“Determinants of non-performing financing in Indonesian Islamic banks: A regional and sectoral analysis”

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DETERMINANTS OF NON-PERFORMING FINANCING IN INDONESIAN ISLAMIC BANKS: A REGIONAL AND SECTORAL ANALYSIS

Abstract

This study examines the determinants of Islamic banks' non-performing financing from the perspective of regional and sectoral aspects during the periods before and during the pandemic. The study adopts a dynamic panel data analysis, namely the Generalized Method of Moments, and assesses panel data from the Indonesian banking industry in 32 provinces from October 2018 to July 2021 on a monthly basis. The study uses non-performing financing as the dependent variable and regional inflation, total financing, financing to deposit ratio, and Islamic bank size as the dependent variables. The findings indicate that the COVID-19 pandemic generally influenced the performance of non-performing financing in Islamic banks. This was evident in the significant relationship between regional inflation, total financing, financing to deposit ratio, and the non-performing financing value. Moreover, in the sectoral analysis, a different level of impact was observed in each sector. The most severe impact was seen in the construction sector, while other sectors were less affected during the pandemic. The regional analysis shows that all provinces on Java Island, as the epicenter of the pandemic in Indonesia, did not perform better than the provinces outside Java. Concerning policy implications, the Indonesian Financial Services Authority must be more aware of the determinants of Islamic banks' non-performing financing by considering sectoral and regional aspects. Furthermore, sectoral and regional-based policies should be developed to achieve and maintain the performance of Islamic banks' non-performing financing.

Keywords non-performing financing, Islamic banks, the COVID-19 pandemic, generalized method of moments

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INTRODUCTION

Statistical data show that Indonesia offers potential in terms of the constant growth of Islamic banking assets. According to the Indonesian Financial Services Authority/Otoritas Jasa Keuangan (OJK) in 2021, there has been consistent year on year growth in the asset levels of the Indonesian Islamic banking industry (OJK, 2021). Indonesia is home to the world's largest Muslim population (Trinugroho et al., 2018) and thus represents a large market for the Islamic finance industry. Moreover, since 1992, under National Law No. 7, Indonesia has adopted a dual banking system, which has enabled significant growth in the assets of Islamic banks (Khattak et al., 2021). The country's banking system was also considered to be robust during the financial crises in 1997/1998 and 2008 (Khattak et al., 2021).

However, at the beginning of March 2020, Indonesia faced a burgeoning health emergency as the government announced the country's first COVID-19 infection. The ensuing health crisis disrupted economic systems in both the real and financial sectors. As reported by Statistics

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Indonesia (2022) in 2020 and 2021, the economy plunged into a recession with negative annual economic growth from Q2 2020 to Q1 2021. The question then arose of how the economic turmoil would affect the performance of Islamic banking, particularly in non-performing financing (NPF). In addition, even though the pandemic was primarily a health crisis, it has inevitably had a multiplier effect on other areas of the economy. Many policies were implemented in response to the crisis, notably to limit direct human interaction. As a result, variations can exist across sectors.

Banking and finance are sectors that are directly impacted by the pandemic. Previous empirical literatures found that NPF has been affected by the COVID-19 pandemic and that bank-specific variables have become some of the main factors in how banks react to financial turmoil (Elnahass et al., 2021; Anto et al., 2022). Most of previous studies provide analyses in general context. A study by Elnahass et al. (2021) only highlights the global banking perspective, while in the Indonesian context, Anto et al. (2022) still focus only on the home financing sector. Regional and sectoral approaches in examining the determinant of Islamic banks' NPF are still meager. This study is significant for the following reasons:

1) It will benefit Islamic banks as players within the financial system can use the results to assess their performance on either a sectoral or regional basis.

2) It is expected to benefit financial institution policymakers, such as the central bank of Indonesia and OJK, which may also consider the performance of Islamic banks on sectoral and regional bases.

3) The findings are also considered to benefit the development of knowledge in Islamic banking and finance in terms of adopting regional and sectoral approaches.

1. LITERATURE REVIEW AND THEORETICAL BASIS

Inflation is one of macroeconomic variables that represent the economic condition. It also becomes an indicator of business cycles either in the stable or unstable financial circumstances (Kiyotaki & Moore, 1997). Moreover, inflation reflects the level of purchasing power from the demand and supply sides. During a financial crisis, a certain level of inflation, serving as a proxy of macroeconomic variables, can weaken the performance of financial institutions. In contrast, however, poor performance on the part of financial institutions may influence the macroeconomic condition, including inflation, as was the case in the era of a great depression (Bernanke et al., 1998). From another perspective, Masood and Ashraf (2012) explained that a fundamental aspect of the banking sector, such as internal financial performance, will determine business sustainability.

Previous studies have found that banking performance is strongly related to macroeconomic conditions. Klein (2013) explained several empirical studies that examined the impact of macroeconomic variables, particularly inflation, on banking performance in central, eastern, and southeastern Europe (the CESEE region) and found that higher inflation impacted a bank's higher non-performing loan. Bank-specific variables are an additional factor in terms of how banks respond to inflation; as such, the banks with a better fundamental or financial performance tend to be those that better mitigate against the risk of inflation. It has similarly been found that when macroeconomic conditions become unstable, it increases the banks' risk exposure particularly for a good loan can quickly become a bad loan, as was shown in the case of Pakistan (Farhan et al., 2012; Rashid & Jabeen, 2016; Siddiqui, 2008), Germany (Blank & Dovern, 2010), Kenya (Warue, 2013), and across countries (Jara-Bertin et al., 2014; Uddin et al., 2017; Alqahtani & Mayes, 2018; An et al., 2022)

Therefore, as suggested by Rashid and Jabeen (2016), at the banking level, it is important to strengthen efficiency and financial risk management to ensure the financial stability of banking performance. In the case of certain Arab countries, Touny and Shehab (2015) revealed that global financial turmoil had a negative effect on banking

performance. Concerning the impact of inflation, a fall in the rate of inflation leads to an increase in the non-performing loan (NPL) rate. This demonstrates how, to a certain extent, a low inflation rate reflects lower purchasing power, which disturbs economic activities and ultimately impacts the quality of the bank's financing.

The size of a bank evidently affects financial performance. Banks with higher levels of banking assets perform better than those with lower asset levels in response to macroeconomic conditions (Masood & Ashraf, 2012). Kabir et al. (2015), in addition to examining the impact of NPF during financial distress, identified the higher credit risk exposure of Islamic banks compared to their conventional counterparts. Other findings from Bourkhis and Nabi (2013), Tan and Floros (2012), and Al Wesabi and Ahmad (2013) generally explained that the performance of banking sectors, particularly in terms of NPLs or financing, is determined by the banks' internal financial performance along with external factors such as inflation and economic growth. With reference to the findings, Kabir et al. (2015) stated that several factors contribute to the higher credit risk exposure of Islamic banks. First, they continue to have only relatively limited experience in the banking industry, particularly in terms of the human capital capable of identifying the risk exposure in financing activities. Second, Islamic banks are impacted by the issue of shariah complexity, which obliges them to maintain a shariah approach. Certain shariah principles are potentially difficult to apply in the current banking industry, particularly concerning the issue of existing regulation acceptance and tax. In undertaking profit-and-loss sharing (PLS) contracts, namely *musharakah* and *mudharabah* contracts, levels of asymmetric information remain high, thus posing a greater risk of moral hazard. Third, Kabir et al. (2015) expressed concern regarding the financing behavior of Islamic banks, which typically advance greater levels of financing in the real estate and construction sectors, although these sectors are considered vulnerable during periods of financial turmoil.

Prior studies in the Indonesian context are needed to provide insight from the perspective from developing countries. Widarjono et al. (2020) delineated the assessment of NPF by explaining the determinants of Islamic rural banks' NPF using province-level data. Their findings revealed that Islamic rural banks outside Java were more exposed to NPLs. This reflected the lower levels of development of the regions outside Java, which results in fewer financing diversification schemes that can be implemented in the banking operation. The PLS scheme is evidently shown to have higher financial risk exposure. Hence, Widarjono et al. (2020) also identified the need to determine the optimal level of PLS-based financing as an attempt to diversify financing risk.

Focusing on the home financing sector in relation to the COVID-19 pandemic, Anto et al. (2022) found that regional inflation had a different influence on the home financing sector in each region of Indonesia over their period of study. The impact of inflation on NPF in the housing sector tended to vary across the provinces, potentially due to the differing levels of inflation and Islamic bank development in each region. In the case of banking sector in Indonesia, Fakhrunnas et al. (2022) stated that inflation had non-linear and asymmetric influence to credit risk of the banking sector. During the outbreak, it also worsened the non-performing loan in the banking sector but the findings did not explain the specific sector of financing activities. Concerning the performance of Islamic banks globally, Elnahass et al. (2021) found that Islamic banking sectors were more robust in terms of financial risk management during financial turmoil compared to conventional banks. However, Elnahass et al. (2021) only examined this on a global basis with no consideration of regional and bank-specific variables.

With respect to the previous studies, Al Wesabi and Ahmad (2013), Bourkhis and Nabi (2013), Masood and Ashraf (2012), and Widarjono et al. (2020) did not explain the determinants of NPLs in the case of Islamic banks during financial turmoil. Siddiqui (2008), Farhan et al. (2012), Touny and Shehab (2015), Kabir et al. (2015), and Rashid and Jabeen (2016), meanwhile, did explain how financial turmoil can be a determinant of NPLs or NPF in the banking industry. However, the characteristics of the current financial distress caused by the COVID-19 pandemic differ from those of previous crises. While Elnahass et al. (2021), Anto et al. (2022), and Fakhrunnas et al. (2022) dis-

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cussed the impact of COVID-19 as a determinant of Islamic bank performance, the former focused only on the global market, while the latter examined only certain sectors and employed solely descriptive explanation.

Thus, to fill the current research gap, this study attempts to examine the determinants of NPF in Islamic banks by focusing on sectoral and regional bases with an emphasis on the current financial crisis caused by the COVID-19 pandemic. Hence, the study constructs the following hypotheses:

H1: Inflation and bank-specific variables have a significant relationship with NPF in Islamic banks.

H2: The COVID-19 pandemic has a significant relationship with NPF in Islamic banks.

H3: The COVID-19 pandemic worsens NPF in all sectors in the Java region compared to outside the Java region.

2. DATA AND METHODS

The study employs a monthly and provincial dataset of Islamic banks obtained from OJK. Macroeconomic information was obtained from Statistics Indonesia, while the dataset covers 32 provinces spanning the period October 2018 to July 2021. The study examines 32 out of Indonesia's 34 provinces, mainly due to the availability of bank-specific data. Meanwhile, the pandemic period is deemed to run from the time of the initial case of COVID-19 in Indonesia (March 2020) until the latest month of the data when this research was undertaken (July 2021). Therefore, the data collection for the pandemic period includes a maximum of 17 months. A sub-dataset (i.e., before the pandemic) was collected for the 17 months preceding the pandemic period, that is, October 2018 to February 2020.

NPF as a measurement of credit risk is constructed using the ratio of impaired financing to total gross financing. This represents the dependent variable in the model. The determinants of NPF are inferred from the macroeconomic and bank-specific aspects. Macroeconomic factors are considered strictly exogenous variables (Castro, 2013). Considering the limited amount of province-level monthly macroeconomic information, the study uses inflation alone as a proxy for the economic fluctuations. Bank size is measured using the total assets in logarithmic form. The existing evidence shows that bank size influences NPL in ambiguous directions; as such, it may positively or negatively affect NPL (Karadima & Louri, 2020). The other measurement from bank-specific assets comprises bank liquidity, which is measured using the ratio of total net financing to total customer deposits (FDR) and total financing in logarithmic form.

2.1. Strategy of analysis

Extant studies show that many economic analyses are dynamic in nature (Baltagi, 2005). Consideration of the dynamic aspect yields a better understanding of dynamic adjustment. Credit risk can be seen as something where past performance in financing is more likely to influence current performance. The presence of a lagged dependent variable can explain this behavior. Ordinary least squares (OLS) will produce a biased estimator, since the lagged dependent variable on the right-hand side is correlated with the error term.

$$\begin{aligned} NPF_{it} &= \beta_0 NPF_{i,t-1} + \beta_1 Inf_{it} + \beta_2 Inf_{i,t-1} + \\ &+ \beta_3 \log\_ Fin_{it} + \beta_4 \log\_ Fin_{i,t-1} + \\ &+ \beta_5 FDR_{it} + \beta_6 FDR_{i,t-1} + \beta_7 \log\_ assets_{it} + \\ &+ \beta_8 \log\_ assets_{i,t-1} + u_{it}, \end{aligned} \quad (1)$$

where $u_{it} = \mu_i + \nu_{i,t}$ due to the inclusion of individual effects as represented by μ_i. *NPF* represents the non-performing financing variable, *Inf* is regional inflation, log_*Fin* is the variable of total financing in logarithmic form, *FDR* represents the financing to deposit ratio, and log_*assets* is the variable of bank's assets in logarithmic form.

OLS does not address the issue of individual effects. Moreover, a larger sample does not tackle the issue of correlation between the lagged dependent variable and the error term (Bond, 2002). Merely employing fixed effects solves the issue of heterogeneity among individuals but does not concern $\nu_{i,t}$ Anderson and Hsiao (1981) in Baltagi (2005) proposed the use of first-differencing transformation to eliminate μ_i and instrumenting $\Delta y_{i,t-1}$ using $\Delta y_{i,t-2}$. However, despite

the consistency of its estimation results, this method has an efficiency issue. Arellano and Bond (1991) introduced the Generalized Method of Moments (GMM), which is considered more efficient. This method uses instruments in level as opposed to difference form, which has no singularities and much smaller variances. The Arellano-Bond estimator uses moment conditions in which lags of the dependent variable and first differences of the exogenous variables are instruments for the first-differenced equation. The method requires several conditions to produce valid results. First, there is no second-order autocorrelation in the differenced equation, which as an issue generates inconsistent estimates in the model. Second, the Sargan specification test should statistically prove that the instruments used in the moment conditions are valid. It demonstrates the consistency of the GMM estimates (Arellano & Bover, 1995).

The main analysis in this study employs Arellano and Bond's generalized moments method followed by post-estimation in the form of an autocorrelation test and Sargan specification test. Separate analyses are conducted for the periods before and during the pandemic. The impact of the COVID-19 pandemic can be assessed with the inclusion of a pandemic dummy variable. However, since the analysis is conducted to determine the magnitude of effects from each independent variable in the two periods, the datasets are analyzed separately, that is, before the pandemic and during the pandemic.

Further analysis focuses on regional and sectoral approaches. Regional analysis compares the results with the same model implemented in samples comprising provinces in Java and outside Java Island. Meanwhile, sectoral analysis specifies NPF in 15 sectors based on classifications set by OJK. In addition, the study conducts analysis using the Arellano-Bover/Blundell-Bond system estimator. This method adopts the Arellano-Bond moment conditions and moment conditions in which the lagged first differences of the dependent variable are instruments for the level equation.

2.2. Econometric model specification

The GMM equation in the analysis takes the following form in the main model:

$$\begin{aligned}\Delta NPF_{it} &= \Delta\beta_0 NPF_{i,t-1} + \Delta\beta_1 Inf_{it} + \\ &+\Delta\beta_2 Inf_{i,t-1} + \Delta\beta_3 \log\_ Fin_{it} + \\ &+\Delta\beta_4 \log\_ Fin_{i,t-1} + \Delta\beta_5 FDR_{it} + \\ &+\Delta\beta_6 FDR_{i,t-1} + \Delta\beta_7 \log\_ assets_{it} + \\ &+\Delta\beta_8 \log\_ assets_{i,t-1} + \mu_i + \Delta\nu_{i,t},\end{aligned} \quad (2)$$

where i = province 1, province 2, …., province 32; t = October 2018, November 2018, …., July 2021; y is NPF and x is the macroeconomic aspect (inflation) as well as bank-specific aspects (FDR, assets, and total financing). The model is applied to the two periods – before and during the pandemic – and is run for both the national and regional sample; that is, for provinces located both on and outside Java Island.

3. RESULTS AND DISCUSSION

Appendix A contains the data description during the periods of observation. By merging all of the regional and sectoral data, it can generally be seen that in Indonesia, there is no significant difference between the NPF of Islamic banks in all sectors before and during the COVID-19 pandemic. The average NPF percentages before and during the outbreak are similar, at 3.09% and 3.06%, respectively. However, when the data are separated into two regions consisting of provinces located on Java Island (6) and provinces located outside Java Island (26), it can be seen that during the pandemic, NPF in Java Island increases by almost 1%, while it decreases by roughly 0.2% outside Java Island.

The initial inference from this evidence is that Islamic banks outside Java Island managed credit risk better than those on Java Island despite both facing the COVID-19 pandemic. Nevertheless, both regions showed an increase in the amount of financing distributed to deficit units. In addition, FDR fell by around 4% in Java Island, 3% outside Java Island, and by about 4% for all provinces in Indonesia. These findings indicate that Islamic banks may not have been aggressive in channeling funds to maintain FDR at a particular level as part of their risk management policies. Finally, despite the onset and occurrence of financial turmoil due to the health crisis, Islamic banks have consistently

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grown in size. Among the regional macroeconomic variables, regional inflation in Indonesia, both on and outside Java Island, decreased during the pandemic. This may indicate a fall in the purchasing power of society and consequently reduced demand for goods and services in the market.

To examine the determinants of NPF in Islamic banks by considering both a sectoral and regional approach, to begin with, Appendix B contains a set of general results on the performance of NPF using aggregate data. In general, when the data are merged for all sectors (using country and regional analysis), relatively few differences emerge when comparing the periods before and during the COVID-19 pandemic. NPF in the previous period significantly affects NPF in the current period. It can be seen that the L.NPF variable has a positive and significant relationship with NPF in Indonesia, Java, and outside Java Island both before and during the COVID-19 pandemic. Therefore, an increase in NPF in the current period tends to increase the percentage of NPF in the next period.

In addition, the bank-specific condition reflected by financing activities had a positive and significant relationship before the COVID-19 pandemic but no significant relationship during the outbreak in Indonesia and Java Island. FDR and Islamic bank size also had a negative and significant relationship before the outbreak in Indonesia and Java Island. These findings are in line with Masood and Ashraf (2012), who stated that Islamic banks' fundamental financial condition affects their performance, particularly for NPF (Bourkhis & Nabi, 2013). In terms of external factors, regional inflation as a proxy for monthly macroeconomic variables had a positive and significant relationship with NPF before the outbreak on Java Island but not in other regions and periods. As mentioned by Widarjono et al. (2020), regional inflation at the province level is one of the key factors to affect the performance of NPF in Indonesian Islamic banks. In terms of Islamic bank size, the findings are also supported by Widarjono et al. (2020), whose findings added that smaller Islamic banks are better at managing credit risk than larger Islamic banks.

During the COVID-19 pandemic, the only determinant of NPF in Indonesia was L.NPF, while for all regions outside Java Island, Islamic bank size was the only variable to show a significant relationship with NPF. These findings mirror those of Widarjono et al. (2020), who stated that during the COVID-19 pandemic, regional macroeconomic variables such as regional inflation created a shock to the NPF percentage in both Java and outside Java Island, while exposure to regional variables was greater outside Java Island. Moreover, Elnahass et al. (2021) reported similar findings to this study and concluded that during the COVID-19 pandemic, since Islamic banks had less exposure to the financial turmoil, it can be assumed that they managed the risk well.

To deepen the analysis, this study adopted a sectoral and regional approach to identify the sectors and regions that had a higher risk of exposure to the value of NPF before and during the outbreak. For all provinces located on Java Island, NPF in the previous period generally had a positive and significant relationship with NPF in the current period, either before or during the COVID-19 pandemic, except for electricity, gas, and water plus transportation, warehousing, and communication, where the relationship was significant before but not during the pandemic. Moreover, the wholesale and retail trade sector were more exposed to regional inflation. Here, according to Appendix C, there is a positive relationship between regional inflation and NPF. This means that higher inflation leads to an increase in the NPF percentage (Klein, 2013). An increase in inflation will erode society's real income, which may in turn increase the inability to return money to Islamic banks (Fakhrunnas et al., 2022), especially in the wholesale and retail trade sector. A different influence is seen in the construction sector, which had a positive and significant relationship with NPF before the pandemic but a negative and significant relationship during the outbreak. These circumstances indicate that in the construction sector, a lower rate of inflation reflects lower purchasing power from society, which will result in lower demand for goods and services. In turn, lower demand in the construction sector leads to an increase in Islamic banks' NPF.

For the provinces on Java Island, the agriculture, hunting, and forestry; construction; financial intermediary; accommodation and food providers; and personal services serving households sectors

experienced a severe impact from the COVID-19 pandemic and recorded a worse fundamental performance compared to before the pandemic. In contrast, based on the fundamental financial performance, various sectors, namely fishery; mining and excavation; processing industry; transportation, warehousing, and communication; education services; and health services and social activities, performed better during than before the pandemic. The latter performed better as they were less exposed to the fundamental financial performance in financing, FDR, or the assets of Islamic banks. As mentioned by Masood and Ashraf (2012), fundamental performance is important for examining the vulnerability of Islamic bank performance to external factors. A bank that has a weak fundamental performance may be sensitive to macroeconomic changes, wherein good financing can suddenly become bad financing (Farhan et al., 2012; Rashid & Jabeen, 2016; Siddiqui, 2008).

In the provinces located outside Java Island, NPF in the previous period was found to have a positive and significant relationship before and during the COVID-19 pandemic except in the sectors of agriculture, hunting, and forestry; mining and excavation; processing industry; electricity, gas, and water; financial intermediary; education services; health services and social activities; and social, cultural, entertainment, and other services. It can be seen from the result that outside Java Island, previous NPF had less exposure to the current NPF percentage. In terms of how regional inflation affects NPF performance, before the outbreak, Islamic banks' NPF had no significant relationship to inflation. This means that Islamic banks operating outside Java Island had better risk management of macroeconomic variables at the regional level. However, during the pandemic, Islamic banks' NPF in the construction sector had a positive and significant relationship with regional inflation. Thus, as a result of this positive relationship, when the regional inflation rate increased by 1%, NPF in the construction sector rose by 0.89%. A lower level of real income in the construction sector due to an increase in inflation may mean that business owners and investors in that sector are less able to repay financing funds to Islamic banks. Therefore, as stated by Kiyotaki and Moore (1997), inflation becomes an important variable with which to determine business activities in the economic system, including in the banking sector.

Furthermore, from the perspective of fundamental performance, several economic sectors recorded a worse performance during the pandemic than before: agriculture, hunting, and forestry; fishery; transportation, warehousing, and communication; real estate; leasing and corporate services; and social, cultural, entertainment, and other services. This means that those sectors had a higher financial risk exposure that tended to worsen Islamic banks' NPF during the pandemic. By contrast, other sectors performed better during the pandemic, meaning they had a strong fundamental and financial performance. In a nutshell, Islamic banks outside Java Island were better able to handle the undesirable impacts of the COVID-19 pandemic, possibly due to their better risk management in the fundamental financial aspect.

With reference to the results concerning the sectoral and regional aspects for measuring the determinants of Islamic banks' NPF, several points are raised for discussion. First, the determinants of Islamic banks' NPF are revealed as the fundamental financial condition and a regional macroeconomic variable, in this case, inflation. This finding aligns with Masood and Ashraf (2012), Bourkhis and Nabi (2013), and Kabir et al. (2015) who stated that banks' financial performance affects NPL or NPF. The fundamental aspect of the banks' financial performance serves as a foundation by which to determine the sustainability of the business. Moreover, in the long run, financial performance becomes a key factor to defend, grow, and develop the bank in any financial conditions. Hence, a strong fundamental performance tends to enable banks to manage financial circumstances, which was particularly noticeable during the COVID-19 pandemic. A large bank may be better able to manage the risk; as a finding, this has been mirrored by many other researchers, although Widarjono et al. (2020) reached the opposite conclusion.

In addition, the impact of the regional macroeconomic variable represented by regional inflation on Islamic banks' NPF is significant in some cases. As mentioned by Kiyotaki and Moore (1997) and Bernanke, Gertler, and Gilchrist (1998), inflation theoretically affects the performance of credit in

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the financial system. This alignment with the theory confirms that Islamic banks' NPF is also influenced by the macroeconomic condition. As explained by Fakhrunnas et al. (2022), a lower rate of inflation that leads to an increase in Islamic banks' NPF may arise because the society, which includes private and business sectors, has lower purchasing power in the market. As a result, there is less demand in the market and, as a direct impact, goods and services are not absorbed perfectly. Moreover, the positive relationship between inflation and Islamic banks' NPF confirms that society experiences a decline in real income, which may in turn lead to a reduced ability to repay money to the banks (Farhan et al., 2012; Rashid & Jabeen; 2016; Touny & Shehab, 2015).

Second, it is true that Islamic banks performed well aggregately to manage their risk during the pandemic, which is in line with Elnahass et al. (2021). However, it is not possible to generalize this statement to all conditions regarding the sectoral and regional aspects. Fakhrunnas et al. (2022) concluded that each sector and region has different characteristics, which is also supported by the findings of this study. Each sector and region has its response to the determinants of Islamic banks' NPF. For example, using the regional approach, the provinces located on Java Island tend to be at greater risk from regional inflation. This may occur because Java Island accounts for around 60% of the Indonesian economy, which means the region is more vulnerable to dynamic macroeconomic conditions. Combining the regional and sectoral aspects, in general, many sectors in Java Island have greater exposure to Islamic banks' NPF, except transportation, warehousing, and communication; real estate; leasing and corporate services; and social, cultural, entertainment, and other services, which are more sensitive to fundamental financial performance and regional inflation dynamics. The difference in each sector may also be caused by each one's degree of vulnerability to a certain level of economic turmoil.

3.1. Robustness check

As suggested by Baltagi (2005), the robustness of the model can be measured by the non-existence of autocorrelation among the variables. According to the results of the Arellano-Bond test in Appendix D, where Ho means there is no autocorrelation, there are no autocorrelation issues in Order 2 for all estimations. In addition, a robustness check was conducted by analyzing the same regressors to the same outcome using a modified method. The Arellano-Bover/Blundell-Bond system estimator, which uses the Arellano-Bond moment conditions and moment conditions as instruments for the level equation, produces an almost similar conclusion as the analysis using Arellano and Bond's GMM. According to Appendix E, in general, there is alignment with the findings of this study. Hence, the model and findings of the study are considered robust.

CONCLUSION

The objective of this study was to examine the determinants of Islamic banks' non-performing financing based on a regional and sectoral approach. The findings reveal that inflation and bank-specific variables reflected by the fundamental financial performance have a relationship with non-performing financing. In addition, the COVID-19 pandemic has evidently had a negative effect on the non-performing financing of Islamic banks. Due to the significant contribution they make to Indonesian economic activity, Islamic banks in Java have been impacted to a much greater extent than Islamic banks outside Java. According to the findings, hypotheses H_1, H_2 and H_3 are accepted.

Additionally, in terms of the sectoral aspects, many sectors on Java Island are more exposed to Islamic banks' non-performing financing, with the exception of transportation, warehousing, and communication; real estate; leasing and corporate services; and social, cultural, entertainment, and other services, which are more sensitive to fundamental financial performance and regional inflation dynamics. The difference in each sector might also be caused by each one's degree of vulnerability to a certain level of economic turmoil.

As a policy implication, the financial authorities of Indonesia must pay more attention to the regional and sectoral aspects. This is important because each sector and region has its own specific characteristics that must be considered in the context of various financial policy areas such as financial regulation, credit relaxation due to the COVID-19 pandemic, and benchmarking of the return for the financing activities of Islamic banks. Lastly, the study has a limitation in that its observations are based only on certain financial data due to an issue with the unavailability of data provided by Statistics Indonesia and the Indonesian Financial Services Authority. Hence, the study was unable to adopt a more comprehensive model to explain either the fundamental financial performance of Islamic banks at the province level or regional macroeconomic variables. This limitation provides other researchers with an opportunity to improve the study in the future.

AUTHOR CONTRIBUTIONS

Conceptualization: Faaza Fakhrunnas, Riska Dwi Astuti.
Data curation: Faaza Fakhrunnas.
Formal analysis: Faaza Fakhrunnas.
Funding acquisition: Faaza Fakhrunnas, Riska Dwi Astuti, Mohammad Bekti Hendrie Anto.
Investigation: Faaza Fakhrunnas, Riska Dwi Astuti.
Methodology: Faaza Fakhrunnas.
Project administration: Mohammad Bekti Hendrie Anto.
Resources: Faaza Fakhrunnas, Mohammad Bekti Hendrie Anto.
Software: Faaza Fakhrunnas.
Supervision: Faaza Fakhrunnas, Riska Dwi Astuti, Mohammad Bekti Hendrie Anto.
Validation: Faaza Fakhrunnas, Riska Dwi Astuti, Mohammad Bekti Hendrie Anto.
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APPENDIX A

Table A1. Data description

Variable	Indonesia		Java Island		Outside Java Island	
	Before	During	Before	During	Before	During
NPF	3.09	3.06	3.38	4.08	3.02	2.82
NPF (%)	(1.8)	(2.11)	(1.33)	(1.91)	(1.89)	(2.09)
Inf	0.44	0.1	0.76	0.1	0.37	0.1
Inf (%)	(0.83)	(0.4)	(0.93)	(0.22)	(0.79)	(0.43)
FDR	106.19	102.93	83.64	79.42	111.40	108.36
FDR (%)	(38.85)	(40.69)	(10.58)	(9.11)	(41.08)	(43.16)
Fin	10361	11726	39958	43551	3531.5	4381.7
Fin (IDR in Billion)	(25230)	(27500)	(47670)	(51934)	(3736)	(5650)
Assets	19912	23304	83223	95051	5302	6746.6
Assets (IDR in Billion)	(61674)	(70548)	(123613)	(141282)	(6546)	(9554.6)
Obs.	544	544	102	102	442	442

Note: The data consist of standard deviation in parentheses and means/average above the parenthetical numbers on a monthly basis.

APPENDIX B

Table B1. GMM results in general

Variables	Indonesia		Java		Outside Java	
	Before	During	Before	During	Before	During
L.NPF	0.488***	0.628***	0.872***	0.692***	0.479**	0.670***
	(0.183)	(0.0830)	(0.0411)	(0.0457)	(0.199)	(0.0749)
Inf	0.0600	0.00986	0.185**	0.0888	0.0423	0.00690
	(0.0467)	(0.0325)	(0.0772)	(0.0727)	(0.0507)	(0.0329)
L.Inf	0.00993	0.0282	–0.0277	0.0111	0.00868	0.0309
	(0.0315)	(0.0494)	(0.0378)	(0.0609)	(0.0322)	(0.0506)
log_Fin	2.108*	–0.0802	7.506*	–1.294	1.400	0.396
	(1.119)	(1.688)	(4.332)	(0.901)	(1.145)	(1.654)
L.log_Fin	0.00868	–1.021	–3.509	3.436	–0.170	–0.633
	(1.362)	(1.321)	(2.788)	(2.306)	(1.416)	(1.398)
FDR	–0.971**	0.461	–7.097*	–0.432	–0.721	0.390
	(0.485)	(0.842)	(4.285)	(1.211)	(0.487)	(0.808)
L.FDR	0.0104	–0.0868	4.280	–1.172	0.0646	–0.130
	(0.310)	(0.525)	(5.604)	(1.983)	(0.341)	(0.585)
log_assets	–2.265*	–0.594	–8.153***	0.349	–1.760	–0.832**
	(1.192)	(0.392)	(1.599)	(1.322)	(1.382)	(0.356)
L.log_assets	0.435	0.0348	5.140**	–2.496	0.345	–0.0388
	(1.379)	(0.389)	(2.579)	(2.718)	(1.530)	(0.418)
Constant	1.037	14.29***	–5.583	3.730	4.181	9.340**
	(8.391)	(4.719)	(11.19)	(7.283)	(7.860)	(3.901)
Observations	480	544	90	102	390	442
Number of provinces	32	32	6	6	26	26

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

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APPENDIX C

Table C1. GMM results on sectoral (Agriculture, hunting, and forestry, fishery, and mining and excavation) and regional bases

Variables	Agriculture, hunting, and forestry				Fishery				Mining and excavation			
	Java Island		Outside Java Island		Java Island		Outside Java Island		Java Island		Outside Java Island	
	Before	During	Before	During	Before	During	Before	During	Before	During	Before	During
L.npf	0.876***	0.585***	0.234	–0.0978	0.583***	0.654***	0.520***	0.534***	0.367***	0.617***	0.00769	–0.118
	(0.0111)	(0.0939)	(0.232)	(0.187)	(0.179)	(0.0823)	(0.0836)	(0.161)	(0.0722)	(0.0816)	(0.0126)	(0)
INF	–0.0650**	–0.0384	0.455	0.501	–0.363**	0.902	0.235	–0.675	–0.0892	–0.221	–4.087	3.753
	(0.0296)	(0.256)	(0.374)	(0.329)	(0.163)	(1.126)	(0.264)	(0.453)	(0.251)	(0.648)	(4.499)	(0)
L.INF	0.0414	–0.369	–0.175	–0.190	–0.467	0.578	–0.0382	–0.491	–0.179	–0.535	5.423	6.630
	(0.0268)	(0.225)	(0.235)	(0.288)	(0.402)	(0.752)	(0.235)	(0.454)	(0.154)	(0.720)	(5.103)	(0)
log_Fin	7.714	13.72	–16.29**	5.829	5.335	27.80	14.54	4.516	–1.519	3.865	–392.7***	–126.9
	(5.603)	(8.716)	(7.708)	(4.122)	(4.058)	(21.92)	(15.91)	(4.167)	(12.35)	(13.17)	(117.1)	(0)
L.log_Fin	–3.367	9.855	9.436	–1.797	–7.135	–6.303	42.51	–5.262	7.194	–11.45	420.5***	75.04
	(3.580)	(11.41)	(12.24)	(5.942)	(7.966)	(16.51)	(27.33)	(4.786)	(12.06)	(22.03)	(88.92)	(0)
FDR	–3.226	–10.10*	5.349	5.727**	1.673	–18.60	–1.216	13.95***	–0.658	–7.510*	–71.95	–74.65
	(3.599)	(5.428)	(5.399)	(2.236)	(7.697)	(12.78)	(8.161)	(3.842)	(6.013)	(4.104)	(106.6)	(0)
L.FDR	–2.528	–6.088	–2.587	–3.712*	1.265	10.38	–22.60	–13.50***	16.27*	–4.067	–12.15	–45.70
	(1.889)	(5.858)	(5.486)	(2.208)	(4.708)	(6.707)	(14.16)	(3.923)	(8.476)	(19.04)	(72.64)	(0)
log_assets	–5.354	–13.73**	5.334	–5.867	–3.804	–17.86	–11.88	–1.640	9.932	2.057	–33.67	105.3
	(5.257)	(6.683)	(6.849)	(3.623)	(6.686)	(12.76)	(17.19)	(1.974)	(12.99)	(4.910)	(109.7)	(0)
L.log_assets	–0.576	–5.467	–3.041	–5.020*	1.524	5.924	–44.69*	–0.507	7.725*	–6.869	48.69	–88.24
	(2.552)	(6.512)	(9.757)	(3.037)	(4.528)	(7.410)	(26.73)	(3.259)	(4.323)	(13.86)	(65.28)	(0)
Constant	23.91	–19.55	34.17	60.40	41.35	–82.59**	48.06	26.07	–252.7	137.6*	–232.5	441.4
	(16.72)	(16.18)	(88.92)	(39.32)	(25.18)	(42.11)	(68.26)	(24.37)	(202.3)	(79.83)	(483.1)	(0)
Observations	90	102	357	394	90	102	343	371	90	102	294	284
Number of provinces	6	6	25	24	6	6	25	22	6	6	21	20

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

Table C2. GMM results on sectoral (processing industry, electricity, gas, and water, and construction) and regional bases

Variables	Processing industry				Electricity, gas, and water				Construction			
	Java Island		Outside Java Island		Java Island		Outside Java Island		Java Island		Outside Java Island	
	Before	During	Before	During	Before	During	Before	During	Before	During	Before	During
L.npf	0.800***	0.758***	0.381***	0.000533	0.485***	0.649	0.702	0.590***	0.915***	0.488***	0.644***	0.613***
	(0.101)	(0.0303)	(0.0544)	(0.169)	(0.0286)	(0)	(0)	(0.0892)	(0.105)	(0.0846)	(0.120)	(0.0706)
INF	0.685	0.239	–1.007	0.623	–0.285	1.722	0.574	0.205	1.901	0.228	0.127	–0.309
	(0.582)	(0.781)	(0.616)	(1.101)	(0.669)	(0)	(0)	(0.130)	(1.337)	(1.185)	(0.310)	(0.741)
L.INF	0.0124	0.714	0.194	0.250	–0.00894	1.714	–0.662	0.151	0.411*	–0.748*	0.163	0.891*
	(0.196)	(0.626)	(0.366)	(1.209)	(0.537)	(0)	(0)	(0.119)	(0.219)	(0.435)	(0.491)	(0.517)
log_Fin	34.16**	43.27	8.304	–7.530	–71.72	–55.68	27.80	–0.801	1.383	–60.05**	–1.362	3.244
	(14.86)	(29.08)	(8.335)	(23.11)	(69.07)	(0)	(0)	(2.197)	(35.06)	(26.82)	(12.75)	(8.491)
L.log_Fin	–51.64***	10.13	–10.63	5.145	69.16	50.82	34.16	5.098*	–20.07	43.64*	4.749	7.026
	(12.59)	(21.27)	(14.13)	(10.92)	(59.91)	(0)	(0)	(2.681)	(38.50)	(24.01)	(6.577)	(4.620)
FDR	–50.70**	–25.77**	–0.176	0.159	26.39	18.98	–13.62	–3.581	25.12	–2.886	–0.306	0.375
	(25.62)	(11.90)	(2.462)	(6.623)	(37.13)	(0)	(0)	(2.627)	(20.21)	(18.70)	(4.162)	(2.439)
L.FDR	48.57**	–14.56	6.371*	–4.376	–47.92	–34.67	–14.82	–4.476**	14.14	–10.19	–3.872*	–1.530
	(21.13)	(25.96)	(3.805)	(3.790)	(49.50)	(0)	(0)	(2.182)	(31.19)	(17.40)	(2.313)	(1.379)
log_assets	–33.47***	–22.75	–14.19	–0.728	41.25	109.6	–25.68	2.435	1.760	18.71	5.230	–5.379
	(12.32)	(14.90)	(11.10)	(20.55)	(41.64)	(0)	(0)	(2.433)	(24.50)	(16.01)	(13.12)	(8.979)

Table C2 (cont.). GMM results on sectoral (processing industry, electricity, gas, and water, and construction) and regional bases

Variables	Processing industry				Electricity, gas, and water				Construction			
	Java Island		Outside Java Island		Java Island		Outside Java Island		Java Island		Outside Java Island	
	Before	During	Before	During	Before	During	Before	During	Before	During	Before	During
L.log_assets	45.51***	–18.23	10.32	–16.41***	–44.90	–121.6	–40.01	–5.302**	42.94	–16.78	–7.475	–2.694
	(16.37)	(29.66)	(19.33)	(6.351)	(36.63)	(0)	(0)	(2.371)	(30.04)	(18.78)	(7.214)	(3.665)
Constant	51.87	–68.57	46.51	168.6*	83.20**	188.9	87.38	–1.537	–315.3***	165.0**	0.289	–8.454
	(60.40)	(43.89)	(84.77)	(87.50)	(33.13)	(0)	(0)	(6.035)	(57.72)	(75.52)	(55.24)	(29.56)
Observations	90	102	390	442	90	102	281	286	90	102	363	421
Number of provinces	6	6	26	26	6	6	19	17	6	6	25	25

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

Table C3. GMM results on sectoral (wholesale and retail trade, accommodation and food providers, and transportation, warehousing, and communication) and regional bases

Variables	Wholesale and retail trade				Accommodation and food providers				Transportation, warehousing, and communication			
	Java Island		Outside Java Island		Java Island		Outside Java Island		Java Island		Outside Java Island	
	Before	During	Before	During	Before	During	Before	During	Before	During	Before	During
L.npf	0.661***	0.886***	0.383***	0.726***	0.475***	0.688***	0.290**	0.611***	0.622***	–0.0167	0.496**	0.772***
	(0.0352)	(0.0509)	(0.0526)	(0.0264)	(0.0232)	(0.106)	(0.146)	(0.210)	(0.0702)	(0.0736)	(0.204)	(0.0914)
INF	0.0903	0.457**	–0.0973	0.105	–0.0330	–0.201	–0.530	–0.533	0.236	–0.428	–0.731	–0.0775
	(0.354)	(0.200)	(0.259)	(0.131)	(0.0622)	(0.218)	(0.518)	(0.486)	(0.173)	(0.326)	(0.673)	(0.114)
L.INF	–0.0825	0.345**	–0.199	–0.116	–0.0568	–0.100	0.242	0.0935	–0.166**	–1.417*	0.377	–0.00286
	(0.302)	(0.136)	(0.259)	(0.209)	(0.0506)	(0.124)	(0.253)	(0.207)	(0.0690)	(0.833)	(0.850)	(0.0872)
log_Fin	–2.094	13.23	8.028**	6.215*	–0.593	0.339	30.76**	–1.607	–7.127	–14.61	–14.67	–7.121*
	(6.339)	(20.66)	(3.967)	(3.758)	(3.654)	(4.926)	(13.47)	(3.615)	(10.08)	(16.63)	(29.05)	(4.283)
L.log_Fin	16.93*	–0.841	0.300	0.382	2.750	1.647	30.54*	–4.341	–13.51	3.894	–16.34	2.131
	(8.963)	(9.378)	(2.160)	(2.416)	(3.544)	(3.805)	(17.88)	(4.145)	(10.48)	(15.53)	(15.55)	(4.534)
FDR	–10.42***	–2.355	–5.564**	0.112	4.291	–0.121	–6.064	4.210	–0.756	9.189	–2.587	–2.919
	(3.094)	(3.122)	(2.439)	(1.164)	(5.565)	(2.614)	(5.029)	(2.744)	(9.264)	(9.604)	(14.55)	(1.904)
L.FDR	6.734	–0.978	0.914	–0.195	–4.919	–6.379*	–11.54**	–0.706	14.38	–11.32	4.477	3.856
	(4.458)	(6.368)	(1.839)	(1.118)	(6.163)	(3.316)	(5.767)	(1.635)	(18.58)	(14.77)	(7.859)	(2.402)
log_assets	–5.135	1.005	–9.987***	–6.865**	1.415	–3.015	–31.06**	2.301	–4.567	11.41	8.617	0.719
	(8.735)	(4.826)	(2.938)	(2.969)	(3.045)	(3.346)	(14.75)	(2.472)	(3.452)	(13.37)	(32.38)	(1.658)
L.log_assets	–5.496	–7.654	–0.991	0.619	–2.379	–1.890	–32.68*	1.526	15.76**	–10.04	16.67	1.850
	(5.475)	(6.019)	(2.928)	(1.443)	(3.010)	(3.409)	(18.87)	(2.786)	(7.983)	(20.36)	(13.14)	(2.009)
Constant	–31.71	–51.07	33.53	1.796	–9.965	37.91***	67.27	12.96	78.22***	98.09	36.36	17.66**
	(43.06)	(33.51)	(28.26)	(7.678)	(16.33)	(7.214)	(61.63)	(15.73)	(18.69)	(116.2)	(89.86)	(7.817)
Observations	90	102	390	442	90	102	388	442	90	102	358	392
Number of provinces	6	6	26	26	6	6	26	26	6	6	25	24

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

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Table C4. GMM results on sectoral (financial intermediary, real estate, leasing and corporate service, and education service) and regional bases

Variables	Financial intermediary				Real estate, leasing and corporate services				Education services			
	Java Island		Outside Java Island		Java Island		Outside Java Island		Java Island		Outside Java Island	
	Before	During	Before	During	Before	During	Before	During	Before	During	Before	During
L.npf	0.646***	0.693***	0.777***	0.357	0.504***	0.667***	0.339**	0.475***	0.385***	0.61***	0.146	–0.115
	(0.0367)	(0.0492)	(0.0519)	(0)	(0.0291)	(0.0622)	(0.147)	(0.130)	(0.147)	(0.0698)	(0.141)	(0)
INF	0.165	–0.106	0.403	–1.853	0.0396	–0.444	–0.137	0.414	–0.0334**	–0.0130	–0.0563	0.646
	(0.135)	(0.339)	(0.512)	(0)	(0.180)	(0.428)	(0.515)	(0.511)	(0.0144)	(0.0415)	(0.151)	(0)
L.INF	0.0372	–0.123	–0.00975	0.900	–0.210	–1.225	–0.227	1.565**	0.0188	–0.00170	0.117	0.744
	(0.0528)	(0.400)	(0.345)	(0)	(0.173)	(0.914)	(0.351)	(0.763)	(0.0156)	(0.0383)	(0.127)	(0)
log_Fin	–3.724	7.773	–15.17	–6.395	–17.92	10.52	–51.18	–27.94*	–1.295	–2.241	–2.870	–0.246
	(4.904)	(6.617)	(10.59)	(0)	(16.84)	(10.70)	(42.27)	(14.44)	(1.218)	(1.366)	(8.995)	(0)
L.log_Fin	–0.116	–11.27***	–10.61	3.633	18.64	–2.096	–53.51	27.00*	–1.098***	0.0155	–5.409	–33.53
	(5.747)	(2.540)	(10.04)	(0)	(21.83)	(17.77)	(33.34)	(14.33)	(0.210)	(1.363)	(10.27)	(0)
FDR	–2.544	–4.442	12.72*	3.568	24.83	–11.01	22.07	–11.81*	1.153	1.132	–1.376	12.57
	(3.523)	(5.110)	(6.865)	(0)	(26.98)	(12.22)	(19.83)	(7.143)	(1.392)	(1.048)	(2.962)	(0)
L.FDR	–4.413	3.082	–3.647	–3.061	–29.12	7.269	10.75	2.514	1.378	0.134	0.916	1.004
	(4.050)	(4.127)	(5.230)	(0)	(19.73)	(10.67)	(10.92)	(4.758)	(0.881)	(1.304)	(3.777)	(0)
log_assets	–4.176	1.639	0.735	5.124	4.161	–9.242	32.84	9.099	–0.461	1.830	–3.810	8.662
	(4.753)	(5.720)	(8.113)	(0)	(7.895)	(7.959)	(38.75)	(10.56)	(0.958)	(1.488)	(6.569)	(0)
L.log_assets	2.454	–0.955	21.23	–3.922	–11.55	10.40	21.84	–3.119	1.962	–0.671	5.026	15.47
	(6.211)	(4.456)	(19.11)	(0)	(8.841)	(11.38)	(21.66)	(5.237)	(1.277)	(1.501)	(10.42)	(0)
Constant	62.93***	29.63	12.09	15.20	75.90*	–92.95**	323.1***	–25.88	6.308	9.213***	55.41	53.89
	(19.56)	(30.53)	(47.64)	(0)	(42.15)	(43.74)	(111.9)	(37.97)	(4.608)	(3.223)	(49.34)	(0)
Observations	90	102	343	365	90	102	370	431	90	102	349	402
Number of provinces	6	6	23	23	6	6	25	26	6	6	24	24

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

Table C5. GMM results on sectoral (health service and social activities, social, cultural, entertainment, and other services, and personal service serving households) and regional bases

Variables	Health services and social activities				Social, cultural, entertainment, and other services				Personal services serving households			
	Java Island		Outside Java Island		Java Island		Outside Java Island		Java Island		Outside Java Island	
	Before	During	Before	During	Before	During	Before	During	Before	During	Before	During
L.npf	0.541***	0.471***	0.614***	0.765	0.740***	0.546***	0.264	0.517***	0.428**	0.702***	0.709***	0.724***
	(0.0614)	(0.0523)	(0.0112)	(0)	(0.0351)	(0.107)	(0.194)	(0.106)	(0.178)	(0.0956)	(0.0204)	(0.0259)
INF	–0.177	–0.0283	0.564	–0.133	–0.00243	–0.617	–0.0712	0.520	–0.186	–0.631	0.0798	0.829
	(0.117)	(0.0408)	(0.431)	(0)	(0.233)	(0.479)	(0.237)	(0.534)	(0.124)	(0.463)	(0.0804)	(1.213)
L.INF	–0.112	0.0144	0.843	–0.221	0.180	–0.424	–0.567	–0.0691	0.00926	0.0706	–0.0704	2.444
	(0.105)	(0.0359)	(0.699)	(0)	(0.173)	(0.533)	(0.366)	(0.433)	(0.0601)	(0.331)	(0.126)	(1.696)
log_Fin	2.062	–0.904	7.836	8.203	–22.52	4.363	–1.471	–8.458*	–2.298	6.816*	–4.455	–2.287
	(5.906)	(0.936)	(8.158)	(0)	(20.73)	(16.27)	(10.06)	(4.923)	(7.110)	(3.581)	(4.937)	(2.324)
L.log_Fin	–10.93***	0.614	1.457	–8.384	21.87***	–49.40***	1.492	–1.149	–21.06***	–5.466	–4.336	4.897
	(2.473)	(0.990)	(5.133)	(0)	(8.121)	(14.93)	(5.937)	(5.660)	(7.646)	(3.680)	(9.478)	(7.985)
FDR	8.563	0.217	–0.342	–6.359	8.610	28.11	–0.412	–0.696	–8.146	–4.506**	5.803***	0.572
	(7.443)	(0.841)	(1.760)	(0)	(12.83)	(30.37)	(2.905)	(2.577)	(13.63)	(2.081)	(1.771)	(2.706)
L.FDR	–0.509	–2.344**	1.140	5.182	–32.23***	–5.993	–5.45**	1.857	–1.061	1.466	6.307**	0.690
	(1.888)	(1.099)	(2.502)	(0)	(3.833)	(15.19)	(2.363)	(2.549)	(7.914)	(3.836)	(2.761)	(5.086)
log_assets	–7.067*	0.0589	–9.764	–2.483	13.26	3.820	–1.347	–2.617	–15.90	–3.446	–5.598	–1.611
	(3.762)	(0.592)	(10.01)	(0)	(20.95)	(21.96)	(9.097)	(5.135)	(11.42)	(2.796)	(6.148)	(3.234)

Variables	Health services and social activities				Social, cultural, entertainment, and other services				Personal services serving households			
	Java Island		Outside Java Island		Java Island		Outside Java Island		Java Island		Outside Java Island	
	Before	During	Before	During	Before	During	Before	During	Before	During	Before	During
L.log_assets	11.66***	–0.737	–2.772	1.772	–13.46	21.77**	0.992	–1.005	15.93	0.740	8.592	–5.079
	(4.003)	(0.583)	(7.287)	(0)	(10.74)	(9.492)	(7.326)	(3.882)	(10.12)	(2.644)	(9.070)	(4.863)
Constant	34.23	11.96**	28.35	9.163	30.46	168.2***	16.15	104.1***	242.6*	18.46	31.45	34.75**
	(20.92)	(4.994)	(47.59)	(0)	(45.72)	(59.15)	(47.67)	(34.30)	(139.2)	(22.41)	(27.93)	(17.18)
Observations	90	102	350	391	90	102	390	442	90	102	318	374
Number of provinces	6	6	24	25	6	6	26	26	6	6	22	22

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

APPENDIX D

Table D1. Arellano-Bond test result

Order	Indonesia		Java		Outside Java	
	before	during	before	during	before	during
Order 1						
z	–2.5853	–2.8932	–1.4437	–2.1618	–2.3645	–2.8435
Prob > z	0.0097	0.0038	0.1488	0.0306	0.0181	0.0045
Order 2						
z	1.4751	0.9651	1.5538	–0.96084	1.5114	0.9739
Prob > z	0.1402	0.3345	0.1202	0.3366	0.1307	0.3301

APPENDIX E

Table E1. Blundell test result

Variables	Indonesia		Java		Outside Java	
	Before	During	Before	During	Before	During
L.npf_all	0.685***	0.789***	0.869***	0.932***	0.682***	0.777***
	(0.136)	(0.0619)	(0.0569)	(0.0188)	(0.147)	(0.0668)
INF	0.0643	–0.00926	0.181**	0.112	0.0581	–0.0221
	(0.0531)	(0.0331)	(0.0749)	(0.0825)	(0.0579)	(0.0330)
L.INF	–0.0164	0.0356	0.0460	–0.0313	–0.0299	0.0388
	(0.0306)	(0.0517)	(0.0536)	(0.0871)	(0.0313)	(0.0538)
log_Fin	1.771*	0.745	7.545**	0.167	1.277	0.723
	(1.040)	(1.751)	(3.070)	(1.050)	(1.174)	(1.748)
L.log_Fin	–0.734	–0.167	–6.836***	0.118	–1.069	–0.306
	(0.947)	(1.633)	(2.533)	(1.299)	(1.082)	(1.640)
FDR	–1.439**	0.428	–6.425	–1.304	–1.161*	0.477
	(0.626)	(0.892)	(4.677)	(1.245)	(0.612)	(0.877)
L.FDR	0.139	–0.466	6.234	1.059	0.384	–0.356
	(0.355)	(0.760)	(5.500)	(0.709)	(0.303)	(0.736)
log_assets	–2.024	–0.515	–7.987***	–0.857	–1.380	–0.473
	(1.236)	(0.538)	(2.146)	(1.665)	(1.420)	(0.572)
L.log_assets	1.252	0.0234	7.331***	0.575	1.595	0.155
	(1.079)	(0.428)	(1.952)	(1.289)	(1.257)	(0.442)
Constant	0.562	0.174	0.288	0.576	–1.407	–0.160
	(1.522)	(0.762)	(1.513)	(0.547)	(2.706)	(0.935)
Observations	512	544	96	102	416	442
Number of provinces	32	32	6	6	26	26

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

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