	-0.0246	-0.0255*	0.00820	1			
impact3	0.00503	0.208***	-0.0314*	0.0177	0.0583***	0.122***	0.0750***	1		
impact4	-0.0268*	0.140***	-0.0206	0.0609***	0.127***	0.138***	0.452***	0.279***	1	
impact5	-0.0127	0.0558***	-0.196***	0.00316	0.00215	0.0275*	0.0105	0.0360**	0.0574***	1
N	6341									

Appendix 4. Correlation Matrix Post Treatment

Tabel A.8

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	access1	**access2**	**access3**	**access4**	**access5**	**usage1**	**usage2**	**usage3**	**usage4**	**quality1**	**quality2**
access1	1										
access2	-0.310***	1									
access3	0.107***	-0.0788***	1								
access4	0.222***	0.471***	-0.418***	1							
access5	0.170***	-0.0636***	0.133***	0.146***	1						
usage1	0.0470***	-0.0227	0.167***	-0.0771***	0.152***	1					
usage2	0.159***	-0.0163	-0.142***	0.277***	0.303***	0.0542***	1				
usage3	0.0608***	-0.0407**	0.144***	0.0871***	0.820***	0.138***	0.235***	1			
usage4	0.0442***	0.00490	-0.0328**	0.228***	0.604***	0.110***	0.303***	0.707***	1		
quality1	0.175***	-0.0805***	0.269***	-0.0104	0.351***	0.268***	0.227***	0.305***	0.226***	1	
quality2	0.303***	0.140***	0.273***	0.256***	0.310***	0.0445***	0.153***	0.251***	0.174***	0.284***	1
quality3	-0.0735***	0.325***	0.158***	-0.0276*	-0.00231	0.0386**	-0.0622***	0.00852	-0.0509***	0.0438***	0.196***
quality4	0.0620***	-0.00395	0.321***	-0.0110	0.0930***	0.259***	0.0545***	0.0895***	0.0996***	0.141***	0.0705***
quality5	0.0112	0.00306	-0.0745***	0.113***	0.0290*	-0.0598***	0.0348**	0.0352**	0.0224	-0.0110	0.0251*
quality6	0.177***	-0.0719***	0.169***	0.0136	0.670***	0.117***	0.107***	0.581***	0.298***	0.283***	0.206***
quality7	0.0955***	-0.0467***	0.130***	0.139***	0.888***	0.128***	0.285***	0.877***	0.678***	0.331***	0.292***
impact1	0.0194	-0.0311*	-0.0685***	0.203***	0.187***	0.349***	0.188***	0.161***	0.191***	0.185***	0.153***
impact2	0.0272*	-0.0639***	0.0275*	0.0671***	0.224***	0.177***	0.415***	0.181***	0.221***	0.318***	0.114***
impact3	0.0498***	-0.0138	0.143***	-0.0428***	0.148***	0.831***	0.0608***	0.141***	0.118***	0.232***	0.0524***
impact4	0.0859***	-0.0501***	0.0872***	0.0420***	0.279***	0.271***	0.322***	0.240***	0.221***	0.446***	0.109***
impact5	0.00816	-0.0159	0.232***	-0.134***	-0.0113	0.0280*	0.00522	-0.0108	-0.00569	0.00709	0.0122
N	6341										

Tabel A.8 (Cont.)

Variables	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
	quality3	**quality4**	**quality5**	**quality6**	**quality7**	**impact1**	**impact2**	**impact3**	**impact4**	**impact5**
access1										
access2										
access3										
access4										
access5										
usage1										
usage2										
usage3										
usage4										
quality1										
quality2										
quality3	1									
quality4	0.00757	1								
quality5	-0.0194	-0.0704***	1							
quality6	0.0194	0.0651***	0.0140	1						
quality7	0.00586	0.0965***	0.0351**	0.608***	1					
impact1	-0.0566***	0.145***	0.00835	0.0546***	0.200***	1				
impact2	-0.0131	0.110***	-0.0122	0.0463***	0.198***	0.238***	1			
impact3	0.0221	0.207***	-0.0415***	0.117***	0.137***	0.191***	0.118***	1		
impact4	-0.00161	0.124***	-0.00443	0.191***	0.252***	0.162***	0.374***	0.308***	1	
impact5	-0.0119	0.122***	-0.124***	0.00427	-0.0101	0.0270*	0.00792	0.0131	-0.00111	1
N	6341									

Formulating natural disaster insurance scheme for micro, small, and medium enterprises (MSMEs) in Indonesia

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Abstract

The existence of disaster insurance in Indonesia is particularly important for disaster-prone areas. In recent years, only 2.96% of 64 million MSMEs have disaster insurance. This is because the existing disaster insurance scheme has not fully met the expectations of MSMEs regarding its premium value, its claims mechanism and MSMEs financial capability. This research seeks to explore the factors that influence MSMEs to own disaster insurance, by using quantitative analysis of Panel Fixed Effects Model as the first model and Probit Models as the second and third models as well as qualitative analysis. The result will be utilized to formulate the appropriate disaster insurance product which optimize insurance features based on MSMEs' demand, encourage regulatory support and improve government funding capacity. Indonesia is currently facing approximately IDR19.75 trillion (USD1.4 billion) financing gap to cover the loss caused by disasters hence, there is also a need to create a high-level financing scheme to cover the gap.

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1. Introduction

Indonesia's geographical location along the equator has made it vulnerable to natural disasters. This often brings economic losses and loss of human life thus, slowing down the pace of economic growth in Indonesia. The Indonesia National Disaster Management Agency (BNPB) data shows that within the last 5 years there has been an increase in the frequency of natural disasters in Indonesia. In 2019 alone, there were more than 9,000 natural disaster events including earthquakes, floods, bushfires, and volcanic eruptions. BNPB estimates that the yearly economic losses from natural disasters can reach up to IDR 80 trillion (USD5.6 billion) (BNPB, 2016).

A study conducted by the World Bank (2006) shows that private sectors are most affected by natural disasters in the form of damage to housing, and the cessation of the production process resulting in layoffs. As a disaster-prone country, Indonesia requires adequate disaster management policies tailored to the needs of the public in particular, the micro, small and medium enterprises (MSMEs). Indonesia's economic structure is dominated by MSMEs, reaching 99%, with a contribution of up to 60.34% to Indonesian GDP in 2019. This group has become one of the most vulnerable groups once hit by a natural disaster due to low literacy in both finance and natural disasters.

To determine MSMEs demand and behavior towards purchasing natural disaster insurance and measure the performance of the current natural disaster insurance market, this research addresses the questions through both qualitative and quantitative methods. The quantitative analysis used Panel Fixed Effects Model and Probit Models. The qualitative analysis will address product feature adequacy, regulatory support, funding instruments, and distribution channels through benchmarking analysis of insurance programs in several disaster-prone countries and analyzing Indonesia's insurance market performance, regulatory and financing gaps. This paper also features a high-level discussion on several alternatives for disaster insurance financing mechanisms along with the natural disaster insurance features framework Indonesia can work on.

2. Literature Review

2.1. Natural disaster insurance in disaster-prone countries

A series of benchmarking below aims to evaluate and acknowledge the mechanism and structure of natural disaster insurance programs in various countries. There are 5 countries: the USA, Japan, Mexico, The Philippines, and Thailand which provide a variety of characters to provide insights in planning disaster insurance programs for Indonesia.

2.1.1. The United States of America (USA)

One of USA's national natural disaster insurance programs, the National Flood Insurance Program (NFIP), offers a maximum coverage of USD 250,000 for private homes and USD 100,000 for building contents. Despite the availability of disaster insurance through the

private sector, the US government still functions as the main insurance provider where the government insists on a suppression rate for insurance companies to limit the difference between the rates that can be charged for different disaster classifications and places more stringent limits on the rates for high-risk classifications (He and Faure, 2018). This program is regulated in the National Flood Insurance Act of 1968, The National Flood Insurance Reform Act of 1994, and the Flood Disaster Protection Act 1973. The Flood Disaster Protection Act of 1973 makes it clear that lenders require special flood insurance for properties located in Special Flood Hazard Areas (SFHA). The National Flood Insurance Reform Act of 1994 prevents federal agencies from providing disaster assistance in SFHA to communities that have not joined the NFIP (American Institute for Research, 2005). Insurance regulations in the USA are structured around several main functions, including corporate licensing, producer licensing, product regulation, market behavior, financial regulation, and consumer services.

2.1.2. Japan

The natural disaster management system in Japan is an example of an effective and organized emergency preparedness system due to years of experience and lessons learned that illustrate and confirm its global relevance. Earthquake insurance for households and SMEs has been prepared by simplifying claims assessment so that insurance payments are made quickly for disaster victims. After the Great East Japan Earthquake, insurance payments in Japan reached 1 trillion yen paid out in 3 months (GFDRR, 2012). Disaster insurance regulations in Japan are regulated in the Earthquake Insurance Act of 1966 which stipulates the Japanese Earthquake Reinsurance Co. (JER) as the only earthquake reinsurance company for the private insurance market. The Japanese government works as a de facto reinsurer, because after insurance companies pay claims for earthquake losses, they will be compensated by the government through JER. The maximum liability of the Japanese government, JER, and the private insurance company is 87 percent, 10 percent, and 3 percent, respectively (GIROJ, 2014). This implies as a comprehensive insurance funding scheme in which Indonesia can look up to.

2.1.3. Mexico

The Mexican government established the Natural Disaster Fund (FONDEN) in 1996 as a mechanism to support post-disaster reconstruction of damaged public infrastructure. The FONDEN program becomes the operator center for disaster risk financing and the government's insurance strategy, which combines several financial instruments for various sources of funding, depending on the time and amount of funding needed as well as how to get the funds. Article 37 of the Mexican Federal Budget Act requires the Secretariat of Finance and Public Loans to undertake an annual percentage, not less than 0.4% of its annual federal budget for FONDEN. FONDEN finances its operations using the federal budget, insurance market and CAT bonds which were supported by the World Bank since 2005. FONDEN has issued the world's first CAT bonds of USD160 million which were combined

with a parametric reinsurance scheme of USD290 million for earthquake coverage totaling USD450 million (USD150 million for each zone) and mature in three years (World Bank, 2012). During the FONDEN program, the Mexican government received approximately USD280 million from the traditional reinsurance program and an additional USD200 million from the issuance of CAT Bonds, for a total recovery of nearly half a billion dollars. CAT Bonds have successfully attracted investors globally, ranging from specialty bond funds, asset management, pension funds, hedge funds, and reinsurance companies.

2.1.4. The Philippines

The Philippines developed the PCIDP (Philippines City Insurance Disaster Pool) program which funds cities in the early recovery phase after earthquakes and typhoons that are not covered by existing local resources. PCIDP was developed under the guidance of the Ministry of Finance as part of the 2015 Disaster Risk Financing and Insurance Strategy. This program uses a parametric insurance structure that bases payments on earthquakes and typhoons according to physical damage, rather than actual losses (Asian Development Bank, 2018). The World Bank has been working with the Philippines over the past nine years to strengthen its resilience to natural disasters through CAT bonds which provides protection against earthquakes and tropical storms in 25 provinces. In 2019, the World Bank issued a two-phase disaster-related bond to provide the Philippines with financial protection of up to USD75 million against losses from earthquakes and USD150 million against losses from tropical cyclones over three years (World Bank, 2019). In 2010, the National Disaster Coordinating Council issued Republic Act No. 10121. The regulation focuses on four thematic areas, namely prevention and mitigation, preparedness, response, recovery, and rehabilitation. The Philippine is currently designing a microinsurance program aimed at MSMEs which are fast and accessible so they can start rebuilding after a natural disaster.

2.1.5. Thailand

Due to a massive flood in 2011 which was declared as one of the biggest insurance losses with the country's economic loss at THB1.4 trillion (USD47 billion), the government decided to develop a natural disaster insurance program. The program involved a pool of funds with an initial size of 50 billion baht (about USD1.57 billion). The fund provided protection for floods, windstorms, and earthquakes. Most insurance companies have a coverage limit of THB100,000 with an annual premium of 0.5% for household damage. For damages suffered by the SME sector, there is a sub-limit of up to 30% of the insured building value with 1% annual premium. Coverage will be available for households, businesses and industrial factory complexes that are affected by the flood event (Willis Thailand, 2012).

The public insurance program in the United States, Japan and Thailand which was firstly initiated by the government and collaborated with private insurance companies could become an initiative for Indonesia to compile a standardized natural disaster insurance program for the MSME sector with a pool-based funding mechanism. Pool of funds has the purpose to

offer affordable premium prices and as a reserved fund when a major disaster strikes in which insurers are unable to pay claims. The Philippines and Mexico are aware of the limited funding from the government in dealing with the damage caused by frequent natural disasters. The implementation of CAT bond-based funding system supported by the World Bank enables them to obtain funding from a wider scope of investors. These countries have also published disaster management regulations that can serve as a reference for private insurance companies to design disaster insurance products.

2.2. Insurance Industry Performance in Indonesia

2.2.1. General performance

During 2016-2019, the insurance industry in Indonesia experienced a growth. The total insurers assets increased by 40.47% or an average of 13.49%. This is supported by an increase in investment, an increase of 46.41% or an average of 15.47% per year. Meanwhile, total liabilities also increased by 47.69% or an average of 15.90%. The premiums collected also increased by 40.88% or an average of 13.63%. On the other hand, the number of claims also increased by 72.12% or an average of 24.04% (BPPDAN, 2019). The increase in claims have been higher than the increase in premium which reduces the profitability of the insurance business to a lesser extent. If the premium spread on claims is IDR132 Trillion (USD9.3 billion) in 2016, it will be only IDR121 Trillion (USD8.6 billion) in 2019 (OJK, 2020). The slowdown in the growth of the insurance industry is still in line with national economic growth in the same period which has not moved from 5%. The Risk Based Capital (RBC) of general insurance companies in 2019 was recorded at 345%, which is greater than the minimum RBC determined under Financial Services Authority (OJK) regulations (120%) (OJK, 2020). This reflects the capital adequacy of the overall Indonesia insurance market for market expansion towards MSMEs natural disaster insurance.

Currently, many insurance companies have issued several household natural disaster insurance products which are marketed as stand-alone products. Based on BPPDAN's annual reports for the last five years regarding disaster insurance policies, Java Island has the largest number of policyholders in Indonesia. This is due to higher public awareness around natural disasters than in other regions. However, other provinces with a high level of disaster risk do not have many policyholders, resulting in a gap between demand and supply of disaster insurance products in Indonesia. Despite the low insurance penetration, some MSMEs have been exposed to microinsurance where it is intended for low incomes entities hence, the insurance imposes lower premiums and insurance policies that are simpler than conventional insurance. OJK in collaboration with Indonesian General Insurance Association (AAUI), Indonesia Life Insurance Association (AAJI), and Indonesia Sharia Insurance Association (AASI) has formulate several microinsurance products, which include: (a) Micro Loss Insurance by AAUI *(Asuransi Mikro Warisanku)*, Rumahku Micro Insurance, Volcanic Eruption Microinsurance *(Stop Usaha Erupsi)*, Earthquake Micro Insurance *(Stop Usaha*

Gempa Bumi); (b) Life Micro Insurance by AAJI (Si Peci); and (c) Sharia Micro Insurance by AASI.

2.2.2. Financing Gaps for National Insurance Program

As of 2019, only 2.96% of 64 million MSMEs in Indonesia have disaster insurance policies. The small percentage of insurance ownership raises questions about whether the current disaster insurance scheme is suitable for their needs as there may be overarching obstacles for MSMEs to purchase insurance. On the supply side, the formulation of natural disaster insurance for MSMEs is highly reliant on the profitability of the product, the potential market share from MSMEs, marketing approach and the adequacy of current government regulation.

Currently, Indonesia's state budget support is not yet sufficient to cover natural disasters and its economic loss. On average, between 2000 and 2017 there was a 75% gap between government disaster recovery budget and the total loss. This situation poses a risk for post-disaster economic recovery in the impacted region. It also creates a variety of risks to the financial institutions owning assets and loans. Indonesia needs a comprehensive high-level financing mechanism to address several challenges in financing disaster insurance. It needs to have the right scale to create an impact, reduces and distributes the risks in the financial sector, and finally be able to make it affordable for the consumers.

Figure 1 shows the current funding mechanism is mostly led by private insurance companies and private reinsurance companies. The insurance company can choose to obtain a bank loan to increase its equity. In this case, private insurance companies can freely manage the design of their products according to their financial capabilities and liquidity ratio. However, in the event of a major catastrophic event, the insurance company may not be able to obtain funds to settle customer claims, increasing the risk of insurance loss. This alternative also runs the risk of a higher premium price, making it less attractive to consumers.

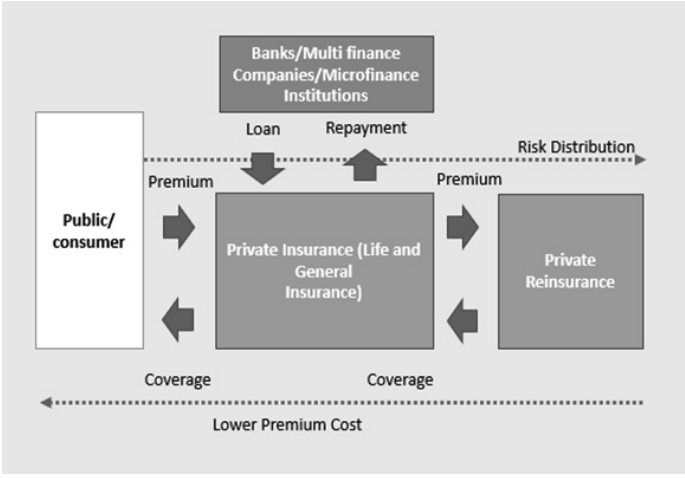

Figure 1. Funding Mechanism Based on Insurance Retention Fund

2.2.3. Regulatory Gaps

Indonesia has a regulation which governs the insurance industry. Law No.40 of 2014 regulates the establishment of an insurance company, the scope and operation of an insurance company which clearly states the position of the OJK as a regulatory and supervisory institution for the financial services sector, one of which is the insurance sector. The law also emphasizes that derivative provisions are needed in the form of Government Regulations related to insurance company legal entities and Financial Services Authority Regulations (POJK) to further regulate insurance products and the implementation of the insurance industry. Article 37 of Law no. 40/2014 explained that the Government and/or the Financial Services Authority, either independently or jointly, can take steps, one of which is to provide facilities for the establishment of an insurance pool or consortium for certain risks, for example the risk of natural disasters. On the other hand, Indonesian Law No.24/2007 on Disaster Management, article 60 of the law states that disaster management funds are a joint responsibility of central government and regional governments and community funding. The government then issued a Government Regulation no. 22 of 2008 on Disaster Aid Funding and Management as a derivative of Article 63 of Law no. 24 of 2007 which stated that only funds from the state budget, regional budget and/or the community will fund disaster management costs.

However, both regulations have not clearly stated the existence of an insurance fund as an alternative for disaster management. The addition of the insurance fund clause will have implications in reducing the burden of utilizing the state budget for natural disaster management. Indonesia Fiscal Policy Agency (BKF) stated that the government only allocated an average of IDR3.1 trillion (USD219 million) between 2005 to 2017 of the state budgets as disaster reserve funds. This financing gap causes Indonesia to be exposed to high fiscal risks due to natural disasters. Hence, in 2018, BKF started to prepare financing and insurance schemes against disaster risk which includes the interest to establish a disaster pooling fund to strengthen the state budget.

3. Methodology

3.1. Data on Policies Numbers (BNPB & BPPDAN)

The secondary data for this study was obtained from several sources such as the National Insurance Data Center Management Agency (BPPDAN), the National Disaster Management Agency (BNPB), the Indonesian Ministry of Small and Medium Enterprises, the Indonesian General Insurance Association (AAUI), and Financial Services Authority (OJK) publications. The secondary data presented in this paper represents micro and macro level data from 2015 to 2019 in the form of panels and cross sections.

3.2. Data on MSMEs Preference (Survey Data)

The primary data is obtained from the results of a survey to MSMEs. The survey was conducted to 503 respondents in 6 disaster-prone provinces: Aceh, West Java, East Java, West Nusa Tenggara, South Sulawesi, and Central Sulawesi[1]. The sample was selected from the list of MSMEs from the 6 provinces and the number of respondents was further determined using the Slovin method with 5% margin of error.

3.3. Econometrics Model and Methodology

The analytical tools for this study consisted of statistical and econometric analysis. Statistical analysis is used to measure the performance of the insurance industry in Indonesia which explains the demographics and insurance market distribution. The econometric analysis used the Fixed Effects Panel Model to determine the factors that influence the number of disaster insurance policies in a province. The results of the analysis are then confirmed with the survey result using the Probit model in the form of MSME preferences for natural disaster insurance products for floods and earthquakes.

3.3.1. Model 1

The quantitative analysis is conducted using 3 models. The first model is using a Fixed Effects Panel Model to interpret disaster insurance policy in Indonesia and intended to look at factors affecting the number of insurance policies in each province.

$$Policy_{it} = \beta_{it} + \beta_2 VarInsurance_{it} + \beta_3 VarDisaster_{it} + \beta_3 VarEconomy_{it} + \alpha i + \varepsilon it$$

Where,

Policy : number of insurance policy available

VarInsurance : number of claims, value of claims, loss ratio, premium, disaster zone characteristic

VarDisaster : *Dummy* variables for flood and earthquake

VarEconomy : year-on-year regional inflation

$\alpha i+\varepsilon it$: *Error term*

3.3.2. Model 2

The second model is conducted using Probit Model assumption and used to look at factors affecting the consumer preferences in purchasing disaster insurance. The dependent variable is run against a set of variables which data is obtained through the survey.

$$Y = \beta_0 + \beta_2 Demographic_i + \beta_3 FinLiteration_i + \beta_3 FinAccess_i + \beta_3 Feature_i + \beta_3 Disaster_i + \beta_3 Incentives_i + \mu$$

Where,

Y : preference probability in purchasing disaster insurance

Demographic : respondents' demographic indicators

[1] These are 6 provinces deemed as disaster-prone areas by the BNPB.

LinLiteration : respondents' financial literacy indicators
FinAccess : respondents' financial access indicators
Feature : disaster insurance features
Disaster : *Dummy* variables for flood and earthquake
Incentives : respondents' preferences indicators
M : *error term*

3.3.3. Model 3

The third model is using Probit Model assumption and intended to look at factors affecting the consumers preference in owning disaster insurance in the future versus those customers who have already purchased disaster insurance. It uses the same structure as the second model, with a different dependent variable.

$$Y = \beta_0 + \beta_2 Demographic_i + \beta_3 FinLiteration_i + \beta_3 FinAccess_i + \beta_3 Feature_i + \beta_3 Disaster_i + \beta_3 Incentives_i + \mu$$

Where,
Y : preference probability in owning disaster insurance
Demographic : respondents' demographic indicators
LinLiteration : respondents' financial literacy indicators
FinAccess : respondents' financial access indicators
Feature : disaster insurance features
Disaster : *Dummy* variables for flood and earthquake
Incentives : respondents' preferences indicators
μ : *error term*

4. Result and Discussion

Table 1. Model 1 Result: Determinants Factors for the Number of Policies

Number of policies (log)	OLS	FE	FE Robust
Constanta	-0.1962 (0,2190)	1.7244 (0.8672)	1.7244 (1.4754)
Value of premium (log)	0.9615*** (0.0307)	0.7885*** (0.0813)	0.7885*** (0.1371)
Number of claims	-0,0001*** (0,0001)	0.0001** (0.0001)	0.0001** (0.0001)
Claim incurred (log)	0,0367* (0,0216)	0.0231*** (0.0082)	0.0231** (0.0089)
Loss of ratio (%)	0,0001 (0,0001)	0.0001 (0.0001)	0.0001 (0.0001)
Zona (1 for dangerous zone, 0 for non-dangerous zone)	-0,0557 (0,0577)	-0,0419* (0,0227)	-0,0419** (0,0181)
Inflasi Regional yoy (%)	-0,0005 (0,0161)	0.0010 (0.0058)	0.0010 (0.0036)

Flood	0,0021*** (0,0006)	-0.0004 (0.0003)	-0.0004 (0.0002)
Earthquake	-0.0348*** (0.0095)	0.0053 (0.0045)	0.0053 (0.0041)
Observation	161	161	161
R-squared	0,9730	0,9661	0.9661

Notes: *; **; *** indicates a significance level at the 10%, 5% and 1% levels

Our analysis using Model 1 shows that the number of insurance policies supplied or offered is positively affected by premium, number of claims, and value of claims emerged after the disaster occurred. However, natural disaster zoning is negatively affecting the number of insurance policies supplied.

It shows that for every 1 percent increase in premium, there could be an increase in the number of insurance policies by 0.78 percent in the region. This could indicate the willingness of the providers in the supply via more aggressive marketing.

There is a positive relationship between the number of claims and the number of insurance policies. An increase in the number of claims by one percent will increase the number of insurance policies by 0.0001 percent significantly. On the other hand, an increase in the value of claim by one percent will increase the number of insurance policies by 0.02 percent.

Higher number or claims and value of claims could also indicate the consumers' awareness and literacy towards insurance products. These results show that policy insurance holders with higher literacy rates and aware of their risks are most likely already have catastrophe insurance. These results only work at the individual level, but not at the regional level.

Interestingly, disaster zoning negatively affects several policies. This could indicate a high-risk perceived by the insurance providers hinders them from actively marketing the disaster insurance in the region marked as disaster prone. This information is particularly useful for policy makers in addressing the high-risk issue faced by the insurance provider as well as keeping affordability on the consumer side.

Table 2. Model 2 Determinant Factors for MSMEs in Purchasing Disaster Insurance

Choose_to_buy	**Coefficient**	**Choose_to_buy**	**Coefficient**
Sex	-0.2277 (0.2298)	Damage_received_flood	6.2619** (2.6038)
Age	-0.0135 (0.0112)	Disaster_intensity_earthquake	-0.0317 (0.0436)
Monthly_income	0.0643 (0.1049)	Damage_received_earthquake	-0.2175 (0.8818)
Years_of_business	-0.0078 (0.0094)	Pref_premi_flood	0.1584 (0.3822)
Dummy_companys_sector	0.2594 (0.2289)	Pref_premi_mechanism	-0.2317 (0.2269)
Dummy_level_MSME	0.4372 (0.3656)	Pref_indemnity_flood	1.5628** (0.7071)

Years_of_using_insurance	0.0398 (0.0335)	Pref_premi_earthquake	0.3061 (0.4798)
Disaster_intensity_flood	-0.2492*** (0.0943)	Pref_indemnity_earthquake	-1.1771* (0.7108)
Constanta	-6.7796* (3.6904)		

Notes: *; **; *** indicates a significance level at the 10%, 5% and 1% levels

Analysis using Model 2 found that disaster intensity, scale of damage, and indemnity preference are positively affecting consumers' probability in purchasing the disaster insurance.

In particular, the scale of damage from flood has high elasticity against the probability of purchasing insurance. A 1 percent increase in the scale of damage from flood will increase 6.26 percent of probability in purchasing disaster insurance. This is also aligned with finding from Model 1 where a 1 percent increase of preference in risk allocation in the insurance increases the probability of its purchase by 1.56 percent. This can also be interpreted as the disaster insurance which can accommodate higher insured value has higher probability to be purchased by the consumer.

About 53 percent of respondents of MSMEs stated their plan to purchase insurance in the future. The higher the level of MSME turnover value, the higher the percentage of MSMEs planning to purchase disaster insurance in the future. The reluctance of MSMEs to buy disaster insurance products indicates the low level of financial capacity to purchase natural disaster insurance.

The demographic distribution of respondents in terms of gender presented 32% of male respondents planned to buy disaster insurance products and 31% of male respondents did not plan to buy disaster insurance products. Meanwhile, 21% of female respondents chose to buy disaster insurance, while 16% of respondents who were female respondents did not plan to buy natural disaster insurance. 70% of the survey respondents accounted for the 30-50 years old age range and they have an almost equal distribution of decisions to buy natural disaster insurance in the future. 37.5% of them chose to buy natural disaster insurance products in the future and 32.66% of them chose not to buy natural disaster insurance products in the future.

The business establishment age also determines the decision of the business owner to insure their business asset against natural disaster. Businesses which have been established for more than 2 years tend to choose to ensure their business on disaster insurance products when compared to new UMKM business units (less than 2 years).

In contrast to the findings above, the economic losses borne related to the disaster intensity affects people's preferences in purchasing natural disaster insurance in the future. Using the same data, the current model tries to find out what factors influence the community in having natural disaster insurance products today. From the three models above, it can be concluded

that there are many opportunities to promote and establish natural disaster insurance for low income and vulnerable groups who are willing to purchase natural disaster insurance.

Table 3. Model 3 Determinant Factors of Owning and Purchasing Natural Disaster Insurance

Having_disaster_insurance	**Coefficient**	**Having_disaster_insurance**	**Coefficient**
Sex	0.04622** (0.2191)	Disaster_intensity_earthquake	-0.0620 (0.0417)
Age	-0.0142 (0.0104)	Damage_received_earthquake	-0.6963 (1.0233)
Monthly_income	0.1529* (0.0861)	Pref_premi_flood	0.4973 (0.4369)
Years_of_business	-0.0141 (0.0089)	Pref_indemnity_flood	-0.0881 (0.6006)
Dummy_companys_sector	0.4204* (0.2326)	Pref_%premi_flood_KPR	3.3695 (38.4410)
Having_KUR	-0.8200*** (0.3656)	Pref_premi_earthquake	0.2931 (0.4953)
Having_KPR	0.9714*** (0.2307)	Pref_indemnity_earthquake	1.0371* (0.6049)
Disaster_intensity_flood	-0.0447 (0818)	Pref_%premi_eathquake_KPR	30.7409 (134.3754))
Damage_received_flood	1.2588 (1.2007)	Constanta	-16.5004*** (3.2345)

Notes: *; **; *** indicates a significance level at the 10%, 5% and 1% levels

From the result shown in Model 3, besides the desire to buy natural disaster insurance products, there are other indicators which influence the public in purchasing natural disaster insurance products, both floods and earthquakes. Those indicators were the types of insurance, insurance premiums, and insured losses. The analysis on model 3 can be interpreted where the access to finance such as income and credit ownership such as mortgage (KPR) and business loan (KUR) have a significant impact on the opportunities for the MSMEs to own natural disaster insurance. However, the intensity of natural disasters, both floods and earthquakes, does not have a significant impact on their preference of owning natural disaster insurance.

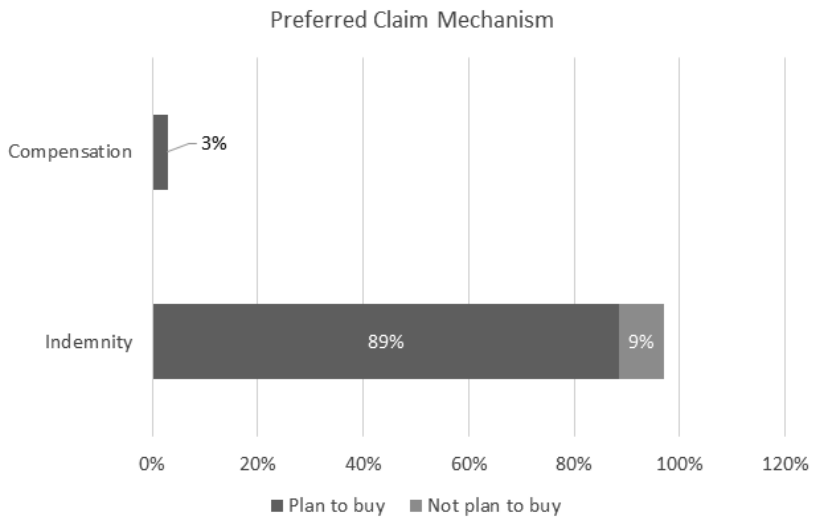

Figure 2. Preferred Claim Mechanism

The result from Figure 2 shows that 89% of respondents prefer a preference for the type of claim mechanism in the form of indemnity and plan to buy disaster insurance in the future. However, 9% of respondents who chose the indemnity mechanism did not plan to buy disaster insurance in the future and 3% of respondents who chose the compensation claim mechanism entirely chose to buy disaster insurance products in the future.

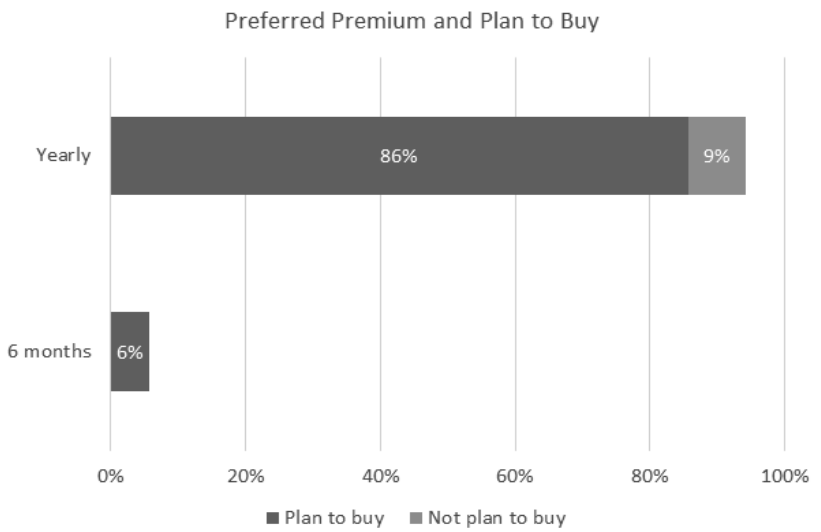

Figure 3. Preferred Premium Payment Mechanism

Figure 3 shows that 95% of respondents prefer the annual premium payment mechanism in which 86% of them choose to buy disaster insurance in the future. Additionally, 6% of the

total respondents who chose the 6-monthly payment mechanism all plan to buy disaster insurance products in the future. Of the two types of disasters, both floods and earthquakes, most respondents chose disaster insurance premiums at a value of less than IDR500,000 (USD35) per year. This value is followed by the class above it, which is in the range of IDR500,000-IDR1,000,000 (USD35-71).

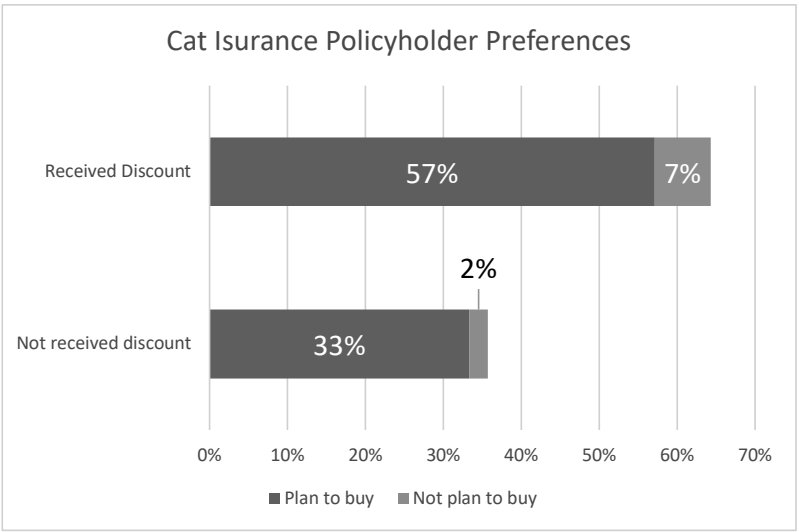

Figure 4. Customers Experience on Insurance Discount Incentives

From the result in Figure 4, it is known that receiving an insurance discount will not affect the respondent's decision to purchase natural disaster insurance. This shows that 57% of the total respondents who received a discount and 33% of the respondents who also did not receive a discount both chose to buy disaster insurance products in the future.

Based on the survey results on micro, small and medium enterprises, it was found that the greater the value of business turnover, the greater the preferred premium price. This can be caused by the increasing value of the insured's assets within the business. Most micro enterprises prefer low premium values over high premium values. However, this preference is the higher the value for small and medium-sized MSMEs. This result accounted for both flood and earthquake insurance.

The higher the level of risk the customer has, the more likely it is that the customer willingness-to-pay increases in paying premiums (Born and Viscusi, 2006). This is due to the customer's desire to reduce the loss ratio in the event of a future disaster. The findings of Born and Viscusi (2006) are in line with the findings of the survey where the higher the turnover value of the customers, which indicates the higher the value of the insured's assets, the higher the willingness-to-pay of natural disaster insurance customers. By combining the public and private sectors, an insurance product can provide a premium value that is low enough to be reached by a wider community (Dewi and Sulistyani, 2015).

The appropriate marketing strategy also determines the success of the insurance company in marketing disaster insurance products. Insurance companies are also trying to take advantage of advances in information technology as their marketing channel. The result shows that of the total respondents surveyed, as many as 77% of respondents who already have disaster insurance purchase disaster insurance products through telemarketing channels, 13% of respondents buy through Financial Services Institutions (LJK), 8% through websites, and 3% buy through insurance agents. From a total of 77% of respondents who purchase through telemarketing, 72% of them plan to purchase disaster insurance in the future, and 3% do not plan to purchase disaster insurance in the future. As many as 56% of respondents obtain information about natural disaster insurance products through financial service institutions, 22% through print media, 8% through social media, 6% through agents, and followed by e-commerce and television with a percentage of 2% each. With a growing audience in the social media platform, the education about natural disaster insurance products through digital media can be a new approach in the future to be able to attract the younger generation.

5. Formulating alternatives for MSMEs Natural Disaster Insurance

5.1. Insurance Features

Insurance for MSMEs needs to prioritize in designing special insurance products that can be easily understood and have affordable premium prices. The government can regulate the insurance to be mandatory for all MSMEs which obtain bank loans or business saving accounts. According to a study by Wibowo, Deviana and Sunardjito (n.d.), it is recommended that the determination of insurance premiums be lower than the customer's willingness to pay.

The issuance of insurance products for MSMEs can use several methods. Firstly, partnership methods with banks and other financial institutions where banks and other microfinance providers can directly offer insurance policy from their partnered insurance company to their clients. Secondly, forming partnerships with various agents where insurance companies along with non-governmental organizations, retail partners and e-commerce partners collaboratively distribute natural disaster insurance products. Insurance companies will benefit from these agents by marketing their products through their adequate distribution network. This method can lower distribution costs and thereby increase affordability.

There are a few payment methods which can be adopted by insurance companies to accommodate all customers. First, an offline method where the payment of insurance premiums and receipt of claims can be carried out through insurance company agents, banks through ATMs or retail partners approved by the insurance company. This method can be intended to reach areas that are not yet covered by adequate communication channels. Second, a digital method where the payment of insurance premiums, reporting and receipt of claims is made through online platforms such as insurance company websites, mobile phone applications by insurance companies and through cooperation with e-commerce and e-banking media. This method can be beneficial in densely populated areas.

The claim mechanism for the disaster insurance program may involve cooperation with government agencies such as BNPB to reduce fraud or fraudulent claims by utilizing satellite images in. Satellite imagery can be used to compare and classify building damage in an objective manner based on the level of damage that has occurred previously. The local insurance company will be responsible for paying based on compensation claims to the insured individual based on a damage or loss assessment that refers to satellite image capture and evidence provided by the customers.

Insurance companies are required to develop cost-effective ways to reach their customer base, for example by partnering with local communities for community education programs, microfinance organizations, or other intermediaries and by leveraging technological developments such as increasing cell phone coverage for financial transactions. Insurance for MSMEs is faced with low levels of financial literacy in their target market. Low customer confidence tends to suppress demand significantly, as insurance companies themselves may find it difficult to convince clients that they will be able to make claim payments after a major disaster. The insurance company is responsible for clearly designing the product with simple rules, affordable premium prices as well as easily accessible claim documentation. According to a study by Wibowo, Deviana and Sunardjito (n.d.), it is recommended that the determination of insurance premiums be lower than the customer's willingness to pay.

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Figure 5. Framework Design for MSMEs Natural Disaster Insurance Features

*) Premium design and coverage values are obtained through a reference to Financial Services Authority Circular Letter Number 6 /SEOJK.05/2017 on Determination of Premium Rates or Contributions in Property and Motor Vehicle Insurance Business Lines 2017

5.2. Funding Alternatives

To minimize the financing gap of this program, there are 2 funding alternatives which could be implemented.

Under the mechanism shown in Figure 6, the government will initiate and lead a premium subsidy program for insurance companies. Subsidies may only be channeled to private insurance companies that provide coverage for natural disasters. This funding mechanism can encourage the insurance industry to increase its disaster insurance portfolio (risk sharing and insurance company liquidity). Customers may benefit from a premium that is more affordable than the insurance company self-financing scheme. To streamline this funding mechanism, the government needs to allocate subsidies for natural disasters in the state budget (APBN).

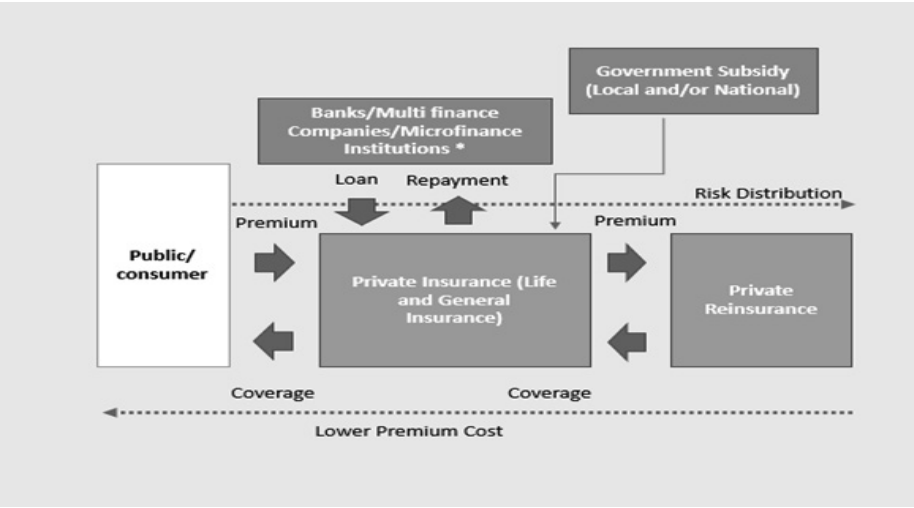

Figure 6. Funding Mechanism through Insurance Retention and Government Subsidy

Figure 7 below presented a scheme where Indonesia's disaster insurance program could be in a form of cooperation between government and business entities through a Public Private Partnership (PPP) to assist its financing plan. Within the PPP, there are several components such as CAT bonds, subsidies, and public financing institutions as well as stakeholders such as reinsurance companies, commercial investors, and bond investors. which need to be included to form a comprehensive funding scheme. In this alternative, an establishment for special purpose vehicles (SPV) would enable insurance companies and reinsurance to transfer risks and liability for compensation due to natural disaster to a capital market.

Within this scheme, the central and local governments would act as guarantors. Thus, a strong legal umbrella from the government is needed to regulate the management of funds in SPV and a means to increase the outreach and achieving the scale of funding. Moreover, if

the government decided to release CAT bonds within its budget plan, a modification towards Indonesia's fiscal regulation is needed to allow the issuance of CAT bonds in the domestic and international sphere (Arham and Firmansyah, 2019). The success in managing CAT Bonds shows that the government has proactively taken financial protection measures to manage natural disaster risks.

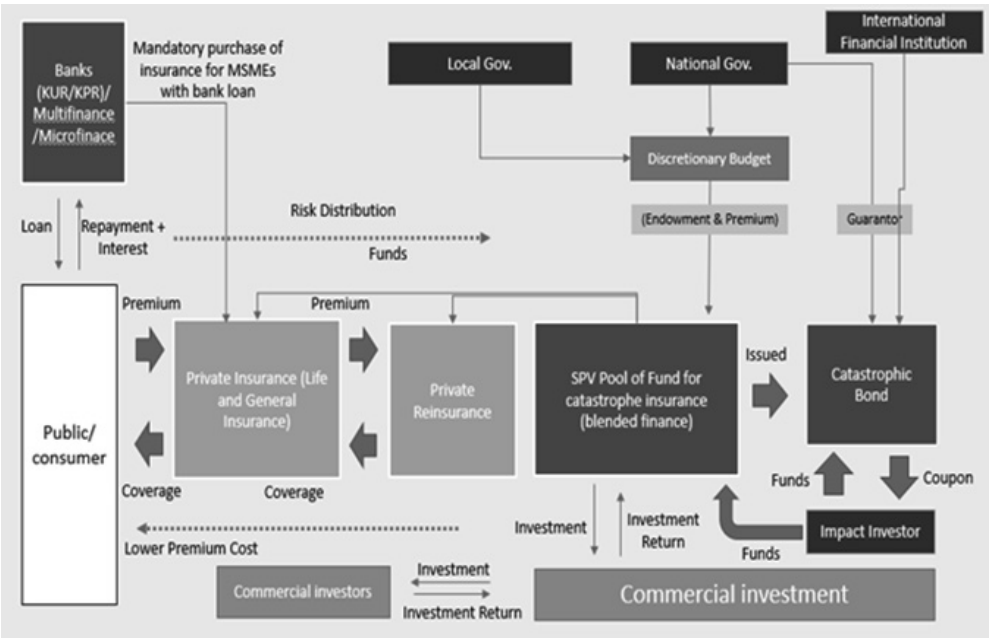

Figure 7. Comprehensive Insurance Funding Mechanism

6. Conclusion

From the research and analysis, it can be concluded that MSMEs are projected as a potential insurance market which has not been optimally explored. Even though there are financial limitations within MSMEs, there is an interest in buying a disaster insurance policy. The government can formulate a financial access mechanism which enables MSMEs to purchase disaster insurance with affordable premiums. In terms of the willingness to pay, while most respondents prefer premiums of up to IDR500,000 (USD35) per year (approximately IDR25,000-IDR50,000 (USD1.8-USD3.5) per month). There are respondents who are willing to pay more in line with the size of their assets. Factors which influence the preferences in purchasing disaster insurance includes financial capacity, the amount of premium, access to finance, preference for disaster risk compensation (claim value) and external factors such as disaster intensity and impact of disaster damage. MSMEs which have access to bank loans (KUR) and mortgage (KPR), have a preference to purchase natural disaster insurance. In the effort to improve the demand of natural disaster insurance, insurance companies are currently still utilizing traditional marketing strategies such as direct marketing and collaboration with

other financial service institutions. They have only just stepped into using marketing media that take advantage of advances in digital technology including e-commerce and the use of social media.

Insurance regulations in Indonesia have not fully encouraged the development of disaster insurance for MSMEs. Current regulations allow for disaster insurance products and disaster insurance products to exist but not in a uniform manner. OJK, insurance associations and the government have initiated the development of micro-disaster insurance, but it has not been properly implemented. The contributing factors include low claim value, relatively difficult and long claim procedures, and low public literacy.

There is the need for a Natural Disaster Insurance Act reformation as this is a multi-stakeholder program which requires large funding. To develop a comprehensive and adequate insurance program there is the need to establish a Disaster Insurance Pooling Funds. One of the additional funding components which can be explored by Indonesia is Catastrophe Bond. Catastrophe bonds are also an alternative financial investment.

To further increase the demand from MSMEs, this research provides several recommendations in terms of funding to make the insurance product affordable for MSMEs. One of the recommendations requires this program to be developed under PPP which involves government agencies, insurance companies, reinsurance companies, and donor agencies for a more adequate and affordable risk transfer. This is because the disaster insurance market requires major investments in infrastructure such as disaster risk models, disaster databases, product pricing designs, and regulations. Thus, a comprehensive disaster insurance funding scheme will be necessary where the government can act as an initiator, establish regulations, and form an SPV Pooling Fund. SPV targets to collect sufficient funds through commercial, non-commercial funds (grants, soft loans), global investors and philanthropists. Therefore, the premium price paid by MSMEs becomes more affordable and insurance companies can provide adequate claim value and increase the insurance market share for MSMEs.

Natural disaster insurance for MSMEs requires insurance policies which are easily understood and can be used as references for the insurance industry. it is necessary to create a disaster insurance policy that suits the needs and capabilities of MSMEs. Insurance features should provide the scope of the disaster, the amount of premium and the value of the claim, which is adjusted for the types of micro, small and medium business groups. This insurance policy standard is to be established by the OJK through involving the associations and the government in the process of its preparation.

There are several mechanisms to increase the demand for natural disaster Insurance. To reach higher customer coverage, insurance companies are increasingly using digital information technology including e-commerce and social media as part of their marketing strategy. OJK, insurance associations and the government are recommended to use digital information

technology to educate MSMEs about the purpose and the benefit of natural disaster insurance. Lastly, the government may resort to setting a mandatory requirement for MSMEs to purchase natural disaster insurance through bank loans or savings accounts.

Apart from the aforementioned efforts, this study also recommends conducting a pilot project before the proposed program is implemented nationally. Further study is also needed to be extended into evaluating demands of other types of disasters such as pandemics.

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