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NON-PERFORMING LOANS: ENDOGENOUS CONSTRAINT ON THE CREDIT–GROWTH NEXUS

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ABSTRACT

This study explores the possibility of a lag in the transmission of credit channeling and non-performing loans to economic growth in Indonesia. The autoregressive distributed lag (ARDL) model was applied to yearly data from 2003 to 2020 and endogenous constraint (EC) was used as a dynamic indicator of credit channeling and non-performance on growth. The model shows that economic growth in Indonesia is positively and significantly affected by credit channeling in years *t-1* and *t-3*; meanwhile, non-performing loans in the current year (year t) suppress the growth. Therefore, from the perspective of the crisis phase, the first step that the monetary and fiscal authorities need to take is to tackle the increase in non-performing loans. It was also concluded that the endogenous constraint (EC) score can be used as a leading dynamic indicator in monetary and fiscal policy during the prosperity phase but is inefficient during a crisis.

Contribution/Originality: In general, the literature on non-performing loans (NPLs) in Indonesia focuses on the causes rather than the relationship between credit defaults and economic growth. Meanwhile, the literature on the credit-growth nexus tends to ignore time lag transmission. Therefore, we use an autoregressive distributed lag (ARDL) model to investigate the effect of Credit-NPL on growth. Also, we propose Endogenous Constraint (EC) scores as an alternative dynamic indicator in monitoring credit-NPL interactions to maintain growth momentum.

1. INTRODUCTION

Theoretically, several variables are sources of economic growth, both on the aggregate demand and supply sides. Bank credit is an essential driver in increasing production and consumption. Working capital and investment credit will push the production side, while household credit will encourage consumption on the demand side. Credit channeling will create a multiplier effect, such as establishing new factories and increasing tax revenue. Growth sustainability will create market optimism in the next phase, increasing demand and credit preferences. Therefore, it can be concluded that economic growth and credit channeling drive a cyclical causality (Hasan & Dridi, 2011; Khan, 2001). However, this study is conducted from a crisis perspective, so it is not appropriate to expect economic growth to drive credit disbursement. It is more rational to expect the role of banks to avoid more severe pressures. Amid the health crisis caused by the COVID-19 pandemic, although the causes may be different, various health protocols, such as social restrictions, have ultimately suppressed the productivity rate on the supply side. On the

other hand, consumers tend to be more frugal in spending on demand. Any social health protocol hides the supply and demand side and increases the probability of higher marginal costs ranging from raw materials to logistics, which causes a weakening of a company's balance sheet.

Levine (2005), McKinnon (1974), and Revell and Goldsmith (1970) argue that banks' financial instruments, such as domestic credit, positively correlate with gross domestic savings and trade openness, and this finding is a proxy for economic growth in the endogenous growth theory. Specifically, Leitão (2012) advocates the positive influence of domestic credit on economic growth. Meanwhile, non-performing loans correlate with the banking balance sheet burden (Jiménez, Ongena, Peydró, & Saurina, 2017). Caprio and Klingebiel (1997) also argue that non-performing loans can lead to the disintermediation of financial institutions and performance efficiency because banks need to allocate more resources to address credit default. If non-performing loans can be suppressed early, resources for handling can be channeled to more productive sectors, such as new lending or securities purchasing. The findings of inefficiency put forward by Caprio and Klingebiel (1997) are confirmed by Abd Karim, Sok, and Hassan (2010); a higher rate of non-performing loans will result in higher burden and lower efficiency of banking intermediation. Disruption of banking intermediation also disrupts the stability of the financial system and drives economic slowdown (Lata, 2015). In addition, history also notes that the higher non-performing loans in the US property sector in 2007 triggered the great depression and global financial crisis; this evidence strengthens the argument that non-performing loans should be managed with the utmost (Aebi, Sabato, & Schmid, 2012).

According to Leitão (2012); Levine (2005); McKinnon (1974); and Revell and Goldsmith (1970), it is clear that scholars have the same consensus that banking balance sheets have a positive impact on economic growth. So, it can be concluded that the growth of credit channeling and controlling the credit default rate are essential factors for financial stability and provide the impetus for economic growth. The same perspective is also reinforced by Caprio and Klingebiel (1997); Hasan and Dridi (2011); and Lata (2015), who found that higher non-performing loans will disrupt the capacity of banking intermediation in maintaining financial stability. However, the studies conducted by Leitão (2012); Levine (2005); McKinnon (1974); Revell and Goldsmith (1970); Caprio and Klingebiel (1997); Hasan & Dridi (2011); and Lata (2015) do not confirm the possibility of a lag between credit disbursement and non-performing loans on economic growth.

In the case of Indonesia, there is not much primary literature that can be explored as a reference in understanding the role of banking credit and non-performing loans on economic growth. One of the comprehensive works of literature is the Financial Services Authority study based on sectoral data, and the panel data regression shows that credit extended to the five priority economic sectors, in general, has a positive impact on regional economic growth (Otoritas, 2016). The latest partial study conducted by Dwiastuti (2020) shows that working capital loans have a positive and insignificant effect, while investment and consumer credit positively and significantly impact economic growth in West Kalimantan province. Meanwhile, for the literature on non-performing loans, scholars generally focus on the causes of non-performing loans rather than the relationship between credit default and economic growth (see Amri & Harianti, 2016; Nuryanto, Salam, Sari, & Suleman, 2020; Ranitasari, 2017).

The transmission speed of lending and credit default to economic growth is undoubtedly very dependent on the ratio of credit and non-performing loans to gross domestic product. Ideally, the lending rate should be directly proportional to the speed of non-performing loans. However, this postulate is not sufficient to understand the complex economic system, including the possibility that the rate of credit channeling and non-performing loans impact the current year and are a proxy for growth in the following years (lag). Therefore, this study investigates the possibility of a lag in bank credit and non-performing loans to economic growth in Indonesia. The autoregressive distributed lag (ARDL) model was used to tackle the research objectives. This paper also offers the theoretical concept of the constraint of credit output, which is a dynamic measure of the effect of credit disbursement and non-performing loans on economic growth. The constraint of credit output is an alternative

indicator for looking at the role of banking intermediation, especially in managing credit channeling, and it also stands out in the endogeneity idea because the constraint in our model is the expected growth of the amount of credit constrained by lending itself (e.g., non-performing loans). Therefore, the constraint in this study is referred to as endogenous constraint (EC). Moreover, the discussion in this paper will also provide a broader perspective on the importance of central bank and government commitment to implementing monetary and fiscal policies that support sustainable growth.

2. LITERATURE REVIEW

2.1. Endogenous Money Theory

Prescott & Kydland (1990) suggest that the transaction component, money in the narrow sense (M1), moves along with the cycle. At the same time, the non-transaction part, money in the broad sense (M2), carries even more significance in leading the business cycle. These findings indicate that lending plays a vital role in the theory of future business cycles. In simple terms, the M1 money supply will have the same pattern following the business cycle, starting from the depression, recovery, prosperity to recession phases, and M2 is the leading indicator heading the process. The argument put forward by Prescott and Kydland (1990) also confirms the view that the neutrality of money supply empirically is a false hypothesis (Moore, 1988; Moore, 1979).

Post-Keynesian economics has answered the fallacy of the neutrality hypothesis of money supply by developing the theory of endogenous money creation (Graziani, 2003; Moore, 1988; Rochon, 1999). This theory argues that private credit encourages economic activity explicitly. A critical aspect of this approach is to reverse the causal mechanism of credit money creation provided by the conventional money multiplier model. In this model, deposits generate loans with a lag time. The endogenous money approach, in contrast, begins with banks providing loans to firms, and those loans simultaneously create an equivalent deposit; meeting reserve requirements happens at a later date. Endogenously created credit then drives economic activity and savings. Referring to the endogenous money theory, where credit money is a factor driving aggregate output that causes growth, we can theoretically conclude that credit channeling is an essential driving factor in increasing the money supply and aggregate output and boosting economic growth.

2.2. Credit Channeling and Growth

One of the studies that has a significant impact and is often used as a primary reference is by King and Levine (1993). The study, which took a sample of 77 countries, shows that the growth of the financial sector does not only follow economic growth; the financial sector is an entity which drives and leads growth itself. Furthermore, Rousseau and Wachtel (2002), through panel data regression of 84 countries from 1960 to 1995, found strong evidence that financial depth and resilience have a positive impact on economic growth when inflation is in the range of 6% to 8%. The study also found that inflation exceeding the threshold can lead to financial sector constraints, especially in long-term financing, which depresses growth. In addition, high inflation can cause the government to protect specific sectors of the economy, potentially leading to inefficient allocation of resources. These findings are reinforced by Bayoumi and Melander (2008), who argue that the banking system is an essential factor in a country's economic growth.

Apart from the first view, which believes that the banking sector, especially credit channeling, influences economic growth, the demand-following theory believes that economic growth is a factor that drives the development of the financial sector. According to the defenders of this statement, real sector growth will trigger demand for financing, leading to increased credit (Akpan, Nwosu, & Eweke, 2016). The idea that economic growth drives financial development was also explored by Rioja and Valev (2004). Their empirical investigation includes 74 countries with different levels of development from 1960 to 1995, and they found that the effect of economic growth on financial development is uncertain in the lower region and stronger in the middle region, and the growth effect

is positive in the higher region but smaller than in the middle region. Oluitan (2012) also found similar evidence, which showed that economic growth in Nigeria led to inclusive financial products, but not vice versa.

In addition, several studies indicate a two-way relationship between bank credit and economic growth. Demetriades and Hussein (1996) conducted a study in 16 of the least developed countries between 1960 and 1990 using time series analysis. They looked at the long-term relationship for financial development indicators and GDP per capita in 13 countries. However, they found bidirectional causality in six countries and reverse causality in six countries. Odedokun (1998) also reported various degrees of the influence of bank developments on economic growth for both high- and low-income groups in developing countries. Demetriades and Hussein (1996) postulated that financial development leads to economic growth, ensuring that the financial system functions appropriately. They believe it will help the real economy take advantage of the new opportunities available. On the other hand, it is assumed that as the real economy grows, more savings will enter the financial system, allowing it to extend new loans.

2.3. Non-Performing Loans

Banks can create money through credit expansion and realize most of their income through new loan offerings (Vodová, 2003). Banks take different risks to stay in business but face a similar threat on credit channeling associated with banking crises (Fofack, 2005). The time involved in managing non-performing loans impacts productivity; there are also cost implications of recovery or setting up an enhanced unit to track non-performing loan recovery activities. As interest income is lost through non-performing loans, the suppressed opportunity to reinvest ultimately hinders profits and credit channeling in the future period. Credit default also affects reputation risk and implies an accompanying credit rating downgrade, further limiting credit extension (Chimkono, Muturi, & Njeru, 2016).

Abd Karim et al. (2010), in their study of the relationship between credit default and bank efficiency in Singapore and Malaysia, found that bank cost efficiency is affected by non-performing loans. The results of the Tobit regression showed a negative relationship between the level of non-performing loans and cost efficiency in banks, thus supporting the poor management hypothesis (Berger & DeYoung, 1997). Finally, credit default triggers a higher probability of financial disintermediation (Caprio & Klingebiel, 1997). In line with Caprio and Klingebiel (1997), Klein (2013) argues that the level of non-performing loans strongly influences the role of banks' financial intermediation. Moreover, Lata (2015) indicates that the accumulation of non-performing loans is a symptom of an economic slowdown. These empirical findings provide a proper understanding of the disruption of credit defaults, shocking the banking balance sheet, causing disintermediation, and ultimately leading to a decline in real sector productivity.

3. ENDOGENOUS CONSTRAINT

We do not deny, theoretically and practically, that non-performing loans will interfere with the role of banking intermediation. However, this does not mean the credit is lost from the economy; credit categorized as default is still used by the debtor to run a business or for consumption. It continues to generate the circulation of money and the economy. The difference is that the impact of non-performing loans is unsustainable and carries systemic risks to the broader economy. There is a triangular relationship in which non-performing loans exist because of credit distribution, and at the same time, credit distribution encourages growth. Therefore, credit default in an economy is natural as long as it does not interfere. We emphasize the fairness of non-performing loans with the axiom of the impossibility of zero credit default (Axiom 1). No matter how much effort the authorities make in supervising and how much banks exercise prudence, the chance of non-performing loans cannot be nil; non-performing loans are a natural part of lending (endogenous). Hence, the most important aspect is maintaining non-performing loans at a low level.

Axiom 1: There is a possibility of default for all credit disbursement.

We construct Proposition 1 based on Bayoumi and Melander (2008); King and Levine (1993); Rioja and Valev (2004); and Rousseau and Wachtel (2002). Meanwhile, Proposition 2 is based on research conducted by (Caprio & Klingebiel, 1997); Chimkono et al. (2016); Fofack (2005); Graziani (2003); Klein (2013); and Lata (2015).

Proposition 1: Credit channeling drives economic growth.

Proposition 2: Non-performing loans suppress economic growth.

Based on Propositions 1 and 2, and by adopting the Cobb–Douglas production functions, we construct Equation 1, where the output growth (Y) is a function of credit channeling (K) and non-performing loans (N). Credit channeling drives the total output, and conversely, the non-performing loans suppress the total output.

$$Y = G(K, N) = K^{\alpha} N^{-\beta} \tag{1}$$

By the logarithm rule, we get y, a function of the output growth in linear form (Equation 2).

$$\log Y = \alpha \log K - \beta \log N \leftrightarrow y = \alpha k - \beta n \tag{2}$$

Through the partial derivative, we get Equation 3 and Equation 4; $\mathrm{M}y_k$ and $\mathrm{M}y_n$ are the marginal values of aggregate output due to the addition of credit or the increase in non-performing loans.

$$y_k' = \frac{\partial Y}{\partial k} = \frac{\partial g(k,n)}{\partial k} = \mathrm{M}y_k \tag{3}$$

$$y_n' = \frac{\partial Y}{\partial n} = \frac{\partial g(k,n)}{\partial n} = \mathrm{M}y_n \tag{4}$$

By applying the concept of elasticity, we construct a partial elasticity for k and n in Equations 5 and 6, respectively.

$$\eta_k = M\mathrm{y}_k \left(\frac{k}{y_k}\right) \tag{5}$$

$$\eta_n = M\mathrm{y}_n \left(\frac{n}{y_n}\right) \tag{6}$$

Assuming that the proportion of credit and output growth is always the same in each period, it can be represented by Equation 7. As a result, when there is a credit growth of k_{t+1}, the relationship between credit growth and output growth can be represented by Equation 8. Equation 8 also represents the concept of the expected growth, g^e. However, output growth does not always represent credit growth proportionally; there is a constraint of credit output, $1 + \rho$, as represented by Equations 9 and 10. To optimize $\mathrm{g}(k_t, k_{t+1})$, the value of the constraint must approach -1 from the right side, according to Equation 11, and the endogenous constraint (EC) follows in Equation 12.

$$\mathrm{g}(k_t) = k_t = y_t \tag{7}$$

$$g(k_t, k_{t+1}) = k_t + k_{t+1} = y_t + y_{t+1} \tag{8}$$

$$g(k_t, k_{t+1}) = y(k_t, k_{t+1}) = k_t + \frac{k_{t+1}}{(1+\rho)} = y_t + \frac{y_{t+1}}{(1+\rho)} \tag{9}$$

$$g(k_t, k_{t+1}) = \alpha(k_t + \varphi k_t) + \frac{\alpha(k_{t+1} + \varphi k_{t+1})}{(1+\rho)} = y_t + \frac{y_{t+1}}{(1+\rho)} \tag{10}$$

By applying the Lagrange multiplier, we get:

$$U(k_t, k_{t+1}) = y(k_t, k_{t+1}) - \lambda\left(\alpha(k_t + \varphi k_t) + \frac{\alpha(k_{t+1} + \varphi k_{t+1})}{(1+\rho)} - y_t + \frac{y_{t+1}}{(1+\rho)}\right)$$

$$0 = \frac{\partial U}{\partial k_t} = \frac{\partial y}{\partial k_t} dk_t - \lambda(\alpha + \varphi) dk_t \rightarrow \lambda = \frac{1}{(\alpha+\varphi)} \frac{\partial y}{\partial k_t}$$

$$0 = \frac{\partial U}{\partial k_{t+1}} = \frac{\partial y}{\partial k_{t+1}} dk_{t+1} - \frac{\lambda(\alpha+\varphi)}{(1+\rho)} dk_{t+1} \rightarrow \frac{\partial y}{\partial k_{t+1}} = \frac{\lambda(\alpha+\varphi)}{(1+\rho)}$$

$$\lambda = \frac{(1+\rho)}{(\alpha+\varphi)} \frac{\partial y}{\partial k_{t+1}}$$

$$\lambda = \frac{1}{(\alpha+\varphi)} \frac{\partial y}{\partial k_t} = \frac{(1+\rho)}{(\alpha+\varphi)} \frac{\partial y}{\partial k_{t+1}}$$

$$\frac{\frac{\partial Y}{\partial k_t}}{\frac{\partial Y}{\partial k_{t+1}}} = \frac{\frac{(1-\rho)}{(\alpha+\varphi)}}{\frac{1}{(\alpha+\varphi)}} = \frac{(1+\rho)}{(\alpha+\varphi)} \cdot (\alpha+\varphi) = (1+\rho)$$

So, $max\, g(k_t, k_{t+1})$ occurs when the $min\ (1+\rho)$, for $(1+\rho) \in R^+$. Therefore, the minimum value of $1+\rho$ occurs when ρ approaches -1 from the right side.

$$min\ 1 + \rho = \lim_{\rho \to -1^+} \rho.$$

$$\max g(k_t, k_{t+1}) = \lim_{\rho \to -1^+} \rho \tag{11}$$

Assuming $y_t = 0$ and y_{t+1} is the expected growth, $g^e = y_{t+1} = \alpha k$, then

$$g(k_{t+1}) = \frac{y_{t+1}}{(1+\rho)} = \frac{\alpha k_{t+1}}{(1+\rho)}$$

in a simple form, since $g = y$,

$$y = \frac{\alpha k}{(1+\rho)}$$

$$\leftrightarrow y(1+\rho) = \alpha k$$

$$\leftrightarrow 1+\rho = \frac{\alpha k}{y}$$

$$\leftrightarrow \rho = \frac{\alpha k}{y} - 1 = \frac{\alpha k}{\alpha k - \beta n} - 1$$

$$\leftrightarrow EC = \rho = \frac{g^e}{y} - 1 \quad (12)$$

Finally, we propose a rule of thumb that the score of EC is $-1 < \rho < 1$. A negative value indicates that the constraints have a positive impact (assumption is false), a zero score means no constraints, and a higher positive value aligns with greater restrictions.

4. RESEARCH METHOD

This study uses annual data on commercial bank lending, non-performing loans, and nominal GDP for 2003–2020. Data on credit and non-performing loans were collected from banking statistical reports issued by the Financial Services Authority of the Republic of Indonesia and nominal GDP from statistical reports issued by the Central Bureau of Statistics of the Republic of Indonesia. In this study, to answer the research hypothesis regarding the possibility of a lag in the transmission of credit and non-performing loans to economic growth, we use the autoregressive distributed lag (ARDL) method. The ARDL approach offers several statistical advantages over other cointegration techniques (e.g., ARDL doesn't need all data series to be stationary of the same order). The ARDL model also removes the limitation on the number of observations and still provides efficient and consistent results (Pesaran, Shin, & Smith, 2001). The model used in this study follows Equation 13, with y being the percentage growth of nominal GDP year on year as a proxy of economic growth, k is the percentage growth of lending year on year as a proxy of bank credit, and n is the percentage of non-performing loan year on year as a proxy of non-performing loans: $y_t = \left(\frac{Y_t - Y_{t-1}}{Y_t}\right) \times 100;\ k_t = \left(\frac{K_t - K_{t-1}}{K_t}\right) \times 100$, and $n_t = \left(\frac{N_t - N_{t-1}}{N_t}\right) \times 100$.

The analysis begins by ensuring that there is no data series for endogenous and exogenous variables integrated of orders higher than 1. To test this assumption, a unit root test was run on the first difference of each data series. Because the amount of lag measured in this study is exploratory, no economic theory correlates the credit lag or

non-performing loans on growth. This study uses a lag length of three for the dependent variable p and the independent variable q. The minimum value of the Akaike Information Criterion (AIC) and the highest value of adjusted R-squared are used to select the optimal lag length, and after the optimal lag length is determined, we calculate the long-term coefficient and perform an autocorrelation test with the LM and Bounds tests for long-term cointegration. This study set a significance coefficient below 0.1 and an average partial elasticity value above 0.1. Furthermore, because the ARDL model in this study follows Equation 13, the EC score follows Equation 14.

$$y_t = \alpha + \sum_{i=1=j}^{p} \delta_j y_{t-i} + \sum_{j=1}^{q+1} \sum_{i=0}^{q} \beta_j^1 k_{t-i} + \sum_{j=1}^{r+1} \sum_{i=0}^{r} \beta_j^2 n_{t-i} + \epsilon_t \quad (13)$$

$$\rho_t = \frac{\sum_{j=1}^{q+1} \sum_{i=0}^{q} \beta_j^1 k_{t-i}}{\sum_{j=1}^{q+1} \sum_{i=0}^{q} \beta_j^1 k_{t-i} + \sum_{j=1}^{r+1} \sum_{i=0}^{r} \beta_j^2 k_{t-i}} - 1 \quad (14)$$

5. EMPIRICAL RESULTS

All data series in this study are stationary at first difference so that the data is suitable for ARDL regression. Based on the AIC, the ARDL (3,3,3) is the optimal model.

Table 1. ARDL regression result.

Variables	Coefficient	Prob.
$y(-1)$	0.181	0.38
$y(-2)$	-0.43	0.185
$y(-3)$	-0.296	0.33
k	-0.138	0.421
$k(-1)$	0.391*	0.093
$k(-2)$	0.024	0.886
$k(-3)$	0.940*	0.026
n	-0.336*	0.026
$n(-1)$	-0.048	0.445
$n(-2)$	-0.082	0.134
$n(-3)$	0.076	0.067
c	1.501	0.673
Adjusted R-squared		0.988
Min. Akaike information criterion (AIC)		3.770
Probability chi-square of Breusch–Godfrey serial correlation LM test		0.379

Notes: * indicates that the average elasticity during the observation period is above 0.1; the best model based on the Akaike Information Criterion (AIC) is ARDL (3,3,3).

The results of the autocorrelation test show the value of prob. Chi-Square is $0.3799 > 0.05$, which means that the error in the model does not experience serial correlation problems (see Table 1). The F-stat value is above $I(1)$ bound, $5.448 > 4.140$, so it can be concluded that growth of credit and non-performing loans have long-run

cointegration with economic growth. The value of $CointEq = -1{,}549$ with a probability of 0.000 suggests the existence of cointegration in the model. A negative value of beta CointEq indicates that the model will go to equilibrium at a rate of 154.9% per year, or the process of reaching equilibrium only takes about half a year (see Table 2).

The ARDL regression results as seen in Table 1 with a significance probability below 0.1 indicate that growth in year t is significantly affected by the number of credits at *t-1* and *t-3*, and non-performing loans at *t-3* in addition to depressed growth with a significant adverse effect on non-performing loans in the current year (year t). These findings indicate that there is a time lag from credit transmission to growth, but this is not the case for non-performing loans. However, because this study sets additional criteria for an average partial elasticity value greater than 0.1, the non-performing loans variable in year *t-3* is excluded from the model. This study generally supports the findings of Bayoumi and Melander (2008); King and Levine (1993); Rioja and Valev (2004); and Rousseau and Wachtel (2002), who state that bank credit is an essential factor in supporting growth. Even Gertler and Kiyotaki (2010) revealed that the role of banks in the crisis phase has a more significant role to play in preventing deeper falls. Regarding the non-performing loans, these findings also support several previous studies, which generally show that non-performing loans interfere with growth (Abd Karim et al., 2010; Klein, 2013; Lata, 2015). The monetary and fiscal authorities need a policy orientation that focuses on restraining non-performing loans and preventing credit disbursement from falling too deep to maintain economic growth.

Table 2. Long-run coefficients.

Variables	Coefficient	Std. Error	t-Statistic	Prob.
k	0.785	0.068	11.464	0.001
n	-0.251	0.051	-4.937	0.015
c	0.969	1.831	0.529	0.633
$CointEg(-1)$	-1.549	0.512	-3.025	0.056
F-statistic of bounds test		5.448		
I(1) Bound		4.140		

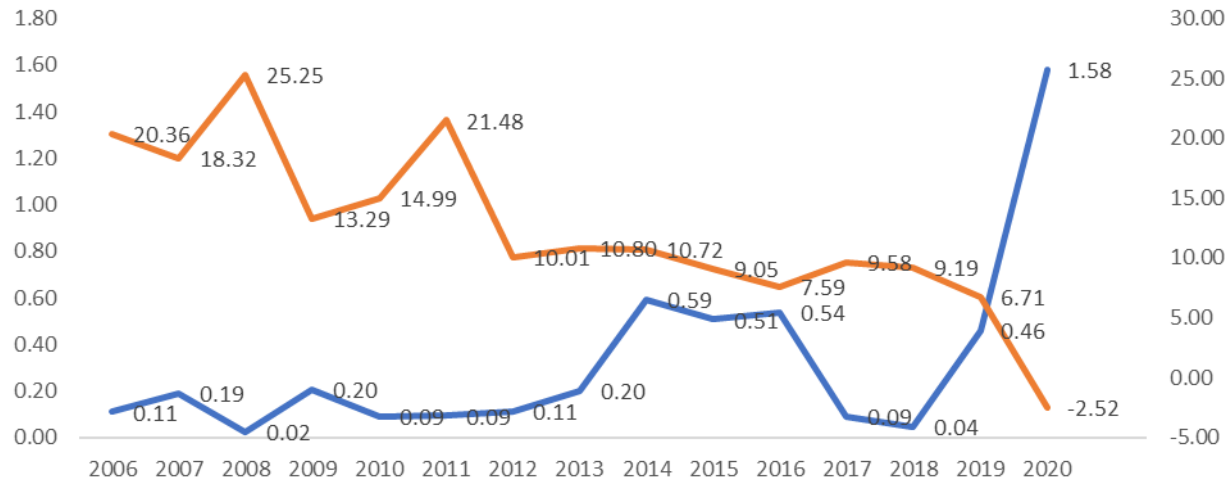

Figure 1. Comparison series of EC score (blue line) and year-on-year percentage growth of nominal GDP (orange line).

Rousseau & Wachtel (2002) argue that the actual impact of the crisis will not be too profound when the banking and non-banking industries enter the crisis phase with a good balance sheet. At the same time, an increasing EC score trend has been seen since before the recession caused by the COVID-19 pandemic. In other words, Indonesia entered the pandemic with an unfavorable economic outlook. Consequently, it has to sacrifice more and put in more effort to make a quick and efficient recovery. However, we realize that the EC indicator seems less relevant to measuring the relative role of credit channeling on economic growth in the crisis phase. The increase in non-performing loans and suppression of credit channeling in 2020 was not as extreme as the pressure on economic growth. In addition, referring to the range of acceptable EC scores, $-1 < \rho < 1$, the EC score in 2020 also exceeded this threshold. However, in better conditions, when the business cycle runs "as usual," the EC score can be a leading dynamic indicator for implementing countercyclical policies (see Figure 1). Technically, the EC is efficient when credit growth and non-performing loans have the same slope direction.

6. DISCUSSION

As we know, the supply and demand sides of credit channeling are influenced by the balance sheet of banks and firms (Holmstrom & Tirole, 1997). However, the crisis phase generally causes financial burdens for firms (Myers, 1977). A balance sheet shock impacts the higher probability of non-performing loans and decreases credit preferences (Bernanke, Gertler, & Gilchrist, 1996). Referring to the endogeneity theory of money, the amount of deposits held by the non-banking sector depends on credit preferences itself. Therefore, credit preference, which is boosted by external factors, such as monetary policy through quantitative easing and lower interest rates, are expected to increase the preference for credit due to the opportunity for higher incentives in the real sector.

At this point, we get a clear understanding that the crisis caused liquidity problems on the banking side and caused imbalance on firms' balance sheets. Therefore, policies that ensure banking liquidity and support firms' balance sheets are the best option amid a crisis. Generally, maintaining banking liquidity is an initial option before the fiscal stimulus. Gertler and Kiyotaki (2010) argue that banking liquidity may be necessary during a recession. Furthermore, through dynamic modeling, Keen (2008) also shows that banking liquidity and firms' balance sheets are essential in preventing credit falls, which can disrupt the financial system and economic stability. Maintained banking liquidity amid a crisis will provide more space for banks to reduce the risk of credit default through various loan restructurings, from extending tenure to long-term refinancing. In the end, sufficient liquidity will give banks the ability to reduce the higher probability of non-performing loans; this is in line with Kibritçioglu (2003), who showed that credit default could burden the balance sheets.

Furthermore, modeling conducted by Keen (2008) also indicates that banking liquidity can be maintained through easing monetary policy, primarily through quantitative easing and maintaining the firm's balance sheet can be done through fiscal stimuli such as tax cuts and subsidies. From a fiscal perspective, this policy is generally carried out through tax deduction and employment security subsidies for various other incentives that reduce operational costs. This policy is also supported by Holmstrom and Tirole (1997), who found that no matter how significant the liquidity assistance to banks, firms' leverage is the primary variable in preventing deeper falls during a crisis. From the demand side, direct cash assistance to cover dues of social health insurance and subsidies for basic needs, such as electricity and gas, can be options during a crisis. The policy is intended to maintain purchasing power so that the probability of both producers' and consumers' credit default can be reduced.

The quantitative easing policy followed by a lowering the interest rate in the recovery phase will have an impact on reducing incentives to save money, reducing the cost of capital, and expanding the potential credit recipients. However, easing monetary policy, such as quantitative easing and lowering interest rates, may not have an optimal impact during a health crisis such as the COVID-19 pandemic. On the one hand, this policy reduces the incentive to save money, but on the other hand, capital spending and expansion amid a pandemic is also very likely

to be high risk because no one can predict the end of the pandemic. Therefore, to increase the preference for credit and reduce the non-performing loan rate, we argue that the central bank and the government should implement short-term policies. The monetary and fiscal authorities need to provide certainty by implementing policies that encourage growth in the medium and long terms and increase policy determination when the economy enters the recovery phase.

The policy that can restrain non-performing loans and suppress the credit fall will maintain economic shock within the range of market expectations. A fall in economic growth that is not too deep during the crisis will increase the confidence of producers and consumers to start preparing for expansion and easing budget expenditures, which is an early indication of increasing credit preferences. Based on the causality condition and research by Demetriades and Hussein (1996) and Odedokun (1998), credit channeling drives economic growth, and expansionary growth will also encourage credit demand. Demand for credit increased as producers saw greater opportunities in the future. Likewise, consumers are more confident in spending their income because they are optimistic about future economic prospects. Indirectly, restraining the non-performing loan rate and maintaining the credit rate will enlarge the probability of credit demand preferences, and credit crunches can be handled.

Quantitative easing and various stimuli issued by the government will undoubtedly be directly proportional to the money supply generally accompanied by inflation. Moreover, the crisis caused by the pandemic is not only a problem of declining demand and supply; the high probability of uncertainty and various health protocols are also very likely to disrupt the supply chain, which leads to an increase in marginal production costs. Although we assume that Fisher's quantity theory of money is not entirely correct, we believe that the growth of money supply will not exceed the inflation target as long as it is in line with aggregate output.

Lending to productive sectors should be encouraged by managing credit channeling to align with aggregate output, especially in the crisis phase, while the demand side is sufficiently driven through fiscal policy. We also implicitly emphasize that the prudence principle must be maintained to reduce the risk of credit default. Our argument is based on the trend of increasing EC scores even before the recession caused by the COVID-19 pandemic. Apart from monetary policy and fiscal stimulus to increase credit demand preferences, the government also needs to carry out transformations, especially from the deregulation of the ease of doing business; this is important so that fiscal stimulus and monetary policy easing can run effectively and efficiently.

7. POLICY RECOMMENDATIONS

Assuming that the economy is in a state of recession, or even depression, the first step that the monetary and fiscal authorities should take is to maintain the non-performing loans. This policy is based on the finding that non-performing loans depress the pace of economic growth in the current year. To suppress the non-performing loan rate, the central bank needs to ensure that banking liquidity is maintained. Quantitative easing and increasing the statutory reserve requirement threshold at the beginning of the downturn are policy options to prevent more severe disruptions. Then, to ensure a fast recovery, the central bank can slowly lower the benchmark rate to reduce incentives to save money and increase credit preferences; this is based on the evidence that credit channeling in year t will impact growth in years $t+1$ and $t+3$. Meanwhile, from the fiscal policy perspective, in the early phase of the downturn, crisis, and recovery, various stimuli, ranging from tax cuts to direct cash assistance, could be carried out to maintain aggregate supply and demand.

One of the main issues amid the crisis is government budget constraints. Therefore, this study also supports the burden-sharing policy between the central bank and the government to manage economic stability, especially to suppress credit falls and reduce the probability of rising non-performing loans. However, the abundance of liquidity and increasing credit preferences could be a ticking time bomb. During the recovery phase, we also encourage gradual monetary policy tightening while ensuring interest rate neutrality. In line with the tightening of monetary policy, the fiscal stimulus will also slowly start to reduce. Furthermore, referring to the value of EC, especially in

the prosperity phase, countercyclical policies can be implemented by tightening monetary policy when there are indications of an increase in EC and vice versa. This countercyclical policy is expected to reduce risk when a sudden or unexpected shock occurs, such as the COVID-19 pandemic.

The policy orientation recommendations in this study can be divided into three main parts: restraining the non-performing loans rate in the early phase of the crisis, increasing credit preferences during recovery, and implementing a countercyclical policy in the prosperity phase. Referring to the findings of this study, restraining the credit default and preventing a fall in lending will maintain economic growth sustainability. Based on the theoretical view and some empirical evidence that state credit channeling and economic growth have a causal relationship, economic growth that does not fall too much during a crisis will maintain the confidence level of producers and consumers, handle credit preferences, and ultimately avoid a credit crunch.

8. CONCLUSION

This study found that credit channeling has a lag transmission in driving economic growth, while the non-performing loans have not. Economic growth in year *t* was driven by credit growth in years *t-1* and *t-3*, and growth suppressed by the rate of non-performing loans in the current year (year *t*). As an implication of this finding, assuming we are in a crisis phase in year *t*, the first step that needs to be taken is to handle the rate of non-performing loans. To prevent higher non-performing loans amid the government budget constraints, a burden-sharing policy between the central bank and the government is an alternative. Quantitative easing to maintain banking liquidity and assist the government in implementing fiscal stimulus needs to be carried out in the early phase of the crisis. Then, the authorities also need to maintain credit channeling because credit growth in the current year will impact years *t+1* and *t+3*. Therefore, when there are indications of recovery, a reduction in benchmark rates balanced by various productivity-oriented fiscal stimuli is an intervention that will accelerate post-crisis recovery.

In the prosperity phase, the authorities can use the EC score as an indicator to implement countercyclical policies. When the EC score begins to rise, the central bank needs to tighten monetary policy, and easing monetary policy can be implemented when the EC score tends to be lower. Based on the 2006–2019 trend, it can be seen that the EC can be a leading dynamic indicator of the "normal" business cycle, but we do not recommend using the EC score during the crisis phase as it tends to be inefficient and misleading.

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