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SECTORAL GROWTH IMPACTS OF BANK CREDIT ALLOCATION: THE ROLE OF COVID-19 PANDEMIC AS MODERATING VARIABLE[3]

Our study aims to investigate the effect of bank credit on sectoral output growth in Indonesia. The sectoral output comprises the agricultural, manufacturing, construction, wholesale & retail trades, and transport & storage sectors. We position the Covid-19 pandemic as a moderating variable between sectoral economic growth and bank credit. Using monthly time series data from 2015.M1 to 2020.M12, we employ hierarchical linear regression to estimate the functional relationship between variables. The study points out that bank credit positively affects sectoral output. In contrast, the covid-19 pandemic has had a negative effect. Nevertheless, the pandemic moderates the influence of bank credit on the manufacturing, construction, transport & storage sectors but not on the agriculture, wholesales & retail trades sectors.
Keywords: Bank credit; Sectoral output; Covid-19 pandemic; Hierarchical linear regression
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1. Introduction

The financial sector plays a driver's role in economic growth around countries (Ahmed, Ansari, 1998; Kenza, Salah Eddine, 2016). This role is realized by carrying out financial intermediation functions, especially in lending to increase business activities (Vaithilingam et al., 2003; Sahul Hamid, 2019; Ikhsan et al., 2020). Using bank credit as the source of financing is expected to encourage community economic and business activity (Lang, Nakamura, 1995; Cepni et al., 2020) and increase output in various economic sectors (Duican, Pop, 2015).

Since 2010, the distribution of commercial bank credit in Indonesia has increased significantly (Mara et al., 2020; Wasiaturrahma et al., 2020). Till December 2019, the total disbursement of bank loans in Indonesia reached IDR 8,280,812.25 billion, a more significant

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increase than the 2016 period of IDR 6,570,902.90 billion. The credits are distributed in several economic sectors comprising agriculture & forestry, mining & quarrying, manufacturing, electricity & gas supply, wholesale & retail trades, transport & storage, information & communication, financial & insurance services, real estate activities, and business services, and other sectors. In line with this regard, there was also an increase in sectoral output marked by the raises in the gross domestic product of the respective sectors (Resosudarmo & Abdurohman, 2018; Burke & Siyaranamual, 2019). In this study, the sectoral growth focus on the agricultural sector, manufacturing, construction, wholesale and retail, and transport and storage. These five sectors have contributed the most to Indonesia's economic growth.

However, the emergence of the Covid-19 pandemic at the end of 2019 affected the national economy. The faster spread causes not only a health crisis (Rizwan et al., 2020). But also harmed various economic sectors, including the banking sector (Cecchetti, Schoenholtz, 2020; Wojcik, Ioannou, 2020). Banks face credit risk because of the disruption of business activities (Elnahass et al., 2021). Outside the banking sector, during the pandemic, economic activity was disrupted, and this condition led to a decline in business activity (Hu, Zhang, 2021). The pandemic poses a disruption to business development, not only for large-scale businesses but also for small and medium-sized businesses (Strain, 2020; Nwokocha et al., 2021). At the same time, the government's efforts to mitigate the spread of Covid-19, such as travel restrictions, and large-scale restrictions, have caused a drastic decline in economic activity in several sectors (Buszko et al., 2021).

Studies on the linkages between bank credit and output growth have been carried out by researchers. Banking credit leads to output growth in the economy (Tinoco-Zermeño et al., 2014; Benczúr et al., 2018; Awad, Al Karaki, 2019). The credit encourages the output growth of the industrial sector (Topcu, Coban, 2017; Svilokos et al., 2019; Taiwo, 2020), the agricultural (Osabohien et al., 2020; Kumari, Garg, 2021); the export and trade (Abor et al., 2014), the construction services (Grown, Bates, 1992) and the transportation sector (Li et al., 2018; Asante, Helbrecht, 2019). Even for national scope, the development of the financial sectors marked by an increase in bank credit has become the main driver of economic growth in most countries (Tang, 2005; Akinci et al., 2014; Petkovski, Kjosevski, 2014; Daly, Frikha, 2016).

Several research results, as mentioned above, reveal that bank credit boosts sectoral output growth. Banking credit for the agricultural sector, for example, has an impact on increasing output in that sector. Likewise, bank credit in the manufacturing industry also impacts the production performance of this business sector. The critical question is whether the Covid-19 pandemic affects the effect of bank credit on sectoral output. As previously explained, the Covid-19 pandemic, accompanied by government policies to mitigate its spread, hurt several economic sectors. In addition, this pandemic has also affected the intermediation function of bank financial institutions, particularly related to lending to the business world. However, the researchers mentioned above have not explicitly disclosed empirical studies regarding the extent of the moderating role of the pandemic in influencing the sectoral output impact of banking credit. Even though this information is needed to evaluate the effectiveness of bank credit in encouraging output growth during the pandemic, it is also useful for policymaking in the post-pandemic period. Therefore, this study seeks to fill the empirical gap in the

Indonesian context. This study also practically contributes input for economic policymakers in creating policies to save the national economy for the post-pandemic period.

Systematically, this paper is organized into four parts. The second section describes the data and the statistical approach used as the analysis model. The third part is the results of the research and discussion. Lastly, the fourth part is the conclusions and recommendations.

2. Literature Review

2.1 The link between Bank credit and economic growth

The banking institution crucially plays an essential role in the economic growth of a country (Alam et al., 2021). Therefore, until now, studies on the relationship between financial institutions and economic growth have often been carried out by economic researchers (Levine, Zervos, 1998; Jansson, 2018; Ioannou, Wojcik, 2020; Zungu, 2022). The banking-economic growth nexus has become an academic discussion among economic researchers. However, there is still no fixed consensus on the relationship between the two, including the direction and causality of the relations and whether economic growth causes banking development or vice versa (Daway-Ducanes, Gochoco-Bautista, 2019).

Several empirical studies reveal a positive relationship between bank credit and output growth (Bist, Bista, 2018; Das, Chavan, 2020; Azolibe, 2021). The distribution of bank credit does not only promote growth but is also closely and positively related to an increase in total factors of production (Gatti, Love, 2008). On the contrary, contractions in credit supply substantially reduce labour productivity and increase the chance firms will fail (Franklin et al., 2020). The positive relationship between bank credit and output growth supported by the empirical findings of Koursaros et al. (2021) suggest that other things being constant, a positive relationship between lending and output growth exists. Previously, the research of Tinoco-Zermeño et al. (2014) on the Mexican economy also points out the statistical results suggesting that the availability of private sector bank credit in the economy exerts a positive impact on real GDP. In line with these researchers, an empirical study conducted by Balasubramanian (2022) on the industrial sector in India also found that bank credit significantly increases industrial output. The same result was also discovered by Osabohien et al. (2020) for the case of the Nigerian economy pointed out that the distribution of agricultural credit by the banking sector significantly improves agricultural outputs.

In contrast to the number of researchers above, other studies provided the opposite empirical evidence. Rapid growth in bank credit can also have a detrimental impact on output growth (Gatti, Love., 2008). A shock in the credit supply is negatively associated with output growth (Chiorazzo et al., 2017), and the negative relationship between bank credit allocation and productivity growth is due to inefficient credit allocation (Ghani, Suri, 1999). An empirical study by Ikpesu (2021) using a panel data set of 35 Sub-Saharan African countries found that credit in the banking sector boosted inflation but had detrimental effects on output growth. Previously, Petkovski & Kjosevski's (2014) study using a panel dataset of 16 countries in Europe also pointed out that bank credit allocation is negatively associated with economic growth. Another research study by Alam et al. (2021) on the economic impacts of bank

lending provides empirical evidence that the distribution of bank credit for the private sector has an insignificant association with economic growth. Similar to Alam et al., the empirical findings of Pham & Nguyen's (2020) study on the case of bank credit allocation in Vietnam also pointed out that, in the long term, credit expansion does not impact economic growth.

2.2 Banking and economic impacts of the Covid-19 pandemic

The COVID-19 pandemic has had a detrimental impact on the global economy (Rizwan et al., 2020). This impact occurred in various economic sectors, including the financial sectors. Bank financial institutions face a high risk due to the harmful effect of Covid-19. Banks' business models are highly vulnerable to economic shocks, so their failure during this pandemic will lead to wide-ranging economic shocks (Cecchetti, Schoenholtz, 2020). Outside of the banking sector, company performance deteriorated during the pandemic (Hu, Zhang, 2021). This pandemic has had a significant impact on decreasing the intensity of production activities in various sectors such as trade, energy and electricity, agriculture, transportation and tourism (Nayak et al., 2021), the processing industry and the food and beverage industry (Hailu, 2021) and other sectors, including hotels and restaurants (Madai Boukar et al., 2021), infrastructure and constructions (Stiles et al., 2021), wholesale & retail trades (Sanguinet et al., 2021), and transport & storage sectors (Gray, 2020; Gray, Torshizi, 2021).

Government policies in mitigating the spread of this virus complicate people's economic activities, which in turn deteriorates the economy (Aragie et al., 2021). Territorial lockdowns, large-scale restrictions, and social distancing in certain areas have disrupted the material supply chain of industrial sectors, and the policy decreases the output growth of the economic sectors (Realff et al., 2020). The spread of the virus and government policies to reduce its negative impact on health created conditions of uncertainty in the economy. Some production activities have stopped, especially in the service and transportation sectors. Many labour-intensive industrial sectors that previously employed more employees must reduce their employees because of the social distancing policy. As a result, more of the workforce suffers from losing their jobs, resulting in increased unemployment and ultimately weakening the purchasing power of consumers, in particular, those who live in urban areas (Cho et al., 2021).

In order to save the economy from the detrimental impacts of the outbreak of Covid-19, the government is trying to implement several policies, especially in the financial sector. The decline in the interest rate policy, which is then following a decrease in lending rates, is expected to encourage banks to continue lending to the business sectors. However, the uncertainty caused by Covid-19 has made the relationship between bank lending and increased output in the economy less pronounced (Asafo-Adjei et al., 2021). The study conducted by Li et al. (2021) revealed that during the Covid-19 pandemic, financial sector policies such as bank lending did not impact economic development, and fiscal policy was more successful than monetary policy. This regard indicates that the Covid-19 pandemic and technical government policies in mitigating its spread could affect the economic impact of bank credit.

Referring to the empirical studies as explained above, it is clear that the Covid pandemic not only affected economic activities but has also potentially disrupted the effectiveness of bank lending in improving output growth in various business sectors. On the one side, bank financial institutions face uncertainty dan high credit risk. On the other side, the pandemic has adversely affected many economic sectors, including agricultural sectors, industries, constructions, wholesale & retail trades, and transport & storage sectors.

3. Data and Methodology

This study uses secondary data sourced from Indonesian statistics and Indonesian banking statistics. The data is monthly time series data from January 2015-December 2020 (n = 72). The predicted variable in this study is sectoral output proxies from sectoral GDP based on 2010 constant prices expressed in IDR billion. This study also uses the Covid-19 pandemic as a moderating variable in the functional relationship between sectoral output and bank credit. This pandemic is measured by a dummy variable scoring 0 for the pre- (January 2015-February 2020) and 1 for the pandemic period (March-December 2020).

The existence of the covid-19 pandemic as a moderating variable implies that the analytical model used to analyze functional relationships between variables is hierarchical regression. However, sectoral GDP and bank credit were firstly transformed into logarithmic values, unless the Covid-19 pandemic was because of a category-scaled variable. The transformation process intends to the estimated coefficient of bank credit reflect the elasticity of the variable (Chen et al., 2019). Adopting the opinion of Helm & Mark (2012), the hierarchical linear regression applied in this study is set in three equations. The equations are then estimated by the ordinary least square (OLS) approach.

Basic model $\quad\quad logSOs_t = \beta_0 + \beta_1 logBCs_t + \varepsilon_1$ $\quad\quad\quad\quad\quad\quad\quad\quad$ (1)

Moderated model $\quad logSOs_t = \beta_0 + \beta_1 logBCs_t + \beta_2 Cvd + \varepsilon_2$ $\quad\quad\quad\quad\quad$ (2)

Interaction model $\quad logSOs_t = \beta_0 + \beta_1 logBCs_t + \beta_2 CVD + \beta_3 logBCs_t * Cvd + \varepsilon_3$ $\quad$ (3)

Where logSOst represents the logarithmic value of sectoral output at the period of t, logBCst represents the logarithmic value of banking credit at the period of t, Cvd stands for the Covid-19 pandemics, proxies by a dummy variable with the provision of 0 for before pandemic (January 2015 until February 2020), and 1 for during pandemic (March-December 2020). logBCst*Cvd is an interaction variable, this is the multiplication result of the logBCst and dummy variable". $\beta 0$ is constant/intercept. β_1, β_2, and β_3 are the estimated coefficient of logBCst, Covid-19 pandemic, and interaction variables, respectively. Last, μ_1, μ_2, and μ_3 are error terms of equations 1, 2, and 3, respectively.

Equation 1 is the first basic model, only using bank credit to predict the sectoral output. The estimated coefficient (β_1) represents the "main effect" of the predictors on output without

involving the Covid-19 pandemic. If $\beta_1 \neq 0$ (p-value <0.05), for example, it means that bank credit has a significant effect on sectoral output. The opposite interpretation applies if $\beta_1 = 0$ (p-value > 0.05). Furthermore, equation 2 is the second basic model, adding the covid-19 pandemic into equation 1. The estimation coefficient β_2 represents the main effect of the pandemic on output. If $\beta_2 \neq 0$ (p-value < 0.05) it means that the moderator variable has a significant effect, and vice versa if $\beta_2 = 0$ (p-value > 0.05) it has an insignificant effect (Amri et al., 2022).

Equation 3 is the interaction model, which adds interaction variables to the previous model. This model is a moderated regression model that explains whether the moderator variable changes the strength or/and direction of the relationship between variables (Anderson et al., 2018; Momen et al., 2019). The estimated coefficient of the interaction variable (logBCst*Cvd) is represented by β_3. The moderating effect can be detected from the estimated coefficient of the interaction variables (Islam et al., 2020). If the coefficient is statistically significant, it informs that the moderating role exists (Kalmaz & Giritli, 2020). This means that if $\beta_3 \neq 0$ (p-value < 0.05), it means that the covid-19 pandemic moderates the sectoral output effects of bank credit. The opposite interpretation applies if $\beta_3 = 0$ (p-value > 0.05). The interaction effect produced by the moderator variable comprises three probabilities, namely strengthening, weakening, or changing the direction of the relationship between variables (Gardner et al., 2017; Amri et al., 2022).

Furthermore, by performing a partial derivation of model 3, the marginal effect of bank credit on sectoral output growth is formulated as follows (Huynh & Tran, 2021; Akcay, 2021):

$$\frac{\partial \log SOS_t}{\partial \log BCs_t} = \beta_1 + \beta_3 Cvd \tag{4}$$

The marginal effects verification refers to the scored value of the pandemic, where the pre-pandemic is scored by zero and the others are one. From Equation (4), if that $\beta_1, \beta_3 > 0$, the pandemic covid-19 caused the rising impact of bank credit on sectoral output growth. On the other hand, if β_1 and β_3 have different signs, there is a threshold effect, suggesting that the impact of bank credit on the sectoral output growth differs between pre and amid the pandemic. For instance, if that $\beta_1 > 0$ and $\beta_3 < 0$, the marginal impact of bank credit would be positive for the pre-pandemic period, but it could be either positive or negative during the pandemic period. Hence, it is essential to calculate the marginal effects to verify this.

4. Empirical Results and Discussion

4.1 The results of descriptive statistics

This sectoral GDP comprises the GDP of the agricultural sector, manufacturing industry, construction services, wholesale & retail trades, and transport & storage sector. Bank credit is sectoral credit allocated nationally by a commercial bank to the five economic sectors. The descriptive statistics on sectoral output and sectoral bank credit are shown in Table 1 and Table 2.

Table 1. Descriptive statistics of sectoral GDP

	Sectoral GDP (IDR Billions)				
	Agriculture	Manufacturing industry	Construction	Wholesale & retail trades	Transport & storage
Mean	421,610.6	699,983.9	329,198.6	438,820.6	133,116.6
Maximum	459,874.4	759,359.7	369,786.3	480,453.5	154,921.7
Minimum	378,565.9	622,369.3	278,265.6	394,016.8	110,132.6
Std. Dev.	25,565.97	43,002.46	29,290.38	28,203.12	13,169.58
Observations	72	72	72	72	72

Sources: Authors' calculation by using E-Views

Table 2. Descriptive statistics of sectoral credit

	Sectoral credit (IDR Billions)				
	Agriculture	Manufacturing industry	Construction	Wholesale & retail trades	Transport & storage
Mean	321,500.1	810,418.7	261,584.4	877,503.9	200,684.4
Maximum	401,627.2	961,568.7	376,473.2	1,006,069.1	266,188.9
Minimum	217,591.5	656,410.3	141,592.2	704,159.4	165,336.8
Std. Dev.	57,147.60	81,066.61	77,278.99	88,957.65	32,697.31
Observations	72	72	72	72	72

Sources: Authors' calculation by using E-Views.

Table 1 above shows that Indonesia's gross domestic product differs by economic sector. On average, the manufacturing industry contributed the largest GDP compared to the other five sectors. Then followed the Wholesale & retail trades sector in second place, and the Agricultural sector in third. Along with differences in GDP, the realization of bank lending for each economic sector is also different. The economic sectors with the most prominent banking credit are the wholesale & retail trade sectors. Then followed the processing industry sector in second place. On the other hand, the economic sector with the lowest credit distribution is the construction sector.

4.2 The result of the estimation

As explained earlier, the functional relationship between sectoral output and bank credit, the covid-19 pandemic, and the interaction of these two predictor variables is predicted using three regression equations. The first model represents the functional relationship between sectoral output and bank lending. Thereafter, the second model adds the covid-19 pandemic as a dummy variable into the first equation. Finally, the third model was designed by adding the interaction between bank credit and Covid-19 as a predictor variable of sectoral output. The three models are then estimated using the econometrical means which is the ordinary least square approach.

The results of model 1 provide statistical evidence that banks' credit has a positive and significant effect on the output of all economic sectors. For the agricultural and manufacturing sectors, for example, the estimated coefficients of bank credit (β_1) for these two sectors are 0.234 ($p < 0.05$) and 0.598 ($p < 0.05$), respectively. This shows that an increase in bank credit has significantly boosted the output of the two sectors. Sectoral output effects of bank credit for three other economic sectors are also positive and significant. In statistics, these statistical indications as shown by the estimated coefficient of bank credit on

the construction services sector ($\beta_1 = 0.289$; p-value < 0.05), wholesale and retail trade ($\beta_1 = 0.617$; p-value < 0.05) and on the transport and storage sectors ($\beta_1 = 0.459$; p-value < 0.05), respectively. The rising bank credit for three business sectors significantly affects output growth. In other words, the larger the bank credit, the greater the output in the three economic sectors. This is because the distribution of bank credit to certain economic sectors can increase business activity in turn, has a direct impact on sectoral output.

Table 3. The result of the OLS-Main effect (model 1)

Constant & predictors	Logarithmic value of sectoral output				
	Agricultural Sectors	Manufacturing sector	Construction sector	Wholesale & retail trades	Transport & storage
Main effect (model 1)					
Constant (β_0)	8.849 [118.563] (0.000)	5.317 [21.813] (0.000)	9.100 [154.397] (0.000)	4.552 [24.519] (0.000)	6.198 [9.602] (0.000)
Log(BCs) (β_1)	0.324*** [54.938] (0.000)	0.598*** [33.389] (0.000)	0.289*** [61.108] (0.000)	0.617*** [45.445] (0.000)	0.459*** [8.670] (0.000)
R^2	0.977	0.941	0.982	0.967	0.518
Adjusted R^2	0.976	0.940	0.981	0.966	0.511
F-statistic	3018.236	1114.873	3733.921	2065.217	75.163
Prob(F-statistic)	0.000	0.000	0.000	0.000	0.000
D-W stat	0.228	0.702	0.258	0.619	0.032
Residual normality					
Jarque-Bera	5.534 (0.063)	1,395 (0.497)	2.199 (0.333)	1.273 (0.529)	7.118 (0.028)
Heteroskedasticity Test: White					
F-statistic	1.027 (0.902)	0.064 (0.801)	2.943 (0.069)	0.783 (0.379)	0.376 (0.423)

Note: the number in [ ] is t statistics; ( ) is p-value; and the sign of * ** *** indicates significance at the confidence level of 90%, 95%, and 97.5%, respectively.
Sources: Authors' calculation by using E-Views.

The positive effects of bank credit on the agricultural sector be accordance with the result of an empirical research study conducted by Osabohien et al. (2020) pointed out that sectoral credit has a positive impact on the development of the economic sectors. These empirical findings are also consistent with the study of Ustarz & Fanta (2021) for the case of sub-Saharan countries, which also found that the development of the financial sectors had a positive effect on the service and agricultural sectors. This finding also supports the empirical study conducted by several researchers. For instance, Taiwo (2020) pointed out that bank credit increases the growth of the manufacturing sector. Previously, the research study conducted by Abor et al. (2014) concluded that an increase in bank credit has a significant impact on business development in the trade sector. Then, the results of studies by Grown & Bates (1992) and Asante & Helbrecht (2019) disclosed empirical evidence of the positive impact of bank credit on output growth in several economic sectors, especially in the manufacturing and trade sectors.

Statistical results related to the sectoral effects of Covid-19 show that the pandemic has a different impact on the respective sectors (Model 2). For the manufacturing industry sectors,

construction services, and transportation and warehousing sectors, this pandemic has a negative and significant effect, with coefficient estimates of the three sectors (β_2) are -0.022 (p<0.05), -0.023 (p<0.05), and -0.164 (p<0.05), respectively. The pandemic has significantly impacted the decline in the output of these three economic sectors. Since the virus spread, the central and regional Indonesian government has implemented several emergency policies. The emergency policies include travel restrictions between regions, territorial lockdowns, social distancing, and the communities' duty to comply with health protocol rules. Its primary objectives are not only to limit the spread of the virus but also to protect the public from health threats. However, this policy harms economic activity in the transportation sector, disrupts the supply chain of raw materials for the manufacturing and construction industries, and reduces the intensity of trade activities. As a result, some workers in the three sectors have loos their jobs and become unemployed. These are what cause a decline in output in the three economic sectors.

This finding supports the research study by Nguyen & Vu (2021) on the case of Vietnam discovered the pandemic significantly impacted the decline in industrial sector output. Also, the empirical findings of Tan et al. (2021) in China pointed out that the pandemic has dramatically reduced the performance of manufacturing sectors. The recent evidence of the related study conducted by Xu et al. (2021) for the case of China's construction and transportation sectors pointed out that pandemics significantly decrease the output growth of the economic sectors.

The effect of the pandemic on the other two sectors is positive, with the estimated coefficients ($\beta_2 = 0.015$, p<0.05) for the agricultural and ($\beta_2 = 0.016$, p<0.05) for the wholesale and retail trade sectors. The pandemic had no impact on the decline in the output of the two economic sectors. This finding differs from the research result of Ahmed et al. (2021) found that the Covid-19 pandemic followed by government policies to mitigate its spread significantly reduced production in the agricultural sector. This finding also contradicts the results of research (Ion et al., 2021) for the case of the Romanian economy, which provides empirical evidence about the negative impact of Covid-19 on the wholesale and retail sectors.

The interaction between bank credit and the Covid-19 pandemic has a negative and significant effect on the output of the manufacturing sector ($\beta_3 = -0.364$, p<0.05), construction ($\beta_3 = -0.673$, p<0.05), and transportation & storage sector ($\beta_3 = -2.529$, p<0.05). This regard provides statistical evidence that the Covid-19 pandemic moderated the effect of bank credit on the output of the three economic sectors. The moderating effect is negative and significant, so the pandemic has changed the significance of bank credit's influence on the sectors' business performance. With another interpretation, for the manufacturing industry sector, construction and transportation, and storage sector, there are significant differences in the sectoral output impact of bank credit between pre and amid the covid-19 pandemic. Changes in the influence of bank credit on the output of the manufacturing sector are described as shown in Figure 1. In conditions before the Covid-19 pandemic, the estimation line of the functional relationship between bank credit and manufacturing output resulted in a slope coefficient marked by a steeper estimation line (black line). In conditions during Covid-19, the estimation line is more gentle than before the pandemic (dash line). So, this figure completes the aforementioned statistical evidence that the pandemic has

significantly reduced the positive influence of bank credit on the output of the manufacturing sector.

Table 3. The result of the OLS-Main effect (Model 2)

Constant & predictors	Logarithmic value of sectoral output				
	Agricultural Sectors	Manufacturing sector	Construction sector	Wholesale & retail trades	Transport & storage
Moderating effect (Model 2)					
Constant (β_0)	9.025	4.793	8.951	4.797	3.259
	[121.885]	[18.719]	[155.491]	[26.931]	[4.740]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Log(BCs) (β_1)	0.309***	0.637***	0.302***	0.599***	0.702***
	[52.832]	[33.800]	[64.882]	[45.939]	[12.402]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Covid-19(β_2)	0.015***	-0.022***	-0.022***	0.016***	-0.164***
	[4.890]	[-4.045]	[-5.268]	[4.089]	[-6.433]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R^2	0.983	0.952	0.987	0.974	0.699
Adjusted R^2	0.982	0.951	0.986	0.973	0.689
F-stat	2015.069	687.944	2594.314	1272.806	79.958
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
D-W stat	0.384	0.881	0.422	0.831	0.170
Residual normality					
Jarque-Bera	3.945	5.747	2.597	0.443	4.218
	(0.139)	(0.057)	(0.273)	(0.801)	(0.121)
Heteroskedasticity Test: White					
F-stat	0.821	0.743	1.838	1.411	1.048
	(0.491)	(0.530)	(0.191)	(0.247)	(0.323

Note: the number in [   ] is t statistics; (   ) is p-value; and the sign of * ** *** indicates a significance at the confidence level of 90%, 95%, and 97.5%, respectively.

Sources: Authors' calculation by using E-Views.

The negative moderating effect of Covid-19 on the influence of bank credits on the manufacturing sector's output statistically explains that the pandemic has had a detrimental impact on the business performance of the manufacturing industry. This finding confirms the findings of Chowdhury et al. (2020), which revealed that the short-run effect of the covid-19 pandemic was the cessation of business activities in the processing industry and disruption of trade activities. Most companies in the manufacturing industry experience logistical challenges besides demanding disruptions (Juergensen et al., 2020). The manufacturing sector experienced a worse performance decline when compared to the other sectors (Rababah et al., 2020). Research conducted by Cai & Luo (2020) also concluded that the covid pandemic impedes the supply chain of raw materials for the manufacturing industry. Supply and demand of the manufacturing industrial supply chains are severely affected by the spread of covid. The Covid-19 pandemic, which was in line with the government's efforts to mitigate the impact of its break, has caused manufacturing sectors' activity to be inactive (Asgary et al., 2020). As a result, the output of this business sector drastically decreased.

Table 4. OLS-Interaction effect (Model 3)

Constant & predictors	Logarithmic value of sectoral output				
	Agricultural sectors	Manufacturing sector	Construction sector	Wholesale & retail trades	Transport & storage
$c(\beta_0)$	9.024 [121.053] (0.000)	4.741 [18.817] (0.000)	8.944 [180.210] (0.000)	4.778 [26.921] (0.000)	3.127 [4.813] (0.000)
Log(BCs) (β_1)	0.309*** [52.483] (0.000)	0.641*** [34.549] (0.000)	0.303*** [75.407] (0.000)	0.600*** [46.209] (0.000)	0.712*** [13.328] (0.000)
Covid-19(β_2)	1.076 [0.334] (0.740)	4.969* [1.989] (0.051)	8.605*** [4.979] (0.000)	3.224 [1.388] (0.169)	31.331 [3.084] (0.003)
Log(BCs)*Covid-19(β_3)	-0.082 [-0.329] (0.743)	-0.364** [-1.998] (0.049)	-0.673*** [-4.992] (0.000)	-0.233 [-1.381] (0.172)	-2.529*** [-3.100] (0.003)
R^2	0.983	0.955	0.990	0.974	0.736
Adjusted R^2	0.982	0.953	0.989	0.973	0.724
F-statistic	1326.055 (0.000)	479.849 (0.000)	2337.350 (0.000)	860.323 (0.000)	63.161 (0.000)
D-W stat	0.374	0.853	0.502	0.745	0.157
Residual normality					
Jarque-Bera	3.965 (0.138)	7.990 (0.119)	4.945 (0.414)	0.292 (0.864)	2.659 (0.265)
Heteroskedasticity Test: White					
F-statistic	1.934 (0.098)	1.316 (0.276)	1.580 (0.145)	1.633 (0.189)	1.894 (0.126)

Note: the number in [ ] is t statistics; ( ) is p-value; and the sign of * ** *** indicates a significance at the confidence level of 90%, 95%, and 97.5%, respectively.

Sources: Authors' calculation by using E-Views.

Figure 1. Scatter plot of logarithmic value for bank credit and manufacturing sector output by difference time (pre- and amid Covid-19 pandemics)
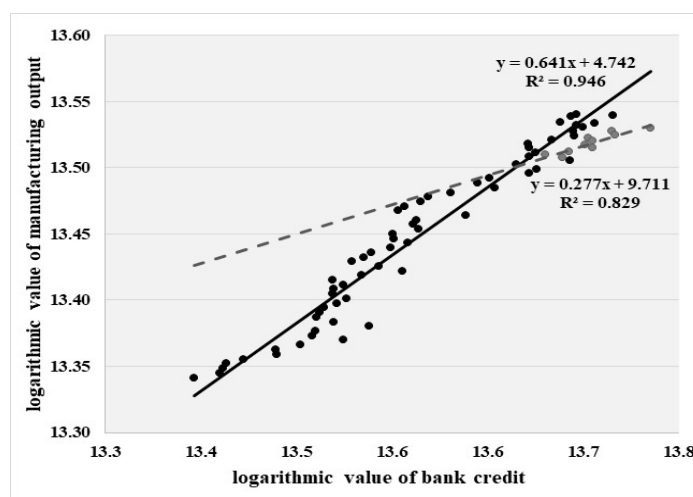
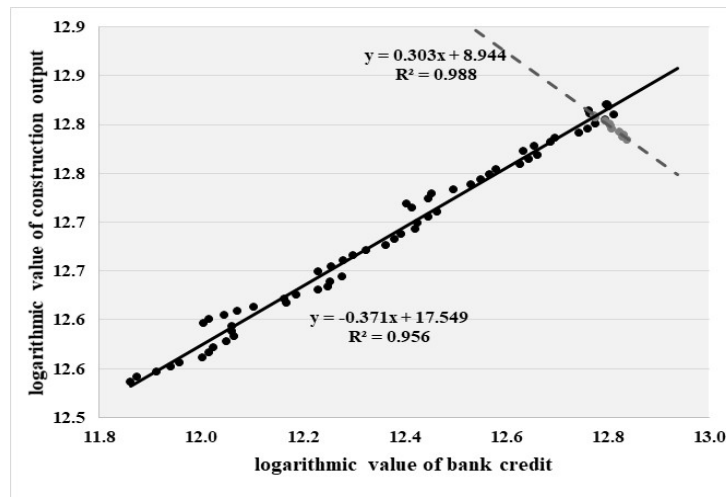*Sources: Authors' compilation refers to mathematical calculation.*

Referring to the interaction model as shown in Table 4 earlier, the marginal effect of bank credit on the output of the manufacturing sector is expressed as follows,

$$\frac{\partial \log SOS_t}{\partial \log BCs_t} = 0.641 - 0.364 Cvd$$

The methodology section explains that the Covid-19 pandemic is a dummy variable measured by a score of zero (0) for pre and 1 for the pandemic period. The marginal effect of bank credit allocation in pre-pandemic conditions is 0.641 (0.641 – 0.364*0). Furthermore, the marginal impact for the pandemic period is 0.277 (0.641 – 0.364*1). These statistical calculations prove that the marginal effects of bank credit on output growth in the manufacturing sector for the pandemic period are lower than in the pre-pandemic period. However, both marginal effect values show a positive sign, which means that the pandemic weakens the positive influence of bank credit on output.

The moderating effect of the Covid-19 pandemic on the nexus between the output of construction sectors and bank credit is more significant than its moderating effect on the manufacturing sectors. Even for this sector, the Covid-19 pandemic has changed the direction of the influence of bank credit on output. As shown in Figure 2, in the pre-pandemic period, the estimation line that reflects the functional relationship between bank credit rises from the bottom left to the top right (black line). In contrast, for the period of pandemics, the estimation line goes down from the top left to the bottom right (dash line). It proves that during the outbreak of the Covid-19 pandemic, the increase in bank credit was followed by decreasing in the construction sector output.

Figure 2. Scatter plot of logarithmic value for bank credit and construction sector output at different times (pre-and amid Covid-19 pandemics)

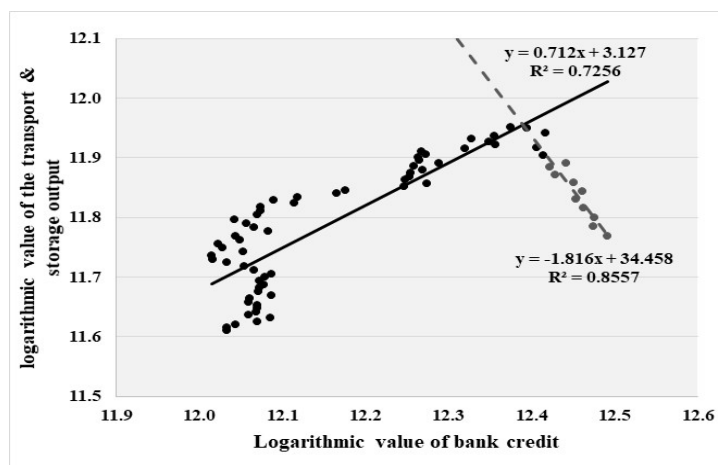*Sources: Authors' compilation refers to mathematical calculation.*

The marginal effect of bank credit allocation on the output of the construction sector is expressed as follows:

$$\frac{\partial \log SOS_t}{\partial \log BCs_t} = 0.303 - 0.673 Cvd$$

Based on the model above, the marginal effect of bank credit in pre-pandemic conditions is 0.303 (0.303 – 0.673*0). Furthermore, the marginal impact on conditions during the pandemic is -0.371 (0.303-0.673*1). These statistics prove that the marginal effect of bank credit on output growth in the construction sector during the pandemic contrasts with the marginal impact on conditions before the pandemic. Before the pandemic, the increase in bank credit for the construction sector significantly boosted the sector's output growth. One percent increase in bank credits leads to a rise in output by 0.303 percent. However, amid the pandemic, the effect of bank credits on the output growth of the construction sector is negative and significant. One percent increase in credit causes the construction sector's output decreases by 0.370 percent. This statistical result is consistent with the estimation line in Figure 2 above that the pandemic has changed the direction of bank credit influence on the construction sector's output.

Similarly, the Covid-19 pandemic has also changed the direction of the influence of bank credits on the output of transport and storage sectors (Figure 3). For the period of pre-pandemics, the functional relationship between the two variables is as figured in a black-coloured estimation line. This line up from the bottom left to the top right. And then, in the aftermath of the pandemic, the relationship is reflected by a dashed line that downturns from the top left side to the bottom right side.

Figure 3. Scatter plot of logarithmic value for bank credit and transport & storage output at different times (pre-and amid Covid-19 pandemics)

Sources: Authors' compilation refers to mathematical calculation.

Figure 3 above illustrates the functional relationship between the transportation sector's output and the bank credits for the pre and amid the Covid-19 pandemic. Before the pandemic, an increase in bank credit led to production growth; conversely, during a pandemic, an increase in bank credit was in line with a decrease in production. The different directions of the effects of credit such as explained in the marginal impact of bank credits, as expressed in the equation below:

$$\frac{\partial \log SOS_t}{\partial \log BCs_t} = 0.712 - 2.529 Cvd$$

In the pre-pandemic period, the marginal effect of bank credits on the output of the transportation and warehousing sector was 0.712 (0.712 – 2.529*0). The output production of this economic sector will increase by 0.712 percent for every 1 percent increase in bank credit. Furthermore, the marginal effect on conditions during the pandemic is -1.816 (0.712 – 2.529*1), which means that output will decrease by -1.817 percent for every one percentage point increase in bank credit. These statistics prove that the marginal effect of the credit on output growth in conditions during the pandemic is in contrast to the pre the pandemic. In pre-pandemic situations, the estimation line representing the functional relationship between output and credit rises from the bottom left to the top right. It informs that the larger the credits, the greater the output growth of the transportation and warehousing sector. On the other hand, in conditions during the pandemic, the estimation line descends from the top left to the bottom right, indicating an inverse relationship between bank credits and the output of the transportation and warehousing sectors. These statistical results are consistent with the estimation line as shown in Figure 2 above, that the pandemic has changed the direction of the influence of credit on the output of the transportation and warehousing sectors.

The change in direction and significance of the relationship between bank credits and output growth in the construction, transport & storage sectors shows that these two sectors are most affected by the spread of Covid-19. As explained earlier, since the beginning of the virus outbreak, the initial policy of the central government in Indonesia was to impose social distancing, large-scale restrictions, and territorial lockdowns. The emergency policies then followed by local governments implement the same approach to mitigate the spread effect of the virus. Both central and local government policy causes economic activity in the construction sector to suffer from disturbance. Regarding the chain supply, for example, the raw material supply needed by the sectors has stopped. In line with the scarcity of raw materials, most construction workers must stop working. This finding supports the result of Shibani et al. (2020) for the case of construction companies discovered that territorial lockdown and social distancing significantly and negatively affect construction companies. The territorial lockdown and large-scale restrictions caused many projects to close, and these emergency policies ultimately encouraged rising unemployment (Biswas et al., 2021). In particular, for urban areas, the policy also directly affects the transportation sector (Stalmachova, Strenitzerova., 2021). The mobility of goods and services and the movement of people between regions are constraining. This unpleasant condition causes the output of the transportation sector to be drastically declining. As a result, despite bank credit increases, the production performance of these two economic sectors has continued to decline.

In contrast to the moderating effect of the covid-19 on the relations between bank credit and the three aforementioned economic sectors, the pandemic did not significantly moderate the impact of bank credit on the output growth of the agriculture, retail, and wholesale sectors. This statistical interpretation refers to the estimated coefficients of the respective interaction variables, which are -0.082 for the agricultural and 0.233 for the wholesale and retail sectors. Both estimate coefficients are insignificant at the 5 percent level (p>0.05). It means that the business performance of the two economic sectors was not significantly affected by the contagion effect of the pandemic. That causes the growth impact of bank credits for agriculture and wholesale and retail trade sectors to not differ across the two opposite periods (pre-and amid covid pandemic).

5. Conclusion

The Covid-19 pandemic has affected the global economy, including the Indonesian economy. The pandemic causes not only a health crisis but also affects various economic sectors and also financial sectors. This study examines the effect of bank credit on sectoral economic growth in Indonesia by placing the Covid-19 pandemic as a moderator of the relationship between the two variables. These sectoral outputs are agriculture, manufacturing, construction, wholesale & retail trades, and transport & storage sectors.

The study found that bank credit had a positive and significant effect on the output of the five economic sectors. The Covid-19 pandemic negatively and significantly affects business development in the manufacturing, construction, wholesale & retail trades, and transport & storage sectors. The impact of the pandemic on these four sectors is negative and significant. This pandemic has significantly reduced the output of the four economic sectors. In contrast, the pandemic did not affect growth in the agricultural sectors.

This pandemic also moderated the influence of bank credit on the output of the construction, transport and storage, and manufacturing sectors. The pandemic reduced the effect significance of bank credit in the manufacturing sectors and altered the influence of bank credit on the output growth in the construction sectors and transport & storage sectors. During the pandemic, changes in bank credit for these two economic sectors move inversely with changes in output growth. Conversely, the Covid-19 pandemic did not moderate the influence of bank credit on the output growth in the agriculture and wholesale & retail trades sector.

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