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THE COVID-19 PANDEMIC AND INDONESIA'S FINTECH MARKETS

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Abstract

This paper investigates the impacts of the COVID-19 pandemic and the large-scale social distancing (PSBB) policy on Indonesia's financial technology (fintech) markets. It also elaborates the roles that fintech companies can play in the national economic recovery.

This paper finds that Indonesia's fintech markets were relatively resilient during the COVID-19 pandemic. The pandemic did not have significant impacts on Indonesia's fintech markets, but the PSBB harmed phone banking, mobile banking, and internet banking transaction values as well as peer-to-peer (P2P) fintech lending. Nevertheless, the PSBB increased electronic money transactions. The relatively short PSBB period prevented the restrictions on economic activities from imposing too much damage on the fintech markets.

The Indonesian authorities involved the fintech industry as a component of the national economic recovery program (PEN), particularly the pre-employment card (Kartu Prakerja) program. There are still many areas in which the government can utilize the fintech industry for economic recovery, including direct cash transfers to poor households and extensions of subsidized loans for micro, small, and medium enterprises (MSMEs).

Keywords: fintech, Indonesia, micro, small, and medium-sized enterprises, MSMEs

JEL Classification: G23, G29, O33, O39

Contents

1. INTRODUCTION

With a large population, a growing middle-income class, and the high penetration of mobile phones and the Internet, Indonesia is a large potential market for the financial technology (fintech) industry. Indonesia's National Statistics Agency (Badan Pusat Statistik (BPS)) (2020a) estimated Indonesia's population at 270 million in 2020. The World Bank estimated that 52 million Indonesians belonged to the middle class (World Bank 2020). The BPS (2020b) reported that around 65.5% of Indonesian households owned or used cellular (mobile) phones in 2019. Hootsuite estimated that, as of January 2021, there were around 202.6 million internet users in Indonesia, with the country's internet penetration ratio being 73.7% (*Kompas* 2021a).

There are various definitions of "fintech" in the economic literature, but these definitions share the same idea: fintech involves the use of technological innovation to create value added in the financial industry. Sahay et al. (2020) defined fintech as a technology-enabled innovation in financial services that could result in new business models, applications, processes, or products with an associated material effect on the provision of financial services. Bank Indonesia defined fintech as the use of technology in a financial system that generates products, services, technology, and/or new business models and may have an impact on monetary stability, financial system stability, and/or the efficiency, fluency, security, and reliability of payment systems (AFTECH 2020).

Two authorities are responsible for regulating the fintech industry in Indonesia: (1) Bank Indonesia (BI), which regulates fintech companies and products related to payments; and (2) the Otoritas Jasa Keuangan (OJK), which regulates fintech companies and products related to financial services (e.g., digital banking, peer-to-peer (P2P) lending, crowdfunding, insure-tech, investment, and market aggregators) (Batunanggar 2020). There are two fintech associations in Indonesia: the Indonesia Fintech Association (AFTECH) and the Indonesia Fintech Lenders Association (AFPI). Each association sets ethical codes for its members.

According to the AFTECH, there are four main types of fintech products in Indonesia based on their respective business models: (1) digital payment; (2) online lending; (3) digital financial innovation (DFI) products (e.g., market aggregator, blockchain, and credit scoring); and (4) equity crowdfunding (ECF). The AFTECH reported that, by the end of Q2-2020, 362 fintech startup companies had joined the association. As of Q2-2020, 44% of the AFTECH members were online lending providers, 24% were DFI product providers, 17% were digital payment providers, 1% were equity crowdfunders, and the remaining 14% offered different types of fintech products. The OJK reported that there were 149 peer-to-peer (P2P) fintech lending companies by the end of 2019.

Several of Indonesia's fintech startup companies have obtained unicorn status (i.e., a startup company with a market value higher than USD1 billion) after receiving funding injections from big investors. These companies include Tokopedia, Traveloka, BukaLapak, OVO, and JD.ID. One fintech startup company, Gojek, has become a decacorn (i.e., its market value is greater than USD10 billion). These six fintech startups utilize big data and cloud computing technology (Abdillah 2020).

The number of studies on fintech in Indonesia is growing. For example, PwC Indonesia (2019) conducted a survey investigating the behavior of 2,800 fintech customers in Indonesia. The study by Batunanggar (2020) found that, in general, financial institutions in Indonesia have embraced fintech and financial customers have become more familiar with fintech products. Nuryakin et al. (2019) reported that the main users

of fintech are urban households, while fintech's penetration to rural households and micro, small, and medium enterprises (MSMEs) is still low. Tritto, He, and Junaedi (2020) found that the largest investment in Indonesia's P2P fintech lending comes from the People's Republic of China (PRC), in part due to the regulatory tightening in the PRC and the regulatory gap in Indonesia's P2P fintech lending environment. The Indonesian authorities have created various regulations and institutions to cope with the potential risk of illegal business practices from the influx of foreign investment to the P2P fintech lending industry.

The COVID-19 outbreak in Indonesia has hit the country's economy. At the beginning of the outbreak, there was concern among Indonesia's fintech companies about the impacts of the pandemic on the industry. However, Indonesia's fintech industry seems to have survived the pandemic. In fact, the revenues for some types of fintech products were higher in 2020 than in 2019. The total values of fintech payment transactions in 2020 reached IDR27,547 trillion, higher than the IDR27,380 trillion in 2019. The P2P outstanding lending position increased from IDR13.2 trillion at the end of 2019 to IDR15.3 trillion at the end of 2020.

Researchers have conducted a growing number of studies to explore the impacts of the ongoing COVID-19 pandemic on the fintech markets. However, the literature investigating the impacts of the pandemic on Indonesia's fintech markets remains scant. This paper seeks to contribute to the existing literature by examining the impact of the COVID-19 pandemic and the PSBB on Indonesia's fintech markets. It also discusses the roles that fintech companies can play in Indonesia's economic recovery. It provides some policy recommendations for BI, the OJK, and the government to utilize fintech companies to support economic recovery.

Some analysts have claimed that the COVID-19 pandemic and the large-scale social distancing (PSBB) to contain it have accelerated the fintech markets' development in Indonesia. The rationale is that the pandemic and the PSBB have induced some households to engage in online financial activities rather than conducting them through conventional channels that involve face-to-face interactions with people. This paper tests the claim and discusses the results.

The paper proceeds as follows. Section 2 discusses related studies on the impacts of the COVID-19 pandemic on the fintech industry and markets in various countries. Section 3 examines the dynamics of Indonesia's fintech markets amid the COVID-19 pandemic. Section 4 discusses the impacts of the COVID-19 pandemic and the PSBB on Indonesia's fintech payment products and P2P fintech lending. Section 5 discusses the utilization of fintech by Indonesia's economic authorities to support the national economic recovery program. Section 6 concludes.

2. RELATED LITERATURE

The World Bank and the University of Cambridge (2020) conducted a survey on 118 central banks and other financial regulatory authorities between June and August 2020 to assess these authorities' response to COVID-19 in regulating and supervising fintech activities and other forms of digital financial services. The survey found that the respondent regulators have reported increases in the use or offering of many fintech products and services since the outbreak of the pandemic, particularly digital payments and remittances. The majority of regulators have either accelerated their existing regulatory innovation initiatives or introduced new initiatives on fintech during the pandemic.

Fu and Mishra (2020) examined the effects of the COVID-19 pandemic on digital finance and fintech adoption and usage in 71 countries. They found that the spread of COVID-19 and related government lockdowns have led to significant increases in downloads of finance applications. They reported that traditional incumbent banks have experienced particularly large gains compared with the "BigTech" companies and newer fintech providers during the pandemic in terms of increased consumer uptake of their digital offerings. They also found that businesses that are amalgamated with an existing digital payment infrastructure have been better able to offset the adverse economic effects of the pandemic.

Hill (2021) observed that the COVID-19 pandemic has transformed the US financial services industry. The pandemic has caused consumers to shift to online and mobile financial services. This shift has hastened banks' adoption of fintech technology and formation of partnerships with non-bank fintech companies. It has encouraged regulators to scrutinize banks' use of technology and bank–fintech partnerships but at the same time encouraged them to use more technology for bank supervision. The pandemic will bring about regulatory changes for fintech companies, and their regulation may become more like that of mainstream financial companies (such as banks).

Moro-Visconti, Rambaud, and Pascual (2020) used the Global FinTech Thematic Index, the MSCI World Banks Weighted Equity Index, and the MSCI World (excluding Australia) Information Technology Index to compare the performance of fintech stocks against that of bank stocks and information technology stocks. They found that fintech stocks are slightly more volatile than information technology (IT) stocks and much more volatile than bank stocks. Fintech and IT stocks fell further than bank stocks in March 2020 in the initial phase of the COVID-19 pandemic; however, they recovered much faster than bank stocks from April 2020.

Didenko et al. (2020) suggested that stable digital currencies (SDCs) (e.g., LIBRA and the digital yuan) and COVID-19 can revolutionize the global payment system. The government can use SDCs as a vehicle for public procurement and subsidies to bypass commercial banks at critical moments, such as the COVID-19 pandemic. The COVID-19 pandemic has given a boost to the digital yuan, which the People's Bank of China (PBOC) is currently preparing to launch.

Tut (2020) investigated the impact of the COVID-19 pandemic on the fintech payment markets in Kenya. He found that the pandemic initially harmed the mobile banking market but that favorable short-term regulatory changes have reversed some of the negative effects. Meanwhile, the use of all types of electronic payment cards except for charge cards (which are cheaper than other types of cards) declined significantly during the pandemic. The pandemic has reduced both domestic and international electronic fund transfers via real-time gross settlements (RTGSs). It has also reduced remittance inflows via fintech platforms.

The COVID-19 pandemic has not necessarily harmed the fintech markets in other countries and has sometimes even boosted them. It accelerated mobile money growth in West Africa (*Reuters* 2020). It boosted e-commerce transactions in Peru, where four out of 10 store purchase orders came from new customers, representing more than 5 million new users (*PéruRetail* 2020). It also promoted e-commerce transactions in Pakistan (*Pakistan Today* 2020) and boosted fintech lending for small and medium-sized businesses in Japan (*Japan Times* 2020).

Al Nawayseh (2020) examined Jordanian citizens' intention to use fintech applications to build resilience during the COVID-19 pandemic. His research sample comprised 500 potential fintech service users in Jordan. He found that the perceptions of

technological risks did not affect customers' intention to use fintech applications during the pandemic, but it did affect their trust in the service. Consumers will be more likely to make fintech transactions when the perceived benefits, social value, and trust are high and at the same time the risk perceptions are low.

Erel and Liebersohn (2020) investigated the impact of fintech on extending the US Government's Paycheck Protection Program (PPP) to regions and borrowers that the traditional banking system does not serve. They found that ZIP codes with fewer bank branches, lower incomes, and a larger minority share of the population showed disproportionate use of fintech. Fintech's role in PPP provision was greater in counties where the economic effects of the COVID-19 pandemic were more severe.

Davidovic et al. (2020) discussed the use of mobile platforms for government-to-person (G2P) transfers in 57 countries during the COVID-19 pandemic. They stated that governments' ability to reach workers and households with lifeline support differs across countries depending on the availability of three basic delivery components: (1) a universal identification (ID) system; (2) socioeconomic data on households; and (3) a mode of benefit delivery. They found that some countries, for example Brazil, Togo, Peru, and Nigeria, have used G2P mobile transfers to overcome delivery infrastructure weaknesses.

Sahay et al. (2020) introduced a digital financial index to examine the role of digital finance in promoting financial inclusion. They found that digital finance increases financial inclusion and is associated with higher GDP growth. Based on these findings, they suggested that digital financial inclusion could play an important role in mitigating the economic and social impacts of the COVID-19 pandemic. Compared with conventional financial services, digital financial services are faster, more efficient, and typically cheaper in reaching lower-income households and MSMEs. Digital financial services can and are enabling contactless and cashless transactions during the pandemic.

Benni (2021) conducted a thorough study on digital finance during the COVID-19 pandemic. He found that the pandemic has accelerated the process of financial digitization, caused a surge in the use of digital payment and transfer services, and helped to reduce dependency on cash exchanges. Meanwhile, the digitization of G2P transfers can enable a social safety net. Digital credit can facilitate the provision of short-term loans to pandemic-affected businesses.

The previous studies have shown that the COVID-19 pandemic and the lockdown policy to curb the spread of the pandemic have promoted the use of fintech technology on a worldwide scale. Nonetheless, the impacts of the pandemic and the lockdown on the fintech industry have differed across countries and market niches of fintech products. Some of the studies and reports have also shown that the authorities in many countries are utilizing their fintech companies to mitigate the negative impacts of the COVID-19 pandemic and to help the economic recovery, such as using fintech payment channels for cash transfers, subsidies, and assistance for MSMEs.

3. INDONESIA'S FINTECH MARKET DYNAMICS AMID THE COVID-19 PANDEMIC

The COVID-19 pandemic had a brief negative impact on fintech payment transactions in Indonesia during the PSBB period, which lasted from April to June 2020 and mostly took its toll on internet banking transactions. The internet banking channel is the largest fintech payment transaction channel in Indonesia.

The fintech payment transaction values via the phone banking (PB), mobile/SMS banking (MB), internet banking (IB), and electronic money (EM) channels fell in February 2020. However, this was more likely a result of the seasonal factor related to the Chinese New Year festival (celebrated on 25 January 2020) than the COVID-19 pandemic (the outbreak of which started in March 2020 in Indonesia). After the festival ended, Indonesian Chinese households returned to their normal spending patterns and thus reduced their fintech transactions.

The IB transaction values fell from IDR2,009 trillion in March 2020 to IDR1,773 trillion in June 2020, while the MB transaction values declined from IDR384 trillion to IDR369 trillion. The PB transaction values increased from IDR9.8 trillion in March 2020 to IDR10.8 trillion in April 2020 and to IDR14.4 trillion in May 2020 before falling to IDR11.6 trillion in June 2020 (Figure 1). The EM transaction values rose from IDR15 trillion in March 2020 to IDR17.6 trillion in April 2020 before falling again and hovering around IDR15 trillion in May 2020 and June 2020 (Figure 2). As the Indonesian Government gradually opened up the economy in July 2020, the IB, MB, and overall fintech payment transaction values rapidly recovered.

According to Mr Dharmasaputra, the AFTECH Secretary-General, the values of fintech payment transactions surged in April 2020 as consumers temporarily switched their main payment channel from ATM debit cards to fintech payment channels. Nonetheless, he added that the values of fintech payment transactions fell in May 2020 and June 2020 (*Bisnis Indonesia* 2020).

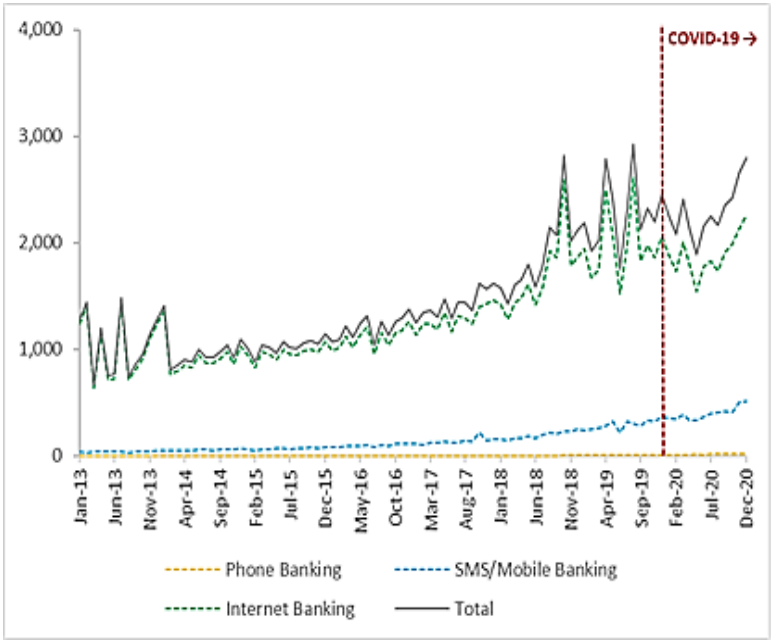
Figure 2 shows that the pandemic caused the values of the EM shopping transactions to approach those of credit cards and combined ATM cards and ATM+ debit cards ("ATM+ cards"). The shopping transaction values of credit cards and ATM+ cards fell sharply from the beginning of the year to May 2020 before rebounding from June 2020. The decline in transaction values of credit cards and ATM+ cards was in part a result of the declining number of face-to-face shopping activities during the PSBB.

The pandemic also briefly affected the P2P fintech lending from April to July 2020. New P2P lending fell from IDR7.1 trillion in March 2020 to IDR3.5 trillion in July 2020, while outstanding P2P lending declined from IDR14.8 trillion to 11.9 trillion (Figure 3). The new and outstanding P2P fintech lending started to increase from August 2020 as economic activities gradually resumed with the end of the PSBB.

As the focus of P2P fintech lending is on the island of Java, the decline in Java drove the fall in the outstanding P2P lending from April to July 2020. While lending in Java still led the P2P lending recovery, the nominal value and the share of P2P lending outside Java have been higher than their pre-pandemic levels (Figure 4). The quality of P2P lending (measured using the 90-day success rate of return) had deteriorated before the pandemic and worsened in the early phase of the pandemic and the PSBB. This situation is also apparent from the increasing P2P lending default rate during the same time span (Figure 5). The P2P lending quality started to improve in September 2020.

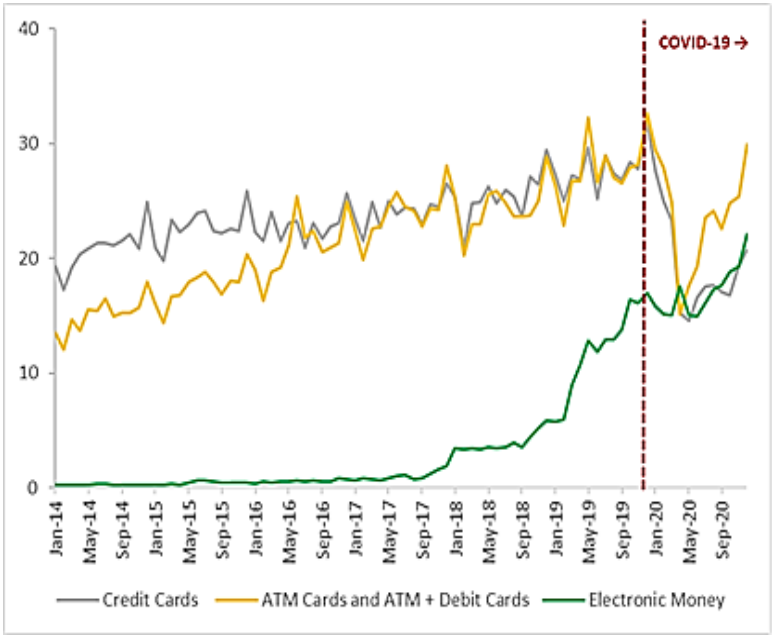
Figure 6 shows that fintech P2P lending values tend to move in the opposite direction to the bank lending rates. Except for the PSBB period, the P2P lending increases as the bank lending rates fall. There are no publicly available data on the P2P fintech lending rates, but these rates move in the same direction as the bank lending rates. According to the AFTECH, banks usually benchmark these rates to the lending rates of conventional banks under the "BUKU 1" (banks with core capital less than IDR1 trillion), "BUKU 2" (core capital between IDR1 trillion and IDR5 trillion), or rural bank (BPR) categories following the OJK and BI classification (*Kompas* 2018).

Figure 1: Digital Banking Transaction Values in Indonesia
(IDR trillion)



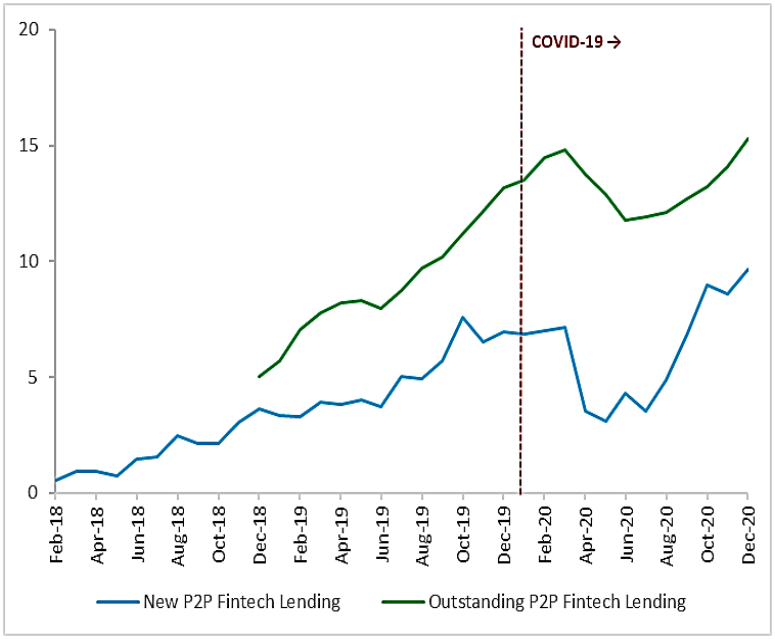
Source: Bank Indonesia (BI).

Figure 2: Shopping Transaction Values by Electronic Money and Payment Cards in Indonesia
(IDR trillion)



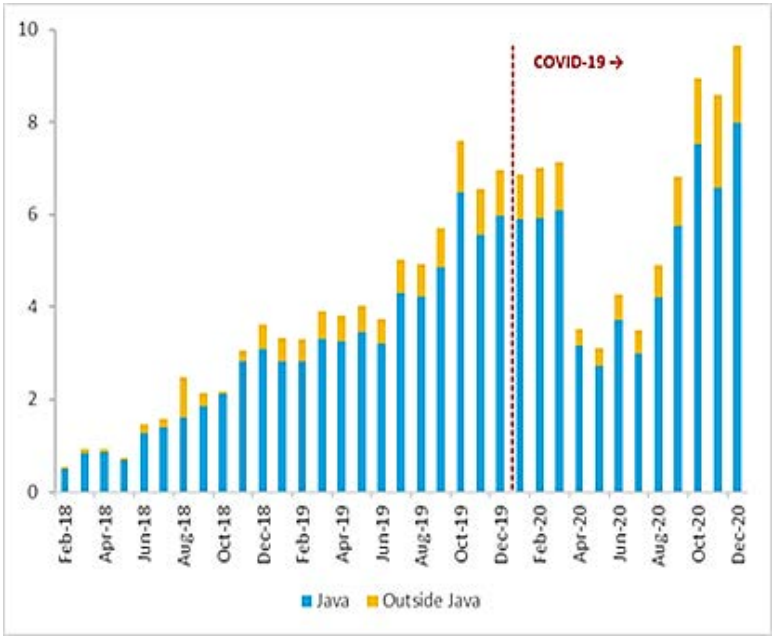
Source: Bank Indonesia (BI).

Figure 3: New vs. Outstanding P2P Fintech Lending in Indonesia
(IDR trillion)



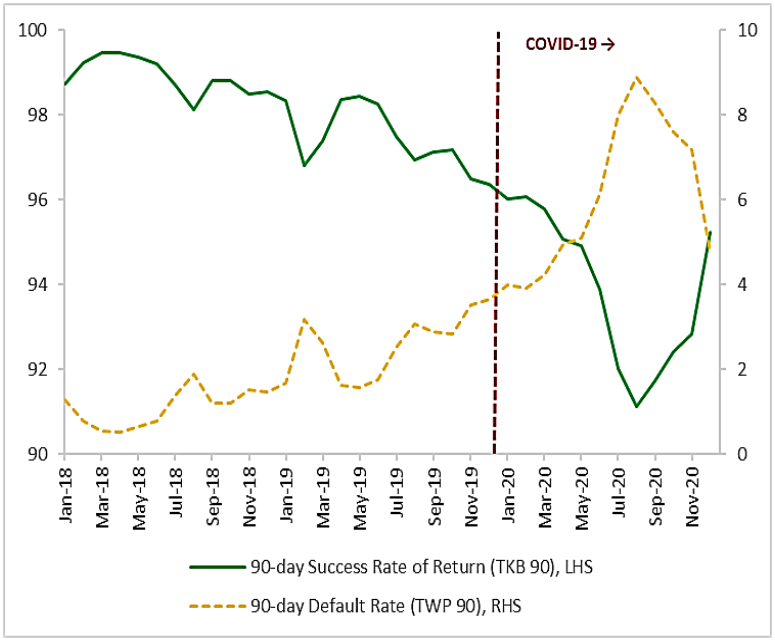
Source: Otoritas Jasa Keuangan (OJK).

Figure 4: Outstanding Fintech P2P Lending: Java vs. Outside Java
(IDR trillion)



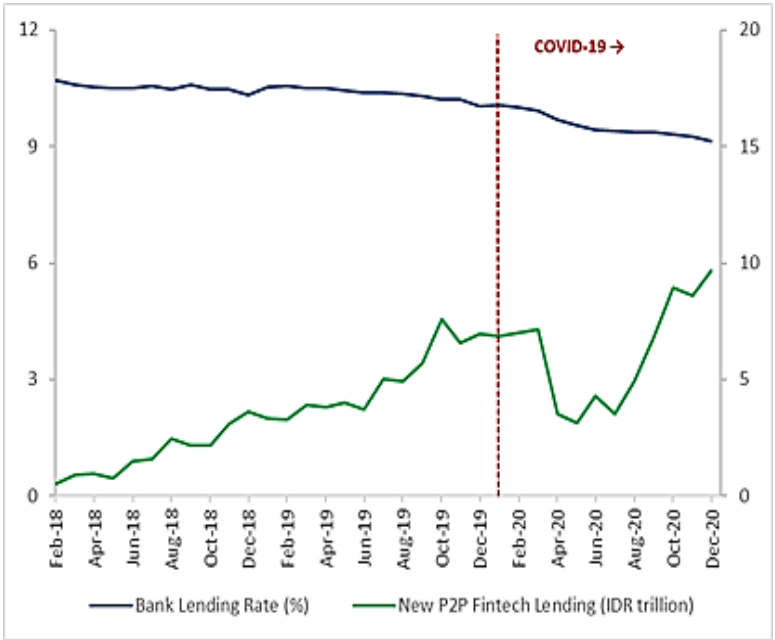
Source: Otoritas Jasa Keuangan (OJK).

Figure 5: Quality of P2P Lending Measured Using the 90-Day Success Rate of Return
(%)



Source: Otoritas Jasa Keuangan (OJK).

Figure 6: Bank Lending Rate vs. Fintech New P2P Lending Rate



Source: Otoritas Jasa Keuangan (OJK).

According to the AFPI, the P2P lending rate for productive business ranges between 16% and 30% (*Kontan* 2019). This rate is higher than banks' average 10.4% working capital and 10.5% investment lending rates in January 2019. The OJK does not impose a limit on the P2P lending rates, but the P2P fintech lending companies should advise lenders and borrowers of the lending rate by considering the appropriateness of the rate and the national economic condition (Article 17 of the OJK Regulation No. 77 /POJK.01/2016).

Although P2P lending fintech companies seem to have been resilient during the COVID-19 pandemic, the pandemic and the lockdown harmed borrowers' ability to repay their loans. As of April 2020, about 50% of the AFPI members (which represents around 80 P2P lending fintech companies) received requests for lending restructuring from their customers (UOB, PwC, and Singapore Fintech Association 2020).

In December 2020, the OJK issued a new regulation (POJK No. 14 /POJK.05/2020) that revised the previous regulation on the countercyclical measure to mitigate the impact of the COVID-19 pandemic on non-bank financial institutions (NBFIs). The new regulation included P2P fintech lending as one of the NBFIs, whereas the previous regulation did not. Based on the new regulation, P2P fintech companies can restructure their lending with borrowers whose businesses the pandemic has harmed.

Equity crowdfunding (ECF) also grew strongly during the COVID-19 pandemic. The OJK reported that, as of 30 September 2020, three ECF fintech companies (Santara, Bizhare, and Crowddana) had helped 111 small and medium-sized enterprises (SMEs) to raise IDR154 billion of funding in total from 16,965 investors (*Kontan* 2020). An SME that receives a capital injection through the ECF scheme gives part of its ownership to investors in the form of company shares (stock).

In December 2020, the OJK issued a regulation (POJK No. 57/POJK.04/2020) that allows securities-based fintech crowdfunding. This regulation replaced the previous regulation that only allowed equity-based crowdfunding. Under the new regulation, crowdfunding can use debt securities and Islamic debt securities (SUKUK). The new regulation also allows MSMEs to engage in fintech crowdfunding. The previous regulation confined the right to conduct crowdfunding to legal limited companies (Perusahaan Terbatas, PTs). The expectation is that the new OJK regulation will facilitate Indonesia's crowdfunding market growth.

As Indonesia's fintech industry is very dynamic, with more and more new companies, it is rather difficult to know the exact number of existing fintech companies in Indonesia. Many fintech companies have registered with the OJK, but others are awaiting a license to operate as authorized fintech companies. The presence of illegal fintech companies is also an issue that the Indonesian authorities need to resolve.

The AFTECH (2020) reported that 362 fintech companies became members in 2020. Fintech Singapore (2020) stated that there were 322 fintech companies in Indonesia in 2020. The UOB, PwC, and Singapore Fintech Association (2020) reported a higher number of existing fintech companies in Indonesia in 2020: 577. The AFPI noted that, as of June 2020, only 33 out of its 161 members had obtained a license from the OJK to operate as authorized fintech lenders, while the remaining 128 only had a registered status of waiting to obtain a license. The OJK stated that, as of 10 January 2021, there were 149 authorized fintech P2P lending companies (*Infobank* 2020).

Fintech Singapore (2020) reported that several major acquisitions had taken place in 2020, including Gojek's acquisition of MOKA (amounting to USD130 million), Fundtastic's acquisition of Invisee (amounting to USD6.5 million), and Gojek's acquisition of MOKA (undisclosed amount). Meanwhile, OVO and Dana are in the

process of negotiating their merger. Besides the purpose of raising capital, mergers and acquisitions allow fintech companies to synergize their services to increase their value added. These corporate actions show that the COVID-19 pandemic did not prevent Indonesia's fintech industry from growing.

MEDICI (2020) reported that more than 77 fintech funding deals, which amounted to USD329 million, took place in 2020. The UOB, PwC, and Singapore Fintech Association (2020) stated that, based on the funding size as a proportion of the total investment deals in Indonesia's fintech industry in 2020, 38% went to insure-tech companies, 32% to payment companies, 5% to finance and accounting tech, and the remaining 25% to alternative lending. The increasing funding (investment) deals for fintech companies during the time of the COVID-19 pandemic shows that investors are still optimistic about the prospect of Indonesia's fintech industry.

4. THE IMPACTS OF COVID-19 AND THE PSBB ON INDONESIA'S FINTECH MARKETS

This section discusses the impacts of the COVID-19 pandemic and the PSBB on Indonesia's fintech payment and P2P lending markets. The selection of the two markets was based on data availability considerations. BI releases monthly data on the fintech payment industry, while the OJK publishes data on P2P fintech lending. The OJK and BI do not publish monthly data on ECF and DFI products.

Models 1 to 8 intended to investigate the impacts of the COVID-19 pandemic and the PSBB on the PB, MB, IB, and IM transaction values. Models 9 and 10 aimed to examine the impact of the COVID-19 pandemic and the PSBB on P2P fintech lending.

The generic form of the models is as follows:

$$Y_t = c + \beta_1\, CONTROL_{t\ or\ t-1} + \beta_2\, COVID_t + \beta_3\, PSBB_t + \beta_4\, INTERACTION_t + \varepsilon_t$$

where Y is the dependent variable; c is the constant term; $CONTROL$ is the control variable(s); $COVID$ is the COVID-19 variable (stated as a dummy variable or as the number of daily new cases); $PSBB$ is the PSBB dummy variable; $INTERACTION$ is the interaction variable; and ε is the error term. Index t is the time index. $\beta_1, \beta_2, \beta_3,$ and β_4 are coefficient vectors (or matrix) for the respective regressors in the models. We introduced the interaction variable to investigate the impact of COVID-19 on the relationship between a particular independent variable and the dependent variable, that is, to determine whether the pandemic altered the impact magnitude of the respective independent variable on the dependent variable.

The dependent variables for each model are the following: (1) PB transaction values for Models 1 and 5; (2) MB transaction values for Models 2 and 6; (3) IB transaction values for Models 3 and 7; (4) EM transaction values for Models 4 and 8; and (5) new P2P fintech lending values for Models 9 and 10.

The regressors for Models 1 to 8 are the following: (i) the per capita nominal gross domestic product (GDP), which is the control variable; (ii) the COVID-19 dummy variable (for Models 1 to 4) or the number of daily new cases of COVID-19 (Models 5 to 8); (iii) the PSBB variable; and (iv) the interaction variable between the per capita nominal GDP and the COVID-19 dummy variable (Models 1 to 4) or the interaction variable between the per capita GDP and the number of COVID-19 daily new cases (Models 5 to 8).

The regressors for Models 9 and 10 are the following: (a) the real GDP (constant price 2010); (b) the bank lending rate (1-day lagged); (c) a COVID-19 dummy variable (for Model 9) or the number of daily new cases of COVID-19 (for Model 10); (d) a PSBB dummy variable; and (e) the interaction variable between the real GDP and the COVID-19 dummy variable (for Model 9) or the interaction variable between the real GDP and the number of COVID-19 daily new cases (Model 10). The real GDP and the bank lending rate are the control variables for Models 9 and 10.

The COVID-19 dummy variable has a value of 0 for every day from 1 January 2014 to 1 March 2020 and 1 from 2 March 2020 (the first announced case of COVID-19 in Indonesia) to 31 December 2020. The PSBB variable has a value of 0 from 1 January 2014 to 30 March 2020 (the pre-PSBB period), a value of 1 from 1 April 2020 to 2 July 2020, and a value of 2 from 3 July 2020 to 31 December 2020. The Indonesian government initially planned to end the PSBB on 31 May 2020 and begin the "New Normal" phase on 1 June 2020. Nonetheless, it left the decision to end the PSBB to the discretion of local governments, depending on the pandemic situation in their areas. Some local governments ended the PSBB in June 2020, but others (including the special region of Jakarta) ended it in July 2020.

All the data in this study have a daily frequency, covering all the days from 1 January 2014 to 31 December 2020. We selected this period due to the public availability of the data. Appendix 1 Table 1-1 summarizes the variables, the data, and the data sources. We interpolated the monthly, quarterly, and annual data to obtain daily data. We interpolated the quarterly nominal GDP data and the annual population data to monthly data to calculate the monthly per capita GDP. Then, we interpolated the monthly per capita data GDP to daily data.

We detrended the PB, MB, IB, and EM transaction values, the P2P new lending values, and the per capita GDP data from their cyclical trend using the one-sided Hodrick–Prescott (HP) filter and seasonally adjusted them using STL decomposition to obtain stationary series. We detrended the bank lending interest rate using the one-sided HP filter to have a stationary series. We treated the variable of daily new cases of COVID-19 with second-order differencing to obtain a stationary series. The augmented Dickey–Fuller test and the Phillips–Perron test at the 5% significance level confirmed the stationarity of the treated variables (Appendix 1 Table 1-2).

We use the Ordinary Least Square (OLS) method to estimate the models. All the models have a first-order autoregressive term AR(1) to treat the serial correlation problem. We conducted variance inflation factor (VIF) tests to check whether the models encountered the multicollinearity problem. We discarded variables that caused the multicollinearity problem from the final models.

Appendix 2 Tables 2-1 and 2-2 display the results. All the models are fit for the regressions, as the F-test results that reject the null hypothesis of the unfitness of the model show. These models are also free from the serial correlation problem, as the values of the Durbin–Watson (DW) statistics indicate having checked them against their critical values. The VIF test results for the final models show no indication of multicollinearity because the centered VIF values for all the variables in each model are lower than 10 (Appendix 1 Table 1-3). This study set the 5% significance level (α) as the benchmark to test the hypothesis. It based the following analysis on the assumption of other things being equal.

All 10 models show that the COVID-19 variable, either as a dummy variable or as a second-order differenced variable of daily new cases, is not significant in all the models at $\alpha = 5\%$. This finding implies that the pandemic did not significantly affect the transaction values of all types of fintech payment products in Indonesia. The pandemic

also did not significantly influence P2P fintech lending. In other words, Indonesia's payment fintech and P2P fintech markets were resilient to shocks from the COVID-19 pandemic. The results also show that the empirical data do not support the claim that the COVID-19 pandemic accelerated fintech's development.

The COVID-19 pandemic did not significantly weaken or strengthen the relationships between the per capita GDP and the PB, IB, or EM transaction values. The interaction variables are not statistically significant in Models 1, 3, 4, 5, 7, and 8. The only significant interaction variable is in Model 2, in which the presence of the pandemic weakens the impact of the per capita GDP on the MB transaction values. The interaction variable is not significant in Model 6. Considering the speed of change in the number of COVID-19 daily new cases, the impacts of the per capita GDP on the MB transaction values before and during the pandemic are not significantly different.

The interaction variable between the COVID-19 dummy and the real GDP is significant in Model 9. The pandemic weakened the impact of the real GDP on the P2P lending values. However, the coefficient of the interaction variable shows that the influence of the pandemic on the relationship between the real GDP and the P2P lending is marginal, if not negligible. Meanwhile, the interaction variable between the real GDP and the speed of change in the number of COVID-19 daily new cases is not significant in Model 10.

The PSBB dummy variable is statistically significant at $\alpha = 5\%$ in all the models except Model 3 (in which it is significant at $\alpha = 10\%$). The variable has a negative sign in Models 1, 2, 3, 5, 6, 7, 9, and 10. Holding other factors unchanged, the PSBB reduced the PB, MB, and IB transaction values. The PSBB curbed economic activities, decreased the income of most households, and caused households to reduce their online spending. The PSBB also reduced new P2P fintech lending. Because the government allowed fewer economic activities during the PSBB and household consumption weakened, the demand for P2P fintech lending fell.

The PSBB variable has a positive sign in Models 4 and 8, implying that the PSBB increased the use of EM, assuming that other factors remained unchanged. As we discussed in Section 4, the increasing use of EM during the PSBB was probably because consumers switched their main payment channels from credit cards, debit cards, and ATM+ cards to the EM as they reduced their face-to-face transaction activities. The finding that many households switched their payment methods to EM cards is similar to the finding of Tut's study (2020) on the case of Kenya.

5. UTILIZING FINTECH FOR ECONOMIC RECOVERY

The Indonesian Government has included and utilized fintech companies in the national economic recovery program (PEN). The government is using fintech companies to distribute social assistance to people and MSMEs that the COVID-19 pandemic has harmed. Fintech companies are arguably more flexible than conventional financial institutions in providing financial services to MSMEs and households with little or no access to conventional financial services.

The government allocated IDR20 trillion to the pre-employment cards (Kartu Prakerja) in the 2020 budget and the same amount in the 2021 budget. It distributes the cards to workers who lost their job due to the COVID-19 pandemic. Kartu Prakerja holders receive training or courses to increase their entrepreneurial skills. Cardholders must have a virtual account to receive a fund transfer from the government. They can only use the funds to pay the course tuition fee. From its first launch in March 2020 until

February 2021, the number of Kartu Prakerja recipients reached 5.5 million people (*Kompas* 2021b).

Different fintech companies play two different roles in the Kartu Prakerja scheme: as a fund distributor or as a course provider. The government appointed Bank BNI (a state-owned bank) and e-commerce fintech companies (e.g., Gopay, OVO, LinkAja, and DANA) to distribute the funds to cardholders, and it established a partnership with fintech companies that provide courses or training (e.g., Tokopedia, Ruangguru, MauBelajarApa, Bukalapak, Pintaria, Sekolahmu, Pijar Mahir, and dan Sisnaker).

BI Deputy Governor Sugeng stated that 52 fintech companies have launched initiatives to help MSMEs survive the COVID-19 pandemic, including an interest rate reduction, a transfer fee reduction, a merchant discount rate, and training. The recent OJK regulation that allows P2P lending fintech companies to conduct loan restructuring will support these fintech companies' initiatives.

The government can broaden the utilization of fintech companies to support the national economic recovery by introducing other measures, such as direct cash transfers (Bantuan Sosial Tunai, BSTs) for poor households and subsidized loans for MSMEs. In the current BST scheme, the recipient can choose one among three alternatives: (1) receiving the money at home; (2) visiting a community center to collect the money; or (3) visiting a post office to collect the money (*Metrotvnews* 2021). The current BST scheme is susceptible to corruption and embezzlement as the disbursement of the fund passes through several bureaucratic levels. Indonesia's Anti-Corruption Agency (KPK) has pledged its commitment to monitoring the disbursement of the BSTs. That said, fintech payment channels can act as an alternative to bypass the levels of bureaucracy and ensure that the recipient receives the correct amount of money.

The government can also extend loans to MSMEs through the P2P fintech lending channel. It can impose a certain interest rate for the loan (which should be lower than the normal P2P fintech lending rates) and pay the loan transmission fee to the P2P. By utilizing the P2P lending channel for economic recovery, the government can simultaneously help the P2P fintech lending companies to expand their market, particularly to the MSME segment. The COVID-19 pandemic has shown that P2P lending fintech companies can act as a partner rather than a disruptor or competitor to banks and the conventional NBFIs. For example, Bank Mandiri (a state-owned bank) allocates funds from the government to Investree to extend to small and medium-sized businesses that the pandemic has affected (*Jakarta Post* 2020).

6. CONCLUSIONS

This paper found that the COVID-19 pandemic did not accelerate the development of the fintech payment and P2P fintech lending markets in Indonesia. There was no significant direct impact of the pandemic on the transaction values of phone banking, mobile banking, internet banking, and electronic money. The pandemic also did not have a significant direct impact on P2P fintech lending. As for the indirect impact, the pandemic weakened the impact of the per capita GDP on mobile banking transaction values. It also marginally weakened the impact of the real GDP on P2P lending. The pandemic did not have a significant indirect impact on the relationships between per capita GDP and phone banking, internet banking, or electronic money transaction values.

Therefore, this study concluded that the empirical evidence does not support the claim that the COVID-19 pandemic has accelerated Indonesia's fintech market development. That said, Indonesia's fintech market has been relatively resilient to the COVID-19 pandemic.

The PSBB had a negative direct impact on phone banking, mobile banking, and internet banking transaction values as the restrictions on economic activities harmed the income and purchasing power of many households. The PSBB also adversely affected P2P fintech lending because the demand for lending fell in line with the slowing economic activities. Nevertheless, the PSBB increased electronic money transactions because many households reduced their face-to-face shopping activities and their use of credit cards, debit cards, and ATM+ cards. The relatively short PSBB period prevented the fintech market from receiving too many negative impacts from the restrictions on economic activities.

This paper considers that the fintech industry can support Indonesia's economic recovery. The Indonesian authorities have involved and utilized the fintech industry as a component of the national economic program, particularly the pre-employment card (Kartu Prakerja) program. There are many areas in which the government can utilize the fintech industry further, including direct cash transfers to poor households and the extension of subsidized loans to MSMEs.

Lastly, this paper suggests that BI, the OJK, and the government develop and maintain a shared database and mapping of Indonesia's fintech industry. There is still a lack of publicly available data on crowdfunding and digital financial innovation products. It would be useful for the public, or at least fintech industry players, to have access to the database. The database will be useful for policymaking and business planning, and it should receive regular updates as Indonesia's fintech industry rapidly grows.

REFERENCES

Abdillah, Leon A. 2020. “FinTech E-Commerce Payment Application User Experience Analysis during COVID-19 Pandemic.” *Scientific Journal of Informatics* 7 (2). http://journal.unnes.ac.id/nju/index.php/sji.

Asosiasi Fintech Indonesia (AFTECH). 2020. *Fintech Indonesia: Annual Member Survey 2019/2020.* Jakarta: AFTECH. https://fintech.id/dokumen/aftech-annual-member-survey-report-20192020

Al Nawayseh, Mohammad K. 2020. “FinTech in COVID-19 and Beyond: What Factors Are Affecting Customers’ Choice of FinTech Applications?” *Journal of Open Innovation: Technology, Market, and Complexity* 6: 153. https://doi.org/10.3390/joitmc6040153.

Ancri, Clement. 2016. *Fintech Innovation: An Overview*. Presentation. Washington, DC: Board of Governors of the Federal Reserve System. http://pubdocs.worldbank.org/en/767751477065124612/11-Fintech.pdf.

Badan Pusat Statistik. 2020a. *Sensus Penduduk 2020.* Jakarta: Badan Pusat Statistik. https://sensus.bps.go.id/main/index/sp2020.

———. 2020b. *Statistik Telekomunikasi Indonesia 2019* (*Telecommunication Statistics in Indonesia 2019*). Jakarta: Badan Pusat Statistik. https://www.bps.go.id/publication/2020/12/02/be999725b7aeee62d84c6660/statistik-telekomunikasi-indonesia-2019.html.

Batunanggar, Sukarela. 2019. “Fintech Development and Regulatory Frameworks in Indonesia.” ADBI Working Paper 1014. Tokyo: Asian Development Bank Institute. https://www.adb.org/publications/fintech-development-regulatory-frameworks-indonesia.

Benni, Niclas. 2021. *Digital Finance and Inclusion in the Time of COVID-19: Lessons, Experiences and Proposals*. Rome: FAO. https://doi.org/10.4060/cb2109en.

Bisnis Indonesia. “Fintech P2P Lending Indonesia Jadi Perhatian Dunia.” https://finansial.bisnis.com/read/20200824/563/1282566/fintech-p2p-lending-indonesia-jadi-perhatian-dunia.

Davidovich, Sonja, Soheib Nunhuck, Delphine Prady, and Herve Tourpe. 2020. “Beyond the COVID-19 Crisis: A Framework for Sustainable Government-To-Person Mobile Money Transfers.” IMF Working Paper, WP/20/198. Washington, DC: International Monetary Fund. https://www.imf.org/en/Publications/WP/Issues/2020/09/25/Beyond-the-COVID-19-Crisis-A-Framework-for-Sustainable-Government-To-Person-Mobile-Money-49767.

Didenko, Anton N., Dirk A. Zetzsche, Douglas W. Arner, and Ross P. Buckley. 2020. “After Libra, Digital Yuan and COVID-19: Central Bank Digital Currencies and the New World of Money and Payment Systems.” University of Hong Kong Faculty of Law Research Paper No. 2020/053. http://dx.doi.org/10.2139/ssrn.3714386.

Erel, Isil and Jack Liebersohn. 2020. “Does Fintech Substitute for Banks? Evidence from Payacheck Protection Program.” NBER Working Paper, 27659. Cambridge, MA: National Bureau of Economic Research. https://www.nber.org/papers/w27659.

Fintech Singapore. 2020. *Indonesia Fintech Report 2020.* Singapore: Fintech News Network. https://fintechnews.sg/wp-content/uploads/2020/12/Fintech-Indonesia-Report-2020.pdf.

Fu, Jonathan, and Mrinal Mishra. 2020. "Fintech in the Time of COVID-19: Trust and Technological Adoption During Crises." Swiss Finance Institute Research Paper No. 20-38. Zürich: Swiss Finance Institute. http://dx.doi.org/10.2139/ssrn.3588453.

Hill, Julie Andersen. 2021. "COVID-19 and FinTech." *Consumer Finance Law Quarterly Report* (forthcoming). https://ssrn.com/abstract=3777562.

Infobank. 2020. "8 Member AFPI Peroleh Izin Usaha Dari OJK." 26 June 2020. https://infobanknews.com/berita-keuangan-terbaru/8-member-afpi-peroleh-izin-usaha-dari-ojk/.

Jakarta Post, 2020. "Fintech Firms Assist Govt, Banks with COVID-19 Public Services." 23 September 2020. https://www.thejakartapost.com/news/2020/09/23/fintech-firms-assist-govt-banks-with-covid-19-public-services.html.

Japan Times. 2020. "Fintech-Based Financing Thriving in Japan Amid Coronavirus Crisis." 1 April 2020. https://www.japantimes.co.jp/news/2020/04/01/business/financial-markets/fintech-japan-coronavirus/.

Kompas. 2018. "Ini Cara Membedakan Fintech Peer-to-Peer Lending dengan Payday Loan." 9 March 2018. https://ekonomi.kompas.com/read/2018/03/09/205533926/ini-cara-membedakan-fintech-peer-to-peer-lending-dengan-payday-loan?page=all.

———. 2021a. "Jumlah Pengguna Internet Indonesia 2021 Tembus 202 Juta." 23 February 2020. https://tekno.kompas.com/read/2021/02/23/16100057/jumlah-pengguna-internet-indonesia-2021-tembus-202-juta.

———. 2021b. "Ada 5,5 Juta Penerima Kartu Prakerja, dari Mana yang Terbanyak?" 26 February 2021. https://www.kompas.com/tren/read/2021/02/26/155200665/ada-5-5-juta-penerima-kartu-prakerja-dari-mana-yang-terbanyak-?page=all.

Kontan. 2019. "AFPI: Suku Bunga Pinjaman di Fintech Lending Berkisar 16% Sampai 30% Per Tahun." 29 January 2019. https://keuangan.kontan.co.id/news/afpi-suku-bunga-pinjaman-di-fintech-lending-berkisar-16-sampai-30-per-tahun.

———. 2020. "Equity Crowdfunding Salurkan Modal Rp 153,91 Miliar kepada UKM per September 2020." 25 November 2020. https://keuangan.kontan.co.id/news/equity-crowdfunding-salurkan-modal-rp-15391-miliar-kepada-ukm-per-september-2020.

McAuley, Danie. 2015. *What is FinTech?* Wharton FinTech, 22 October 2015.

MEDICI. 2021. "Indonesia FinTech Report 2021." https://gomedici.com/indonesia-fintech-report-2021-by-medici.

Metrotvnews. 2021. "Ini Mekanisme Penyaluran Bantuan Sosial Tunai." 4 January 2021. https://www.metrotvnews.com/play/ba4CV1vW-ini-mekanisme-penyaluran-bantuan-sosial-tunai#:~:text=Ada%203%20metode%20penyaluran%2C%20yakni,diundang%20ke%20kantor%20pos%20terdekat.

Moro-Visconti, Roberto, Salvador Cruz Rambaud, and Joaquín López Pascual. 2020. "Sustainability in FinTechs: An Explanation through Business Model Scalability and Market Valuation." *Sustainability* 12: 10316. https://doi:10.3390/su122410316.

Nuryakin, Chaikal, Lovina Aisha, Natanael Waraney, and Gerald Massie. 2019. "Financial Technology in Indonesia: A Fragmented Instrument for Financial Inclusion?" LPEM FEBUI Working Papers, 201936. Jakarta: LPEM FEB Universitas Indonesia.

Pakistan Today. 2020. "The Pandemic Is e-Commerce's Time to Shine. But Will It Last?" 4 May 2020. https://profit.pakistantoday.com.pk/2020/05/04/the-pandemic-is-e-commerces-time-to-shine-but-will-it-last/.

PéruRetail. 2020. "Conozca las Tendencias del ecommerce en América Latina Tras la Crisis del Covid-19." 7 July 2020. https://www.peru-retail.com/conozca-las-tendencias-del-ecommerce-en-america-latina-tras-la-crisis-del-covid-19/.

PwC Indonesia. 2019. "Indonesia's Fintech Lending: Driving Economic Growth through Financial Inclusion." https://www.pwc.com/id/en/industry-sectors/financial-services/fintech-lending.html.

Reuters. 2020. "Coronavirus Seen as Trigger for Mobile Money Growth in West Africa." 1 April 2000. https://www.reuters.com/article/health-coronavirus-africa/coronavirus-seen-as-trigger-for-mobile-money-growth-in-west-africa-idUSL8N2BN6AF.

Sahay, Ratna, Ulric Eriksson von Allmen, Amina Lahreche, Purva Khera, Sumiko Ogawa, Majid Bazarbash, and Kim Beaton. 2020. "The Promise of Fintech: Financial Inclusion in the Post COVID-19 Era." Departmental Paper Series No. 20/09. Washington, DC: International Monetary Fund, Monetary and Capital Markets Department. https://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2020/06/29/The-Promise-of-Fintech-Financial-Inclusion-in-the-Post-COVID-19-Era-48623.

Tritto, Angela, Yujia He, and Victoria Amanda Junaedi. 2020. "Governing the Gold Rush into Emerging Markets: A Case Study of Indonesia's Regulatory Responses to the Expansion of Chinese-Backed Online P2P Lending." *Financial Innovation* 6 (51). https://jfin-swufe.springeropen.com/articles/10.1186/s40854-020-00202-4.

Tut, Daniel. 2020. "FinTech and the COVID-19 Pandemic: Evidence from Electronic Payment Systems." Munich Personal RePEc Archive Paper No. 102401. https://mpra.ub.uni-muenchen.de/102401/.

UOB, PwC, and Singapore Fintech Association. 2020. "Fintech in ASEAN: Get Up, Reset, Go!" https://www.uobgroup.com/techecosystem/pdf/UOB-Get-up-Reset-Go.pdf.

World Bank. 2020. *Aspiring Indonesia: Expanding the Middle Class*. Washington, DC: World Bank. https://www.worldbank.org/en/country/indonesia/publication/aspiring-indonesia-expanding-the-middle-class.

World Bank and the University of Cambridge. 2020. *The Global Covid-19 FinTech Regulatory Rapid Assessment Study*. Washington, DC: World Bank. https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/2020-global-covid-19-fintech-market-rapid-assessment-study.

APPENDIX 1

Table 1-1: Variables, Data, and Data Sources

Variable	Measurement	Frequency	Data Source
Phone banking transaction value	IDR trillion	Daily (interpolated from monthly)	Bank Indonesia
Mobile banking transaction value	IDR trillion	Daily (interpolated from monthly)	Bank Indonesia
Internet banking transaction value	IDR trillion	Daily (interpolated from monthly)	Bank Indonesia
Electronic money transaction value	IDR trillion	Daily (interpolated from monthly)	Bank Indonesia
P2P lending value	IDR trillion	Daily (interpolated from monthly)	Otoritas Jasa Keuangan
Per capita GDP:	IDR million	Daily:	
– Nominal GDP	IDR trillion	– interpolated from quarterly	CEIC
– Population	Million people	– interpolated from annually	CEIC
Real GDP (constant price 2010)	IDR trillion	Daily (interpolated from quarterly)	CEIC
Bank lending rate	%	Daily (interpolated from monthly)	CEIC
COVID-19 new cases	Unit	Daily	Bloomberg
COVID-19 dummy	0, 1	Daily	Author
PSBB dummy	0, 1, 2	Daily	Author
Interaction variables:			
– Per capita GDP × COVID-19 dummy	IDR million	Daily	Author
– Per capita GDP × COVID-19 new cases	IDR million	Daily	Author
– Real GDP × COVID-19 dummy	IDR trillion	Daily	Author
– Real GDP × COVID-19 new cases	IDR trillion	Daily	Author

Table 1-2: Stationarity Level-Test Results (t-statistics Probability)

	Augmented Dickey–Fuller	Phillips–Perron
Phone banking transaction value (detrended, seasonally adjusted)	0.0000***	0.0000***
Mobile banking transaction value (detrended, seasonally adjusted)	0.0000***	0.0000***
Internet banking transaction value (detrended, seasonally adjusted)	0.0000***	0.0000***
Electronic money transaction value (detrended, seasonally adjusted)	0.0000***	0.0002***
P2P lending value (detrended, seasonally adjusted)	0.0463**	0.0018***
Per capita GDP (detrended, seasonally adjusted)	0.0001***	0.0005***
Real GDP (detrended, seasonally adjusted)	0.0005***	0.0056***
Bank lending rate (detrended)	0.0000***	0.0000***
COVID-19 daily new cases (second-order differenced)	0.0000***	0.0001***

Note: * significant at α = 10%; ** significant at α = 5%; *** significant at α = 1%.

Source: Author's calculation.

Table 1-3. Centered Variance Inflation Factors (VIF) Values

	Model 1	**Model 2**	**Model 3**	**Model 4**
Constant	N/A	N/A	N/A	N/A
Per capita GDP	1.686333	1.666791	1.195805	1.156588
COVID-19 dummy	1.321420	1.123000	1.103424	1.288043
PSBB dummy	1.013552	1.068858	1.033858	1.116986
Per capita GDP × COVID-19 dummy	2.073073	1.254361	1.121593	1.251998
AR(1)	1.895128	1.232380	1.046480	1.234182
Sigma-square	1.571430	1.277129	1.162382	1.210682
	Model 5	**Model 6**	**Model 7**	**Model 8**
Constant	N/A	N/A	N/A	N/A
Per capita GDP	1.120987	1.562117	1.134616	1.004837
d(d(new COVID cases))	2.078139	1.497468	2.547031	3.180102
PSBB dummy	1.014128	1.152120	1.011496	1.245506
Per capita GDP × COVID-19 dummy	2.377271	1.518023	2.570405	3.442086
AR(1)	1.745325	1.324954	1.043802	1.182375
Sigma-square	2.674193	1.354784	1.156065	1.120605
	Model 9	**Model 10**		
Constant	N/A	N/A		
Real GDP (IDR trillion)	1.100538	1.152583		
Lending rate (%, lag 1)	1.900753	2.265502		
COVID-19 dummy	1.296377	–		
d(d(COVID new cases))	–	4.751354		
PSBB	1.153096	1.087298		
Real GDP × COVID-19 dummy	1.680028	–		
Real GDP × d(d(COVID new cases))	–	2.185456		
AR(1)	3.149984	5.194088		
Sigma-square	2.122129	1.341364		

Note: When the VIF values of all the variables in the model are lower than 10, the model does not encounter the multicollinearity problem.

Source: Author's calculation.

APPENDIX 2

Table 2-1: Factors Affecting Fintech Payment Transaction Values in Indonesia (t-Statistics Probability Value in Brackets)

	Model 1	Model 2	Model 3	Model 4
Dependent Variable	**Phone Banking Transaction Value**	**Mobile Banking Transaction Value**	**Internet Banking Transaction Value**	**Electronic Money Transaction Value**
Regressors	(IDR Trillion)	(IDR Trillion)	(IDR Trillion)	(IDR Trillion)
Constant	–0.246104	3.910686	21.69792	0.015761
	(0.7296)	(0.4334)	(0.6481)	(0.9594)
Per capita GDP (IDR million)	–1.246077	115.9791	276.7875	2.636498
	(0.1816)	(0.0000 ***)	(0.0028 ***)	(0.0000***)
COVID-19 dummy	0.022418	–0.093955	7.174596	0.034300
	(0.9795)	(0.9910)	(0.9698)	(0.9264)
PSBB dummy	–0.186740	–12.48756	–27.82298	0.728008
	(0.0000***)	(0.0000***)	(0.0501 *)	(0.0000***)
Per capita GDP × COVID-19 dummy	0.659750	–229.0943	-10.07293	0.817385
	(0.7712)	(0.0000***)	(0.9809)	(0.2517)
AR(1)	0.993903	0.988770	0.990763	0.995593
	(0.0000***)	(0.0000***)	(0.0000***)	(0.0000***)
Sigma-square	0.018410	6.929109	499.7083	0.003524
	(0.0000***)	(0.0000***)	(0.0000***)	(0.0000***)
Number of observations	2,557	2,557	2,557	2,557
R^2	0.978864	0.972659	0.980981	0.990690
Adjusted R^2	0.978815	0.972595	0.980936	0.990669
Prob (F-statistic)	0.000000***	0.000000***	0.000000***	0.000000***
Durbin–Watson statistics	1.684226	1.710990	1.621193	1.613300
	Model 5	**Model 6**	**Model 7**	**Model 8**
Dependent Variable	**Phone Banking Transaction Value**	**Mobile Banking Transaction Value**	**Internet Banking Transaction Value**	**Electronic Money Transaction Value**
Regressors	(IDR Trillion)	(IDR Trillion)	(IDR Trillion)	(IDR Trillion)
Constant	–0.241693	3.736738	22.19858	0.020267
	(0.6755)	(0.5055)	(0.6370)	(0.9456)
Per capita GDP (IDR million)	–0.992640	37.15423	269.6548	2.924754
	(0.1941)	(0.0122 **)	(0.0029***)	(0.0000***)
d(d(new COVID cases))	0.000025	–0.000063	0.000524	0.000004
	(0.0640*)	(0.8359)	(0.9303)	(0.6382)
PSBB dummy	–0.187785	–12.46250	–27.27031	0.729588
	(0.0000***)	(0.0000***)	(0.0491**)	(0.0000***)
Per capita GDP × d(d(new COVID case))	0.000418	–0.000761	–0.014569	–0.000037
	(0.1053)	(0.9363)	(0.9008)	(0.8151)
AR(1)	0.993870	0.989601	0.990781	0.995569
	(0.0000***)	(0.0000***)	(0.0000***)	(0.0000***)
Sigma-square	0.018411	7.005137	500.0082	0.003526
	(0.0000***)	(0.0000***)	(0.0000***)	(0.0000***)
Number of observations	2,555	2,555	2,555	2,555
R2	0.978879	0.972380	0.980944	0.990692
Adjusted R2	0.978829	0.972315	0.980899	0.990670
Prob (F-statistic)	0.000000***	0.000000***	0.000000***	0.000000***
Durbin–Watson statistics	1.682498	1.674580	1.619523	1.609239

Note: * significant at α = 10%; ** significant at α = 5%; *** significant at α = 1%.

Source: Author's calculation.

Table 2-2: Factors Affecting Fintech Peer-to-Peer (P2P) Lending in Indonesia (t-Statistics Probability in Brackets)

	Model 9	Model 10
Dependent variable		
P2P lending (IDR trillion)		
Regressors		
Constant	0.197320 (0.4865)	0.283760 (0.4290)
Real GDP (IDR trillion)	–0.000044 (0.0042***)	–0.000057 (0.0025***)
Lending rate (%, lag 1)	–1.190154 (0.0000***)	–1.227546 (0.0000***)
COVID-19 dummy	0.222375 (0.3300)	–
d(d(COVID new cases))	–	0.000029 (0.3754)
PSBB	–0.424758 (0.0000***)	–0.454015 (0.0000***)
Real GDP × COVID-19 dummy	–0.000012 (0.0085***)	–
Real GDP × d(d(COVID new cases))	–	0.000000 (0.7852)
AR(1)	0.966652 0.0000***)	0.975917 (0.0000***)
Sigma-square	0.038179 (0.0000***)	0.038166 (0.0000***)
Number of observations	1,064	1,064
R^2	0.939871	0.939892
Adjusted R^2	0.939472	0.939493
Prob (F-statistic)	0.000000***	0.000000***
Durbin–Watson statistics	2.126561	2.109044

Note: * significant at α = 10%; ** significant at α = 5%; *** significant at α = 1%.

Source: Author's calculation.