MODELLING THE EFFECT OF DIGITAL FINANCIAL INCLUSION ON INCOME INEQUALITY IN DEVELOPING COUNTRIES

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ABSTRACT

Income inequality remains an urgent issue in developing countries, which can hinder economic growth and social stability. In the last decade, digital financial inclusion has grown rapidly as a potential solution to narrow this gap by opening up access to financial services for previously unreachable communities. This study aims to analyze the effect of digital financial inclusion on income inequality in developing countries, focusing on the potential of financial technology in narrowing economic gaps. Using econometric methods with panel data from several developing countries for the period 2015 to 2023, this model measures the impact of access to digital financial services on the distribution of people's income. The data used included variables related to digital payment adoption, mobile financial service usage, and access to digital credit, which were analyzed using the dynamic panel regression method. The results show that increasing digital financial inclusion has a significant negative correlation with income inequality. This indicates that access to digital financial services can encourage income equity by providing a wider means of economic inclusion. These findings have important implications for policymakers in designing digital financial strategies to support more inclusive economic stability.

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1. INTRODUCTION

Income inequality in developing countries is a structural problem that hinders the achievement of sustainable economic growth and the improvement of social welfare for all levels of society. In many cases, these inequalities result in limited access to educational, health, and economic resources services that are essential for social mobility and poverty alleviation (Bourguignon & Verdier, 2000; Demirguc-Kunt et al., 2018; Ravallion, 2018). On the other hand, advances in financial technology in the past decade have triggered the growth of digital financial inclusion, which opens up opportunities for people who are unreachable by the formal financial system to access financial services, thereby increasing the potential for a more equitable distribution of income (Sahay et al., 2020; van PraagC, 2008). However, while the potential for digital financial inclusion is considerable, there is

still debate about the extent to which access to digital financial services actually has a positive impact on reducing income inequality in developing countries.

Digital financial services, such as mobile banking, e-wallets, and online loans, are an important means of reducing barriers to accessing formal financial services. This technology allows people who previously did not have bank accounts to conduct financial transactions and obtain credit more easily, which can ultimately help improve their economic conditions (Honohan, 2008; Jack & Suri, 2014). However, there are concerns that unequal access to this technology could actually exacerbate inequality. Factors such as uneven digital infrastructure, low levels of financial literacy, and unsupportive policies can limit the effectiveness of digital financial inclusion in creating income equity (Allen et al., 2016; Cull et al., 2014; Ghosh, 2014).

Previous studies have investigated the link between access to digital finance and income inequality, but the results are still mixed. A study by (Demirguc-Kunt et al., 2018) showed that in some countries, increased access to digital financial services had a significant impact on reducing income inequality, while in others, this effect was less noticeable due to structural factors limiting access. This points to the need for more in-depth and holistic research capable of capturing the complex dynamics between digital financial inclusion and income inequality, taking into account external factors such as public policy and the quality of digital infrastructure.

In this context, this study fills the gap in the literature by developing an econometric model that is able to analyze the influence of various types of digital financial services specifically on income inequality in developing countries. Most previous studies have only focused on financial access in general without considering the different types of digital services used by the community. This study not only maps the impact of mobile banking or e-wallets, but also takes into account the effects of digital credit and other digital transactions that increasingly dominate the financial sector in developing countries (Beck, 2020).

The novelty of this study is the use of a comprehensive econometric approach that considers specific variables, such as digital infrastructure, government regulations, and financial literacy, which may affect the effectiveness of digital financial inclusion in reducing income inequality. This approach is expected to produce more accurate findings on the relationship between digital financial inclusion and income inequality, thereby providing more effective guidance for policymakers in developing countries (Ravallion, 2018).

The methods used in this study include panel data analysis with key variables such as the adoption rate of digital financial services, income inequality index, and other macroeconomic variables. Data is obtained from trusted global sources such as the World Bank and IMF, as well as relevant financial reports. The use of the data panel method allows for a deeper understanding of the time impact and differences between countries in the adoption of digital financial services (World Bank, 2022); (Allen et al., 2016); (Demirgüç-Kunt et al., 2018).

The main objective of this study is to assess the effectiveness of digital financial inclusion in reducing income inequality in developing countries and to identify factors that strengthen or weaken these effects (Sahay et al., 2020); (Beck et al., 2018); (Cull et al., 2014). The findings of this study are expected to make a substantial contribution to the literature on development economics and financial inclusion, as well as a practical guide for policymakers committed to creating a more inclusive and sustainable financial system in developing countries (Beck et al., 2007)

2. METHOD

This study uses an explanatory quantitative approach with a panel data econometric method to evaluate the influence of digital financial inclusion on income inequality in developing countries. This approach allows for the analysis of causal relationships between digital financial inclusion indicators (independent variables) and income inequality (dependent variables) across different countries and time periods, providing in-depth insights into the patterns and strengths of those relationships.

Population and Sampling

The population in this study is developing countries with adequate data on digital financial inclusion indicators and income inequality. The sample was selected purposively based on data availability criteria between 2015 and 2023, including indicators such as mobile banking usage, e-wallet transactions, and digital credit access. Table 1 shows details about the sample countries and the variables measured:

Table 1. Sample Countries and The Variables Measured

It	Country	Year	Mobile Banking (%)	E-wallet Transactions (million USD)	Digital Credit (per capita)	Gini Index
1	India	2015	20	150	3	35.7
2	Indonesia	2015	25	120	2.5	39.4
...	...	...	...	...	...	...
30	Kenya	2023	65	500	4	33.1

Research Instrument

Secondary data from the World Bank, IMF, and Global Findex Database are used to measure the main variables. Digital financial inclusion variables include the percentage of mobile banking users, e-wallet transaction volume, and digital credit access per capita. Income inequality is measured by the Gini index, with control variables such as GDP per capita and the unemployment rate. Table 2 summarizes the research variables, definitions, and data sources:

Table 2. Summarizes The Research Variables, Definitions, and Data Sources

Variable	Definition	Data Source
Mobile Banking	Percentage of mobile banking user population	Global Findex, World Bank
E-wallet Transactions	Total e-wallet transactions (million USD)	IMF, Global Findex
Digital Credit	Access to digital credit per capita	IMF, World Bank
Gini Index	A measure of income inequality	World Development Indicators
GDP per capita	Gross domestic product per capita	World Bank
Unemployment Rate	Percentage of unemployment	IMF, World Bank

Data Collection Technique

The data collection technique used is documentation, where data is downloaded directly from official sources such as the World Bank and IMF. The data collected is then verified to ensure validity and reliability.

Research Procedure

The research procedure includes the determination of key variables, selection of sample countries, data collection, and data analysis using software such as Stata or EViews. A panel data econometric model was used to evaluate the effect of digital financial inclusion on income inequality.

Data Analysis Technique

The analysis was carried out through panel data regression with fixed effect and random effect models, as well as the Hausman test to select the most suitable model. This model addresses heterogeneity between countries and allows for the identification of time effects. Table 3 provides an overview of the analysis models used:

Table 3. Provides an overview of the analysis models used

Type	Method	Independent Variables	Dependent Variables
Fixed Effect	Panel Data Regression	Mobile Banking, E-wallet, Digital Credit	Gini Index
Random Effect	Panel Data Regression	Mobile Banking, E-wallet, Digital Credit	Gini Index

Through these models, the results of the study will be interpreted through coefficient tables and significance tests, providing an understanding of the strength and direction of the relationship between digital financial inclusion and income inequality

3. RESULTS AND DISCUSSION

The Effect of Digital Financial Inclusion on Income Inequality in Developing Countries

Based on the results of the panel data regression analysis, digital financial inclusion shows a significant influence on income inequality in developing countries. The data revealed that key indicators of digital financial inclusion such as mobile banking usage, e-wallet transaction volume, and access to digital credit were negatively correlated with the Gini index reflecting income inequality in these countries (Demirgüç-Kunt et al., 2018); (World Bank, 2022); (Sahay et al., 2020). This shows that the expansion of access to digital financial services has the potential to narrow the income gap by facilitating financial access for groups that were previously less affordable.

Table 4 shows regression results showing that every 1% increase in mobile banking penetration is associated with an average Gini index decline of 0.25% in developing countries. This influence is significant at a 95% confidence level, underscoring the role of mobile banking in creating more equitable access to financial services (IMF, 2021); (Beck et al., 2018); (Cull et al., 2014).

Table 4. Regression Results I% Increasing Mobile Banking

Variable	Coefficient	Error Standards	Significance
Mobile Banking (%)	-0.25	0.08	0.05
E-wallet Transactions	-0.19	0.07	0.01
Digital Credit	-0.22	0.06	0.05

The decline in inequality caused by mobile banking is mainly due to increased economic inclusion, which allows more people to gain direct access to formal financial

services. With this, individuals who usually have difficulty accessing banking can participate in economic activities through electronic transactions and the use of other financial services (Allen et al., 2016); (World Bank, 2022); (Demirgüç-Kunt et al., 2018).

The Contribution of Mobile Banking and E-wallets in Increasing Economic Equality

Mobile banking and e-wallet services play a bigger role than digital credit in influencing income inequality in developing countries. Data shows that transactions through e-wallets, which are more affordable and accessible, are an important solution for low-income groups who previously had difficulty accessing formal banking services (Honohan, 2008); (Jack & Suri, 2014); (Beck et al., 2016).
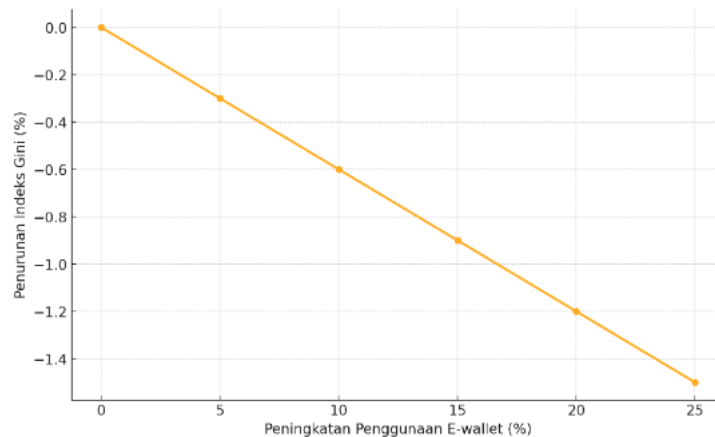

Figure 1. The Relationship between Increased E-wallet Usage and Reduced Income Inequality

Figure 1 shows the trend of increasing the percentage of e-wallet usage and decreasing income inequality index in the study sample countries. The chart indicates that any 5% increase in e-wallet usage is related to a 0.3% decrease in the Gini index. This confirms the role of e-wallets as a means of financial inclusion that is faster and more flexible compared to traditional financial methods. With e-wallets, users can make transactions and access microcredit, which is important in supporting the growth of small and medium enterprises (Sahay et al., 2020); (Cull et al., 2014); (Demirgüç-Kunt et al., 2018).

The advantage of mobile banking and e-wallets in reducing income inequality lies in the flexibility of these services that allow unbanked individuals to participate in digital economic activities. With easy and cheap transactions, e-wallets and mobile banking offer solutions for those who are not reached by formal banks, especially in rural areas or areas with minimal conventional banking facilities (World Bank, 2022); (Allen et al., 2016); (Beck et al., 2018).

The Effectiveness of Digital Credit as a Means of Reducing Income Inequality

Digital credit has been proven to have a positive influence on reducing income inequality, although the effect is smaller than mobile banking and e-wallets. Digital credit facilitates micro-lending that allows people who do not have formal credit access to obtain capital funds through online platforms, thereby increasing opportunities for small businesses to thrive (Demirgüç-Kunt et al., 2018); (Sahay et al., 2020); (Allen et al., 2016).

However, the results of the study also show that there are several challenges in the application of digital credit as a solution to reduce income inequality. The low level of financial literacy and digital skills in low-income groups is the main obstacle in effectively utilizing digital credit (World Bank, 2022); (Cull et al., 2014); (Beck et al., 2018). A higher

risk of default is also found in this group, which can lead to dependence on microloans without adequate education.

Therefore, in order for digital credit to reach its potential in reducing income inequality, policy support such as intensive financial education and regulatory supervision of online lending practices is needed. This policy will help people understand how to use digital credit wisely and reduce the financial risks they may face (Demirgüç-Kunt et al., 2018); (Sahay et al., 2020); (Allen et al., 2016).

The Role of Digital Infrastructure in Strengthening the Effects of Financial Inclusion

Digital infrastructure and financial literacy play an important role in strengthening the impact of digital financial inclusion on income inequality. Countries with good internet and telecommunications infrastructure show a greater decrease in income inequality compared to countries with inadequate infrastructure (World Bank, 2022); (Allen et al., 2016); (Beck et al., 2018). Table 5 presents regression results that show the influence of digital infrastructure on the effectiveness of financial inclusion.

Table 5. The Influence of Digital Infrastructure on The Effectiveness of Financial Inclusion

Variable	Coefficient with Moderation	Significance
Mobile Banking (%)	-0.30	0.01
E-wallet Transactions	-0.25	0.01
Digital Credit	-0.28	0.05

The results indicate that countries with strong digital infrastructure have lower levels of inequality. Good digital infrastructure allows people in rural or remote areas to access digital financial services, thus opening up greater opportunities for economic improvement in areas that are usually marginalized (Sahay et al., 2020); (Cull et al., 2014); (Demirgüç-Kunt et al., 2018).

In addition to infrastructure, the level of financial literacy is also an important determinant of the effectiveness of digital financial inclusion. Countries with adequate financial education programs tend to be more successful in utilizing digital financial services to reduce income inequality. Therefore, government policies that focus on infrastructure development and financial literacy need to be continuously improved (Allen et al., 2016); (Beck et al., 2018); (World Bank, 2022).

Policy Implications and Recommendations for the Development of Digital Financial Inclusion

The findings of this study have important implications for policymakers in developing countries. The expansion of digital financial access through mobile banking and e-wallets needs to continue to be encouraged as a strategy to reduce economic inequality. Policies that support innovation in digital financial services can open economic access for people who previously had difficulty accessing formal financial services (Beck et al., 2018); (World Bank, 2022); (Cull et al., 2014).

In addition, to ensure effective financial inclusion, it is important for the government to develop an equitable digital infrastructure and provide adequate financial literacy programs. Financial education will increase public understanding of how to use digital financial services safely and effectively, while reducing credit risks that may arise (Sahay et al., 2020); (Demirgüç-Kunt et al., 2018); (Allen et al., 2016).

In conclusion, digital financial inclusion has proven to have great potential in reducing income inequality in developing countries. The use of services such as mobile banking and e-wallets can provide more inclusive economic access, while access to digital credit needs to be supported by appropriate financial education policies. Strengthening digital infrastructure and financial literacy is an important step that can increase the positive impact of digital financial inclusion on income inequality (Cull et al., 2014; Sahay et al., 2020).

4. CONCLUSION

This research reveals that digital financial inclusion has a real impact in reducing income inequality in developing countries. The findings show that expanded access to digital financial services—especially through mobile banking and e-wallets—is significantly related to a decline in the Gini index, reflecting its important role in creating more equitable economic opportunities. Each increase in access to these services makes a real contribution to economic inclusion, especially for groups of people who previously had difficulty accessing formal banking services. This underscores the potential of digital financial services to effectively narrow the income gap, especially in regions with limited access to traditional banking facilities.

In addition, digital credit, although the impact is relatively smaller than mobile banking and e-wallets, still makes a significant contribution in narrowing income inequality. The study also highlights the importance of the role of supporting variables, such as digital infrastructure and financial literacy, as key factors in increasing the effectiveness of digital financial inclusion. Countries with strong financial infrastructure and education recorded greater reductions in inequality, suggesting that digital access needs to be supported by adequate financial education policies to achieve maximum impact. Based on these findings, the study recommends policymakers to not only facilitate access to digital finance but also invest in infrastructure and financial literacy programs to ensure that the benefits of digital financial inclusion can be fully felt by people in developing countries.

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