

To What Extent Has Digital Financial Inclusion Contributed to Reducing Income Inequality in Developing Economies, and Through Which Economic Channels Has This Effect Occurred?

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ABSTRACT: In this paper, the author conducts a study to determine the connection between digital financial inclusion (DFI) and income inequality in developing economies and specifically, the economic pathways that this relationship follows. This paper builds on both cross-country panel data, case studies in Sub-Saharan Africa, South Asia, China, and Latin America, and a critical analysis of the published empirical literature on DFI (2010-2024) to make the argument, positing that DFI has (on balance) played a significant but disproportionate role in declining income inequality in the developing world.

According to the analysis, there are five main economic channels (1) access to credit and democratisation of capital; (2) entrepreneurship and the labour market; (3) risk management and mobilisation of savings; (4) effectiveness of remittances and efficient household consumption; and, (5) digital government transfers and social protection. Quantitative data such as the Suri and Jack (2016) discovery that M-Pesa increased the amount of Kenyan households out of poverty by 2% and World Bank Global Findex statistics that account ownership in developing economies have moved 42% (2011) to 71% (2021) are synthesised with heterodox criticisms of the digital divide, algorithmic bias, and the threat of a 'fintech Matthew effect'. The paper concludes that DFI is a necessary, yet insufficient precondition of the reduction of inequality in the long term, and that its effectiveness requires the presence of complementary investments in digital infrastructures, financial literacy, and effective regulatory frameworks.

INTRODUCTION

Income disparity is one of the major problems of today's society. According to Oxfam (2023), the world's richest 1% has seized nearly 66% of all new wealth since 2020. Meanwhile, billions of citizens in developing nations remain stuck in low-production jobs with insecure employment. In this environment, financial exclusion (if an individual or business cannot access formal financial services) has long been known to contribute to and perpetuate long-lasting inequality. Founded in Galor and Zeira (1993) and later established by Banerjee and Newman (1993), the original theoretical insight states that imperfect capital markets prevent the poor from moving up to higher-skill jobs hence, if you cannot borrow money to invest in learning a trade or to create a business, you will be limited to your hereditary economic status for the rest of your life.

Digital financial inclusion (DFI) refers to access to basic formal financial services delivered electronically to people who were previously excluded from them through non-electronic means (such as cash). The last two decades have seen DFI emerge as the biggest opportunity to catalyze even greater financial inclusion. Telenor's Launchpad (formerly known as Launch4) is a good example of this; it has used digital technology (through mobile money) to allow people to access banking services they may not have been able to afford before. More specifically, in Kenya, M-Pesa has become one of the world's most popular mobile payment services and has helped change the way people do business and transact externally. The main example is the growth of mobile money in Sub-Saharan Africa and digital payment platforms in South Asia. According to the World Bank's Global Findex Database (2022), the number of people with an account at a financial institution increased from 42% of the adult population in developing nations in 2011 to 71% of the population in 2021. That is a 29 percentage point increase in a decade, mostly attributed to the introduction of mobile money to Sub-Saharan Africa.

The link between Digital Financial Inclusion (DFI) and the inequality of income is complex. While there are many studies that show positive relationships between DFI and benefiting poor people by reducing poverty and meeting consumption smoothing needs, the data that demonstrates both Gini coefficient and income distribution metrics is mixed. Some research indicates that people with high levels of education, people in urban centres and male users are likely to benefit more than others from digital financial

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services; as such they will end up with more wealth thus effectively expanding existing inequalities. This effect is further compounded by what is termed the "fintech Matthew effect"; the individuals who are digitally literate, own smartphones and have access to stable internet connections are best able to take advantage of the benefits provided by – or created through – new digital financial technologies, leaving people who do not have access to those types of tools behind.

This paper will explore these tensions, focusing on two interrelated questions; the first is the extent to which DFI has led to decreased income disparity as measured by Gini-based measures and household survey data in developing countries and the second is through which specific economic channels will DFI reduce income disparity when it does. The rest of the paper will be laid out as follows; Section 2 will outline the theoretical framework used; Section 3 will provide a literature review; Section 4 will provide an analysis of the five main economic transmission channels; Section 5 will present country case studies; Section 6 will contain key data and statistics; Section 7 will provide critiques and limitations; and finally Section 8 will conclude and summarise.

THEORETICAL FRAMEWORK

Financial Development and Inequality

Greenwood and Jovanovic (1990) were the first economists to provide a formal theory that describes how financial development and income inequality are related through an inverted U-shaped, non-linear relationship. Initially, as the economy develops its financial sector, income inequality rises because only the wealthy can access the financial system. However, as the financial sector matures and expands its reach to less wealthy individuals (i.e., the poor), income inequality eventually begins to decline. This theoretical model is also called the "financial Kuznets curve" and has become a major theoretical development in economics, but some have questioned the firmness of its empirical basis.

Galor and Zeira (1993) take a quite different angle. They model an economy as one in which individual investments in human capital are discrete, indivisible, and dependent upon the availability of credit. Because credit market imperfections exist, only those individuals who exceed a certain wealth threshold will invest in their education and, thus, only they will acquire skills, and all others will remain unskilled. In this model of the economy, when the poor have increased access to the credit market, they will be able to accumulate human capital and, therefore, inequality will be reduced as a direct result of their increased access to the credit market. Banerjee and Newman (1993) extend this framework to the occupational-choice decision faced by the poor; their inability to access credit will cause them to only be able to choose a wage job for their occupation and, thus, generations of wage workers will perpetuate income inequality.

The major implication on DFI is that assuming that digital technologies can minimize the transaction costs and informational asymmetries that cause credit rationing to the poor, it should, in theory, eliminate the relationship between initial endowment and lifetime income. This is the theoretical potential of digital financial inclusion: it will not take the time-consuming, capital-heavy deployment of physical bank branches to rural Tanzania subsistence farmer, or Lagos street vendor; in theory, all of the financial products and services can be brought to a person with a mobile phone and a SIM card.

Digital Technologies as a Disruptive Force in Finance

There are some differences between digital financial services and traditional banking with regard to the way these services affect inequality. First, the cost of serving a non-banking customer on a mobile service is practically zero once the mobile service infrastructure exists, while building a branch or ATM costs a lot of money. As a result, mobile banking can be part of the banking industry at income levels much lower than traditional banks can be.

Second, using digital transactions generates transaction records that may be used as collateral for a loan using new automated methods; this allows banks to evaluate potential loans for those without a formal credit record, which is the type of customer will have been previously excluded from receiving a bank loan.

Third, digital services dramatically reduce the cost associated with sending money home through remittance, which is a primary channel that transfers money from city workers to family members in rural areas. In fact, World Bank research indicates that remittance costs average between between 5% and 7% of the total amount of money being remitted back home through traditional remittance channels and between 1% and 2% for remittance sent via digital service providers. As a result, recipients of these remittances will receive a much larger amount than what they presently receive.

Nonetheless, new types of exclusion are also brought about by digital technologies. The digital divide, unequal access to smartphones, access to high-quality internet connectivity, and digital literacy, could imply that the distributional gains of DFI are accrued mainly by already relatively advantaged people. Moreover, the discriminatory practice of lending to women and ethnic minorities and other marginalised groups can be reinforced or intensified through algorithmic systems that are trained on historical data that uses existing biases (Philippon, 2019).

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Conceptual Model of DFI and Inequality

Based on the body of literature above, a relationship exists between DFI and income inequality via 5 distinct economic channels with both theoretical/casual explanation and empirical data supporting each one. These channels are: (1) access to credit channel which allows reduced borrowing limits and therefore increases ability of the poor to invest in both human and physical capital; (2) entrepreneurship channel which facilitates new business starts and access to payment system for establishing small or micro-business; (3) savings and risk mitigation channel through which digital savings accounts and insurance products allow the poor to smooth consumption and prevent the need to liquidate distressed assets; (4) remittance channel which decreases transfer costs such that the transfer of money from / to inter-households actually enables a larger amount of real income to change hands; and (5) social protection channel which enhances the targeting effectiveness & reach of social transfers provided electronically via digital G2P payment systems. Furthermore, although they can be separately derived or hypothesized, the channels are interrelated and reinforce each other in practice.

EMPIRICAL LITERATURE REVIEW

Cross-Country Panel Studies

Cross-country panel studies of financial inclusion using conventional financial inclusion proxies like the density of bank branches, ATM coverage, and the number of deposit accounts per capita provide the earliest systematic empirical evidence on the relationship between financial inclusion and inequality. In a study of 70 countries, Mookerjee and Kalipioni (2010) discover that the breadth of the banking system is related to reduced income inequality in terms of the Gini coefficient. The same is replicated by Neaime and Gaysset (2018) in the case of the MENA region, but they mention that the heterogeneity is high among countries. Researchers and academics can examine how digital finance inclusion (DFI) specifically impacts the financial landscape, thanks to the introduction of digital finance inclusion metrics. Utilizing a composite Digital Financial Inclusion Index, the combination of the IMF Financial Access Survey and the Global Findex Database, Demir et al. (2022) produced a quantitative analysis of 140 nations across the years 2011 through 2018. They discovered that a one standard deviation increase in DFI correlated to an approximate decrease of 1.2 Gini Points; this correlation was statistically significant and demonstrates a modest effect. Khera et al. (2021) also evaluated data from 52 emerging market/developing economies and produced an original DFI index for those nations through the Financial Access Survey and Global Findex Database. Their findings supported Demir et al.'s (2022) original finding, supporting the theory that nations with a higher DFI experienced a faster decrease in income inequality, especially when the DFI result was associated with mobile money adoption, not internet-based banking.

The finance inequality nexus has been studied internationally by Čihák & Sahay (2020). The researchers used data from 128 countries spanning four decades. The authors determined that there is a Kuznets curve for finance. This indicates that financial development has a negative impact on inequality to a point, and then additional financial development could increase inequality. Of importance, the researchers found that a positive turning point for inequality reduction occurred at a significantly lower level when the financial system had inclusive characteristics. This suggests that financial inclusion and breadth are important for distributional impacts of DFI.

The IMF (2025) recently conducted a new analysis of the provincial and prefectural panel data of China between 2011 to 2018 using the Peking University Digital Financial Inclusion Index. They found substantial evidence to suggest that DFI development is likely to provide a rapid convergence of lagging regions with high inequality. This finding indicates that DFI may play a role in closing the regional income gap in China.

Household Survey Evidence

Evidence at the household level gives a more detailed understanding of how DFI has an impact on inequality. The most referenced work on this literature is Suri and Jack (2016), published in the journal *Science*, which employs a difference in the implementation of M-Pesa agents in Kenya to determine the causal impact of access to mobile money on household welfare. They estimate that 194,000 Kenyan households out of poverty (around 2 percent of all households) were due to access to M-pesa, and that it increased per capita consumption levels. The impact was highest when it was female headed households and this is in line with the hypothesis that mobile money will have a disproportionate impact on women by enhancing their control of household finances.

In India, Agarwal et al. (2017) evaluated how Pradhan Mantri Jan Dhan Yojana (PMJDY) impacted the rollout of bank accounts to 255 million new account holders, concluding that newly banked households have experienced increased formal savings and reduced dependence on costly informal sources of borrowing due to consumption smoothing and an improvement in the welfare of the poor. Singh et al. (2021) evaluated whether the PMJDY-related financial inclusion index is positively related to economic

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growth across 25 major Indian states, and their research supports the conclusion that including low-income groups in the formal financial system creates economy-wide multiplier effects.

Wen, Xiao, and Hu (2024) examined how financial digital inclusion (DFI) would decrease urban-rural income inequality as well as income inequality among residents of rural areas in their analysis of data collected from panel surveys conducted in 52 counties in Zhejiang Province of China between 2014 and 2020. The authors found that industrial restructuring, particularly moving from subsistence-based farming to high-value commercial activity and service-oriented industries, has had a substantial, statistically significant effect on reducing urban-rural and within-rural income inequalities as a result of DFI. Furthermore, they found that DFI had a greater impact upon counties with lower income levels, demonstrating that DFI has a local convergence characteristic.

Regional Studies: Sub-Saharan Africa and Latin America

Some studies in Sub-Saharan Africa take advantage of the phenomenal growth of mobile money to determine the effects of inequality. A study by Abiona and Foureaux Koppensteiner (2018) of Tanzania reveals that access to mobile money cushions households against descent into poverty in the aftermath of adverse rainfall shocks, which directly applies to the Inequality question to the extent that covariate risk is a significant contributor to rural poverty traps. Using panel data on access to mobile money in Uganda, Munyegera and Matsumoto (2016) demonstrate that mobile money access raises per capita income and remittance receipts among rural families, with greater impacts among women.

According to recent research done by (insert reference) and published in (insert publication), countries that belong to the West Africa Monetary Union (WAEMU) showed that Foreign Direct Investment (FDI) has a long-term negative and statistically significant impact on income inequality, as measured by the Gini coefficient, over the period of 2007 to 2020. Analysis of short-term effects found mixed results across countries, due to differing country-level factors, such as institutional structures and quality of infrastructure.

In Latin America, (insert reference) examined data from (insert number) different Latin American countries to determine if technology and financial inclusion had any effect on poverty headcount ratios or the Gini index. The results indicated that both variables had significant positive effects on both poverty and income inequality, although the effect of DFI on poverty reduction was larger than the effect of DFI on reducing the overall distribution of income.

ECONOMIC CHANNELS OF TRANSMISSION

The Credit Access Channel

The democratisation of credit is the most theoretically basic way in which DFI influences income inequality. In typical financial exclusion models, the poor cannot borrow due to lack of collateral, verifiable income history, or what is necessary to create a creditworthy record, proximity to formal financial institutions. All these barriers are broken by digital technology in different ways. To begin with, mobile money transaction histories offer an alternative to formal credit histories in algorithmic credit scoring models. M-Shwari in Kenya, Tala in several African markets, and the Zhima Credit scoring system of Ant Financial in China are examples of machine learning to determine creditworthiness with respect to mobile payment history, frequency of airtime top ups, social network features and geographic mobility data. This allows micro-loans to be given to people who would otherwise be unknown to conventional bank underwriters.

Second, small-value lending transaction costs are drastically lowered by digital credit. A physical bank loan involves visiting a branch, paperwork, a loan officer, collateral evaluation and in many cases additional visits after the loan is made- a process whose fixed costs make small loans uneconomical to banks. A mobile loan, in comparison, can be automatically disbursed within seconds at almost zero variable cost. This alters the micro-lending economics fundamentally: lending small sums of money to poor borrowers will become profitable at lower than informal moneylender interest rates and still yield enough to cover the cost of capital.

The effects of credit democratization on inequality could be enormous. According to Galor and Zeira (1993), relaxing credit constraints on poor people would lead to a chain reaction of investments in human capital, which would continually reduce inequality. Empirical evidence provided by Čihák and Sahay (2020) supports this hypothesis; more access to credit for the poor is associated with lower Gini coefficients, even when controlling for the financial depth of the entire economy. In the context of a developing economy, evidence from digital credit expansion in China (namely, Ant Financial's Jiebei and Huabei products to previously unbanked rural and semi-urban populations) demonstrates significant increases in household consumption and small business investment (Zhang et al., 2020).

While some may see credit access as a benefit, there are also risks associated with the credit access route. The ability of borrowers to obtain loans through mobile devices, paired with the very aggressive marketing tactics employed by digital credit providers,

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has raised concerns about the overindebtedness of low-income borrowers. A number of studies in Ethiopia, Kenya, Tanzania, and Uganda highlight the prevalence of high default rates among mobile micro-loans for first-time borrowers who lack basic financial literacy (CGAP, 2020). The findings of these studies suggest that the credit democratization route to reducing inequality could potentially exacerbate the problem of inequality if digital credit products are predatory in nature or if there is a lack of appropriate regulatory oversight.

The Entrepreneurship and Labour Market Channel

Another key avenue that DFI can use to eliminate inequality is by empowering the poor to be entrepreneurs. The reasoning is simple, many people in third world economies have good ideas on how to start small businesses but they do not have capital to start businesses and the payment structure and availability of supply chain that would make the business work. DFI is able to relieve the three constraints at the same time.

Digital payment systems remove the aspect of cash intensive business processes lowering the chances of theft and facilitating business to conduct transactions with customers and suppliers who are geographically distributed. There is a paper trail that is provided by digital invoice and receipting which can be presented in order to access formal credit. Online markets, such as M-Pesa-based merchant accounts in Kenya and Taobao Rural in China, link small producers with urban and export markets otherwise closed to them.

The labour market consequences of M-Pesa expansion in Kenya are recorded by Suri and Jack (2016): in those regions where the agent network expanded at a rapid pace, women were much more prone to change their occupation in subsistence farming to business and retail services. The researchers project that about 185,000 women switched jobs directly due to M-Pesa growth. This occupational modernization is a noteworthy equality-reducing approach: it raises the earnings of a group of workers (rural women) which is disproportionately located at the low end of the income ladder.

Several studies conducted in China have evaluated the entrepreneurship-related impact of digital financial inclusion (DFI). One study found that mobile payment use has significantly enhanced rates of entrepreneurship across China and that the increase was disproportionately large amongst economically underdeveloped regions. Therefore, these findings are consistent with the notion that DFI relieves the pressure of a binding constraint to entrepreneurial development, especially for those interested in starting a business but lacking access to traditional banking services. Another study found that digital financial inclusion contributes to reducing income inequality, largely due to increasing levels of entrepreneurship among lower-income households; these findings also support the entrepreneurship-driven equality reduction theory.

At the aggregate level, DFI also promotes increased growth rates of small to medium size enterprises (SMEs) and thereby broadens the number of employment opportunities available in developing countries. In most developing countries, SMEs are the primary source of employment for low-skilled workers; thus, increased levels of SME growth create additional demand for low-skilled workers, which further compresses wage differentials. For example, one study analyzed SMEs in sub-Saharan Africa and discovered that banks use digital finance products to remove many of the financial barriers that prevent SMEs from accessing capital to grow their businesses. The effect on employment growth was substantial (Ayalew and Xianzhi 2019).

The Savings Mobilisation and Risk Management Channel

Financial exclusion is not just being locked out of credit: it is also being locked out of formal savings. The poor have no access to bank accounts, and thus must keep their savings in high-risk, low-paying forms: physical cash (theory of theft and inflation), livestock (theory of illiquidity and disease risk), or informal savings clubs (theory of default by other members). Even when the digital savings accounts have low or no nominal interest, they are more beneficial than these options in terms of security, liquidity, and systematic savings accumulation.

According to the World Bank Global Findex (2022), as of 2021 over half of the adults in developing economies who saved any money did so in a formal account, the first year that formal methods of saving took the lead as the most widespread, overtaking informal savings. In Sub-Saharan Africa, 15% of adults and 39% of mobile money account holders used mobile money accounts to save in 2021.

The implications on inequality of improved savings access are multiple. Formal savings serve as a financial safety net for families in case of unexpected events, such as sickness or the loss of a job; they can then avoid having to either sell productive property (like land or machinery) or else pay exorbitant interest rates on loans that would trap families in cycles of poverty and inequity. Additionally, establishing a normal habit of savings and savings that can build up over time allow for the financing of large expenditures like tuition, starting a business, or making improvements to a home, without needing to obtain a loan. The act of mobilising savings also provides for domestic financial intermediation, and thus the potential to lower the overall cost of capital to the economy.

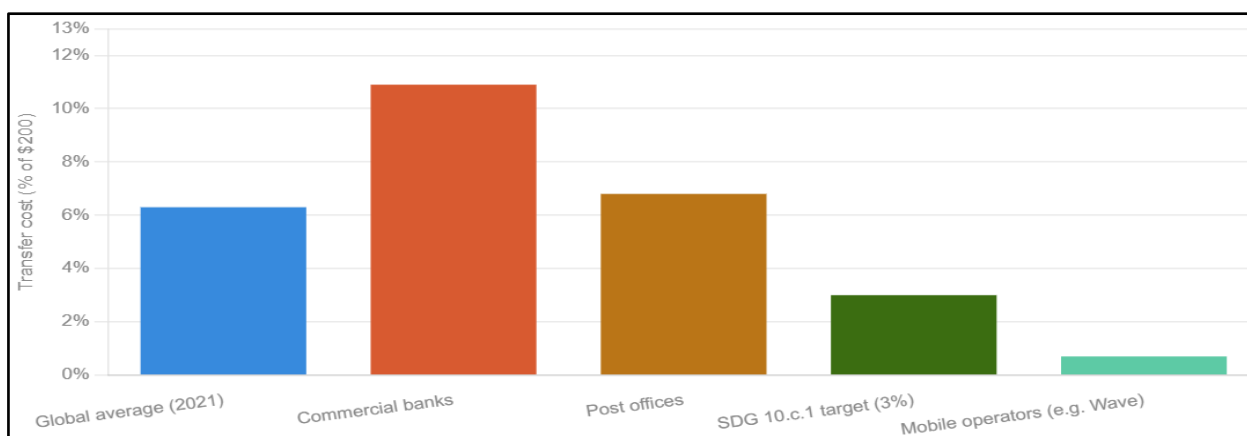
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Digital finance improves the risk mitigation capability of households participating in the digital economy. According to Townsend (1994), one of the main causes of the loss of welfare in developing countries is the lack of an ability for households to engage in a level of income risk-sharing sufficient to maintain their standard of living. In addition to the theoretical confirmation of the previous statement, other empirical research has documented the significant effect that an income shock can have for extended periods of time on the consumption and human capital investments made by families living in poverty. The use of digital financial services like remittances and digital insurance can improve risk sharing between families and households by providing a mechanism for transferring money to family members and households in a timely and low-cost manner after experiencing an income shock. M-Pesa users (Jack & Suri, 2014), for example, have been found to be better able to smooth their consumption through times of income shocks than those families that do not use this digital money service, which the authors attribute to improved access to informal networks of insurance through mobile money.

The Remittance Channel

In most developing economies, remittances, the transfer of funds by migrants back to their families, are quantitatively significant. World Bank data show that in 2022, global remittance flows to low- and middle-income countries amounted to \$647 billion, more than the official development assistance. In some countries like the Philippines, Nepal, Haiti and Tajikistan, remittances are 20-40% of GDP and they are the main income source of many rural residents.

Historically, remittance transfer fees have been quite significant. For example, the average fee for an international remittance transfer of \$200 worldwide was estimated at an average fee of 6.3% in 2021, causing over \$40 billion in losses as a result of the transfer costs associated with remittances. However, by providing more efficient access to digital/online financial services, such as mobile money platforms, digital remittance providers like WorldRemit and Wave, and bank transfer applications, these fees can now be significantly reduced. For instance, Wave operates in multiple countries throughout West Africa and charges no foreign exchange margin/fees on remittances sent along select corridors; this represents a significant decrease from the industry norm of 5-8% charged by traditional remittance providers.



Sources: World Bank Remittance Prices Worldwide 2022; UN SDG 10.c.1 target; Wave Money pricing data.

The negative implications on social and economic equity from the reduction of remittance transfer fees are evident and, therefore, an enormous incentive for persons using the system to participate. Providing recipients with an increased income via the reduction of remittance transfer fees will likely improve social/economic equity and levels of poverty for the recipient. Additionally, the largest share of remittance recipients are typically found at the lower end of the income distribution scale in developing countries (e.g., wealthy individuals will often use other means to transfer wealth), and as such, it is reasonable to conclude that a greater number of individuals will benefit from any reductions in remittance transfer fees. One study (Springer et al., 2024) used panel data from 123 developing countries from 2000 to 2020 to explore the relationship between digital financial inclusion (DFI), using mobile phone subscriptions to proxy for DFI and the level of poverty in countries receiving remittances. The study found strong evidence that DFI has been shown to have a significantly negative impact on poverty levels in countries receiving remittances, and that the level of poverty was reduced even further in performing this role when both DFI and the volume of remittances into the recipient country are high.

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The Social Protection & Digital Government Channel

The use of digital financial infrastructure - the fifth and most rapidly growing avenue being developed to improve the provision of social protection payments. The introduction of conditional cash transfers, pension payments and disaster relief payments have experienced significant problems in terms of 'leakage' (i.e. funds going missing because of administrative fraud, corruption and/or inefficiency) at different stages along their delivery processes resulting in actual recipients receiving less than they should-of depending on which stage the funds have leaked from the sending country. However, by utilising digital payment systems that link individual accounts with biometric identity systems (such as India's Aadhaar), financial institutions can thus provide a more accurate payment system to recipients and reduce the amount of funding that leaks from any point within the delivery process. The Direct Benefit Transfer (DBT) system established by the Indian government is widely recognised as an excellent target to study the effectiveness of the social protection channel. With government subsidies being transferred directly to account holders using Aadhaar biometric identities for PMJDY beneficiaries for cooking fuel, food, education scholarships and for COVID-19 relief, the government estimates that approximately \$33 billion in leakage has been saved since the introduction of DBT.

Due to the underlying digital financial infrastructure established by PMJDY over the last seven years, more than 200 million women received government support as a result of the COVID-19 emergency response in less than a week, something that would have been logistically disallowed prior to introducing the digital financial services.

According to the World Bank Global Findex report (2022), 36% of adults in developing countries received a payment into an account in the previous year (including wages, government payments, and payments for agricultural products) and 83% of those individuals sent a digital payment via their bank account; approximately two-thirds stored money; and 40% of respondents borrowed or saved from formal banks. The 'gateway' effect in which payments from the government lead to unbanked people coming into the financial system provides evidence of the potential multiplier impact beyond the benefit received from the direct transfer of income.

Real-Life Case Studies

Kenya: The M-Pesa Revolution

Kenya illustrates the most analyzed country for DFI's effect on poverty and inequality; it provides a good example of what DFI could do, while also demonstrating the limits of DFI. Launched by Safaricom in 2007, M-Pesa expanded rapidly to 25 million subscribers by 2015. Its transaction volume is now comparable to a large percentage of Kenya's GDP. Nearly 9 in 10 Kenyans had a bank account in 2021 (79%), compared with only half of the Sub-Saharan African population (55%), effectively all due to mobile money.

The Suri and Jack (2016) paper provides the best quality causal evidence as to how DFI affects poverty. Using the rollout of M-Pesa agents as a natural experiment and controlling for pre-existing differences across locations by using fixed-effects, they find that an average increase of five agents leads to a 2% decrease in the likelihood of living in poverty. This was especially true for female-headed households, where the effect was nearly twice as much, demonstrating the particular importance of women having greater financial control and access to better jobs as a result of improved access to finance.

In addition to reducing poverty, Kenya's mobile money expansion has an interesting gender aspect. Tavneet Suri and William Jack provide proof that M-Pesa has changed women's job opportunities and their access to finances. Because women have access to mobile money, they are able to leave subsistence farming, increase their savings, and keep up their spending during difficult times. Since women-headed households and women who are part of male-headed households tend to be over-represented in the bottom two income quintiles, these changes directly reduce income inequality.

However, the success of mobile money in Kenya shows that DFI has limitations in reducing inequality as well. Despite the very high rate of mobile money use in Kenya, the Gini coefficient for Kenya is still quite high compared to other countries in sub-Saharan Africa. Although the percentage of adults who own an account is very high, there are still large differences in how financially utilized accounts are. Wealthier adults living in cities are about 20 percentage points more likely than rural, low-income adults to own an account and have access to credit and insurance. Therefore, it has been found that the economic benefits created by DFI can be considerable; however, in order to make rural adults economically better off, DFI benefits must be augmented by other significant structural efforts.

India: Jan Dhan Yojana and the JAM Trinity

India has taken a unique top-down, state-led approach to inclusivity via digital finance. The Pradhan Mantri Jan Dhan Yojana (PMJDY) was launched in August 2014 to give every unbanked household in India access to a bank account. Over 510 million (51 crore) Jan Dhan accounts were opened by the end of 2024, holding deposits over ₹2.30 lakh crore (\$27.6 billion). Around 55.5%

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of these accounts are held by women, and 67% are located in rural or semi-urban areas, highlighting how well targeted these products are to include those without access to financial services.

The JAM Trinity of Jan Dhan accounts, Aadhaar biometric identification, and mobile connectivity has built a digital financial infrastructure that is unprecedented in scale for any developing country. This infrastructure has facilitated a Direct Benefit Transfer (DBT) system that can route government transfers directly from the government to the beneficiary's account, eliminating intermediaries which have in the past caused large-scale leakage of government funds. For example, in 2020, during the COVID-19 lockdown, ₹0.3 trillion was sent through the PMJDY-DBT pipeline from the government to over 200 million women's accounts within just a few weeks.

The inequality implications of the DBT system have important consequences. An increase in real income for poor households as a result of reduced leakage from social protection programs (the indirect equalising effect of DBT). Further, the PMJDY system has allowed many more excluded small business owners to access credit than before, mainly through overdraft facilities against their PMJDY accounts and through Pradhan Mantri MUDRA Yojana micro-enterprises. Women's businesses have benefited in particular; they represent about half of all loan amounts lent under MUDRA, and four-fifths of all loans made.

Despite the fact that the Indian experience has demonstrated the difference between account ownership and meaningful financial inclusion and has shown an enormous number of PMJDY accounts, much of the PMJDY accounts are inactive and not frequently used. The IMF (2021) also points to persistent digital divides in India. Internet penetration in rural areas is 36 per 100 people, while in urban areas it is 107 per 100. It is estimated that about 57% of households in the poorest quintile own a smartphone, versus 90% of households in the richest quintile. Finally, men are 20% more likely to own a mobile phone compared to women. Due to these disparities, the distributional gains of DFI in India continue to be unequal, and there is a chance that the benefits will be concentrated among the poor, who are already highly privileged.

China: Digital Finance and Regional Convergence

China's digital inclusion has benefited from: 1) A huge amount of money flowing through Alibaba's Alipay & Tencent's WeChat Pay mobile wallets, tens of trillions processed every year; and 2) The Peking University DFI Index (PKU-DFIIX), very detailed longitudinal data showing how DFI has reduced inequality for many poor communities in China by improving access to financial services and increasing savings and investment capacity for rural families who might otherwise be stuck in low-productivity farming or do not have the support of a financial institution.

A variety of research projects using the PKU-DFIIX demonstrate that while digital financial inclusion has reduced inequality in China, the amount of reduction varies dramatically between regions and communities. For example: Wen et al. (2024) found that in Jiangsu Province, digital financial inclusion reduces income inequality between urban and rural residents by enabling rural household to transition from low-productivity subsistence farming to higher-productivity commercial activities. The KDI-DFIIX shows that the effect of DFI on urban-rural income inequality is greater in lower-income counties in Jiangsu, thus supporting a convergence hypothesis within developing nations.

The IMF (2025) report demonstrated that increasing DFI has led to an expanded process of convergence between high- and low-income regions in China. In particular, among provinces with high DFI, the relationship between economic growth and DFI is negatively associated with initial income level, while this association does not hold for provinces with low DFI. This implies DFI has amplified the convergence process by allowing low-income regions to grow at a faster rate than high-income regions.

Furthermore, China is the source of most research used to demonstrate the economic conditions needed to stimulate entrepreneurship through DFI. Specifically, Yao et al. (2022) conducted a study using data from 280 prefectural cities between 2011 and 2020 and found an initial Kuznets effect: at low levels of economic development, DFI increases the degree of disparity in income between connected and unconnected individuals; however, over time, as the digital economy matures, the benefits of DFI will become more widely available to all members of the economy.

West Africa: WAEMU and the Limits of Mobile Money

WAEMU is a good example of DFI where there are substantial improvements, such as a rapidly increasing rate of mobile money usage and the fact that all of the participating countries including Côte d'Ivoire, Senegal and Mali, are benefiting from greater access to fintech solutions. However, Structural Constraints to DFI will still be limiting the full benefits DFI will create or provide.

Through pooling mean groups to analyse Waemu, Yao and colleagues (2023) determined that on average, Digital Financial Inclusion (DFI) has a long-run negative and statistically significant relationship to the Gini coefficient for each of the eight member countries. The short-run relationships, however, were found to be heterogeneous; in certain countries and time periods, the DFI may in fact be causing an increase in Gini, potentially as a result of the connection between urban elites and the adoption of mobile money in its early stages.

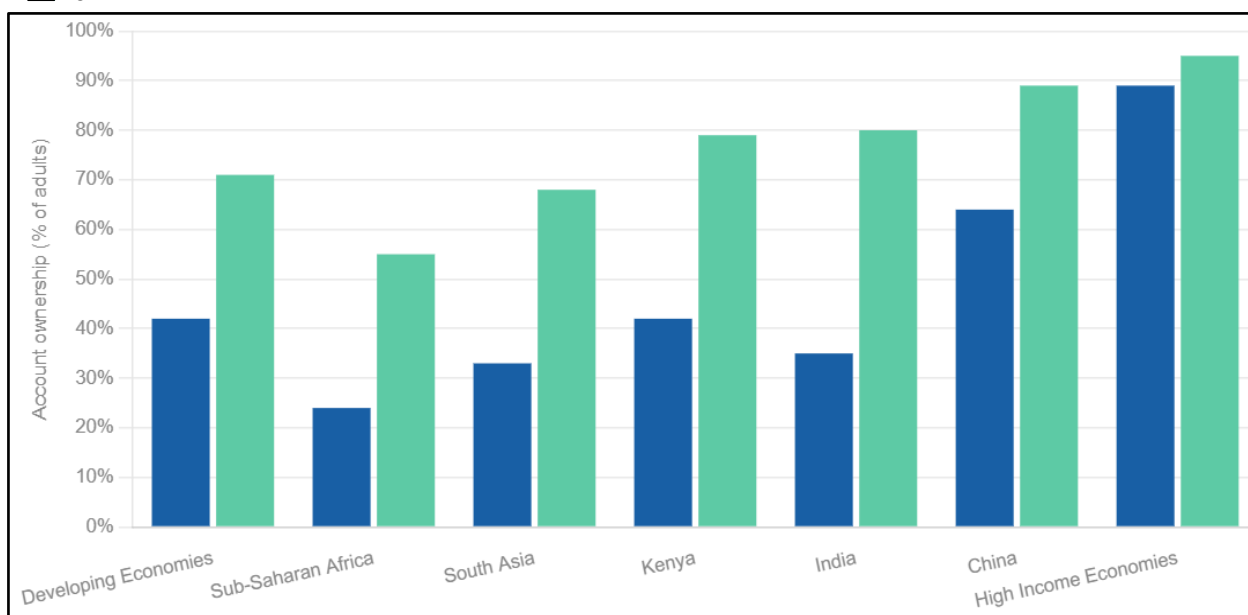
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In addition, these findings highlight that the regulatory and policy environment can have an impact on the rate at which countries in WAEMU reduce inequality with DFI and that those believing in the benefits of DFI have implemented a supportive regulatory framework for fintech innovations such as the introduction of mobile money interoperability regulations that allow for efficient transfer of funds across platforms. As a result of this ability to transfer funds between platforms, countries in WAEMU that have implemented supportive regulatory environments display greater and more rapid reductions in inequality from DFI. Therefore, complementary policy investment is critical to realizing a full benefit from DFI as the effectiveness of DFI to reduce inequality is maximized within an environment that supports DFI by having strong institutions, competition policy and consumer protection policies and regulation.

DATA SUMMARY AND STATISTICS

Global Progress in Financial Account Ownership (2011-2021)

■ 2011 ■ 2021



Source: World Bank Global Findex Database 2022

The table below depicts the rapid growth in account ownership of all people over the last ten years across different regions as reported by the World Bank's Global Findex Database. There are two compelling characteristics exhibited by these data. First, progress toward increasing access to and ownership of accounts has been greatest in areas that had the fewest accounts to begin with (i.e., Sub Saharan Africa, South Asia) and demonstrates a trend toward convergence. Second, mobile money has been the most significant factor contributing to the increase in Sub Saharan Africa; further, it has also substantially contributed to the increase in South Asia, whereas digital banking via the internet has been the primary driver in East Asia.

Region / Country	Account Ownership 2011 (%)	Account Ownership 2021 (%)	Change (pp)	Mobile Money Driver?
Developing Economies (avg.)	42	71	+29	Yes
Sub-Saharan Africa	24	55	+31	Yes (dominant)
South Asia	33	68	+35	Partially
Kenya	~42	79	+37	Yes (M-Pesa)
India	~35	~80	+45	Partially (PMJDY)
China	~64	~89	+25	Yes (Alipay/WeChat)

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Latin America & Caribbean	39	74	+35	Partially
High-Income Economies	89	95	+6	Less relevant

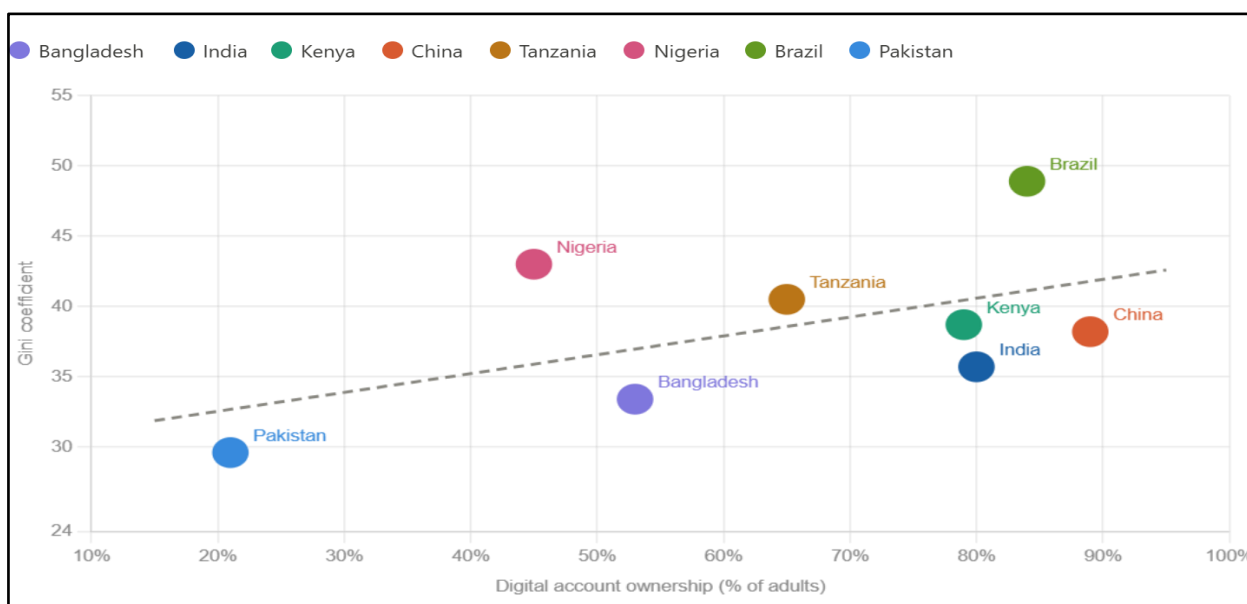
Source: World Bank Global Index Database 2022

The Digital Financial Inclusion – Gini Relationship

The relationship between the level of DFI penetration and the Gini coefficient across various developing countries is illustrated in Figure 1 (the schematic below). In an unweighted, simple cross-sectional scatter plot, we see a negative correlation (i.e., higher DFI penetration is associated with a lower Gini coefficient) between these two variables; however, the slopes of the individual country clusters vary according to the availability of digital infrastructure, the stability of regulatory systems for digital technologies, and the extent to which there exists an equitable governance structure in a country (i.e., countries that have these three attributes generally exhibit a steeper negative slope).

Country / Group	DFI Penetration (Mobile Accounts, % Adults)	Gini Coefficient (~2021)	Trend
Kenya	79%	38.7	Declining
Tanzania	65%	40.5	Declining
India	~80% (incl. PMJDY)	35.7	Broadly stable
China	~89%	38.2	Slowly declining
Brazil	~84%	48.9	Slowly declining
Nigeria	~45%	43.0	Volatile
Pakistan	~21%	29.6	Broadly stable
Bangladesh	~53%	33.4	Declining

Sources: World Bank Index Database (2022); World Bank Poverty and Inequality Platform. Note: Gini coefficients are approximate and subject to measurement variance.



Sources: World Bank Index Database (2022); World Bank Poverty and Inequality Platform. Note: relationship is illustrative; causal inference requires panel controls.

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M-Pesa and Poverty Reduction: Quantitative Evidence

A theoretical poverty reduction due to M-Pesa in Kenya was estimated to be 194,000 households by Suri and Jack (2016). This estimate is an anti-causal estimate derived by quasi-experimental design using agent density as a variable for mobile money access, therefore representing a lower bound estimate for causation. This represents a 2% reduction of poverty for Kenyan households, or approximately 2 percentage points of the overall poverty headcount ratio.

In comparison to the overall economy and the M-Pesa effect: for every 1% GDP growth, World Bank estimates indicate that 0.5-1 percentage points of poverty are removed (Ravallion, 2001). Thus, in regard to its poverty reduction impact, the M-Pesa effect is equivalent to 2-4 years of typical average GDP growth. This finding demonstrates what has been referred to as DFI's potential for being an equalising resource.

Critiques and Limitations

The Digital Divide and the Risk of a Fintech Matthew Effect

Critics claim that DFI actually contributes to income inequality by disproportionately benefitting people who already have the tools necessary to access digital financial services, including smartphones, reliable internet access, digital literacy and verified identities. This raises a possible scenario where growth in digital finance may ultimately make income inequality worse by creating two classes of financial service providers, an advanced digital service tier primarily used by higher-income individuals, and a cash-based tier generally used by lower-income individuals.

This is often referred to as the 'Matthew Effect' of fintech, based on the biblical saying "to he/she who has, much will be given." There are many lines of evidence to support the existence of this phenomenon. Daud et al. (2020) look at cross-country panel data and show that while digital technology overall has broad productivity gains, it has contributed to an expanding income gap, likely due to the fact that productivity gains from digital technology accrue to skilled workers and the owners of capital rather than being distributed evenly across the workforce. In India, the IMF (2021) demonstrates that digital access is still a challenge for many segments of the population, finding that the Internet penetration rate in rural areas is only about 1/3rd that of urban areas, and that women are much less likely than men to own a mobile phone or to have the digital literacy necessary to independently use financial services through mobile apps.

The worldwide gender gap in digital finance inclusion raises big questions about equality issues from an inequality standpoint. From the World Bank's 2022 data, we find that globally, women require assistance with their mobile money account usage 5% more than men do, as well as that developing countries have a six percentage point disparity in their mobile money account ownership between men and women, even though that disparity is decreasing over time. Because women comprise a larger proportion than men do of lower income quintiles across developing countries, lower digital finance engagement rates by women directly result in a smaller equalising impact of DFI.

Over-Indebtedness and Predatory Digital Lending

Secondly, it is important to note that the democratization of credit via digital platforms as a possible means of reducing inequality, but it can also lead to financial distress and exploitation of borrowers if those platforms are poorly regulated. According to the CGAP (2020), evidence exists that users of mobile micro-lending solutions in Kenya, Tanzania, and Uganda suffer from high levels of indebtedness and default on loans at a disproportionately high rate as first-time borrowers; moreover, there is evidence that many mobile micro-lending providers employ aggressive marketing tactics to acquire new customers.

The fact that mobile credit is so easily and quickly accessible (i.e., it is possible to be approved for, and receive disbursement of, a loan within 30 seconds with no involvement from a human), removes the friction that would otherwise protect a poorly informed borrower from incurring unsustainable levels of debt. Insights from behavioural economics suggest that low-income people, like all people, have a present bias and are naturally prone to underestimating the long-term cost of borrowing. Digital credit providers may have an incentive to facilitate this behaviour rather than correct it because their business model is based on high volumes of loans and repeated borrowing.

If digital credit allows for higher-than-usual levels of access, but costs more in terms of effective interest rates because they are used to fund short-term spending vs long-term productive investment, then the digital credit access channel could make economic inequality worse instead of helping reduce inequality. Therefore, it is essential to have strong consumer protection regulations, interest rate caps (as needed), as well as mandatory disclosure regulations on digital financial intermediaries (DFIs) who provide digital credit.

Measurement and Endogeneity Concerns

Methodological difficulties with defining and measuring DFI using empirical literature will restrict the confidence level with which researchers can make causal statements about the relationship between DFI and inequality. One significant methodological hurdle

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is that measuring DFI is extremely difficult because most of the cross-country studies have utilized a number of proxies for measuring DFI such as mobile phone penetration, number of mobile money accounts and other composite indices developed by combining disparate data sources together. Each of these proxy measures reflects different dimensions of DFI (e.g., access versus utilization; supply versus demand) and are not always closely aligned to measuring "true" financial inclusion.

Furthermore, endogeneity is a problem with regard to understanding DFI as it relates to inequality. DFI is not distributed randomly across countries/regions; countries/regions that have better infrastructure, higher education rates, greater availability of progressive regulation and higher per capita incomes typically tend to adopt DFI more frequently than countries/regions that do not exhibit these characteristics. As a result, these variables also have direct effects on reducing economic inequality. This suggests that DFI's causal effect on inequality could be biased by omitted variable bias due to the fact that the variables that are causing the bias are also what causes the DFI effect, thus leading to biased OLS coefficients. While a few researchers have attempted to develop acceptable instrumental variable strategies for quantifying these effects (e.g., agent density instrument proposed by Suri and Jack, 2016), at least at the cross-country level, researchers will have problems finding appropriate instruments.

Thirdly, running a meta-analytic review on studies of how financial inclusion affects economic growth published by Biru et al., (2024) warns against reverse causation: it is possible for less economic inequality to lead to higher requests for DFI and therefore have an effect of higher DFI, is what I mean by this as well as DFI causing less economic inequality. Even though panel data and dynamic estimation methods (like GMM) can be useful to remove reverse causation, they present other difficulties due to increased numbers of instruments used to account for weak instruments that may be identified.

Structural Limitations: Infrastructure, Regulation, and Literacy

In conclusion, it should be noted that DFI is not an independent solution for addressing income disparity. Rather, its impact will be affected by a number of other related elements that likewise are inequitably dispersed. For DFI to work properly, there needs to be appropriate and dependable digital networks (for example: mobile carrier networks, internet). The regulations governing these networks should equally promote open competitive marketplace conditions (including enabling fintech innovation), as well as protect users. In addition, many users will not have enough information regarding their financial literacy level to make adequately informed decisions regarding savings and borrowings and/or insurance policies due to their level of knowledge.

In many developing nations, especially in fragile (or conflict-impacted) nations, the conditions mentioned previously are either altogether absent or severely underdeveloped. Thus, although DFI can offer persons previously not financially included access to financial products/services (in this case enhanced digitalization in financial transactions), the promise and potential of DFI as an equalizer could reasonably be viewed as being mostly unrealized; as such, resources used to expand DFI could return insignificant social returns relative to investing in basic infrastructure, educational opportunities or public health care provision.

CONCLUSION

This article analyzed how much digital financial inclusion helps lower income inequality across various developing countries. It also looked at how digital financial inclusion reduces income inequality through different economic channels.

After evaluating the overall body of available evidence, there appears to be a limited but cautiously optimistic conclusion that digital financial inclusion (DFI) has played a meaningful role in reducing income inequality in several developing countries via five economic channels: 1) democratizing access to credit; 2) entrepreneurship and labor market effects; 3) mobilizing savings and managing risk; 4) lowering the cost of remittances; and 5) improving the delivery of social protection. The key supporting evidence of the effectiveness of these economic channels comes from Kenya, where the introduction and increase in the use of M-Pesa resulted in approximately 194,000 families being lifted out of poverty and 185,000 women leaving subsistence farming for higher productivity jobs. Additionally, large sample evidence from India, China, and WAEMU lends support to this causal relationship, and multiple cross-country panel analyses demonstrate a consistent statistically significant negative association between the penetration of DFI and Gini coefficients for developing countries.

The overall effect of DFI's equalisation is relatively small (approximately 1-3 Gini Points per standard deviation) with factors such as geographic location, and demographics contributing to a wide range of differences in outcome. The most alienated and marginalised population groups such as rural women, the elderly, people with disabilities, and those living in fragile-state conditions tend to encounter systematic barriers to entry due to barriers to digital access, insufficient digital literacy skills, and inadequate regulatory framework. As a result, the concept of the Fintech Matthew Effect emerges, whereby digital innovation can increase rather than decrease pre-existing inequalities and disadvantage within existing populations or society as a whole.

Therefore, any country/region/international institution that wants to exploit the use of DFI as a tool for reducing inequality needs to invest simultaneously in: (1) developing better digital infrastructure (with an emphasis on increasing access to rural mobile

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connections); (2) developing financial literacy and digital literacy programs specifically aimed at those individuals currently excluded; (3) creating gender-sensitive product design and regulatory frameworks; (4) establishing strong consumer protection through the implementation of strong digital financial infrastructures that would allow the effective delivery of social protection programs; and (5) putting DFI into practice by embedding them in broader policy environments promoting inclusivity. In order for DFI to be effective at reducing inequality, it must be adopted within an inclusive policy-oriented system; conversely, DFI will most likely increase inequality if there is no institution or regulatory framework to support it, or digital or financial activity is conducted in an environment of profound institutional inadequacy or systemic inequalities.

Future research must address many gaps in the literature. The first gap is the need for longer time series data to measure how long the inequalities-reducing effects of DFI will persist; this is important because the time series studies we have reviewed have all been short panel studies that are not able to accurately convey if the effective impacts of DFI lessen over time with more growth and possibly more over-indebtedness. The second critical gap is developing better evidence regarding the distributional effects of DFI within the bottom quintile of earners; the literature has yet to answer the question of whether DFI benefits the 'poorest of the poor' or just the 'connected poor.' Third, we need greater clarity about the entire economy's general equilibrium effects stemming from DFI: how it affects labor markets, goods markets, and the provision of public services.

In conclusion, digital financial inclusion benefits developing countries' efforts to decrease income inequality through DFI, but by itself, it does not eliminate the problem. DFI's viability as an economic tool relies heavily on support from complementary investment and policy measures; the potential risks of DFI (over-indebtedness, algorithmic discrimination, and digital exclusion) are significant and will require an active management approach. However, if implemented thoughtfully and in conjunction with a broader inclusive development strategy, DFI has potential as one of the most effective strategies for turning economic growth into prosperous development for the majority of citizens.

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