

Exploring the Effects of Financial Technology on Economic Growth: Evidence from Indonesia

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ABSTRACT

Objective: This study aims to examine the impact of fintech developments on economic growth in 34 provinces in Indonesia during the 2019-2023 period. Fintech indicators are measured through total loans disbursed, the number of borrower accounts and the number of lender accounts. This study also considers gross fixed capital formation, population, government size and HDI as human capital as control variables that affect economic growth. **Method:** The study applies pooled multiple linear regression to panel-structured data. To address differences in measurement scales and improve coefficient comparability, the independent variables are standardized using Z-scores prior to estimation. The analysis incorporates classical diagnostic tests including normality, multicollinearity, heteroskedasticity, and autocorrelation as well as panel-data diagnostics to assess potential cross-sectional dependence and ensure the robustness of the estimates. **Results:** The findings show that the amount of loan disbursement and the number of borrower accounts affect economic growth, however, this study found that the number of lender accounts did not affect economic growth. **Novelty:** This shows that the use of fintech in Indonesia is still limited to loan distribution and its potential has not been utilized optimally. This study conducted a sensitivity analysis with the results proving that the model used is robust.

INTRODUCTION

In recent decades, technology has become a major driver of change in various sectors, including the financial sector. One of the manifestations of technological development in finance is the presence of financial technology or better known as financial technology. Financial technology has significantly changed the landscape of the financial industry by providing services that are faster, cheaper, and more accessible to various levels of society (Aris et al., 2024; Kapoor et al., 2024; Meena, 2023; Rohit & Sheikh, 2025; Shalini & Swarnalatha, 2025). The integration of financial technology with digital trade and e-commerce has also emerged as a transformative force, offering new metrics and economic products that enhance financial accessibility and inclusion (Fayyaz, 2019; Hasan et al., 2024; Schularick & Thomas M. Steger, 2007). Moreover, fintech's ability to lower transaction costs and promote financial efficiency plays a critical role in economic growth by enabling greater access to credit and improving resource allocation (Adetokunbo et al., 2025; Hmoud et al., 2025; Philippon, 2019; Zhao et al., 2024). In Indonesia, which has a population of more than 270 million with a wide geographical distribution, financial technology is a relevant solution to overcome traditional financial challenges, such as limited access to services (Leong et al., 2017), formal banking, and economic disparities between regions (Akhir & Dhayan, 2025; Christiaan et al., 2025; Khaerunnisa, 2018; Kohirudin et al., 2025; Serang et al., 2025). With innovations such as digital payments, peer-to-peer lending, and online investment platforms, financial technology not only improves financial inclusion but also promotes more equitable economic growth across

the country (Daud & Ahmad, 2023; Mashamba & Gani, 2023; Salampasis & Mention, 2017). Additionally, financial innovation in Indonesia aligns with global trends where fintech has demonstrated both its benefits, such as efficiency and inclusiveness, and its challenges, such as managing systemic risks and protecting consumer data (Beck et al., 2016).

Financial technology serves as a strategic instrument for promoting financial inclusion while enhancing transparency, efficiency, and trust within Indonesia's financial system. By improving transaction efficiency and reducing the risk of fraud, fintech contributes to greater public confidence in financial services (David Iyanuoluwa Ajiga et al., 2025; Harsono & Suprapti, 2024; Saliger et al., 2020). The Indonesian government has shown a strong commitment to fostering an inclusive and sustainable fintech ecosystem (Rusdianasari, 2018), as evidenced by regulatory frameworks from the Financial Services Authority (OJK) and Bank Indonesia (BI) that emphasize consumer protection, data security, and financial stability. Moreover, fintech facilitates access to financial services for populations previously excluded from the formal banking sector. World Bank data (2021) indicate that approximately 51% of Indonesia's population remains unbanked, underscoring fintech's pivotal role in expanding financial inclusion (Daud & Ahmad, 2023; Lee et al., 2023).

The development of financial technology is also considered as one of the important pillars in achieving sustainable economic growth. Sustainable economic growth does not only emphasize economic growth alone, but also pays attention to the balance between economic growth, social inclusion, and environmental sustainability. Financial technology potential to bridge these aspects has been increasingly acknowledged. For instance, studies have shown that in large emerging economies, fintech has facilitated financial inclusion, particularly for underserved groups, contributing to economic growth and sustainability goals (Song & Appiah-Otoo, 2022; Sreenu & Verma, 2024). Financial technology has the potential to play a strategic role in these three aspects. First, in terms of economic growth, financial technology can support the micro, small and medium enterprise (MSME) sector, which is the backbone of the Indonesian economy. The Coordinator of the Indonesian Ministry of Economic Affairs noted that the Micro, Small, and Medium Enterprises (MSMEs) sector accounts for 61% of the Gross Domestic Product (GDP), which is equivalent to a value of IDR 9,580 trillion; furthermore, the contribution of Small and Medium Enterprises (SMEs) to employment is reported to cover 97% of the overall labor force[AP2.1] (Kementerian Pariwisata dan Ekonomi Kreatif Republik Indonesia, 2014). With easier access to financing through financial technology platforms, MSMEs can thrive and increase their contribution to the national economy (Damodaran et al., 2019; Pham et al., 2024).

Second, in terms of social inclusion, financial technology enables more equitable access to finance for people living in remote areas or those who are underserved by conventional banks. This financial inclusion is important in creating social balance and reducing economic disparities between regions (Ding & Kang, 2023; Garai, 2017). With better access to financial services, people can participate more actively in economic activities, improve their welfare, and reduce the risk of being trapped in a cycle of poverty. In addition, financial technology also provides opportunities for vulnerable

groups, such as women and youth, to gain access to capital and other financial services that can boost their economic participation (Fowowe et al., 2025; Jie, 2024; Koppisetty., 2016).

Third, from an environmental sustainability perspective, financial technology has great potential to support efforts to achieve green growth (Iftikhar et al., 2024; Macchiavello & Siri, 2022; Nassiry, 2018). One form of financial technology's contribution to environmental sustainability is by facilitating green investments, such as financing renewable energy projects or investing in environmentally friendly businesses. In addition, the digitization of financial services through financial technology also reduces the need for paper-based transactions and activities that generate a large carbon footprint, thus contributing to the reduction of carbon emissions (Nassiry, 2018).

However, the role of financial technology in supporting sustainable economic growth in Indonesia is not free from challenges. First, digital financial literacy among Indonesians is still relatively low (Aryanto & Chrismastuti, 2011; Narayan, 2019). Many people do not fully understand how to utilize financial technology properly and safely, thus increasing the risk of fraud or misuse of personal data. Another challenge is related to regulation. Although the government has issued various policies to support the development of financial technology, challenges related to supervision and law enforcement in regulating the dynamic and ever-evolving financial technology ecosystem still remain. In some remote areas, limited internet access is a major obstacle in the development of financial technology. Without adequate technology infrastructure, the potential of financial technology to expand financial inclusion and support sustainable economic growth in Indonesia cannot be fully utilized.

This research focuses on exploring the role of financial technology in enhancing sustainable economic growth in Indonesia. Through a comprehensive approach, this research will analyze how financial technology can contribute to aspects of economic growth, social inclusion, and environmental sustainability. In addition, it will also identify challenges and recommend policies that can strengthen the role of financial technology in achieving sustainable economic growth in Indonesia. Thus, this research is expected to provide deeper insights into the potential and challenges of financial technology in promoting sustainable economic growth, and contribute to the development of policies that can maximize the benefits of financial technology for all levels of society in Indonesia.

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Solow - Swan Growth Model

The relationship between technological development, investment and economic growth of a country has evolved over time. The relationship between investment, technological development and economic growth is illustrated in the Harod-Domar Theory. The Harod-Domar Theory predicts that the rate of economic growth is directly proportional to the level of investment in the economy. However, the theory has several weaknesses, one of which is the assumption that capital and labor are used in fixed

proportions (more capital cannot be replaced by labor). Several theories have tried to correct this assumption, one of which is the New Growth Theory developed by Solow. The New Growth Theory developed by Solow states that economic growth is not solely influenced by the factors of human capital, labor, and investment realization. Solow's growth model also focuses on the use of technology including the use of digital technology in finance and information.

The Solow economic growth model adapts the Harrod-Domar growth model by relaxing the unrealistic assumption of a fixed capital-labor and capital-output ratio. The Solow economic growth model is designed to show the interaction between capital stock growth, labor force growth, and technological progress in the economy, and its effect on the total production of goods and services in a country (Mankiw, 2015, p. 212). The Solow Growth Model assumes that there is depreciation in the rate of return on capital, in contrast to Harrod-Domar who assumes that the rate of return on capital is constant (no depreciation in the rate of return on capital). The Solow growth model assumes countries will reach the same level of income if they have the same savings rate, capital depreciation rate and labor growth rate. However, even if some countries have the same savings rate, depreciation rate, and labor growth rate, there are still other factors that cause differences in the income level of a country. These factors will affect the productivity of a country's capital or labor, popularly known as the "*solow residual*". Equation 2.1 illustrates the relationship between these variables.

$$Y_{i,t} = A_{i,t}F(K_{i,t}, L_{i,t}) \quad (2.1)$$

Where:

Y = *Economic Growth*

A = *Solow Residual*

K = *Capital*

L = *Labor Force*

In the Solow growth model, the "*Solow residuals*" can be interpreted as factors that affect economic growth other than capital and labor. These factors include technological development, institutional efficiency and the depth of the financial sector. On the technological aspect, technological development can increase capital productivity or labor productivity. On the labor productivity side, technological development causes a country's economy to "seem" to have more labor so that it can encourage economic growth.

On capital productivity, technological development can increase the penetration of financial access and increase the savings rate. In the Solow growth model, the savings rate plays an important role in increasing economic growth. If more savings are collected by the financial system, more funds can be channeled to the community to finance

productive activities. In this aspect, financial technology plays an important role in collecting and channeling funds to and from the community.

If equation 2.1 above is regressed on labor, we get an equation that relates the output/labor and capital/labor ratios depicted in the following equation:

$$\frac{Y}{L} = f\left(\frac{K_t}{L_t}, A_t\right) \quad (2.2)$$

The Solow production function equation above links factors of production to economic output. An efficient financial sector can mobilize capital, strengthen human capital, and increase labour productivity, which in turn can contribute to economic growth.

New growth theory assumes that firm growth depends on knowledge. Such knowledge comes from two sources. First, knowledge generated within the firm as a result of research and development (R&D). Second, knowledge that spreads to the broader economy and can be utilized by other firms (Spratt, 2009, p. 48). In the new growth theory, good financial development can support the research and development process.

A study conducted by Wibowo (2018) explains that technological factors have a favorable influence on GDP, suggesting that the use of financial technology can increase GDP growth in ASEAN countries. However, strengthening this utilization is crucial, ensuring that growth includes increased usage and expanded engagement of businesses using financial technology.

RESEARCH METHOD

This study aims to see the impact of fintech on economic growth in 34 provinces in Indonesia during the period 2019-2020. In the Solow growth model, economic growth is influenced by the amount of capital, the amount of labor and technology. The interaction between these variables is described through the following model:

$$\frac{Y}{L} = f\left(\frac{K_t}{L_t}, A_t\right) \quad (3.1)$$

$$L\left(\frac{Y_{i,t}}{L_{i,t}}\right) = \alpha_1 + \beta_1 L\left(\frac{K_{i,t}}{L_{i,t}}\right) + \beta_2 L(Fintech)_{i,t} + \beta_3 LZ_{i,t} + \varepsilon_{i,t} \quad (3.2)$$

To analyze the impact of *fintech* on economic growth, the following model can be used:

$$PDB_{i,t} = \beta_0 + \beta_1 PDB_{i,t-1} + \beta_2 cap_labor_{i,t} + \beta_3 Fintech_{i,t} + \beta_4 Control_{i,t} + \varepsilon_{i,t} \quad (3.3)$$

The model was adopted from research conducted by Bu et al. (2023) which examines the non-linear impact of *fintech* on economic growth in China. In this study Bu et al. (2023) used a set of control variables such as education level, government size, trade openness, urbanization, industrial structure.

By adopting the model and adjusting to the characteristics of provinces in Indonesia, this study uses a set of control variables such as population, government size and education level, the model 3.1 can be written as follows:

$$\text{LnPDB}_{i,t} = \beta_0 + \beta_1 \text{LnPDB}_{i,t-1} + \beta_2 \text{cap_labor}_{i,t} + \beta_3 \text{LnLending_akm}_{i,t} + \beta_4 \text{borrower_acc}_{i,t} + \beta_5 \text{lender_acc}_{i,t} + \beta_6 \text{Gsize}_{i,t} + \beta_7 \text{Edu}_{i,t} + \varepsilon_{i,t} \quad (3.4)$$

Where:

$\text{PDB}_{i,t}$ = Gross Regional Domestic Product at constant price

$\text{cap_labor}_{i,t} = \frac{\text{Gross Fix Capital Formation}}{\text{Labor Force}}$

Lending.Akm = Loan Accumulation

Lender.Acc = Lender Account

Borrower.Acc = Borrower Account

$\text{Gsize} = \frac{\text{Government Spending}}{\text{GRDP}}$

HDI = Human Development Index

In the model, there are allegations of endogeneity such as when there is high economic growth, the demand for fintech loans will also increase. These conditions imply that there is GRDP will also affect the amount of accumulated *fintech* loans, *lender* accounts and *borrower* accounts. To ensure the reliability of the model, this research applied syst-GMM method as adopted in Cevik (2024).

RESULTS AND DISCUSSION

Results

Table 1 describes the eight variables used in this study, namely log total gross national income (LnPDB), capital to labor ratio (Cap_labor), log accumulated loan value (Ln.Akm.Loan), number of borrowers (Borrower.Acc), number of lenders (Lender.Acc), log population (Ln.Population), government size (Govt.Size), and Human Development Index (HDI).

Table 1. Statistic Description

	GDP	Cap_la bor	Accum.Loan	Borrowe r.Acc	Lender. Acc	Populati on	Govt. Size	HDI
Observation	170	170	170	170	170	170	170	170
Mean	$3.67e^8$	31.55	10731.79	2090783	25426.29	7969671	10.61	72.545
Maximum	$2.84e^9$	203.69	196633.6	$3.82e^7$	300906	$4.99e^7$	28.839	83.55
Minimum	$2.840e^7$	10.68	36.68	10993	594	695600	2.338	60.84
Std Dev	$5.30e^8$	27.91	29069.66	5809131	54755.06	$1.13e^7$	5.848	3.888

Source: Central Bureau of Statistics - Author's calculation

Based on Table 1, the average total fintech loan is 10,731 trillion with high variation (standard deviation 29,069 trillion), indicating disparities in distribution across regions. In addition, the lower average loan per capita (31.55) with a smaller standard deviation indicates that despite the potential, loan distribution is still uneven.

Furthermore, the average population value stands at 7.97 million, demonstrating the scale of the challenges faced in providing inclusive financial services. The size of government (10.61) and the average HDI value (72.545) also show the potential and challenges in sustainable economic development. With the maximum HDI reaching 83.55 and the minimum 60.84, there is significant variation in people's quality of life. This data suggests that financial technology has a crucial role to play in addressing these disparities by improving access to loans and other financial services, which in turn can support more inclusive and sustainable economic growth in Indonesia.

Table 2. Estimation Results of E-commerce on GDP growth in Indonesia for the period 2019 – 2023

Variables	Model 1 (Accum.Loan)
LnPDRB _{t-1}	0.0596*** (0.1514)
Cap/labor	0.0025*** (0.00078)
LnAkmLoan	0.0534*** (0.0080)
Borrower Account	1.82e ⁻⁹ * (1.05e ⁻⁹)
Lender Account	2.33e ⁻⁸ (1.78e ⁻⁷)
Total population	3.72e ⁻⁸ (1.14e ⁻⁸)
gsize	-0.028*** (0.0306)
HDI	0.9101 (0.8453)
Const	15.842 (00.533)
Observations	136
Number of Region	34
Instrument	8
AR(1)	0.136
AR(2)	0.135
Sargan Test	0.221
Hansen Test	0.209

Standard errors in parentheses, ***p<0.01, **p<0.05, *p<0.

Source: Central Bureau of Statistics - Author's calculation

Based on table 2, it can be seen that the lag of GRDP has a coefficient of 0.0596 which is significant at the 1% level. It shows that the analysis of year t is still influenced by GRDP in the previous period, so the model in this study has a dynamic relationship. The positive coefficient means that a 1% increase in GRDP in the previous period will increase the

current GRDP by 0.0596%. Cap/labor variable has a positive influence with a coefficient value of 0.0025 which is significant at the 1% level. The coefficient can be interpreted that if there is an increase in the ratio of capital to labor by 1%, it will increase GRDP by 0.25%. The loan accumulation variable has a positive influence with a coefficient value of 0.0534 which is significant at the 1% level. This means that if there is an increase in the accumulation of loans to the community by 1%, it will be able to increase GRDP by 0.0534%. The number of lender accounts has no effect on GRDP, however, the number of borrower accounts has a negative and significant effect at the 10% level.

This means that each additional unit of borrower accounts is expected to increase GRDP per capita by $\{1.82e\}^{-7}\%$. The government size variable (Gsize) is proxied by the ratio of local government expenditure to GRDP. This variable measures the amount of government participation in the economy. The government size variable has a negative effect with a coefficient value of -0.028 and is significant at the 10% level. This indicates that an increase in local government participation in the economy by 1 percent can reduce GRDP by 0.028%. The variables of population and education level have no significant influence on GRDP. The positive and significant constant value indicates that when all independent variables are zero, the value of GRDP per capita remains positive at 13.04.

Discussion

From the model estimation results, it can be seen that increasing the use of financial technology (loan accumulation) can increase the GRDP of a region. The loan accumulation variable shows a positive and significant influence on GRDP, with a coefficient value of 0.0534 at the 1% significance level. This result implies that a 1% increase in the total value of loans disbursed through fintech platforms contributes to a 0.0534% rise in regional economic output.

In terms of loan disbursement, based on the results of the analysis, it is known that the amount of loan disbursement through fintech will affect the GRDP of a region. This finding aligns with the Solow growth framework, where increased capital availability stimulates investment and production, ultimately enhancing economic performance. Fintech platforms, by facilitating faster and more inclusive loan distribution, play a complementary role to the formal banking sector in mobilizing capital for productive activities.

Loan disbursements, whether used for capital or for consumption, will affect the economy. The distribution of capital for consumption will cause the region's consumption to increase and will ultimately increase aggregate demand. In macroeconomic theory, increasing aggregate demand will provide incentives for the business sector to increase production. This will lead to an increase in the GRDP of a region.

In addition to being used for consumptive financing (financing for consumption), fintech can also be used as an instrument for productive financing sources (capital financing). The characteristics of fintech that have more flexible regulations compared to banks make fintech an alternative source of financing for the business sector that is classified as unbanked (Nurhayati et al., 2022; Sabda Maulana et al., 2022). The simpler level of regulation compared to banks can be utilized for micro and small businesses or businesses in the agricultural sector that generally have low credit scores. The flexibility of fintech regulations compared to traditional banks makes it viable financing alternative for unbanked sectors, including micro, small businesses, and agricultural industries

(Chen, 2024; Maryam & Ahamad, 2021). Liu & Chu (2024), which highlights fintech's significant contribution to economic growth, particularly in regions with limited access to financial infrastructure. In addition, fintech utilizes a digital platform that allows fintech to be accessed by people and businesses located in areas that still lack financial infrastructure development. However, the utilization of fintech in Indonesia is still not optimal.

The utilization of fintech in Indonesia is still limited to a source of financing for the community and [L4.1] haven't utilized as a capital formation instrument. This can be seen from the effect of the number of lender accounts on GRDP in the results of data analysis. Based on the estimation results in Table 2, the number of lender accounts shows an insignificant coefficient, while the number of borrower accounts has a negative and significant coefficient at the 10% level. These findings indicate that although fintech lending activities are expanding, their contribution to regional economic growth remains limited. The insignificant effect of lender accounts suggests that the role of fintech as an investment or capital formation instrument has not yet materialized effectively. Meanwhile, the negative effect of borrower accounts implies that a higher number of borrowing activities may not always correspond to productive credit use, as some of these loans may be directed toward short-term consumption rather than long-term investment (Cevik, 2025; Huang et al., 2025; Song & Appiah-Otoo, 2022).

The results also indicate that fintech in Indonesia has primarily been utilized as a source of financing rather than as an investment or capital formation instrument. This finding reflects the structural characteristics of Indonesia's fintech ecosystem, where digital lending platforms dominate, while investment-based fintech instruments such as crowdfunding and peer-to-business lending remain underdeveloped. From a theoretical standpoint, this condition aligns with the early stage of fintech diffusion in emerging economies, where financial technology tends to address short-term liquidity gaps rather than mobilize long-term capital accumulation (Darman, 2019; Renaldo et al., 2024; Sabilla, 2023; Tambunan, 2021; Utami & Ekaputra, 2021).

The limited participation of lenders also highlights a potential market asymmetry, suggesting that public trust and digital financial literacy remain key barriers to broader fintech investment adoption. Based on 2023 fintech statistics there are 1,205,745 lender accounts, this data is much smaller than the borrower accounts which have 120,259,912 accounts. This data implies that the number of borrowers is far more than the number of lenders, or in this case the proportion of debtors is far more than creditors. The data implies that the use of fintech so far has only been used as a source of financing and not as a fundraiser or public investment driven.

Consequently, the absence of significant effects from lender accounts on regional GRDP underscores the need to strengthen the role of fintech as a facilitator of productive investment rather than solely as a consumption-driven credit provider. Policymakers should therefore encourage regulatory frameworks and incentive mechanisms that promote investment-oriented fintech models, such as equity crowdfunding or digital savings platforms, to enhance the sector's contribution to sustainable economic growth.

In summary, the empirical evidence highlights the dual nature of fintech's role in Indonesia's regional economies. While fintech lending has positively contributed to economic growth through increased credit accessibility and capital circulation, its overall impact remains constrained by structural imbalances between borrowers and lenders. The predominance of consumption-based financing, coupled with limited investment-

oriented activity, indicates that fintech's contribution to sustainable and inclusive growth has yet to be fully realized. These findings provide the foundation for the subsequent conclusion, which outlines key implications for policy development and future research directions to strengthen the role of fintech in promoting long-term economic growth.

CONCLUSION

Fundamental Finding: This study aims to analyze the impact of financial technology (fintech) on economic growth in 34 provinces in Indonesia. This study uses GRDP data as an indicator of economic growth, the number of fintech loan disbursements, the number of borrower accounts and the number of lender accounts as indicators of financial technology. **Implication:** The results of data analysis show that the indicator of the number of fintech loan disbursements and the number of borrower accounts has an influence on economic growth in 34 provinces in Indonesia. The number of fintech loan disbursements and the number of borrower accounts is proven to significantly increase economic growth. However, the number of lender accounts has no effect on economic growth. This shows that financial technology has not been optimally utilized to increase economic growth. The analysis is also supported by data showing that borrower accounts have a much larger number than lender accounts, indicating that financial technology has only been utilized as a source of financing. The study also found that capital per labor ratio, local government size and economic growth in the previous period have a positive influence on economic growth. **Limitation:** This research provides insight into the role of financial technology in improving the economic growth of a region. However, there are still limitations in this study. The lack of data representing various indicators means that the study of fintech cannot be conducted comprehensively, especially on the aspects of service penetration, service accessibility and quality of service use. In addition, there is a spatial influence on provincial level data during the observation period. **Future Research:** Although this study is able to analyze the impact of financial technology on economic growth, there are still limitations to this study. This study has not been able to capture spatial effects. During the observation, there was a phenomenon where the lender who applied for a loan did not reside in accordance with the domicile used when registering on the fintech service. This causes the individual to be recorded as making a loan in one province and using the loan funds in another province. As a result, the effect of loan disbursement on economic growth may be overestimated.

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