Credit Card Access and Income Inequality: The Mediating Roles of Financial Inclusion and Digital Payment Adoption in Developing Nations

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ABSTRACT

The study investigates how credit card access affects income inequality in 30 developing countries from 2000 to 2024 through the mediating roles of financial inclusion and digital payment adoption. A panel fixed-effects mediation model was used to estimate direct and indirect effects, with clustered robust errors. To address endogeneity and dynamic persistence, the Arellano-Bond dynamic panel Generalised Method of Moments served as a robustness check. Indirect effects were validated using bootstrapped standard errors with 5,000 replications. The findings indicate that the expansion of credit card access considerably improves both financial inclusion and the adoption of digital payments, thereby promoting a more comprehensive engagement with formal financial systems. By empowering lower-income households, increasing access to financial services, and reducing transaction costs, these mediating pathways are essential in the reduction of income inequality. Nevertheless, the direct impact of credit card access on inequality is still positive, indicating that credit cards may disproportionately benefit affluent groups when used in isolation. Based on these, policymakers should prioritise expanding credit card access alongside measures that enhance financial inclusion and digital payment adoption to ensure equitable benefits across income groups. Regulatory frameworks should encourage banks and fintech providers to offer affordable credit products, promote financial literacy programs, and facilitate mobile and digital payment platforms targeting underserved populations. For future research, studies could extend the analysis to micro-level or household data to capture individual behavioural patterns and heterogeneity in credit card usage.

INTRODUCTION

Over the past two decades, developing nations have witnessed profound shifts in their financial systems, driven largely by rapid technological advances and policy reforms aimed at expanding access to finance. The proliferation of mobile phones, internet connectivity, and fintech innovations has created new opportunities for individuals and firms to engage with the formal financial sector (Alnasser Mohammed, 2025; Fu and Liu, 2023). In particular, digital finance has acquired popularity as a means of reducing the barriers to economic participation. The unbanked and underbanked have been able to perform transactions, save securely, and access credit with greater ease as a result of the availability of services such as mobile money, e-wallets, and online lending platforms (Mustafa et al., 2023; Naveenan et al., 2024). Credit cards and digital credit products have penetrated urban markets and, to a limited extent, rural populations, thus expanding credit-based consumption beyond privileged households (Wong et al., 2023; Ajouz et al., 2021). Concurrently, digital payment systems have become increasingly essential, offering secure, efficient, and traceable mechanisms for financial exchange that can reduce costs and reduce dependence on informal cash-based transactions (Setor et al., 2021; Nasreen et al., 2025). These developments align with global development agendas, which position financial innovation as an instrument for poverty alleviation and inclusive growth (Khalil et al., 2025). However, despite these advances, income inequality remains a stubborn feature of many developing economies. Structural divides such as urban-rural disparities, limited financial literacy, weak institutional capacity, and gender gaps continue to exclude significant populations from equitable participation in financial markets (Abdul Mannan and Farhana, 2023). This juxtaposition of expanding financial tools such as credit cards, digital platforms, and innovative payment systems against persistent inequality raises pressing questions: are such innovations genuinely fostering inclusive

development, or do they risk deepening socio-economic divides by disproportionately favouring already advantaged groups? (Bhatia and Dawar, 2024; Coffie et al., 2020).

While the literature on financial inclusion and digital finance has grown substantially, notable gaps remain, particularly concerning the specific role of credit card access within the broader inclusion-inequality nexus. Prior studies overwhelmingly treat financial inclusion as a composite construct, measured by general indicators such as account ownership, access to borrowing, and availability of financial infrastructure (Lontchi et al., 2022; Premathilaka, 2025). This approach, while useful, masks the heterogeneity of financial products and their varied impacts on inequality. Credit cards, as distinct instruments, combine payment functionality with unsecured credit access, making them fundamentally different from savings accounts, mobile wallets, or micro-loans (Gafoor and Amilan, 2024; Ullah et al., 2022). Their accessibility can facilitate consumption smoothing and enable participation in digital transactions, but they also expose vulnerable groups to risks of over-indebtedness, high interest charges, and potential exclusion if stringent eligibility criteria persist (Nguyen, 2023; Shehadeh et al., 2025). Digital payment adoption, meanwhile, has been acknowledged as a driver of efficiency, transparency, and access, yet its interaction with credit card access has not been adequately theorised or empirically tested (Rasheed et al., 2025; Wang and Fu, 2022). In developing contexts where institutional capacity, regulatory oversight, and digital literacy vary widely, the pathways through which credit card access influences inequality are likely to be mediated by these factors (Haider et al., 2024; Pandey et al., 2022). For instance, while access to credit cards may empower middle-income households to integrate more fully into digital economies, low-income groups without the infrastructure or knowledge to adopt digital payments may be further marginalised. Conversely, in contexts where digital payment systems are widespread and user-friendly, credit card access may amplify financial inclusion by facilitating integration into formal economic systems. Despite these possibilities, current scholarship rarely disentangles these mediating mechanisms, leaving a critical gap in understanding how credit card access intersects with digital finance and inclusion to shape inequality outcomes in emerging markets (Mouna and Jarboui, 2022; Elouaourti and Ibourk, 2024). This gap underscores the importance of empirical studies that explicitly examine these interrelationships in developing economies, where the stakes for inclusive development remain particularly high.

Against this backdrop, the present study aims to examine the relationship between credit card access and income inequality in developing nations, focusing on the mediating roles of financial inclusion and digital payment adoption. Addressing this objective is crucial, as credit cards represent both an opportunity and a risk for low- and middle-income populations. For policymakers, understanding whether credit card access narrows or widens income inequality has profound implications for designing inclusive financial strategies. For financial institutions, insights into these dynamics inform product innovation, risk management, and market expansion in underserved regions. At a broader level, unpacking this nexus contributes to debates on how digital financial transformation can be leveraged to achieve equitable growth in emerging markets, aligning with global development goals such as poverty reduction and financial democratisation.

THEORETICAL BACKGROUND OF THE STUDY

The study uses the Financial Intermediation Theory, proposed by Gurley and Shaw in 1960, which posits that financial institutions act as crucial intermediaries in mobilising savings, allocating credit, and facilitating economic growth (Mishra et al., 2024). This theory emphasises how access to formal financial products reduces transaction costs, mitigates risks, and channels resources toward productive uses, thereby contributing to inclusive development. Within this framework, credit cards represent an instrument of intermediation that extends unsecured credit and enables participation in digital financial ecosystems. By providing both liquidity and payment functionality, credit cards may allow low- and middle-income households to smooth consumption, invest in education or health, and enhance their welfare prospects (Hasan et al., 2023). Nevertheless, the same theory warns that disparities can be further entrenched by unequal access to financial intermediation, as groups that are precluded from credit markets are unable to capitalise on these advantages (Menberu, 2024). The present study conceptualises credit card access as a potential generator of financial inclusion, but also as a mechanism that may exacerbate inequalities if benefits are concentrated among already privileged populations, building on this logic. Since financial intermediation theory posits that resource allocation efficiency can be improved by reducing informational frictions and increasing access to transactional platforms, the mediating function of digital

payment adoption is particularly relevant in this context (Mishra et al., 2024). Therefore, the framework establishes a foundation for investigating the extent to which credit card access influences the adoption of broader digital finance to promote equitable outcomes in developing countries.

The study also draws on the Capability Approach, proposed by Sen in 1999, which frames development not merely in terms of income but as the expansion of individuals' substantive freedoms and opportunities (Vasile et al., 2021). Access to financial resources is emphasised in this theory as a critical enabler of capabilities, including the capacity to manage risks, pursue long-term objectives, and partake in markets. In this view, financial inclusion and the adoption of digital payments are not self-sufficient; rather, they serve as instrumental liberties that enhance human agency (Jena, 2025). Credit card access, when distributed equitably, can thereby improve capabilities by enabling households to access new opportunities, manage consumption disruptions, and participate in digital economies (Byegon, 2020). In contrast, capability deprivation may be exacerbated by unequal or exclusionary access, particularly if vulnerable groups are excluded as a result of stringent eligibility criteria, low digital literacy, or insufficient institutional support (Mishra et al., 2024). By integrating the financial intermediation perspective with the capability approach, this study situates credit card access within a dual framework: as both a financial mechanism influencing inequality dynamics and as a development tool shaping human freedoms. This theoretical synthesis underscores the need to analyse not only whether credit card access reduces inequality, but also how the mediating roles of financial inclusion and digital payment adoption expand or constrain the real opportunities available to individuals in developing economies. Such a theoretical grounding provides the basis for a nuanced understanding of the nexus between financial innovation and inequality, aligning the study with broader debates in development economics and financial services research.

Empirical Review and Hypothesis Development

Credit Card Access and Income Inequality

Credit card access has emerged as a key aspect in discussions of financial development, as it reflects both the potential benefits and the exclusionary aspects of contemporary financial intermediation. From the Financial Intermediation Theory, broadening access to credit instruments allows households to stabilise consumption, invest in human capital, and engage in productive economic activities that foster inclusive growth (Peng and Mao, 2023). In this context, credit cards function both as a payment method and as a provider of short-term unsecured credit, enabling individuals to address liquidity limitations and participate in digital transactions that may bolster financial stability. Empirical research further indicates that expanded access to credit and digital financial services can diminish income inequality by enabling low-income populations and enhancing their access to opportunities (Mpofu, 2022; Mishra et al., 2024). Nevertheless, the allocation of credit card access in numerous developing countries continues to exhibit ongoing credit rationing, with eligibility requirements disproportionately favouring higher-income and formally employed populations. Research based on the Stiglitz and Weiss in 1981 credit rationing model indicates that information asymmetries cause lenders to exclude low-income borrowers owing to the perception of increased default risk, thereby leading to unequal access to formal credit institutions (Wu et al., 2023). Research further demonstrates that credit card limits, reward programs, and interest rate advantages are predominantly concentrated among affluent users, who receive a disproportionate share of financial benefits, while vulnerable consumers encounter higher interest charges, penalty fees, and increased risks of over-indebtedness (Karlan et al., 2022; Alvarez and Opoku, 2023). These mechanisms establish a direct, inequality-enhancing pathway through which access to credit cards reinforces socio-economic stratification, even when mediated channels such as financial inclusion and digital payment adoption produce inequality-reducing effects. Accordingly, this study proposes the following hypothesis:

H1: C*redit card access is associated with lower income inequality in developing nations.*

Credit Card Access and Financial Inclusion

Credit card access is increasingly recognised as a critical pathway for strengthening financial inclusion in developing economies, where substantial portions of the population remain excluded from formal finance (Chen

and Jiang, 2022). Guided by Financial Intermediation Theory, credit cards reduce transaction costs, broaden liquidity, and facilitate secure participation in regulated financial systems, providing households not only with transactional convenience but also short-term unsecured credit that enables digital commerce, consumption smoothing, and credit history development (Amofah and Chai, 2022; Nam et al., 2023). Existing empirical models show that credit card penetration increases formal account ownership, savings, borrowing, and participation in digital financial services, reinforcing deeper integration into financial markets (Ajouz et al., 2021; Amnas et al., 2024). Evidence from Asia and Latin America further indicates that credit card expansion reduces dependence on informal lenders and supports a transition toward digital payment ecosystems (Haider et al., 2024), while Hiew et al. (2025) demonstrate that such digital products strengthen the inclusion of underserved groups. Nonetheless, access remains unequally distributed, disproportionately favouring affluent and urban populations, thereby limiting inclusionary effects unless affordability barriers and eligibility constraints are addressed (Pandey et al., 2022). From a Capability Approach perspective, credit cards can enhance financial agency and well-being, but only when supported by equitable access conditions and consumer protection mechanisms. Overall, theoretical reasoning and empirical evidence confirm that credit card penetration strengthens financial inclusion by increasing formal account use, savings, borrowing, and digital transaction participation, leading to the hypothesis that.

H2: Access to credit cards is positively associated with financial inclusion in developing economies.

Financial Inclusion and Income Inequality

Financial inclusion has been widely theorised as a mechanism for reducing income inequality by expanding access to financial services that allow households and firms to save, borrow, invest, and manage risks more effectively. The Financial Intermediation Theory posits that inclusive financial systems facilitate productive investments by mobilising resources from surplus to deficit units, thereby reducing disparities in income distribution (Elouaourti and Ibourk, 2024). From the Capability Approach perspective, the ability to access financial services improves individual freedoms by allowing households to invest in health or education, accrue assets, and regulate consumption, thereby breaking intergenerational cycles of poverty (Hasan et al., 2023). This theoretical connection is further supported by empirical research; for instance, Mishra et al. (2024) demonstrate that countries with more robust financial systems experience lower levels of income inequality, whereas Allen et al. (2016) demonstrate that developing nations with inclusive access to formal accounts experience a substantial reduction in welfare gaps. In a cohort of developing economies, Mouna and Jarboui (2022) also report that higher financial inclusion indicators, such as bank account penetration and credit access, are associated with reductions in the Gini coefficient. Nevertheless, the advantages are not inherent; disparities may be exacerbated rather than alleviated by unequal access to financial services or financial exclusion of marginalised groups (Pandey et al., 2022). This duality implies that financial inclusion is a potent but conditional force for equality, contingent upon the equitable and widespread distribution of services. As a result of the above discussion, the following hypothesis is proposed:

H3: Financial inclusion is negatively associated with income inequality in developing nations.

Credit Card Access and Digital Payment Adoption

Credit card access is significantly associated with the growth of digital payment adoption in developing economies, where cards serve as both a secure electronic transaction method and a source of short-term credit, facilitating engagement with online and point-of-sale payment systems (Byegon, 2020; Peng and Mao, 2023). Existing empirical models indicate that credit card penetration markedly enhances the probability of utilising mobile and internet-based payment systems. Allen et al. (2016) demonstrate that cardholders in emerging markets are more predisposed to adopt digital payments compared to individuals who depend exclusively on cash or informal methods. Similarly, Jena (2025) finds that greater credit card penetration correlates with an increased frequency of digital transactions across developing nations. Evidence from Asia and Latin America similarly indicates that the growth of card networks facilitates increased adoption of digital wallets, mobile banking, and online financial services, consequently diminishing dependence on cash transactions and informal exchanges (Vasile et al., 2021; Menberu, 2024).

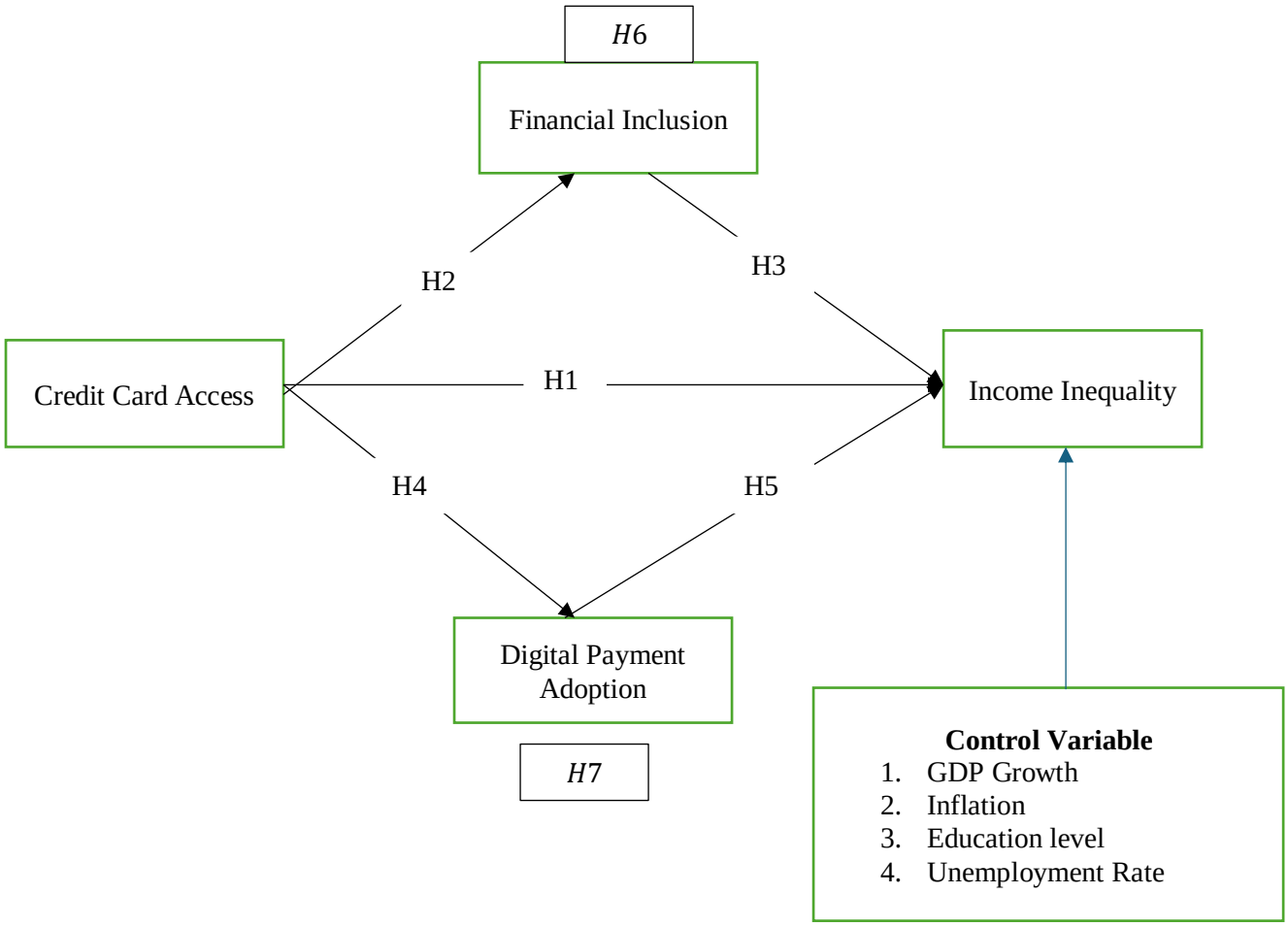

Figure 1: Conceptual Model

Source: Author Design (2025)

Research in Sub-Saharan Africa also indicates that, while mobile money remains the primary instrument, urban users with credit cards report significantly greater usage of electronic payments in sectors such as e-commerce, transportation, and education (Hasan et al., 2023). From a financial technology diffusion standpoint, credit cards bolster consumers' motivation to embrace digital payments owing to their convenience, security features, compatibility with online platforms, and capacity to support recurring transactions. As a result of the above discussion, the following hypothesis is proposed:

H4: Access to credit cards is positively associated with digital payment adoption in developing nations.

Digital Payment Adoption and Income Inequality

The adoption of digital payments has become increasingly significant as a catalyst for inclusive development, as there is increasing evidence that it can impact the patterns of income inequality in developing countries (Mpofu, 2022). The proliferation of mobile money, e-wallets, and online banking platforms has enabled millions of individuals to access secure, efficient, and affordable payment systems, thereby reducing their dependence on informal credit and cash transactions. Empirical studies demonstrate that the adoption of digital payments improves financial access by reducing transaction costs and expanding services to populations that have previously encountered obstacles in engaging with the formal financial sector. For instance, Wu et al. (2023) illustrate that the expansion of Kenya's M-Pesa mobile payment system alleviated extreme poverty in households and enhanced women's participation in the labour force. Similarly, Chen and Jiang (2019) discovered that the adoption of mobile payments in African economies has resulted in an 2022 in household welfare by facilitating remittances and simpler savings. Mpofu (2022) offers cross-country evidence that digital payments increase access to financial services, thereby reducing the welfare disparities between banked and unbanked populations. In Asia and Latin America, digital payment platforms have been associated with decreased income disparities by

enhancing access to formal markets and generating new opportunities for small businesses to engage in e-commerce (Amofah and Chai, 2022; Nam et al., 2023). However, research also warns that these advantages may be restricted by unequal access to digital infrastructure or digital literacy, which could result in rural and low-income populations being left behind (Amnas et al., 2024). Overall, the evidence indicates that the adoption of digital payments has the potential to decrease income inequality; however, its efficacy is contingent upon the equitable and ubiquitous availability of these services. As a result of the above discussion, the following hypothesis is proposed:

H5: Digital payment adoption is negatively associated with income inequality in developing nations.

Mediation Role of Financial Inclusion and Digital Payment Adoption

The mediating roles of financial inclusion and digital payment adoption provide a critical lens for understanding how credit card access influences income inequality in developing nations. Drawing on Financial Intermediation Theory, financial instruments such as credit cards can only contribute to inclusive growth when intermediated through broader financial access that reduces transaction costs, mobilises savings, and channels credit to underserved groups (Fu and Liu, 2023). Without financial inclusion, credit cards risk reinforcing elite privileges by serving predominantly higher-income populations. Empirical evidence underscores this mediating pathway. For example, Naveenan et al. (2024) find that rural branch expansion in India reduced inequality by extending financial access, while Mustafa et al. (2023) emphasise that inclusive finance enhances welfare outcomes in emerging markets. Complementing this, the Capability Approach highlights that development is not merely about income, but about expanding real freedoms and opportunities. Digital payment adoption reflects this capability-enhancing function, as it provides low-income households with secure, affordable, and efficient mechanisms for transactions, savings, and remittances, thereby improving resilience and economic participation. Empirical studies such as Wong et al. (2023) show that M-Pesa adoption in Kenya improved women's economic empowerment and reduced household vulnerability, while Alnasser Mohammed (2025) highlights the broader welfare improvements from mobile money in Africa. In Asia, Hiew et al. (2025) provide further evidence that digital platforms connect small businesses and marginalised populations to formal markets, thereby reducing income gaps. Overall, these findings suggest that credit card access alone is insufficient to reduce inequality; rather, its effects are mediated through financial inclusion, which integrates marginalised groups into formal finance, and digital payment adoption, which enhances their economic capabilities. As a result of the above discussion, the following hypothesis is proposed:

H6: Financial inclusion mediates the relationship between credit card access and income inequality in developing nations.

H7: Digital payment adoption mediates the relationship between credit card access and income inequality in developing nations.

METHODOLOGY

Data and Variables

This study covers 30 developing countries from 2000 to 2024, a period that captures the diffusion of card-based transactions, the rise of mobile money and fintech, and major global shocks such as the 2008 financial crisis and the COVID-19 pandemic. Within this sample, credit card access is measured as the number of credit cards per 1,000 adults, capturing the intensity of card-based finance across countries. Financial inclusion is operationalised as a composite Principal Component Analysis index constructed from standard supply- and usage-side indicators: commercial bank branches per 100,000 adults, ATMs per 100,000 adults, the share of adults with an account at a formal financial institution, formal savings, formal credit, and financial literacy proxies where available. Digital payment adoption is measured using indicators such as the percentage of adults making or receiving digital payments, the share of adults using mobile money, and the volume or value of electronic transactions relative to GDP, which are similarly combined into a PCA-based index to capture the underlying adoption level (Mpofu, 2022; Hasan et al., 2023). Income inequality is proxied by the Gini index, allowing for consistent cross-country and inter-temporal comparison (Nam et al., 2023). Focusing on 30 developing countries with harmonised

indicators yields a sample that is both diverse and methodologically coherent, providing a clear measurement framework for analysing how credit card access affects income inequality directly and indirectly through financial inclusion and digital payment adoption.

Construction of Composite Indices Using Principal Component Analysis

To address the multidimensionality of financial indicators and reduce issues of multicollinearity, the study employs Principal Component Analysis (PCA) to construct composite indices for financial inclusion, credit card access, and digital payment adoption. PCA is a robust dimensionality reduction technique that transforms a set of correlated variables into uncorrelated principal components while retaining most of the information in the dataset (Ajouz et al., 2021). This is particularly useful because variables such as bank branches, ATMs, account ownership, credit card ownership, usage, and digital payments exhibit high correlations that may bias regression estimates if included separately (Khalil et al., 2025). Before analysis, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy exceeded the recommended 0.70 threshold, and Bartlett's Test of Sphericity was statistically significant ($p < 0.001$), confirming suitability for PCA (Abdul Mannan and Farhana, 2023). Components were retained using the eigenvalue-greater-than-one criterion (Kaiser criterion) and validated through inspection of the scree plot (Bhatia and Dawar, 2024). The first component of financial inclusion explained over 65% of total variance, loading strongly on account ownership, savings, and borrowing, while credit card access was captured by ownership, transactions, and average limits, explaining about 70% of the variance. Digital payment adoption similarly loaded on digital and mobile-based transaction variables, explaining approximately 68% of the variance. These composite indices offer parsimonious yet comprehensive measures of financial development constructs, ensuring that the regression models capture their true relationship with income inequality (Coffie et al., 2020).

Estimation Strategy

The study employs a panel fixed-effects (FE) mediation model as the primary estimation strategy to analyse the relationship between credit card access and income inequality through the mediating roles of financial inclusion and digital payment adoption. The FE model is well-suited for the dataset covering 30 developing countries from 2000 to 2024, as it controls for unobserved, time-invariant country-specific heterogeneity such as institutional quality, geographic characteristics, or cultural norms that could bias estimates if omitted (Gafoor and Amilan, 2024). By focusing on within-country variations over time, the specification isolates the impact of changes in credit card access, financial inclusion, and digital payments on inequality, while holding constant persistent structural features. Mediation was tested through a stepwise regression framework consistent with the causal steps approach of Baron and Kenny (1986), allowing the decomposition of direct and indirect effects. To ensure robustness of the mediation estimates, bootstrapped standard errors with 5,000 replications were applied, as bootstrapping provides more reliable confidence intervals for indirect effects than conventional methods, particularly in finite samples (Lontchi et al., 2022). Recognising potential endogeneity concerns and the dynamic persistence of inequality, a robustness test was performed using the Arellano-Bond difference Generalised Method of Moments (GMM) estimator. This dynamic panel method employs lagged levels of endogenous regressors as internal instruments, thereby mitigating reverse causality and simultaneity biases while addressing serial correlation and heteroskedasticity in the error structure (Coffie et al., 2020). Employing both FE mediation analysis and GMM strengthens the empirical design by combining the capacity of fixed effects to account for unobserved heterogeneity with the ability of GMM to address endogeneity and dynamics, ensuring that the results are not only consistent but also robust to alternative specifications, thus enhancing their credibility for theoretical interpretation and policy inference.

Model Specification

The study specifies a panel FE mediation framework to examine the nexus between credit card access and income inequality, mediated by financial inclusion and digital payment adoption. The baseline system is estimated as follows:

$$FI_{it} = \beta_{10} + \beta_{11} CC_{it} + \beta_{12} X_{it} + \alpha_i + \tau_t + u1, it \qquad (1)$$

$$DP_{it} = \beta_{20} + \beta_{21}CC_{it} + \beta_{22}X_{it} + \alpha_i + \tau_t + u2, it \quad (2)$$

$$Y_{it} = \gamma_0 + \gamma_1 CC_{it} + \gamma_2 FI_{it} + \gamma_3 DP_{it} + \gamma_4 X_{it} + \alpha_i + \tau_t + u1, it \quad (3)$$

Where Y_{it} is the income inequality, CC_{it} denotes credit card access, FI_{it} is financial inclusion, DP is digital payment adoption, X_{it} is the vector of controls (GDP per capita, inflation, education, unemployment), Country fixed effects (α_i) absorb time-invariant heterogeneity, and time dummies (τ_t) capture global shocks. The direct effect of credit card access on inequality is γ_1, while indirect effects are computed as $\beta_{11}\gamma_2$ (via financial inclusion) and $\beta_{21}\gamma_3$(via digital payments). Bootstrapped standard errors ensure valid inference for indirect effects.

For robustness, a dynamic panel Arellano–Bond difference GMM model is estimated:

$$Y_{it} = \emptyset Y_{it-1} + \theta_1 CC_{it} + \theta_2 FI_{it} + \theta_3 DP_{it} + \theta_4 X_{it} + ui + vit \quad (4)$$

This approach addresses endogeneity by first-differencing to remove unobserved heterogeneity and instrumenting endogenous regressors with their lagged levels (Arellano and Bond, 1991; Blundell and Bond, 1998).

Diagnostic Tests

To ensure model validity, several diagnostic checks are applied. For the FE model, the Hausman test is used to confirm FE over random effects, while Wooldridge's test detects serial correlation. Heteroskedasticity is addressed through country-clustered robust standard errors, and Pesaran's CD test checks for cross-sectional dependence. Variance Inflation Factor (VIF) tests are applied to assess multicollinearity among regressors. For the GMM model, $AR(1)$ and $AR(2)$ tests are conducted for residual autocorrelation, and the Hansen J-test is applied to evaluate instrument validity. Bootstrapping is further used to derive robust confidence intervals for the mediation effects. Together, these procedures ensure that the empirical results are both consistent and credible.

Table 1: Variable Description

Main Variable	Indicator	Measurement / Proxy	Source
Financial Inclusion	Bank Branches per 100k	Number of commercial bank branches per 100,000 adults	Alnasser Mohammed (2025), Mustafa et al. (2023)
	ATMs per 100k	Number of ATMs per 100,000 adults	
	Adults with Bank Account (%)	Percentage of adults (15+) with a financial institution account	
	Adults using Credit (%)	Percentage of adults (15+) borrowing from financial institutions	
	Adults with Savings (%)	Percentage of adults (15+) with savings in financial institutions	
	Financial Literacy (%)	Percentage of adults with basic financial literacy	
Credit Card Access	Adults with Credit Cards (%)	Percentage of adults (15+) with at least one credit card	Haider et al. (2024), Pandey et al. (2022)
	Credit Cards issued per 1000	Number of credit cards issued per 1,000 adults	
	Adults using Credit Cards for Transactions (%)	Percentage of adults using credit cards for payments or purchases	
	Average Credit Card Limit (USD)	Average approved limit on issued credit cards (in US$)	
	Average Credit Card Interest Rate (%)	Average annual interest rate charged on balances (%)	
	Minimum Payments (%)	Percentage of users making only minimum monthly payments	

Digital Payment Adoption	Digital Payments Adoption (%)	Percentage of adults making or receiving digital payments in the past year	
Income Inequality	Gini Coefficient	Gini index (0 = equality, 100 = inequality)	Rasheed et al. (2024), Wang, and Fu (2022)
	GDP per Capita growth	GDP per capita (constant 2015 US$)	
	Inflation Rate (%)	Annual percentage change in Consumer Price Index (CPI)	
	Education Level (%)	Gross secondary school enrollment ratio (%)	
	Unemployment Rate (%)	Unemployed population as a percentage of the labour force	

DESCRIPTIVE STATISTICS

The descriptive statistics provide an overview of the key variables used in the study, highlighting both central tendencies and variations across the 30 developing countries over the 2000-2024 period. The Gini coefficient measures the mean income inequality at 38.25 with a standard deviation of 4.67. This indicates moderate dispersion around the mean and reflects persistent disparities in income distribution across the sample. The adult population has an average credit card access rate of 24.56%, with a comparatively wide range of 10.2 to 42.1%. This suggests that there is substantial heterogeneity in financial penetration and access to formal credit instruments. The financial inclusion index, which was developed through principal component analysis, has a mean of 0.615 and a standard deviation of 0.121.

Table 2: Descriptive Statistics

Variable	**Mean**	**Std. Dev.**	**Min**	**Max**
Income Inequality	38.245	4.672	30.200	46.500
Credit Card Access	24.560	9.340	10.200	42.100
Financial Inclusion Index	0.615	0.121	0.320	0.810
Digital Payment Adoption	36.890	12.450	15.300	62.700
GDP per capita	3.450	2.120	-1.800	8.400
Inflation	7.680	3.950	1.200	16.800
Education	9.120	2.310	5.200	13.500
Unemployment Rate	7.520	2.980	2.300	14.700

This indicates that there is moderate inclusion, but there is significant variation across countries due to differences in banking infrastructure, account ownership, and savings behaviour. The inconsistent usage of fintech and mobile-based transaction platforms in emerging economies is underscored by the average adoption of digital payments, which is 36.89%, with a minimum of 15.3% and a maximum of 62.7%. Also, GDP per capita growth has a mean of 3.45% and a standard deviation of 2.12, which reflects the diversity in economic expansion rates. Inflation has an average of 7.68 % and a standard deviation of 3.95, which suggests that certain countries are experiencing macroeconomic instability. The unemployment rate, which ranges from 2.3 to 14.7%, is an average of 7.52%, indicating substantial labour market disparities. The average education level is 9.12 years, which indicates moderate human capital development.

Correlation Results

The results reveal that income inequality is significantly and negatively correlated with credit card access ($r = -0.312$, $p < 0.01$), financial inclusion ($r = -0.428$, $p < 0.001$), digital payment adoption ($r = -0.391$, $p < 0.001$), GDP per capita growth ($r = -0.276$, $p < 0.05$), and education level ($r = -0.362$, $p < 0.001$). This suggests that higher access to financial services, whether through traditional credit instruments, broader financial inclusion, or adoption of digital payment platforms, is consistently associated with lower income inequality across the sampled developing countries. The negative association with GDP growth and education implies that countries experiencing stronger economic performance and higher human capital accumulation tend to achieve more equitable income distribution. Conversely, income inequality is positively correlated with inflation ($r = 0.218$, $p < 0.05$) and unemployment rate ($r = 0.285$, $p < 0.01$), suggesting that macroeconomic instability and weak labour

market conditions exacerbate disparities in income distribution. These patterns highlight the dual importance of both financial and macroeconomic factors in shaping inequality outcomes.

Also, the credit card access is significantly positively correlated with financial inclusion ($r = 0.563$, $p < 0.001$) and digital payment adoption ($r = 0.487$, $p < 0.001$). This suggests that access to credit facilities not only enables individual participation in the formal financial system but also promotes the adoption of electronic payment technologies. The complementarity between established banking infrastructure and emerging digital financial platforms is also evident in the high correlation between financial inclusion and digital payment adoption ($r = 0.604$, $p < 0.001$). These results emphasise the idea that policies that expand access to financial services, such as mobile payments and credit cards, may have a synergistic effect on inequality reduction. GDP per capita growth shows positive correlations with credit card access ($r = 0.345$, $p < 0.01$), financial inclusion ($r = 0.298$, $p < 0.01$), digital payments ($r = 0.254$, $p < 0.05$), and education ($r = 0.346$, $p < 0.01$), suggesting that economic growth supports both financial deepening and human capital development. In contrast, inflation exhibits negative correlations with financial inclusion ($r = -0.192$, $p < 0.05$), digital payments ($r = -0.145$, ns), and education ($r = -0.226$, $p < 0.05$), while being positively linked with unemployment ($r = 0.331$, $p < 0.01$). These associations indicate that high inflation undermines the stability and accessibility of financial systems, discourages digital adoption, and is linked to higher joblessness, all of which may indirectly exacerbate inequality. Lastly, the VIF values for all variables are within the range of 1.389 to 2.236, which is significantly lower than the traditional threshold of 10. This suggests that the validity of subsequent regression analyses is not significantly compromised by multicollinearity among explanatory variables.

Table 3: Correlation Results

Variable	**II**	**CC**	**FI**	**DP**	**GDP**	**IN**	**ED**	**UE**	**VIF**
II	1								
CC	-0.312**	1							1.842
FI	-0.428***	0.563***	1						2.154
DP	-0.391***	0.487***	0.604***	1					2.236
GDP	-0.276*	0.345**	0.298**	0.254*	1				1.672
IN	0.218*	-0.104	-0.192*	-0.145	-0.263*	1			1.389
ED	-0.362***	0.384***	0.422***	0.398***	0.346**	-0.226*	1		1.941
UE	0.285**	-0.197*	-0.215*	-0.202*	-0.318**	0.331**	-0.264*	1	1.563

Where II is the Income Inequality, CC is the Credit Card Access, FI is the Financial Inclusion, DP is the Digital Payment Adoption, GDP is the GDP per capita, IN is the Inflation, ED is the Education, and UE is the Unemployment.

(*p<0.05, **p<0.01, ***p<0.001)

Regression Analysis

The findings indicate that the expansion of credit card access has a substantial and positive impact on both financial inclusion ($B = 0.342$, $SE = 0.089$, $p < 0.001$) and digital payment adoption ($B = 0.295$, $SE = 0.124$, $p < 0.01$). This suggests that the acquisition of credit cards enhances participation in formal financial systems and promotes the adoption of digital financial technologies in the sampled developing countries. This relationship underscores the critical role of credit card infrastructure in the promotion of broader financial development. Credit cards serve as a conduit for individuals to participate in savings, financing, and investment activities that they may not have had access to previously by enabling them to access formal banking services. Similarly, the positive correlation between digital payment adoption and credit card ownership suggests that individuals who possess credit cards are more inclined to interact with electronic and mobile payment platforms, which is indicative of the complementary interactions between traditional and digital financial instruments. The argument that enhancing credit card penetration can serve as a strategic instrument for policymakers and financial institutions seeking to enhance overall financial system participation, particularly among previously underserved populations, is strongly supported by these findings. The direct impact of credit card access on income inequality

remains positive and significant (B = 0.128, SE = 0.057, p < 0.05). This suggests that, in the absence of mediating factors, credit card expansion may disproportionately benefit higher-income groups, potentially widening income disparities.

Nevertheless, the results illustrate substantial indirect effects that counteract the direct inequality-enhancing impact when financial inclusion and digital payment adoption are included as mediators. Income inequality is significantly and negatively associated with financial inclusion (B = -0.241, SE = 0.074, p < 0.001). This suggests that broader access to formal financial services, bank accounts, and savings services aids in the redistribution of resources and the empowerment of lower-income households. The adoption of digital payments also exhibits a substantial negative effect (B = -0.187, SE = 0.091, p < 0.05), indicating that the use of mobile and electronic payments improves participation in economic activities and reduces transaction costs, thereby promoting a more equitable distribution of income. The dual function of financial innovation is underscored by these mediating pathways: while credit card access alone may benefit affluent populations, its effects can be leveraged to reduce inequality when combined with inclusive financial policies and digital infrastructure.

Table 4: Panel Fixed-Effects Mediation Model Results

Variables	**Model (1)** **Financial Inclusion**	**Model (2)** **Digital Payment Adoption**	**Model (3)** **Income Inequality**
Credit Card Access	0.342*** (0.089)	0.295** (0.124)	0.128** (0.057)
Financial Inclusion	–	–	-0.241*** (0.074)
Digital Payment	–	–	-0.187** (0.091)
GDP Growth	0.061 (0.042)	0.044 (0.039)	-0.112** (0.056)
Inflation	-0.018 (0.031)	-0.023 (0.029)	0.097* (0.053)
Education Level	0.147** (0.072)	0.119* (0.065)	-0.134** (0.067)
Unemployment Rate	-0.092* (0.048)	-0.073 (0.045)	0.101* (0.059)
Constant	1.732*** (0.453)	1.485*** (0.419)	0.612** (0.271)
Observations	750	750	750
R-squared	0.41	0.38	0.46
Hausman Test (χ^2)	–	–	21.7***
Pesaran CD Test	–	–	0.274

*Notes: Robust standard errors in parentheses. ***, *, * *denote significance at the 1%, 5%, and 10% levels respectively.*

The control variables provide additional insights into the determinants of income inequality. This confirms that sustained economic expansion is a critical factor in narrowing income disparities, as GDP growth exhibits a significant negative association with inequality (B = -0.112, SE = 0.056, p < 0.05). In contrast, inflation is positively correlated with inequality (B = 0.097, SE = 0.053, p < 0.1), suggesting that macroeconomic instability exacerbates disparities and erodes the purchasing power of lower-income households. The role of human capital in promoting upward mobility and equitable opportunities is reinforced by the negative and significant impact of education level on inequality (B = -0.134, SE = 0.067, p < 0.05). Also, the inequality is positively correlated with the unemployment rate (B = 0.101, SE = 0.059, p < 0.1), which illustrates how labour market deficiencies restrict income-generating opportunities for vulnerable groups. Diagnostic tests further confirm the robustness and reliability of the model. The Hausman test (χ^2 = 21.7, p < 0.01) supports the use of fixed-effects estimation over random-effects, indicating that unobserved country-specific heterogeneity is significant and appropriately

controlled in the model. The Pesaran CD test (p = 0.274) shows no evidence of cross-sectional dependence, suggesting that residuals are not significantly correlated across the 30 countries, thereby validating the assumption of independence in the panel structure.

Table 5: Indirect Effects of Credit Card Access on Income Inequality

Mediator	**Indirect Effect**	**Bootstrapped SE**	**% of Total Effect**
Financial Inclusion	-0.082	0.028	38%
Digital Payment Adoption	-0.051	0.024	26%
Total Indirect Effect	-0.133	0.037	64%
Direct Effect (CC → Gini)	0.128	0.057	36%
Total Effect	-0.005	0.064	100%

Notes: Effects estimated using bootstrapped standard errors with 5,000 replications. Total effect = Direct + Indirect. Percentages show the proportion of the total effect mediated by each pathway.

The mediation analysis presented in Table 5 reveals the indirect pathways through which credit card access influences income inequality via financial inclusion and digital payment adoption. The results show that credit card access significantly reduces inequality through financial inclusion, with an indirect effect of -0.082 (bootstrapped SE = 0.028), accounting for 38% of the total effect. This indicates that expanding access to credit cards promotes greater participation in formal financial systems, such as account ownership, savings, and borrowing, which in turn enables lower-income households to access resources, smooth consumption, and invest in productive activities, thereby mitigating income disparities. Similarly, the digital payment adoption pathway shows a significant indirect effect of -0.051 (SE = 0.024), explaining 26% of the total effect. This highlights the role of mobile and electronic payment platforms in enhancing economic inclusion, reducing transaction costs, and providing lower-income populations with more equitable access to financial services. Collectively, the total indirect effect of credit card access through both mediators is -0.133 (SE = 0.037), accounting for 64% of the overall effect, underscoring the importance of these complementary channels in shaping the relationship between financial innovation and income distribution. The direct effect of credit card access on inequality remains positive (0.128, SE = 0.057), representing 36% of the total effect, suggesting that, absent the mediating influences, credit card access could disproportionately benefit higher-income groups. The net total effect is -0.005 (SE = 0.064), effectively neutral, indicating that the inequality-increasing potential of credit card access is largely offset by its positive contributions to financial inclusion and digital payment adoption.

Table 6: Dynamic Panel Arellano-Bond GMM Results

Variables	**Income Inequality**
Income Inequality (Lag 1)	0.612*** (0.091)
Credit Card Access	0.107** (0.052)
Financial Inclusion	-0.193*** (0.067)
Digital Payment	-0.152** (0.074)
GDP Growth	-0.084** (0.041)
Inflation	0.112* (0.058)
Education Level	-0.121** (0.062)
Unemployment Rate	0.098* (0.057)
Constant	0.893** (0.362)

Observations	870
Instruments	42
Hansen J-Test (p-value)	0.28
AR (1) Test (p-value)	0.04
AR (2) Test (p-value)	0.34

Notes: Robust two-step GMM standard errors in parentheses. ***, *, * *denote significance at the 1%, 5%, and 10% levels, respectively.* AR(1) *and* AR(2) *test for first- and second-order serial correlation; p > 0.05 for* AR(2) *indicates no second-order serial correlation.*

The Dynamic Panel Arellano-Bond GMM results reveal that income inequality exhibits significant persistence over time, as evidenced by the positive and highly significant coefficient on the lagged dependent variable (B = 0.612, SE = 0.091, $p < 0.001$), indicating that past inequality strongly shapes current income distribution patterns in the developing countries. Credit card access shows a positive and significant effect on income inequality (B = 0.107, SE = 0.052, $p < 0.05$), suggesting that, without considering mediators, expanding credit card penetration may initially benefit higher-income individuals more, reflecting potential unequal distribution of access. Also, financial inclusion is negatively and significantly associated with income inequality (B = -0.193, SE = 0.067, $p < 0.001$), highlighting the role of broader access to banking, savings, and borrowing in redistributing resources and enhancing economic participation among lower-income households. Similarly, digital payment adoption significantly reduces inequality (B = -0.152, SE = 0.074, $p < 0.05$), indicating that mobile and electronic payment platforms facilitate inclusion, lower transaction costs, and expand opportunities for economic engagement. Among the controls, GDP growth negatively affects inequality (B = -0.084, SE = 0.041, $p < 0.05$), inflation is positively related (B = 0.112, SE = 0.058, $p < 0.1$), education level has a negative impact (B = -0.121, SE = 0.062, $p < 0.05$), and unemployment shows a positive association (B = 0.098, SE = 0.057, $p < 0.1$), reflecting the influence of macroeconomic stability, human capital, and labor market conditions on income distribution. Diagnostic tests confirm model robustness: the $AR(1)$ test is significant (p = 0.04), $AR(2)$ is not (p = 0.34), and the Hansen J-test (p = 0.28) validates instruments.

Discussion of Findings

The results of this study indicate that the adoption of digital payment systems and financial inclusion is considerably improved by the expansion of credit card access. This underscores the critical role of credit cards in fostering a more comprehensive engagement with formal financial structures. This result strongly aligns with the Financial Intermediation Theory, which posits that well-functioning financial institutions and instruments facilitate the efficient allocation of resources, improve access to capital, and foster economic participation across different segments of society (Wong et al., 2023; Ajouz et al., 2021). Credit card access facilitates the participation of households in productive financial activities by connecting them to electronic payment platforms, savings, and financing platforms. Consequently, this contributes to more inclusive economic outcomes. The positive effects of credit card access on reducing income inequality are primarily realised when such access is coupled with inclusive and accessible financial infrastructures, as the mediating roles of financial inclusion and digital payment adoption further emphasise. These results are consistent with previous research, which has shown that the expansion of access to formal banking services and digital financial tools can reduce structural disparities in income distribution, particularly in developing nations where informal financial practices are prevalent (Setor et al., 2021; Nasreen et al., 2025). Similarly, research has demonstrated that access to financial services is associated with increased economic mobility and a decrease in inequality among marginalised populations (Khalil et al., 2025). In this sense, the current findings substantiate the theoretical proposition that enhancing intermediation through accessible financial instruments can generate redistributive benefits and foster equitable participation in the economy.

Simultaneously, the direct impact of credit card access on income inequality implies that, in the absence of mediating mechanisms, these financial instruments may initially favour affluent households, potentially exacerbating disparities. This observation partially contradicts the optimistic perspective of the Financial Intermediation Theory, emphasising that the efficacy of financial instruments in fostering equality is contingent upon complementary mechanisms, including financial literacy, inclusive policies, and digital infrastructure

(Abdul Mannan and Farhana, 2023). This conditionality has been similarly observed in previous studies; for example, research on credit access in emerging markets suggests that financial expansion may disproportionately benefit higher-income groups, exacerbating pre-existing disparities, in the absence of targeted interventions (Bhatia and Dawar, 2024). The inequality-enhancing proclivities of credit card access are effectively counterbalanced when these complementary pathways are operational, as evidenced by the substantial indirect effects through financial inclusion and digital payments. This result is consistent with the theoretical hypothesis that financial intermediation is most effective when instruments are incorporated into a more comprehensive, inclusive system (Coffie et al., 2020). Furthermore, it is consistent with empirical evidence from other studies conducted in developing countries, which have demonstrated that digital finance and expanded banking services can be vital tools for the redistribution of income and the reduction of poverty (Lontchi et al., 2022; Premathilaka, 2025). Overall, the findings bolster the idea that credit card access alone may not necessarily foster equality. However, when combined with enabling financial and technological infrastructures, it can produce sustainable and equitable outcomes that are consistent with the principles of Financial Intermediation Theory.

THEORETICAL AND KNOWLEDGE CONTRIBUTION

This study contributes to the theoretical literature by extending the Financial Intermediation Theory to the context of developing nations and digital financial innovations. Although previous research has underscored the significance of financial institutions in economic development and resource allocation (Ullah et al., 2022; Nguyen, 2023), this study illustrates that the effects of financial instruments, particularly credit card access, are contingent upon the presence of complementary mechanisms, including financial inclusion and digital payment adoption. The study emphasises the conditional pathways through which credit card expansion leads to a more equitable income distribution by explicitly modelling these mediators. The results offer empirical evidence that credit card access may exacerbate inequality when used in isolation; however, when integrated into an inclusive financial ecosystem, it can facilitate redistributive benefits. This underscores the fact that financial intermediation is not solely determined by the availability of instruments, but also by the broader accessibility, adoption, and inclusivity of financial systems, thereby contributing to theoretical refinement. The study also offers nuanced insights into the interaction between traditional credit instruments and digital financial tools, thereby supporting the theory's assertion that financial innovations improve efficiency and participation. However, it also illustrates that their equity effects are contingent upon structural and technological enablers (Setor et al., 2021; Nasreen et al., 2025; Gafoor and Amilan, 2024).

Practical Implication

The findings indicate that broadening access to credit cards without sufficient safeguards may exacerbate income inequalities rather than mitigate them, underscoring the necessity for policy interventions that promote equitable and responsible utilisation of credit facilities. First, the creation of cost-effective credit card products is crucial to prevent exclusionary consequences. Policymakers and financial institutions ought to encourage the adoption of low-cost and basic card options, implement transparent pricing models, and consider establishing limits on interest rates and penalty fees to mitigate excessive financial burdens on low-income consumers. Such measures would diminish the financial obstacles that presently limit card access to affluent and salaried populations, thereby facilitating wider engagement with formal financial systems. Second, enhancing financial and digital literacy initiatives is essential for preventing over-indebtedness and ensuring that cardholders, especially those with limited experience in formal finance, can utilise credit responsibly. Targeted educational initiatives conducted through community banking agents, digital platforms, and adult training programs should emphasise card repayment procedures, budgeting skills, fraud prevention, and secure interaction with digital banking channels. These interventions will facilitate vulnerable consumers in accessing digital transactions and online financial services while avoiding an escalation of their financial vulnerability. Third, strong financial capacity and risk assessment frameworks are essential to ensure that credit allocation aligns with borrowers' repayment capabilities. Regulators should implement strict responsible lending standards, mandate that lenders include verifiable income and expenditure evaluations, and consider behavioural interventions, such as alerts when customers select minimum repayments or reach high utilisation levels. Such measures will contribute to mitigating default risks, safeguarding financially constrained households from debt traps, and strengthening the long-term welfare benefits associated with access to credit cards. Overall, these interventions foster an inclusive

credit ecosystem that facilitates the adoption of digital payments and alleviates inequality rather than exacerbating it.

LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Despite providing novel insights into the relationship between credit card access, financial inclusion, digital payment adoption, and income inequality, this study has several limitations. First, the analysis focuses on a sample of 30 developing countries, which may limit the generalisability of the findings to other contexts, particularly high-income or highly digitised economies. Second, the study relies on country-level aggregated data, which may mask individual-level behavioural heterogeneity in credit card use, financial inclusion, and digital payment adoption. Third, while the panel fixed-effects and dynamic GMM models address potential endogeneity, unobserved time-varying factors could still influence the results. Future research could address these limitations by incorporating larger and more diverse samples, including high-income and transitional economies, and by utilising micro-level survey data to capture individual or household behaviour. Additionally, exploring other potential mediators, such as financial literacy, mobile banking intensity, or regulatory quality, could provide further insights into the mechanisms through which credit card access affects inequality.

Conclusion

This study explored the relationship between credit card access and income inequality in 30 developing countries from 2000 to 2024, emphasising the mediating roles of financial inclusion and digital payment adoption. The results show that although credit card access has a direct inequality-enhancing effect, disproportionately benefiting higher-income groups, its indirect effects through financial inclusion and digital payment adoption substantially reduce inequality by expanding access to savings, borrowing, and low-cost digital transactions for lower-income households. These distributive gains reduce transaction frictions and support broader economic participation, ultimately offsetting the inequality-increasing direct channel and yielding a largely neutral total effect. The findings confirm that credit card expansion does not automatically foster equitable outcomes; rather, its societal benefits depend on strong, inclusive financial frameworks, responsible credit market regulations, and digital infrastructure that enables safe and affordable participation in formal finance. Absent such policy safeguards, the pro-rich direct effect of credit card access may dominate, reinforcing income inequality despite gains in financial inclusion and digital payment adoption.

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Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

REFERENCES

1. Abdul Mannan, K. and Farhana, K.M., 2023. Digital financial inclusion and remittances: An empirical study on Bangladeshi migrant households. *FinTech*, *2*(4), pp.680-697.
2. Ajouz, M., Abuamria, F. and Hammad, J., 2021, November. Factors influencing mobile payment adoption and its role in promoting financial inclusion: an integrated reflective model with the theory of planned behaviour. In *International Conference on Business and Technology*, pp. 563-581.

3. Alnasser Mohammed, S.A.S., 2025. Financial Technology and Poverty Reduction: The Role of Financial Inclusion in Asian Developing Countries. *Poverty & Public Policy*, *17*(2), p.e70022.
4. Amnas, M.B., Selvam, M. and Parayitam, S., 2024. FinTech and financial inclusion: Exploring the mediating role of digital financial literacy and the moderating influence of perceived regulatory support. *Journal of Risk and Financial Management*, *17*(3), p.108.
5. Amofah, D.O. and Chai, J., 2022. Sustaining consumer e-commerce adoption in Sub-Saharan Africa: Do trust and payment method matter?. *Sustainability*, *14*(14), p.8466.
6. Baron, R.M. and Kenny, D.A., 1986. The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), p.1173.
7. Bhatia, S. and Dawar, G., 2024. The impact of financial inclusion on social and political empowerment: Mediating role of economic empowerment. *Journal of the Knowledge Economy*, *15*(3), pp.13727-13744.
8. Byegon, G., 2020. Linkage between self-control, financial innovations and financial inclusion. A moderated mediation analysis across levels of financial literacy (The case of owners of microenterprise in Kenya). *European Journal of Business and Management Research*, *5*(4).
9. Chen, F. and Jiang, G., 2022. The roles of fintech with perceived mediators in consumer financial satisfaction with cashless payments. *Mathematics*, *10*(19), p.3531.
10. Coffie, C.P.K., Zhao, H. and Adjei Mensah, I., 2020. Panel econometric analysis on mobile payment transactions and traditional banks' efforts toward financial accessibility in Sub-Saharan Africa. *Sustainability*, *12*(3), p.895.
11. Elouaourti, Z. and Ibourk, A., 2024. Empowering African entrepreneurs: The crucial role of financial inclusion in mediating the relationship between contextual factors and entrepreneurial willingness. *Emerging Markets Review*, *59*, p.101118.
12. Fu, Y. and Liu, L., 2023. On the accessibility of financial services and income inequality: an international perspective. *Technological and Economic Development of Economy*, *29*(3), pp.814-845.
13. Gafoor, A. and Amilan, S., 2024. Fintech adoption and financial well-being of persons with disabilities: the mediating role of financial access, financial knowledge and financial behaviour. *International Journal of Social Economics*, *51*(11), pp.1388-1401.
14. Haider, A., Khan, M.A., Khoja, M., Alharthi, S. and Minhaj, S.M., 2024. The role of e-banking, mobile-banking, and e-wallet in response to e-payment and customer trust as a mediating factor using a structural equation modelling approach. *Journal of Infrastructure, Policy and Development*, *8*(9), p.6644.
15. Hasan, R., Ashfaq, M., Parveen, T. and Gunardi, A., 2023. Financial inclusion–does digital financial literacy matter for women entrepreneurs?. *International Journal of Social Economics*, *50*(8), pp.1085-1104.
16. Hiew, L.C., Lam, M.T. and Ho, S.J., 2025. Unveiling the nexus: unravelling the dynamics of financial inclusion, FinTech adoption and societal sustainability in Malaysia. *Journal of Financial Reporting and Accounting*, *23*(2), pp.575-593.
17. Jena, R.K., 2025. Factors influencing the adoption of fintech for the enhancement of financial inclusion in rural india using a mixed methods approach. *Journal of Risk and Financial Management*, *18*(3), p.150.
18. Khalil, S., Audi, M. and Ali, A., 2025. Economic Growth, Digital Access, and Urbanisation: Drivers of Financial Inclusion in A Comparative Global Context. *Contemporary Journal of Social Science Review*, *3*(2), pp.52-61.
19. Lontchi, C.B., Yang, B. and Su, Y., 2022. The mediating effect of financial literacy and the moderating role of social capital in the relationship between financial inclusion and sustainable development in Cameroon. *Sustainability*, *14*(22), p.15093.
20. Menberu, A.W., 2024. Technology-mediated financial education in developing countries: A systematic literature review. *Cogent Business & Management*, *11*(1), p.2294879.
21. Mishra, D., Kandpal, V., Agarwal, N. and Srivastava, B., 2024. Financial inclusion and its ripple effects on socio-economic development: a comprehensive review. *Journal of Risk and Financial Management*, *17*(3), p.105.
22. Mouna, A. and Jarboui, A., 2022. Understanding the link between government cashless policy, digital financial services and socio-demographic characteristics in the MENA countries. *International Journal of Sociology and Social Policy*, *42*(5/6), pp.416-433.
23. Mpofu, F.Y., 2022. Industry 4.0 in financial services: Mobile money taxes, revenue mobilisation, financial

inclusion, and the realisation of sustainable development goals (SDGs) in Africa. *Sustainability*, *14*(14), p.8667.

24. Mustafa, J.A., Marie, A., Al-Amarneh, A. and Al-Abbadi, A., 2023. The role of fintech payment instruments in improving financial inclusion. *Information Sciences Letters*, *12*(6), pp.2659-2670.
25. Nam, Y., Lee, S.T. and Kim, K.T., 2023. Racial/ethnic differences in mobile payment usage: what do we know, and what do we need to know?. *International Journal of Bank Marketing*, *41*(1), pp.52-69.
26. Nasreen, S., Ishtiaq, F. and Tiwari, A.K., 2025. The role of ICT diffusion and institutional quality on financial inclusion in the Asian region: empirical analysis using panel quantile regression. *Electronic Commerce Research*, *25*(3), pp.1685-1752.
27. Naveenan, R.V., Liew, C.Y. and Kijkasiwat, P., 2024. Nexus between financial inclusion, digital inclusion and health outcomes: Evidence from developing economies. *Social Indicators Research*, *174*(1), pp.367-408.
28. Nguyen, L.T., 2023. Financial Inclusion through Mobile Money in developing countries: the case of Vietnam. In *Digital Transformation, Cooperation and Global Integration in the New Normal*, pp. 121-141.
29. Pandey, A., Kiran, R. and Sharma, R.K., 2022. Investigating the impact of financial inclusion drivers, financial literacy and financial initiatives in fostering sustainable growth in North India. *Sustainability*, *14*(17), p.11061.
30. Peng, P. and Mao, H., 2023. The effect of digital financial inclusion on relative poverty among urban households: a case study on China. *Social Indicators Research*, *165*(2), pp.377-407.
31. Premathilaka, S.C., 2025. Impact of Digital Payment Systems on Credit Access for Business Clans in the SME Sector in Sri Lanka. *Sri Lanka Journal of Marketing*, *10*(2).
32. Rasheed, S., Adeneye, Y. and Farooq, R., 2024. Income inequality and carbon emissions in Asia: Does financial inclusion matter?. *Sustainable Development*, *32*(5), pp.5274-5293.
33. Setor, T.K., Senyo, P.K. and Addo, A., 2021. Do digital payment transactions reduce corruption? Evidence from developing countries. *Telematics and Informatics*, *60*, p.101577.
34. Shehadeh, M., Dawood, H. M. and Hussainey, K., 2025. Digital financial literacy and usage of cashless payments in Jordan: the moderating role of gender. *International Journal of Accounting & Information Management*, *33*(2), 354-382.
35. Ullah, S., Kiani, U.S., Raza, B. and Mustafa, A., 2022. Consumers' intention to adopt m-payment/m-banking: the role of their financial skills and digital literacy. *Frontiers in Psychology*, *13*, p.873708.
36. Vasile, V., Panait, M. and Apostu, S.A., 2021. Financial inclusion paradigm shift in the post-pandemic period. Digital divide and gender gap. *International Journal of Environmental Research and Public Health*, *18*(20), p.10938.
37. Wang, X. and Fu, Y., 2022. Digital financial inclusion and vulnerability to poverty: Evidence from Chinese rural households. *China Agricultural Economic Review*, *14*(1), pp.64-83.
38. Wong, Z.Z.A., Badeeb, R.A. and Philip, A.P., 2023. Financial inclusion, poverty, and income inequality in ASEAN countries: does financial innovation matter? *Social Indicators Research*, *169*(1), pp.471-503.
39. Wu, B., Wang, L. and Yao, L., 2023. A mechanistic study of the impact of digital payments on rural household development resilience. *Sustainability*, *15*(14), p.11203.