# Digital Financial Transformation in The Financial Inclusion Program and Its Impact on Income Inequality: The Case of Middle-Income Countries

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**Abstract.** The rise of the financial industry is essential for economic expansion, which includes reducing income disparity. The public will engage in more transactions, investments, savings, and credit if the financial industry is strong. The rise will then boost economic expansion and lessen wealth disparity. In 15 middle-income countries between the years of 2012 and 2019, this study sought to quantify the impact of digital finance, financial inclusion, and financial development on income disparity. The panel data regression with fixed effect model was the analytical method utilized. The findings revealed that although financial development index has a negative and substantial impact on income inequality, the number of fintech startups and commercial bank branches per 100,000 persons had a positive and significant impact on income inequality.

**Keywords:** Income Inequality, Digital Finance, Financial Inclusion, Panel Data, Financial Development Index.

## 1 Introduction

Differences in the endowment of natural resources and the demographic circumstances observed in each place can be the first causes of inequality [1]. Given that the allocation of economic resources will have a significant impact on income disparity, it is crucial to address this issue, particularly in emerging nations [2]. More focus is needed on why the government hasn't been able to considerably reduce poverty and income inequality, and in particular, what could be causing the poor economic growth that has an effect on poverty levels and income inequality [3].

Financial progress promotes economic expansion, which narrows the disparity in household incomes. Increased general accessibility to and utilization of banking services may result from the growth of the financial industry, particularly the banking sector. People can enhance their income through loans by financial institutions with greater access to financial products and services, especially when utilized for constructive activities [4]. The creation of real capital will be encouraged by increased finance for the productive/real sector, and this will eventually support economic growth [5]. Financial services may aid in the promotion of development, claims [6] by encouraging


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investments in people's health, education, and businesses, they assist individuals in escaping poverty. According to the findings of [7], there is a connection between improving the banking sector and equal benefit distribution that is moderated by incentives to boost economic activity that is productive. While research by [8], which mostly focused on financial depth, showed that development in finance is effective in lowering poverty and inequality.

Revolution 4.0 and society 5.0 are examples of how technology is advancing and continuing to change. Digitalization and technology advancements are transforming conventional economic activity. Technology breakthroughs may be used by the financial industry to speed up financial development.

According to study findings by [9], the economy as a whole (GDP) has benefited greatly from the economic effects of internet usage over the last few decades. By bringing people together, fostering a sense of community, and facilitating access to resources and services, internet access has also influenced societal change. [10] Also mention the possibility that conventional financial institutions may employ tech-based approaches to provide a range of financial services to the underserved, ultimately resulting in financial inclusion. As a component of the priority development plans, the growth of digital transformation in the financial industry is a key way to speed up financial inclusion. Having the ability to utilize financial services also enables the poor to save money and spend it in worthwhile endeavors like entrepreneurship and education that help individuals escape the cycle of poverty [11].

This study aimed to estimate the effect of digital finance, financial inclusion, and financial development on income inequality in 15 middle-income countries for the 2012-2019 period. The research enriched previous literature and research in the field of financial sector development, particularly digital finance, financial inclusion, and income inequality in middle-income countries by utilizing the number of fintech company as digital finance variable, the use of this data is novelty of this research.

## 2 Method

This study uses secondary data and panel data analysis methods with fixed effect model on observation of 15 developing countries in the middle-income category (lower and upper) in 2012-2019. The research aims to analyze the impact of digital finance (number of fintech companies), financial inclusion (number of ATMs per 100,000 adults, number of commercial bank branches per 100,000 adults, number of deposit accounts per 1,000 adults), and financial development (financial development index) on income inequality (Gini index). The data retrieved from the World Bank, SWIID (Standardized World Income Inequality), International Monetary Fund (IMF) and Tracxn. The following is the econometric models:

$$GINI_{it} = \beta_0 + \beta_1 FIN_{it} + \beta_2 ATM_{it} + \beta_3 BNK_{it} + \beta_4 DEP_{it} + \beta_5 KEU_{it} + \varepsilon_{it} \quad (1)$$

Where GINI indicates inequality measured by Gini index, FIN is the number of fintech company, ATM is the number of ATM machines per 100,000 adults, BNK is the number of commercial bank branches per 100,000 adults, DEP is the number of deposit accounts per 1,000 adults, and KEU is the financial development index, $i$ represents the countries in the sample, $t$ represents the period, $\beta_0$ is the constant, $\beta_1 \ldots \beta_5$ are the estimated coefficient for each variable, and ε refers to error term.

# 3 Result and Discussion

## 3.1 Results

Panel data Regression Estimation shown in Table 1. We may infer from the Chow and Hausman test's Table 2 and Table 3 that the probability value is 0.05. It suggested that the fixed-effects model is the proper one. The outcome (Table 4) demonstrates that the Gini index (GINI) is positively impacted by the number of financial technology firms (FIN) and the proportion of commercial banking establishments per 1,000 individuals (BNK). The Gini index (GINI), meantime, is negatively impacted by the financial development index (KEU).

Table 5 shows that the constant values between countries have significant differences, the countries with the highest constant values are Brazil, Colombia and Panama, while the countries with the lowest constants are Ukraine, Georgia and Bulgaria. This indicates that Brazil has the greatest disparity in income, while Ukraine has the lowest income inequality with regard to the factor of the number of fintech firms, the number of bank ATMs, the amount of deposit accounts, the number of commercial bank branches, and the financial development index on income disparity in MICs in 2012-2019.

**Table 1.** Panel Data Regression Estimation

| Variable | Regression Coefficient | | |
|---|---|---|---|
| | PLS | FEM | REM |
| C | 45,4654 | 44,5487 | 44,1228 |
| FIN | 0,0015 | 0,0007 | 0,0007 |
| ATM | -0,0809 | -0,0077 | -0,0150 |
| BNK | 0,0248 | 0,0778 | 0,0286 |
| DEP | -0,0013 | 0,0000 | 0,0000 |
| KEU | 7,4828 | -9.7198 | -4,9772 |
| $R^2$ | 0,4816 | 0,9894 | 0,0565 |
| *Adjusted* $R^2$ | 0,4589 | 0,9874 | 0,0151 |
| Statistik *F* | 21,1895 | 492,9247 | 1,3657 |
| Prob. Statistik *F* | 0,0000 | 0,0000 | 0,2424 |

**Table 2.** Chow Test

| Effects Test | Statistic | d.f. | Prob. |
|---|---|---|---|
| Cross-section F | 520,7336 | (14, 100) | 0,0000 |

**Table 3.** Hausman Test

| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob. |
|---|---|---|---|
| Cross-section random | 12,8337 | 5 | 0,0250 |

**Table 4.** Fixed Effects Model Estimation

$$\underset{}{\widehat{GINI}_{it}} = \underset{}{44{,}5487} + \underset{(0{,}0458)}{0{,}0007\ FIN_{it}} - \underset{(0{,}3352).}{0{,}0077\ ATM_{it}} + \underset{(0{,}0610)^{***}}{0{,}0778\ BNK_{it}} + \underset{(0{,}7358)}{0{,}0000\ DEP_{it}} - \underset{(0{,}0676)^{***}}{9{,}7198 KEU_{it}}$$

$R^2 = 0{,}989435$; $DW = 1{,}076225$; $F = 492{,}9247$; Prob. $F = 0{,}0000$

Description: *Significant at α = 0,01; **Significant at α = 0,05; *** Significant at α = 0,10; The number in brackets is the probability of the t statistic

**Table 5.** Constant and Effects

| No | Country | Effect | Constant |
|---|---|---|---|
| 1 | Argentina | -0.770973 | 43,777807 |
| 2 | Brazil | 13.46932 | 58,018100 |
| 3 | Bulgaria | -5.924129 | 38,624651 |
| 4 | China | 2.121700 | 46,670480 |
| 5 | Ecuador | 1.984578 | 46,533358 |
| 6 | Georgia | -6.646866 | 37,901914 |
| 7 | Indonesia | -3.413760 | 41,135020 |
| 8 | Colombia | 9.432906 | 53,981686 |
| 9 | Malaysia | 1.124460 | 45,673240 |
| 10 | Panama | 8.583948 | 53,132728 |
| 11 | Peruvian | 2.177608 | 46,726388 |
| 12 | Romania | -5.385704 | 39,163076 |
| 13 | Thailand | -1.078540 | 43,470240 |
| 14 | Turkey | 0.901261 | 45,450041 |
| 15 | Ukraine | -16.57581 | 27,972970 |

Source: Data processed

### 3.2 Discussion

Digital financial development proxied by the number of fintech companies positively impacts economic inequality. This shows that the number of fintech companies increases the level of income inequality in the selected MICs. The existence of fintech cannot yet be a solution to overcome inequality in middle-income countries because several countries are still lacking in technological infrastructure development. Based on the 2019 technological readiness index data by UNCTAD, out of 15 middle-income countries there are seven countries that have an index value of <0.5 which means that they are less prepared to fully utilize fintech in their financial sector. Research findings by [12] show that the development of fintech 3.0 has a positive short-term effect on income inequality in Indonesia. These findings indicate that the development of fintech 3.0 which began in 2000 increased income inequality in Indonesia. Research by [13] found that there is no direct path from fintech to income inequality, because the two are not statistically related to each other.

ATM density per 100,000 adults as an indicator of financial inclusion has no effect on income inequality. This is likely because ATM facilities are used more for consumptive activities than investment or working capital. In addition, the banking structure in several Asian countries has not been sufficiently developed in terms of access to and utilization of financial services that can effectively reduce poverty. This research is supported by the findings of [14] found that the financial inclusion indicator with the number of ATMs has no effect on income inequality. Research conducted by [15] state that the number of ATMs as an indicator of financial access reduces income inequality as measured by the Gini coefficient in the sample. Widespread ATM networks reduce the distance to financial services and increasing access to economic agents.

Commercial bank branches density per 100,000 adults as an indicator of financial inclusion positively impact income inequality. The distribution of bank branches in developing countries is largely unequal and use of access to banking/financial services is still dominated by the upper middle class or those with a fixed income. The results are in line with the findings of [16], where the number of bank branches has a positive effect on income inequality in 18 Asian countries from 1997-2017. [17] found different results, in which the Indian government's increasingly intensive distribution of bank branches during the 1977-1990 period increased the poor's access to the formal financial sector, thereby reducing income inequality.

The number of deposit accounts per 1,000 adults has no effect on income inequality. IMF data shows that in the 2011-2019, there were 3 middle-income countries, namely Indonesia, China and Turkey, with deposit account growth on average approaching 100%. However, the overall number is still relatively small, so it does not have a significant impact on income inequality. In contrast to the research results of [18], a case study in Bangladesh shows that deposits per adult have a negative effect on poverty. The results of the study stated that growth in savings deposits can help alleviate poverty. Bank deposit accounts can serve to motivate saving and support better financial management even among the most disadvantaged (poor).

The financial development index has a negative effect on income inequality. Financial development is one of the financial sector instruments in overcoming economic problems, including income inequality. The index developed by the IMF consist of several indicators, depth, efficiency and access in the financial sector. A study by [19] found that income distribution was negatively affected by financial developments in the early stages of banking sector development. The results of this study are in line research by [20] found that there is a negative linear relationship between financial development and income inequality in the long term.

## 4 Conclusion

The financial sector has an important role in overcoming income inequality. By improving financial services in all areas, both urban and rural areas, people's financial activities can be increased. It can also boost community productivity and reduce income inequality. The government of MICs should provide better financial infrastructure to

assist the development of financial sector which proven by this study that financial development significantly lower income inequality. The research results are inversely proportional to the theory which states that fintech can reduce income inequality. This is due to various factors, one of which is the readiness of middle-income countries to adopt the technology. The government and private sectors collaboration is crucial in developing the technological aspect of financial sectors, incentives and tax exemption needed to be set in place to encourage the engagement from businesses. Some studies have empirically proven that a developed fintech has negative effects to income inequality. The suggestions for further research are as follows, similar research by using other variables that are more complex in explaining indicators in the financial sector that can affect income inequality can be carried out by using a more updated data. In addition, the object of research and the span of research time can be expanded so that the results will be better structured in explaining the hypothesis and the final results of the study. Policymakers may utilize the study's findings to establish and carry out initiatives that will enhance financial service access, which will boost economic growth, decrease poverty, even out income distribution, and promote financial stability, all of which can contribute to sustainable development.

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## References

1. D. Mahardiki and R. P. Santoso, "Analisis Perubahan Ketimpangan Pendapatan dan Pertumbuhan Ekonomi Antar Provinsi di Indoensia 2006-2011," *J. Econ. Policy*, vol. 6, no. 2, pp. 103–213, 2013, doi: 10.15294/jejak.v7i1.3596.
2. T. Pratysto and I. Panjaitan, "Eradicating Income Inequality in Lower Middle-Income Countries," *J. Ekon. Pembang. Kaji. Masal. Ekon. dan Pembang.*, vol. 20, no. 2, pp. 222–231, 2020, doi: 10.23917/jep.v20i2.8517.
3. R. Jayanthi, "The Effect of Electricity Development in Indonesia on Poverty and Income Inequality," *J. Ekon. Pembang. Kaji. Masal. Ekon. dan Pembang.*, vol. 22, no. 1, pp. 104–116, 2021, doi: 10.23917/jep.v22i1.12076.
4. B. B. Ummah, N. Nuryartono, and L. Anggraeni, "Analisis Inklusi Keuangan dan Pemerataan Pendapatan di Indonesia," *J. Ekon. dan Kebijak. Pembang.*, vol. 4, no. 1, pp. 1–27, 2018, doi: 10.29244/jekp.4.1.2015.1-27.
5. Y. H. Supartoyo, B. Juanda, M. Firdaus, and J. Effendi, "Pengaruh Sektor Keuangan Bank Perkreditan Rakyat Terhadap Perekonomian Regional Wilayah Sulawesi," *Kaji. Ekon. dan Keuang.*, vol. 2, no. 1, pp. 15–38, 2018, doi: 10.31685/kek.v2i1.207.
6. A. Demirgüç-Kunt, L. Klapper, D. Singer, S. Ansar, and J. Hess, "The Global Findex Database 2017: Measuring Financial Inclusion and Opportunities to Expand Access to and Use of Financial Services," 2020. doi: 10.1093/wber/lhz013.
7. I. Z. Zia and P. E. Prasetyo, "Analysis of Financial Inclusion Toward Poverty and Income Inequality," *J. Ekon. Pembang. Kaji. Masal. Ekon. dan Pembang.*, vol. 19, no. 1, pp. 114–125, 2018, doi: 10.23917/jep.v19i1.5879.

8. R. Zhang and S. Ben Naceur, "Financial Development, Inequality, and Poverty: Some International Evidence," *Int. Rev. Econ. Financ.*, vol. 61, pp. 1–16, 2019, doi: 10.1016/j.iref.2018.12.015.
9. World Economic Forum dan INSEAD, "The Global Information Technology Report 2015: ICTs For Inclusive Growth," 2015. doi: 10.3359/oz0304203.
10. J. Ebong and B. George, "Financial Inclusion Through Digital Financial Services (DFS): A Study in Uganda," *J. Risk Financ. Manag.*, vol. 14, no. 9, p. 393, 2021, doi: 10.3390/jrfm14090393.
11. A. Demirgüç-Kunt and L. Klapper, "Measuring Financial Inclusion: Explaining Variation in Use of Financial Services Across and Within Countries," 2013. doi: 10.1353/eca.2013.0002.
12. B. Dian Saraswati, G. Maski, D. Kalug, and R. Kresna Sakti, "Does Financial Technology Affect Income Inequality in Indonesia?," in *KnE Social Sciences*, 2020, vol. 2020, pp. 151–161, doi: 10.18502/kss.v4i7.6850.
13. T. Chinoda and T. Mashamba, "Fintech, Financial Inclusion and Income Inequality Nexus in Africa," *Cogent Econ. Financ.*, vol. 9, no. 1, pp. 6–16, 2021, doi: 10.1080/23322039.2021.1986926.
14. K. Ratnawati, "The Impact of Financial Inclusion on Economic Growth, Poverty, Income Inequality, and Financial Stability in Asia," *J. Asian Financ. Econ. Bus.*, vol. 7, no. 10, pp. 73–85, 2020, doi: 10.13106/jafeb.2020.vol7.no10.073.
15. M. Gehrung, "The ATM Around the Corner - How Financial Development, Access, and Integration Influence Economic Growth and Inequality," 2020. doi: 10.2139/ssrn.3595265.
16. J. Ali, M. A. Khan, M. Wadood, and U. S. Khan, "Revisiting Financial Inclusion and Income Inequality Nexus: Evidences from Selected Economies in Asia," *J. Asian Financ. Econ. Bus.*, vol. 8, no. 12, pp. 19–29, 2021, doi: 10.13106/jafeb.2021.vol8.no12.0019.
17. J. B. Ang, "Finance and Inequality: The Case of India," *South. Econ. J.*, vol. 76, no. 3, pp. 738–761, 2010, doi: 10.4284/sej.2010.76.3.738.
18. K. Iqbal, P. K. Roy, and S. Alam, "The impact of banking services on poverty: Evidence from sub-district level for Bangladesh," *J. Asian Econ.*, vol. 66, p. 101154, 2020, doi: 10.1016/j.asieco.2019.101154.
19. M. A. Destek, A. Sinha, and S. A. Sarkodie, "The Relationship Between Financial Development and Income Inequality in Turkey," *J. Econ. Struct.*, vol. 9, no. 1, pp. 2–14, 2020, doi: 10.1186/s40008-020-0187-6.
20. P. M. B. Selim and H. Güngör, "Inequality and Financial Development: Evidence From Selected MENA Region Countries," *Int. J. Financ. Econ.*, vol. 26, no. 2, pp. 2732–2747, 2021, doi: 10.1002/ijfe.1930.