

NON-INTEREST INCOME AND BANKING INTERMEDIATION IN ASIAN COUNTRIES

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ARTICLE INFO

Keywords:

Bank,
Intermediation Function,
Loan To Deposit Ratio,
Non-Interest Income

ABSTRACT

Bank has a vital role as an intermediary institution that can encourage economic growth in countries. However, many banks have started expanding non-interest income activity based on income from fees. This study discusses the factors associated with non-interest income, especially during the banking digitalization era. Banks may rely on non-interest income in dire economic conditions when credit demand drops. However, if banks continue to rely on non-interest income in good economic conditions, they hamper their intermediation function. Therefore, it is essential to know the association between loan to deposit ratio (LDR) as a proxy of intermediation function with non-interest income in good economic and dire economic conditions. This study uses panel data with fixed effect model regression on banks from 10 Asian countries. The estimation result shows that the loan to deposit ratio is negatively correlated with non-interest income in good and dire economic conditions. Thus, there is an indication that banks have more and more shifting to non-intermediation services.

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1. INTRODUCTION

Banks have an essential role in the economy. The bank is a financing source for entrepreneurs to produce activity and for an individual to consumptive (Koch & MacDonald, 2000). The primary function of a bank is financial intermediation. The financial intermediation arises from monitoring cost, liquidity costs, and price risk due to asymmetric information between the owner of the funds and the company that uses the fund, so an intermediary is needed that can accommodate the needs of both parties (Saunders & Cornett, 2018). According to Kasmir (2014), the bank's income is divided into two sources: spread-based and fee-based. Spread-based income is derived from collecting and distributing funds, which is the banking industry's main activity. At the same time, fee-based income is derived from other supporting services activities.

Recently, non-interest income has grown in some countries, especially in Asia. The trend of non-interest income in Asian countries began to occur after the crisis in 1997 – 1998. After the crisis, many banks are conglomerating, producing cross-sector activities between banking and non-bank financial services (Hahm, 2008). In addition, if the bank has a sister company engaged in other financial services, it can do cross-selling (Tay, 2016).

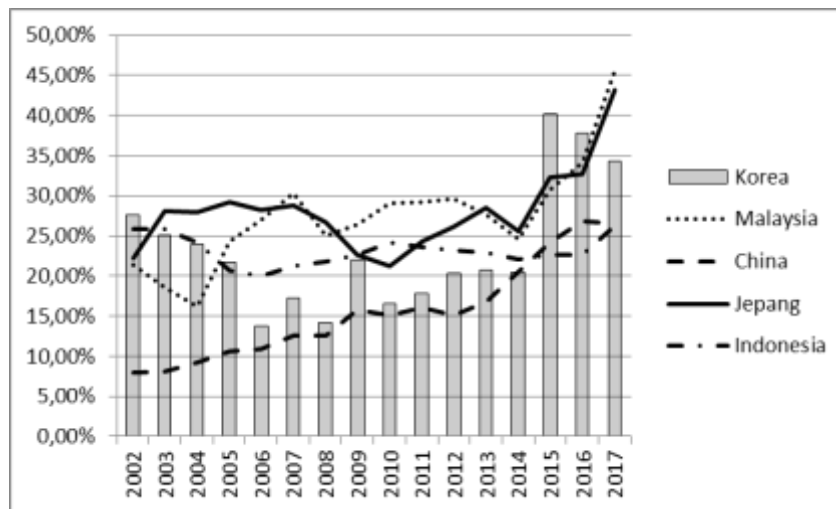


Figure 1. Percentage of non-interest income to total income in Asian countries
 Source: theglobaleconomy.com (processed data)

Figure 1 shows the increasing percentage of non-interest income in several countries in Asia. Japan, Korea, Malaysia, and China have shown an increase in the percentage of non-interest income. Traditionally, along with the growth of assets or credit, non-interest income will increase due to its role as a complement income. Thus, the non-interest income is associated with bank's internal condition, such as total asset or equity, return on asset (ROA), net interest margin (NIM), the cost to income ratio (CIR), and loan loss provision (Rogers & Sinkey, 1999, DeYoung & Hunter, 2001, Craigwell & Maxwell, 2006, Xia & Chunsom, 2018).

Previous studies have discussed the associated factors with non-interest income. Rogers & Sinkey (1999) found that net interest margin (NIM) was negatively correlated with non-interest income, while bank size in terms of assets positively correlated with non-interest income. A low net interest margin (NIM) indicates the company is not getting the maximum interest from its loans, so it must switch to non-interest income to maintain profits. DeYoung & Hunter (2001) and DeYoung & Rice (2004) also argue that bank size positively correlates with the development of non-interest income. Banks with significant assets use economies of scale to dominate lending to consumers, generally having low net interest margins (NIM). Therefore, they must develop non-interest income to complement the income stream. In contrast to banks with smaller assets, they tend to get higher margins for their customers (Hahm, 2008).

Another internal bank variable that has a relationship with non-interest income is equity. Rogers & Sinkey (1999) and Hahm (2008) stated that the bank's equity is positively and significantly associated with non-interest income. Banks with more significant equity can diversify their products into non-interest income. In addition, Rogers & Sinkey (1999) also stated that the loan loss provision is positively associated with non-interest income. The higher the level of loan loss provision, the potential for companies to diversify their income to non-interest income. Furthermore, Hahm (2008) includes the cost to income ratio (CIR) variable. Banks use CIR to measure the company's efficiency. If the CIR is low, then the banks are more efficient. Hahm (2008) stated that CIR is positively and significantly associated with non-interest income. In general, to increase non-interest income, new costs are needed in other business lines, so the CIR also increases.

Recently, the banking industry began to enter the digitalization era, especially in Asia. The growth of technology also affects banking's behavior, such as internet banking or mobile banking as an electronic transaction. Bank's electronic transactions that facilitate customer's transactions can encourage banking non-interest income through the fee. Furthermore, many companies are currently engaged in financial technology (Fintech). Fintech companies also provide financial services like banking, and they can channel credit through peer-to-peer lending and provide digital wallets as electronic payment transactions. The presence of financial technology companies makes the financial facility more accessible. They can also take the banking market through credit facilities. Thus, the banks carry out their intermediation function and enter electronic payment services.

Financial technology companies also encourage banks to make innovations through digital finance. Guo & Shen (2016), Fu et al (2020), and Hou et al (2016) state that the banking sector receives a positive impact from the development of internet finance because it can reduce costs, including transaction costs,

as well as risk in decision making so that banks become efficient. Meanwhile, research from Kashmari et al (2016) and Mustapha (2018) found that innovation in electronic payments is recognized as an essential factor in improving bank performance and market share. Xia & Chunsom (2018), who conducted research in China, showed that third-party payments positively impacted non-interest income for both state-owned and private banks. The study also stated that any inflow of funds for third-party payment companies must go through bank account access so that if a transaction occurs, the banks will receive a fee. With the increase in third-party payment transactions, the bank's non-interest income will also increase.

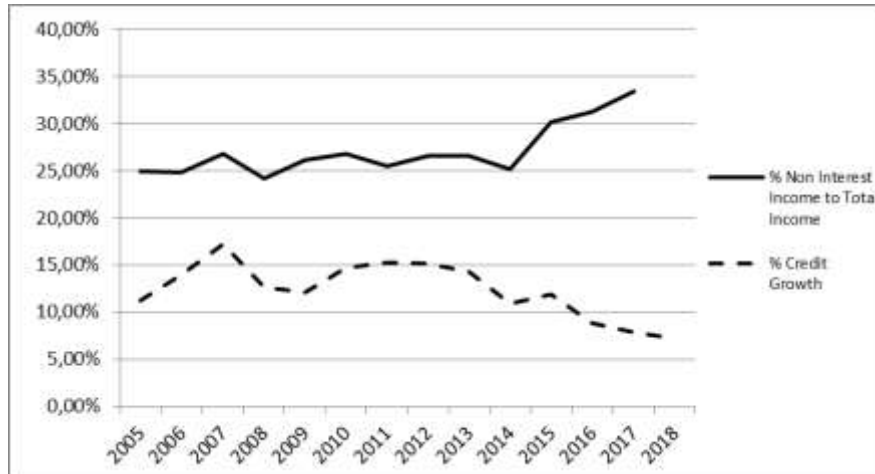


Figure 2. Comparison between average credit growth and the average percentage of non-interest income to total income in 10 Asian countries

Sources: theglobaleconomy.com; published financial report (processed data)

Based on Figure 2, it can be seen that the comparison of the average credit growth with the percentage of non-interest income to total income in the 10 Asian countries that are the objects of this research (Indonesia, Malaysia, Singapore, Thailand, Philippines, Vietnam, South Korea, India, China, and Japan). In general, credit growth has been declining. Initially, the average credit growth has reached above 15%. In 2010, it seemed stable around 15% until 2013, but it started to decline gradually until 7.25% in 2018. Otherwise, the percentage of non-interest income to total income was initially stable at 25%. However, after 2013, it was gradually increased to 35% in 2017. The declining credit growth and the increasing percentage of non-interest income indicate decreasing banking intermediation function.

The trend of banking non-interest income in Figure 2 shows that the banks are starting to focus on non-interest income compared to interest income. Banks may rely on non-interest income as a "cushion" to survive in dire economic conditions. Because of the declining economic condition or crisis, the demand for loans also decreases which the debtors tend to hold their consumption or investment. Banks will also face high-risk lending if they channel credit in dire economic conditions because the declining output makes the capacity to pay decline. This condition potentially causes default from debtors. In addition, some debtors who already have facilities are likely to be arrears during the crisis, thereby increasing the bank's non-performing loan (NPL). So that banks must diversify their income. Strategy to diversify concern product line characteristics, generally requiring new skills, techniques, or facilities (Ansoff, 1957). Non-interest income is a banking strategy to diversify income, making income more stable (Stiroh, 2002).

However, a worrying condition occurs if banks still rely on non-interest income when the economic conditions are good, especially for countries that still depend on the banking sector, such as the developing countries included in this study. It can make the banks shift from their function. Banks should have a central role as a financial intermediary which relies on interest income. The shifting of banking functions could negatively impact the economics because the business expansion will be hampered due to limited loans from banks. In addition, the distribution of credit is a path of monetary policy so that the monetary policy can be no significant effect.

This paper studies two points. First, we will determine the factors associated with banking non-interest income from internal banking factors, macroeconomic, and digitalization. It is important to know considering the development of non-interest income while the credit growth continues to decline. Second, we will focus on the banking intermediation function. The banking intermediation function can be

measured by the loan to deposit ratio (LDR). LDR is used to measure the effectiveness of banks in distributing credit through the fund that has been collected. If the LDR ratio is high, most funds have been distributed.

Nevertheless, on the contrary, if the LDR ratio is low, it means that the banks have excess funds to lend. So that if LDR has a positive correlation with non-interest income, then the role of non-interest income can be concluded as a complement to the banking intermediation function. However, if the LDR is negative, the non-interest income trend can reduce the banking intermediation function.

This study also looks at the correlation between LDR and non-interest income when the economic conditions are dire or good. If the economic conditions are dire, the correlation between non-interest income and LDR should be negative because the banks cannot rely on interest income due to decreasing credit demand. The correlation should be positive in good economic conditions because banks can rely on interest income by distributing credit and non-interest income only as a complement of interest income. However, if the correlation between LDR and non-interest income is still negative in good economic conditions, the banks potentially shift into non-interest income and reduce their intermediary function. The intervention from policymakers is needed if the banks start to lose the intermediary function. This study focuses on Asian countries because Asia has experienced the banking crisis and has run restructuring programs in several Asian countries (Agusman et al., 2008). In addition, the shifting towards non-interest income or fee-based income activities such as underwriting, securities trading, and derivatives has been regulated in several Asian countries (Lee et al., 2014).

2. METHOD

This study uses secondary data sources. Secondary data is primary data that is further processed and presented either by primary data collectors or other parties (Umar, 2011). This study uses panel data consisting of 291 banks, 1990-2019. The banks are from 10 Asian countries, including Indonesia, Malaysia, Singapore, Thailand, Vietnam, Philippines, China, India, South Korea, and Japan. In this study, for internal banking variables such as non-interest income (NII), loan to deposit ratio (LDR), total assets, total equity, net interest margin (NIM), return on assets (ROA), the cost to income ratio (CIR), and loan loss provision (LLP) variables are taken from the financial reports of each bank from 1990 to 2019. The financial reports are published on the stock exchanges of each country. The banks included in this study are the only banks listed on the stock exchange. Then, for macroeconomic variables, we used East Asia & Pacific's gross domestic product (GDP) growth and inflation (each country) from 1990 to 2019, taken from the World Bank's website.

In this study, the dependent variable is non-interest income (NII). NII is operating income derived from fees, commissions, or other costs to support banking operations. In contrast, the other variables are independent and control variables. The primary independent variable is the loan to deposit ratio (LDR), which uses as a proxy of the banking intermediation function. LDR is the percentage of total credit to the total deposit. We also included others seven independent variables and four control variables. EQUITY is measured by the percentage of total equity to total assets. The other internal bank variables are banking financial ratios such as NIM (Net Interest Margin), LLP (Loan Loss Provision), ROA (Return on Assets), and CIR (Cost to Income Ratio) is measured. Meanwhile, this study also uses a dummy variable digitization (d_DIGITALIZATION). For the dummy variable d_DIGITALIZATION, we assume that the digitalization era started in 2009. The dummy is one for the digitalization era in 2009 and after and is zero before 2009.

For macroeconomic control variables, there are four variables in this study, namely inflation (INFL), GDP growth (Gross Domestic Product), the dummy of 1998 Asian economic crisis (d_CRISIS1998), and the dummy of 2008 global economic crisis (d_CRISIS2008). For the variable d_CRISIS1998, the value is 1 for data in 1997-1998 and 0 for other years. Meanwhile, the variable d_CRISIS2008 has a value of 1 for data in 2008-2009 and 0 for other years. The following is the definition of the summary operational variables:

Table 1. The Definition of Operational Variables

| No. | Variable Name | Variable Type | Symbol | Measurement |
|-----|-----------------------------|--------------------|--------|--|
| 1 | Non Interest Income | <i>Dependent</i> | LnNII | Natural logarithm (Ln) of <i>Non Interest Income</i> |
| 2 | Loan to Deposit Ratio (LDR) | <i>Independent</i> | LDR | Percentage of Total Credit to Total Deposit (%) |

| | | | | |
|----|---|--------------------|------------------|--|
| 3 | Asset | <i>Independent</i> | LnAsset | Natural logarithm (Ln) of Total Asset |
| 4 | Equity | <i>Independent</i> | Equity | Percentage of Total Equity to Total Asset (%) |
| 5 | Return on Asset | <i>Independent</i> | ROA | Percentage of Net Income to Total Asset (%) |
| 6 | Cost to Income Ratio | <i>Independent</i> | CIR | Percentage of Total Cost to Total Income (%) |
| 7 | Net Interest Margin | <i>Independent</i> | NIM | Percentage of Net Interest Income to Total Loan (%) |
| 8 | Loan Loss Provision | <i>Independent</i> | LLP | Percentage of Loan Loss Provision to Total Asset (%) |
| 9 | Dummy Digitalisasi | <i>Independent</i> | d_DIGITALIZATION | Value 1 for year > 2009 (digitalization era), value 0 to year ≤ 2009 (before digitalization era) |
| 10 | Inflation | <i>Control</i> | INFL | Consumer Price Index (%) |
| 11 | Gross Domestic Product (GDP) Growth | <i>Control</i> | GDP | Economic Growth Rate (%) |
| 12 | Dummy of Asian Economic Crisis 1997-1998 | <i>Control</i> | d_CRISIS1998 | Value 1 for year 1997-1998, value 0 for other years |
| 13 | Dummy of Global Economic Crisis 2008-2009 | <i>Control</i> | d_KRISIS2008 | Value 1 for year 2008-2009, value 0 for other years |

This study uses panel data with a fixed-effect model to be processed in Stata 14. This model has a different intercept for each subject (cross-section), but the slope of each subject is fixed/does not change over time (Gujarati, 2004). The empirical equation model can be as follows :

$$\text{LnNII}_{it} = \alpha_i + \beta_1 \text{LDR}_{it} + \beta_2 \text{LnASSET}_{it} + \beta_3 \text{EQUITY}_{it} + \beta_4 \text{ROA}_{it} + \beta_5 \text{CIR}_{it} + \beta_6 \text{NIM}_{it} + \beta_7 \text{LLP}_{it} + \beta_8 \text{d_DIGITALIZATION}_{it} + \beta_9 \text{INFL}_{it} + \beta_{10} \text{GDP}_{it} + \beta_{11} \text{d_CRISIS1998}_t + \beta_{12} \text{d_CRISIS2008}_t + \epsilon_{it}$$

Where *i* is the bank symbol (cross-section), *t* is the symbol of the years (time series), and α is the intercept of each individual. LnNII is the natural logarithm of non-interest income, the dependent variable (Y). Other variables consist of independent and control variables, as mentioned before.

The estimation was also carried out using the threshold regression method in this study. The threshold regression model determines individual observations, divided into several classes/regimes based on the observed values (Hansen, 1999). The value used as the threshold in this study is the growth of Gross Domestic Product (GDP) in the East Asia & Pacific region as a proxy for the good or dire economic conditions of the countries . The threshold in this study is divided into two regimes, that is, when economic conditions are dire and when economic conditions are good. We determine the economic performance threshold using the median value as Vianna & Mollick (2021) did in their research. The empirical equation model of threshold regression can be as follows:

$$NII = \begin{cases} \mu_i + \beta_1 \text{LDR}_{it} + \beta_1 X_{it} + \beta_1 D_t + e_{it} & \text{GDP}_{it} \leq \lambda \\ \mu_i + \beta_2 \text{LDR}_{it} + \beta_2 X_{it} + \beta_2 D_t + e_{it} & \text{GDP}_{it} > \lambda \end{cases}$$

Where X_{it} is all independent variables (other than LDR) and control variables (other than dummy variables); meanwhile, the symbol D_t represents all research variables in a dummy. At the same time, λ is a parameter of the threshold, which in this study the threshold is the median value of East Asia & Pacific GDP growth. The median value in this research is 4.29%. μ is the coefficient of the independent variables in the study. The regime is divided into two regimes to know the difference slope when economic conditions are good or dire. Regime one for GDP growth below the threshold means the economic conditions are dire, while regime two for GDP growth above the threshold, which means the economic conditions are good.

3. RESULT AND DISCUSSION

This section comprises two subsections. We discuss the result of statistical test without threshold GDP in first subsection, followed by the result of statistical test with threshold GDP in second subsection.

Estimation Without Threshold GDP

The first estimate is the regression of dependent and independent variables without threshold GDP. In table 2 below, it can be seen a summary of the results of the regression estimation with Stata 14. Based on the information from Table 2, it can be seen that the number of observations is 4,994, with a total of 287 groups.

Table 2. Estimation Results without Threshold

The reported t-Statistic are corrected for heteroskedasticity using robust standard errors with STATA 14. Also, *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

| Dependent Variable : LnNII | Coef. | | t-Stat |
|----------------------------|---------|-----|--------|
| LDR | -0,0050 | *** | -4,73 |
| LnAsset | 0,9846 | *** | 31,06 |
| Equity | 0,0237 | *** | 3,98 |
| ROA | 0,2801 | *** | 7,97 |
| CIR | 0,0067 | *** | 5,56 |
| NIM | -0,0554 | *** | -4,05 |
| LLP | 0,2706 | *** | 6,50 |
| d_DIGITALIZATION | 0,0968 | *** | 3,05 |
| INFL | -0,0050 | | -1,12 |
| GDP | -0,0026 | | -0,37 |
| d_CRISIS1998 | -0,0801 | * | -1,75 |
| d_CRISIS2008 | 0,1240 | *** | 2,95 |
| Constanta | -4,9455 | *** | -9,24 |
| Adjusted R-Squared | 0.8612 | | |
| F-Statistic | 0.0000 | | |
| Total Obs. | 4.994 | | |
| Total Group | 287 | | |

Table 2 shows the main findings from baseline analysis that the LDR coefficient is positive and significant at the 1% level. They were implying that non-interest income is sensitive to the value of LDR. Specifically, an increase of LDR of 1% is associated with a -0.005% decrease in non-interest income. We interpret the result that non-interest income potential substitutes interest income when the LDR declines. This result is consistent with Craigwell & Maxwell (2006) and Hahm (2008). Banks focus on managing their interest income if the loan value is high. Otherwise, banks are likely to switch to non-interest income if low loan value. However, this finding is different from Xia & Chunsom (2018), which state that LDR has a positive association with non-interest income. Only Hahm (2008) researched several countries among the three previous studies, including OECD countries. The negative relationship between LDR and non-interest income will potentially cause non-interest income to become more dominant, significantly increasing the trend of non-interest income like recently happened. The negative relationship can lead to the decline of the banking intermediary function.

Table 2 also found that the coefficient of dummy variable digitalization is positive and significant at the 1% level. It implies that banks have driven higher non-interest income since the banking digitalization era. Non-interest income will rise higher 0.096% in the digitalization era compared to before. It is also consistent with Xia & Chunsom (2018) research, which stated that third-party payment is positively and significantly associated with non-interest income as part of digitalization. The banking digitalization transaction such as the internet or mobile banking can encourage non-interest income through the fee. The platform of financial technology companies must have access to the bank account. Once there is a transaction, the banks will get the fee income.

The results also show that all the internal banking variables significantly determined non-interest income. Total asset, equity, return on asset, cost to income ratio, and loan loss provision showed a positive association with non-interest income. These results show that more considerable total asset or equity banks are more likely to realize the economic scale and achieve non-interest income. Then the higher return on assets tends to generate total income, including non-interest income. With better performance, banks would like to diversify their income sources. Also, the higher loan loss provision indicates the higher arrears. Therefore the banks have switched to non-interest income. Only the net interest margin has a negative association. If the banks have a low value of net interest margin, they will switch into non-interest income activities to raise their operating income.

Otherwise, GDP growth and inflation do not show a significant association for macroeconomic variables. Furthermore, $d_CRISIS1998$ has a negative association while $d_CRISIS2008$ has a positive association. It is indicated that during the 1998 crisis, banking's income has decreased overall. Many banks are conglomerating, producing cross-sector activities between banking and non-bank financial services (Hahm, 2008). In the 2008 crisis, banks already have non-interest activities. So when the global economic crisis occurred, banks could rely on non-interest income.

Estimation With Threshold GDP

The second estimate is the regression with threshold GDP. It can be seen in table 3 that the primary independent variable, loan to deposit ratio (LDR), has a negative and significantly associated both in the good economic conditions or dire economic conditions. It implies that non-interest income potentially replaces the interest income in good economic or dire economic conditions. Banks should increase their non-interest income as a "cushion" in dire economic conditions because the credit demand will decline when the economic conditions are dire. In addition, some debtors who already have facilities will be in arrears during the crisis, thereby increasing the bank's non-performing loan (NPL). Non-interest income becomes an alternative for banks to survive. Nevertheless, when the economic conditions are good, non-interest income should have a role as a complement of interest income. Therefore the relationship should be positive in good economic conditions.

However, the LDR also has a negative association with good economic conditions. Because the trend of non-interest income recently continues to increase, the negative association in a good economic condition indicates that the banking seems will be abandoned its intermediary function. It will be risky, especially for countries that still rely on banking to stimulate economic growth. The lower credit distribution makes the business difficult to expand. Also, individual consumption will decrease.

The coefficient values are not too different between the two regimes. The values are -0.0039 in regime one and -0.0050 in regime two. Even so, this research focuses on the positive or negative association between LDR and non-interest income. When the economic conditions are good, LDR should positively associate non-interest income, meaning non-interest income only complements interest income. With the negative association between LDR and non-interest income in good economic conditions, the banks leave the intermediation function. The development of financial technology makes it people easier to access financial facilities. It makes the banks are no longer become the only choice for people to access finance or loans. So it is possible to shift the function from banking intermediation to other services such as electronic payment. These services can lead to an increase in non-interest income.

The other independent variables such as LnAsset, Equity, ROA, CIR, NIM, LLP, and $d_DIGITALIZATION$ have the same association both on regime one and regime two, only different on the value of the coefficient. Mostly the variables have a higher coefficient value on regime two. However, GDP growth and inflation differ in regime one and regime two. Inflation does not have a significant effect. However, it has a negative association in regime two. GDP growth also has differences. In dire economic conditions, non-interest income will increase if the economic conditions worsen. Otherwise, in good economic conditions, GDP growth can encourage banks' non-interest income due to the ability of companies or individuals to obtain banking facilities.

Table 3. Estimation Results with Threshold GDP

The reported t-Statistic are corrected for heteroskedasticity using robust standard errors with STATA 14. There is no result for $d_CRISIS1998$ dan $d_CRISIS2008$ on regime two because those crisis years were only in regime one. Also, *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

| Dependent Variable : | Regime 1 : GDP ≤ Median | | | Regime 2 : GDP > Median | | |
|----------------------|-------------------------|-------------|-------------|-------------------------|-------------|-------|
| | LnNII | Coef. | t-Statistic | Coef. | t-Statistic | |
| LDR | | -0,0039 *** | -2,89 | -0,0051 *** | | -3,97 |
| LnAsset | | 0,9553 *** | 24,47 | 1,0035 *** | | 30,19 |
| Equity | | 0,0238 *** | 2,82 | 0,0237 *** | | 3,47 |
| ROA | | 0,2752 *** | 5,58 | 0,2907 *** | | 9,13 |
| CIR | | 0,0066 *** | 5,49 | 0,0072 *** | | 4,88 |
| NIM | | -0,0500 ** | -2,25 | -0,0612 *** | | -5,08 |
| LLP | | 0,2561 *** | 4,67 | 0,2961 *** | | 5,94 |
| $d_DIGITALIZATION$ | | 0,1452 *** | 2,79 | 0,0809 ** | | 2,6 |
| INFL | | 0,0043 | 0,64 | -0,0116 ** | | -2,2 |
| GDP | | -0,0272 ** | -2,26 | 0,0316 *** | | 3,48 |

| | | | | | | |
|--------------------|---------|-----|-------|------------------|-----|-------|
| d_CRISIS1998 | -0,1487 | *** | -2,70 | N/A ^a | | |
| d_CRISIS2008 | 0,0998 | ** | 2,10 | N/A ^a | | |
| Constanta | -4,5117 | *** | -7,04 | -5,4183 | *** | -9,23 |
| Adjusted R-Squared | 0.8746 | | | 0.8482 | | |
| F-Statistic | 0.0000 | | | 0.0000 | | |
| Total Obs. | 2.531 | | | 2.431 | | |
| Total Group | 287 | | | 283 | | |

4. CONCLUSION

The trend of non-interest income has been increasing over the past few years. Factors associated with non-interest income can come from the bank's internal or macroeconomic conditions. However, entering 2009, banking began to enter the digitalization era. Many banks have started to rely on technology for financial services. One of them is the development of an electronic payment system. Transactions through electronic payment also encourage banking non-interest income. Nevertheless, recently, an increase in non-interest income is along with the decline of credit growth. These condition looks like the banks started to shift their primary function as an intermediary. This study determines the factors associated with non-interest income. It analyzes the relationship between the loan to deposit ratio (as a proxy of intermediary function) and non-interest income in good and dire economic conditions. In a dire economic condition, banks may increase their non-interest income as a "cushion" because the credit demand drops. Many debtors are in arrears because their income has also decreased. Non-interest income can be an alternative for banks to survive. However, if the economic conditions are good but the banks continue to rely on non-interest income, it will be risky for the national economy, especially for the developing countries that still rely on banking for economic growth. This research shows that the loan to deposit ratio (LDR), a proxy for banking intermediation, is negative and significantly associated with non-interest income. The results are consistent in regression without a threshold and threshold GDP growth (regime one as a dire economic condition and regime two as a good economic condition). A lower LDR is associated with higher non-interest income. It suggests that the banks are starting to shift to the non-intermediation services. Even in good economic conditions, LDR is also negatively associated with non-interest income. The trend of non-interest income is also associated with the digitalization of banks. The dummy digitalization has proved that it has a positive and significantly associated with non-interest income. Digitalization reduces banks' intermediation function and enters electronic payment services to earn non-interest income. Our findings have important policy implications. The reform of digitalization in banking must improve credit access, not only derive the non-interest income. All this time, banking digitization is used for electronic payment systems. However, banks must facilitate credit access through digitalization. To implement this policy, the financial services authority or the central bank as the policymaker must conduct an assessment in terms of business models, technology, and corporate governance. Digitalization can provide credit access to the unbanked, thereby increasing the banking intermediation function. In addition, banking digitization can also make it easier to get the data to analyze the prospective debtors to reduce the costs in the credit process. Thus, banks can continue to rely on interest income through digitalization.

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