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BEYOND ACCESS: DIGITAL PAYMENTS AND FINANCIAL INCLUSION ACROSS ASIA

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Abstract

This study examines the relationship between digital payment adoption and financial inclusion across 23 Asian countries using cross-sectional data. Financial inclusion is measured by account ownership, while digital payment usage is the main explanatory variable, alongside GDP per capita, internet usage, an interaction term between digital payment and internet usage, and regional dummy variables. The models are estimated using Ordinary Least Squares (OLS) with Huber-White robust standard errors to address potential heteroskedasticity. The results show that digital payment adoption is positively and significantly associated with financial inclusion, indicating that countries with higher digital payment usage tend to have higher levels of account ownership. In contrast, GDP per capita and internet usage do not show robust significant associations with financial inclusion. The interaction between digital payment and internet usage is also not statistically significant, suggesting that internet usage does not significantly moderate the relationship between digital payment adoption and financial inclusion. The findings further reveal the importance of regional heterogeneity, indicating that structural differences across Asian regions contribute to variations in financial inclusion.

Keywords: Digital Payment, Financial Inclusion, Fintech, Regional Differences, Asia

INTRODUCTION

In an era where digital transformation is rapidly reshaping global economies, access to financial services has become not only a matter of convenience but also a fundamental driver of inclusive growth. Despite significant progress, substantial disparities in financial inclusion persist, particularly across developing regions. Financial inclusion plays a crucial role in enabling individuals and businesses to access essential financial services such as savings, credit, and payments, thereby improving welfare and supporting sustainable economic development. Limited access to formal financial systems can exacerbate inequality, restrict economic participation, and hinder economic growth (Afjal, 2023).

The rapid development of financial technology (FinTech), especially digital payment systems, has significantly transformed the financial landscape. Digital payment platforms, such as mobile banking, e-wallets, and online transaction systems, reduce transaction costs, increase efficiency, and expand access to financial services, particularly for underserved populations (Shahen & Sharaf, 2025). Empirical evidence suggests that FinTech payment instruments, including digital remittances, debit and credit cards, and mobile-based payment systems, play a key role in increasing financial inclusion, particularly through higher account ownership (Mustafa et al., 2023).

However, the level of financial inclusion and digital payment adoption varies significantly across Asian countries. Based on data obtained from the Global Findex Database and World Development Indicators (WDI) for 2024, significant disparities across countries can be observed. For example, countries such as Mongolia and China exhibit high levels of financial inclusion, with

account ownership reaching 98% and 89%, respectively, alongside high digital payment usage. In contrast, countries such as Pakistan and Iraq show significantly lower levels of financial inclusion, with account ownership below 30%, accompanied by limited digital payment adoption.

Similar disparities are evident in Southeast Asia. While Malaysia and Thailand demonstrate high levels of digital payment usage (above 75%) and financial inclusion, countries such as Cambodia and Lao PDR lag behind, with account ownership below 40% and digital payment usage below 35%. These variations indicate that the relationship between digital payment adoption and financial inclusion is not uniform across countries.

In addition, economic development and digital infrastructure also vary widely across regions. GDP per capita ranges from approximately USD 1,300 in Tajikistan to over USD 35,000 in Saudi Arabia, while internet usage varies from below 50% in some South Asian countries to nearly full penetration in more advanced economies. These differences suggest that financial inclusion is influenced not only by digital payment adoption but also by broader economic and technological factors.

From a broader perspective, FinTech contributes to financial inclusion by addressing structural barriers such as high transaction costs, geographical limitations, and limited access to financial institutions. Digital financial services, especially mobile money and digital payments, have proven effective in reaching unbanked populations by leveraging mobile networks and reducing reliance on physical banking infrastructure (Morgan, 2022). However, several challenges remain, including low financial literacy, unequal access to digital infrastructure, and concerns regarding data security and trust, particularly in developing economies (Sriyono et al., 2025).

Despite the growing literature, several research gaps remain. First, many studies focus on single-country analysis, limiting cross-country comparability. Second, limited attention has been given to the interaction between digital payment adoption and internet usage. Third, regional heterogeneity across Asia is often overlooked, even though it plays a crucial role in shaping financial inclusion outcomes.

Therefore, this study aims to examine the relationship between digital payment adoption and financial inclusion across Asian countries by incorporating economic development, internet usage, the interaction between digital payment and internet usage, and regional differences. Specifically, this study seeks to: (1) analyze the association between digital payment adoption and financial inclusion; (2) examine whether internet usage moderates the relationship between digital payment adoption and financial inclusion; and (3) identify regional disparities in financial inclusion across Asian countries.

This study contributes to the literature both theoretically and practically. Theoretically, it provides a comprehensive framework by integrating digital payment adoption, macroeconomic factors, and regional heterogeneity. Practically, the findings offer policy insights for governments and financial institutions in designing strategies to enhance financial inclusion through digital financial services.

The novelty of this study lies in its cross-country comparative approach combined with moderated regression analysis and regional heterogeneity. By including the interaction between digital payment adoption and internet usage, as well as regional dummy variables, this study provides a more comprehensive understanding of how digital financial adoption is associated with financial inclusion across diverse Asian economies.

From a policy perspective, the findings are expected to provide practical recommendations, including the need to strengthen digital ecosystems, improve financial literacy, and develop region-specific strategies tailored to different levels of economic and technological development.

LITERATURE REVIEW AND HYPOTHESIS FORMULATION

Financial Inclusion Theory

Financial inclusion refers to the accessibility and usage of formal financial services by individuals and businesses. It is widely recognized as a key driver of economic development, as it enables efficient allocation of resources, reduces inequality, and promotes financial stability. According to recent studies, financial inclusion improves welfare by allowing households to save, invest, and manage risks more effectively (Klapper et al., 2025).

Traditional theories suggest that financial inclusion is closely linked to economic development. Higher income levels are expected to increase access to financial services, as individuals have greater financial capacity to participate in formal financial systems. However, recent studies argue that economic growth alone is not sufficient to ensure inclusive financial access, particularly in developing countries where structural barriers still exist (Ozili & Ademiju, 2022).

In addition, previous studies indicate that socioeconomic conditions, particularly labor market factors, play an important role in determining welfare outcomes. Higher unemployment is associated with increased poverty, while higher income levels contribute to improved economic well-being (Saifuloh et al., 2019). This implies that financial inclusion, as a mechanism to improve access to financial resources, may also contribute to reducing poverty and enhancing welfare.

Digital Payment and Financial Inclusion

The development of financial technology (FinTech) has significantly transformed the financial sector, particularly through digital payment systems. Digital payments reduce transaction costs, improve efficiency, and eliminate geographical barriers, making financial services more accessible to underserved populations.

Empirical studies consistently show a positive relationship between digital payment adoption and financial inclusion. The use of mobile payments, e-wallets, and online transaction systems increases account ownership and financial participation (Shahen & Sharaf, 2025; Mustafa et al., 2023). This suggests that digital payment systems act as a catalyst for expanding financial inclusion, especially in developing economies.

Based on this theoretical and empirical evidence, the following hypothesis is proposed:

H1: Digital payment adoption is positively associated with financial inclusion.

Economic Development and Financial Inclusion

Economic development is commonly proxied by GDP per capita and is considered a fundamental determinant of financial inclusion. Higher income levels are associated with better access to financial services, improved financial literacy, and stronger financial institutions. The role of financial sector performance in shaping economic outcomes has also been emphasized in previous studies, particularly in the context of banking sector development and asset growth (Indura et al., 2019).

However, recent studies suggest that the impact of economic development on financial inclusion may not always be significant when digital financial services are considered. In some cases, digital financial innovation can substitute for traditional financial development, reducing the dependence on income levels (Ozili & Ademiju, 2022).

Based on this argument, the following hypothesis is proposed:

H2: Economic development (GDP per capita) is positively associated with financial inclusion.

Internet Usage and Financial Inclusion

Internet usage represents digital infrastructure and is often considered a key enabler of digital financial services. A higher level of internet penetration is expected to facilitate access to digital payments, thereby improving financial inclusion.

However, the relationship is not always direct. Some studies indicate that internet access alone does not guarantee increased financial inclusion without effective adoption of digital financial services and supportive ecosystems (Afjal, 2023).

Thus, the following hypothesis is proposed:

H3: Internet usage is positively associated with financial inclusion.

Interaction between Digital Payment and Internet Usage

The effectiveness of digital payment systems may depend on the level of internet penetration. Internet access is expected to strengthen the impact of digital payment adoption by enabling users to access and utilize digital financial services more effectively. A higher level of internet usage facilitates digital transactions, enhances connectivity, and supports the expansion of financial technology services (Bongomin et al., 2018; Suri & Jack, 2016).

However, empirical findings on this interaction effect remain mixed. While some studies suggest a complementary relationship between internet usage and digital financial services, others indicate that digital payment adoption can independently promote financial inclusion without strong reliance on internet penetration, particularly in mobile-based financial ecosystems (Ozili & Ademiju, 2022; Klapper et al., 2025).

Based on this argument, the following hypothesis is proposed:

H4: Internet usage strengthens the positive relationship between digital payment adoption and financial inclusion.

Regional Heterogeneity in Financial Inclusion

Cross-country studies highlight significant differences in financial inclusion across regions. These differences are influenced by variations in institutional frameworks, regulatory environments, financial development, and technological readiness. Countries with stronger financial systems and supportive regulations tend to exhibit higher levels of financial inclusion (Klapper et al., 2025; Ozili & Ademiju, 2022).

In the Asian context, regional disparities are particularly evident. East and Southeast Asian countries generally demonstrate higher levels of financial inclusion and digital financial adoption due to more advanced digital ecosystems and stronger financial infrastructure. In contrast, South and Central Asian countries often face structural challenges such as limited financial access, lower levels of financial literacy, and uneven digital development (Morgan, 2022).

Furthermore, differences in institutional quality and policy frameworks across regions play a crucial role in shaping financial inclusion outcomes. Studies suggest that government policies, financial regulations, and digital transformation strategies significantly influence the effectiveness of financial inclusion initiatives (Park & Mercado, 2018; Klapper et al., 2025).

Ignoring these regional differences may lead to biased estimation results in cross-country analysis. Therefore, incorporating regional heterogeneity is essential to better capture structural differences and improve the accuracy of empirical findings.

RESEARCH METHODS

Research Design

This study employs a quantitative research design using a cross-sectional approach to examine the relationship between digital payment adoption and financial inclusion across Asian countries. The analysis focuses on identifying the association between digital payment usage and account ownership while incorporating economic development, internet usage, interaction effects, and regional heterogeneity.

Population and Research Target

The population of this study consists of countries in the Asian region. This study uses secondary data obtained from the Global Findex and World Development Indicators (WDI) databases for the year 2024.

The research target includes 23 countries with complete data availability for all variables used in this study. The countries are classified into five regions, which are East Asia, Southeast Asia, South Asia, Central Asia, and West Asia, to capture regional differences.

Data Collection and Variable Measurement

This study uses secondary data obtained from the Global Findex Database and the World Development Indicators (WDI). The variables used in this study are defined in Table 1.

Table 1. Variable Definitions and Measurements

Variable	Symbol	Measurement	Source
Financial Inclusion	ACCOUNT	Percentage of adults who have an account	Global Findex
Digital Payment	DIGITALPAYMENT	Percentage of individuals who made or received digital payments	Global Findex
Economic Development	LNGDP	GDP per capita (US$), natural logarithm	WDI
Internet Usage	INTERNET	Percentage of individuals using the internet	WDI
Interaction Term	DP_INTERNET	DIGITALPAYMENT × INTERNET	Author's calculation
Regional Dummy	REGION	Dummy variables for Asian regions	Author's classification

Source: Author's calculation based on Global Findex and World Development Indicators (2024).

Model Specification

To examine the relationship between digital payment adoption and financial inclusion, this study employs a moderated regression model estimated using Ordinary Least Squares (OLS). The moderated regression approach is used because this study examines not only the direct association between digital payment adoption and financial inclusion, but also whether internet usage moderates this relationship through an interaction term. To improve the reliability of statistical inference, the regression models are estimated using Huber-White robust standard errors to address potential heteroskedasticity in cross-country data.

The main model is specified as follows:

$$ACCOUNT_i = \beta_0 + \beta_1 DP_i + \beta_2 LNGDP_i + \beta_3 INT_i + \beta_4 (DP_i \times INT_i) + \sum_{r=1}^{R-1} \delta_r REGION_{ri} + \varepsilon_i \quad \text{ie (1)}$$

As a robustness specification, the model is also estimated without regional dummy variables:

$$ACCOUNT_i = \beta_0 + \beta_1 DP_i + \beta_2 LNGDP_i + \beta_3 INT_i + \beta_4 (DP_i \times INT_i) + \varepsilon_i \quad \text{ie (2)}$$

where $ACCOUNT_i$ represents financial inclusion in country i, measured by the percentage of adults who own an account. $DIGITALPAYMENT_i$ denotes the percentage of individuals who made or received digital payments, $LNGDP_i$ represents the natural logarithm of GDP per capita, and $INTERNET_i$ refers to the percentage of individuals using the internet. The interaction term ($DIGITALPAYMENT_i \times INTERNET_i$) is used to examine the moderating role of internet usage.

$REGION_{ri}$ represents regional dummy variables for Asian regions, with South Asia used as the reference category to avoid the dummy variable trap. Finally, ε_i denotes the error term.

Data Analysis Techniques

The data analysis is conducted using Stata. First, descriptive statistics are used to summarize the distribution of the main variables and to describe cross-country variation in financial inclusion, digital payment adoption, economic development, and internet usage. Second, several regression specifications are estimated to examine the consistency of the relationship between digital payment adoption and financial inclusion. The baseline model includes only digital payment adoption, while the control model adds GDP per capita and internet usage. The interaction model includes the interaction term between digital payment adoption and internet usage to examine the moderating role of internet usage. The full model incorporates regional dummy variables to capture structural differences across Asian regions.

All models are estimated using OLS with Huber-White robust standard errors to address potential heteroskedasticity. In addition, a robustness check is conducted by estimating a model without the interaction term. This allows the study to assess whether the main association between digital payment adoption and financial inclusion remains consistent across different model specifications.

RESULTS AND DISCUSSION

Descriptive Analysis

To provide an overview of the data characteristics, descriptive statistics are presented in Table 2.

Table 2. Descriptive Statistics

Variable	Min	Max	Mean	Std. Dev
Account (%)	27.00	98.00	65.78	22.01
Digital Payment (%)	25.00	95.00	56.35	23.45
GDP per capita (US$)	1341.20	35121.66	8225.47	8392.61
Internet Users (%)	46.32	100.00	80.12	16.85

Source: Author's calculation based on Global Findex and WDI (2024)

The results indicate substantial variation across countries, particularly in financial inclusion and digital payment adoption. This suggests the presence of cross-country disparities in the Asian region, supporting the relevance of a comparative analysis.

Regression Results

The regression results are presented in Table 3. Five model specifications are estimated to assess the consistency of the relationship between digital payment adoption and financial inclusion. Model 1 presents the baseline relationship between digital payment and financial inclusion. Model 2 adds GDP per capita and internet usage as control variables. Model 3 includes the interaction term between digital payment and internet usage. Model 4 represents the full model with regional dummy variables. Model 5 serves as a robustness check by excluding the interaction term while retaining the regional dummy variables.

Table 3. Regression Results

Variables	Model 1 Baseline	Model 2 Controls	Model 3 Interaction	Model 4 Full Model	Model 5 No Interaction
Constant	19.005***	21.114	-22.543	-66.078	20.658
	(5.792)	(19.313)	(58.618)	(75.625)	(21.559)

Variables	Model 1 Baseline	Model 2 Controls	Model 3 Interaction	Model 4 Full Model	Model 5 No Interaction
Digital Payment	0.850***	0.992***	1.877	2.673**	1.056***
	(0.075)	(0.083)	(1.170)	(1.181)	(0.086)
LnGDP	—	2.709	3.811	2.670	0.525
	—	(2.806)	(2.895)	(3.187)	(3.626)
Internet	—	-0.423**	0.007	0.876	-0.054
	—	(0.209)	(0.567)	(0.715)	(0.245)
Digital Payment × Internet	—	—	-0.011	-0.020	—
	—	—	(0.014)	(0.014)	—
Regional Dummy	No	No	No	Yes	Yes
Observations	23	23	23	23	23
R-squared	0.790	0.830	0.841	0.913	0.882
Adjusted R^2	0.780	0.804	0.805	0.863	0.827
F-statistic	129.294	65.894	51.343	236.166	107.884

Notes: Robust standard errors are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. South Asia is used as the reference category for regional dummy variables.
Source: Author's calculation based on Global Findex and WDI (2024)

The results in Table 3 show that digital payment adoption is positively associated with financial inclusion across most model specifications. In the baseline model, digital payment has a positive and statistically significant coefficient. After adding GDP per capita and internet usage in Model 2, the coefficient of digital payment remains positive and significant. In the full model with regional dummy variables, digital payment also shows a positive and statistically significant association with financial inclusion. This indicates that countries with higher digital payment adoption tend to have higher levels of account ownership.

GDP per capita does not show a statistically significant association with financial inclusion across the model specifications. Internet usage is significant only in Model 2, but its significance disappears after the interaction term and regional dummy variables are included. This suggests that internet usage does not have a robust direct association with financial inclusion in the sample. Furthermore, the interaction term between digital payment and internet usage is not statistically significant, indicating that internet usage does not significantly moderate the relationship between digital payment adoption and financial inclusion.

The inclusion of regional dummy variables improves the explanatory power of the model, as shown by the increase in R-squared from 0.841 in Model 3 to 0.913 in Model 4. This finding highlights the importance of regional heterogeneity in explaining differences in financial inclusion across Asian countries. The robustness model without the interaction term also shows that digital payment remains positive and statistically significant, indicating that the main result is not sensitive to the inclusion of the interaction term.

Based on the regression results, H1 is supported because digital payment adoption is positively and significantly associated with financial inclusion. H2 is not supported because GDP per capita does not show a statistically significant association with financial inclusion. H3 is not robustly supported because internet usage is significant only in the control model, but not in the interaction and full models. H4 is not supported because the interaction term between digital payment adoption and internet usage is not statistically significant.

Discussion

Effect of Digital Payment on Financial Inclusion

The results show that digital payment adoption is positively and significantly associated with financial inclusion. This finding suggests that countries with higher levels of digital payment adoption tend to have higher levels of account ownership. Digital payment systems may support financial inclusion by reducing transaction costs, improving transaction efficiency, and overcoming geographical barriers to formal financial services. In the context of Asian countries, this result highlights the importance of digital financial adoption as one of the key mechanisms for expanding access to formal financial services. This finding is consistent with previous studies that emphasize the role of fintech and digital payment instruments in improving financial inclusion (Shahen & Sharaf, 2025; Mustafa et al., 2023).

Effect of Economic Development

GDP per capita does not show a statistically significant association with financial inclusion across the model specifications. This suggests that economic development alone may not be sufficient to explain differences in account ownership across Asian countries. In some countries, financial inclusion may be more closely related to the availability, affordability, and usability of digital financial services than to income level alone. This finding supports the argument that digital financial innovation may reduce dependence on traditional income-based access to financial services, particularly in developing economies (Ozili & Ademiju, 2022).

Internet Usage and the Moderating Role of Internet Access

Internet usage does not show a robust significant association with financial inclusion. Although internet usage is statistically significant in the control model, its significance disappears after the interaction term and regional dummy variables are included. This indicates that general internet access does not automatically translate into higher financial inclusion. One possible explanation is that internet usage reflects general digital connectivity, while financial inclusion depends more on the effective use of digital financial services, trust, financial literacy, and supportive digital ecosystems. This finding is consistent with previous studies suggesting that access to digital infrastructure alone is not sufficient to improve financial inclusion without effective adoption and supportive financial ecosystems (Afjal, 2023; Ozili & Ademiju, 2022; Klapper et al., 2025).

The interaction term between digital payment adoption and internet usage is also not statistically significant. This implies that internet usage does not significantly strengthen the relationship between digital payment adoption and financial inclusion in the sample. Although previous studies suggest that mobile networks and internet-based financial services can support financial inclusion by improving connectivity and facilitating digital transactions (Bongomin et al., 2018; Suri & Jack, 2016), the result of this study indicates that internet access alone may not be enough to amplify the role of digital payment adoption. In this context, digital payment adoption may already capture the practical use of digital financial services, while internet usage only reflects broader digital access.

Regional Differences

The inclusion of regional dummy variables improves the explanatory power of the model, indicating that regional heterogeneity plays an important role in explaining financial inclusion across Asia. This suggests that differences in financial inclusion are not only related to digital payment adoption, GDP per capita, and internet usage, but also to broader structural and institutional factors across regions. These factors may include financial regulation, banking infrastructure, digital ecosystem development, institutional quality, and public trust in financial

services, as emphasized in previous studies on financial inclusion and regional institutional differences (Park & Mercado, 2018; Morgan, 2022; Klapper et al., 2025). Therefore, regional characteristics should be considered when designing financial inclusion policies in Asia.

Implications of Findings

The findings provide several important policy implications. First, digital payment adoption should be strengthened as an important strategy to expand financial inclusion. Policies should not only focus on increasing access to digital payment platforms, but also on improving usability, security, consumer trust, and digital financial literacy. Second, the insignificant and non-robust results of GDP per capita and internet usage suggest that economic growth and digital infrastructure alone may not be sufficient to improve financial inclusion. Third, the presence of regional heterogeneity indicates that financial inclusion policies should be tailored to regional conditions. A uniform policy approach may be less effective because Asian regions differ in terms of financial infrastructure, regulatory capacity, technological readiness, and institutional support.

CONCLUSION

This study examines the relationship between digital payment adoption and financial inclusion across 23 Asian countries by incorporating economic development, internet usage, the interaction between digital payment and internet usage, and regional heterogeneity. The findings show that digital payment adoption is positively associated with financial inclusion. This indicates that countries with higher levels of digital payment adoption tend to have higher levels of account ownership.

In contrast, GDP per capita does not show a statistically significant association with financial inclusion. Internet usage also does not show a robust significant relationship after the interaction term and regional dummy variables are included. Furthermore, the interaction between digital payment and internet usage is not statistically significant, indicating that internet usage does not significantly moderate the relationship between digital payment adoption and financial inclusion. These findings suggest that digital infrastructure alone may not be sufficient to improve financial inclusion without effective digital financial adoption, trust, and supportive financial ecosystems.

From a practical perspective, the findings suggest that policymakers should prioritize the adoption and effective use of digital payment systems as part of financial inclusion strategies. Efforts should focus on improving accessibility, usability, security, and trust in digital financial services. In addition, policies should not rely solely on economic growth or internet expansion, but should also address barriers related to financial literacy, institutional readiness, and consumer protection. The presence of regional differences further implies that policy approaches should be adapted to specific regional conditions rather than applying a uniform strategy across all Asian countries.

This study has several limitations. First, the analysis is based on cross-sectional data, which limits the ability to capture changes over time. Therefore, the findings should be interpreted as associations rather than causal relationships. Second, the model does not fully address potential endogeneity or reverse causality between digital payment adoption and financial inclusion. It is possible that countries with higher financial inclusion are also more likely to adopt digital payment systems. Third, the sample is limited to 23 Asian countries due to data availability, which may affect the generalizability of the findings. Fourth, this study focuses on a limited number of explanatory variables and does not include other potentially important factors such as financial literacy, institutional quality, regulatory frameworks, and trust in digital financial services.

Based on these limitations, future research is recommended to use panel data across several Global Findex survey waves to capture dynamic changes in financial inclusion and digital payment adoption over time. Future studies may also expand the country sample and incorporate additional variables, such as governance indicators, financial literacy, regulatory quality, consumer

protection, and trust in digital financial services. In addition, future research may consider alternative methods, such as panel data models or fractional response models, to provide a more comprehensive understanding of the relationship between digital finance and financial inclusion.

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