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Who Uses Mobile Payment Apps in Developing Countries? Literacy, Education, and the Role of Trust[1]

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Abstract

Financial inclusion is a key developmental objective for many low- and middle-income countries. It is generally believed that improving general education and financial literacy (knowledge of banking and financial systems) will translate into greater participation rates in various forms of digital finance. We investigate this issue using unique microdata from Indonesia and Bangladesh. Our econometric models show that education and literacy are not robustly correlated with greater levels of digital finance usage. Further, we show that distrust in the financial system (which very strongly undermines participation) sometimes *rises* with an individual's education or level of financial knowledge. Together, the results suggest that financial literacy and education may not effectively promote financial inclusion unless undertaken alongside efforts to build trust in the security of financial services.

JEL Classification: O12, O17

Key Words: Financial inclusion; Financial Literacy; Digital Literacy, Digital Finance, Trust, Economic Development

1. Introduction

Financial inclusion is often considered to be a major enabler of economic growth and development (Van et al., 2019; Kim, Yu and Hassan, 2018). By advancing access to high-quality and affordable financial products and services and enabling more people to become part of the formal financial system, financial inclusion can lead to greater economic opportunities by creating more access to finance and stimulating business activities (Charfeddine and Zaouali, 2022; Ajide, 2020). This, in turn, can result in higher levels of income generation which can significantly impact a person's overall wellbeing. The potential for financial inclusion to have a positive impact on economic growth is even greater in developing countries (Van et al., 2019; Ozili, Ademiju and Rachid, 2022). Recognizing this, strategies to advance financial inclusion have become a priority for many governments of developing countries (World Bank, 2022).

Crucially, advancing financial inclusion requires more than just increasing the supply of financial products and services. While increasing access to remote or rural communities, for

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example, is an important part of the equation, enhancing the demand for these services is of equal importance (Mukhopadhyay, 2016; Yangdol and Sarma, 2019; Singh, 2021). To help increase demand for formal financial products and services, efforts to improve financial literacy, or levels of education more broadly, have long been major areas of focus for both policymakers and practitioners. As consumers become more informed about the availability and benefits of financial products and services, they demand more financial inclusion as a pathway to access more sophisticated financial services (Grohmann, Klühs and Menkhoff, 2018). As the financial systems of each country become increasingly digital, a new dimension of digital financial literacy is necessary to add to this equation.

In this paper, we use ordinary least squares (OLS) regressions to empirically study the correlation between education and financial literacy and individual's propensity to having a mobile payments app on their phone. While the correlation between financial literacy or education and digital financial inclusion is generally assumed to be positive, this may be an oversimplification. We show that, in Bangladesh, these variables are indeed associated with greater uptake of digital financial services, but in Indonesia (a richer and more developed country) the results are weakened, or even reversed. We also show that distrust in the digital financial services tends to rise with literacy and education, especially in Indonesia. Since trust in the banking system is a very strongly associated with mobile payment app usage in both countries, the findings suggest that educational programs that also emphasize the security of these systems are likely to be most successful in driving digital financial inclusion. Trust also appears to matter more when the overall level of educational attainment is higher, and is a stronger correlate in our data for men than for women.

There are several important implications of this research which are applicable to the various stakeholders interested in promoting a more inclusive financial system, including policymakers, practitioners (i.e. financial service providers) and civil society. For example, the research highlights the potential need to reevaluate the content and delivery methods of financial education programs to ensure that these programs adequately address concerns associated with digital transactions. It also adds weight to consumer concerns about the security and privacy of digital financial services, which could possibly warrant policy changes relating to consumer protection or collaboration with industry to implement programs aimed at enhancing levels of trust in digital financial services. Lastly, our research demonstrates the need for more research to understand better the underlying issues that drive adoption (or rejection) of digital financial services.

The paper is structured as follows. Section 2 presents relevant background information and a review of current literature. Section 3 provides an overview of the data collected to support this study. Section 4 introduces our baseline models and estimates used for analysis. Section 5 reports the findings on the role of trust in influencing a person's usage of digital finance. Section 6 presents the results within a gender comparison. Section 7 concludes.

2. Background and Literature Review

In recent years, digitally enabled financial products and services have emerged as a new cornerstone of the financial inclusion agenda. Digital financial inclusion has been driven largely by the rapid pace of mobile phone adoption worldwide. As of 2022, there were an

estimated 5.4 billion unique mobile subscribers (GSMA, 2023), up from 3.6 billion in 2014 (GSMA, 2015). Access to this technology has provided a new gateway for financial service providers to reach an increasing number of previously inaccessible customers. The World Bank's most recent Global Findex Database has reported strong gains in achieving financial inclusion over the past decade with account ownership increasing by 50% between 2011 and 2021, and further noted that much of these gains were the result of mobile financial services including digital payments which served as important enablers for entering the formal financial system (Demirgüç-Kunt et al., 2022).

The COVID-19 pandemic also played an important role in accelerating the development and adoption of digital financial services (Tay, Tai and Tan, 2022). Faced with lockdowns and social distancing measures, the number of individuals in developing economies making or receiving digital payments for the first time increased sharply during the pandemic (Klapper, Pesme and Sirtaine, 2022). The continued uptake of digital payments is often promoted as an important step towards broader engagement in the digital economy, including further uptake of additional digitally enabled financial services (i.e. credit, insurance, savings, etc.), thus further deepening levels of financial inclusion (dos Santos and Harvold Kvangraven, 2017; Ouyang, 2021).

However, despite extensive financial inclusion efforts and the "boost" in digital adoption brought on by COVID-19 containment policies (Shriwise, 2022), the uptake of mobile payment systems in many developing countries has remained relatively slow (Almajali et al., 2022; Pal et al., 2021). Some of the common barriers to the adoption of mobile payment apps cited in the literature include cost, complexity, perceived risks (Mallat, 2007), or lack of incentive to change behaviours (i.e. preference to use alternative payment methods such as cash or credit card) (Au & Kauffman, 2008).

Overcoming these barriers and supporting the development and adoption of digital financial services can bring several benefits to the individuals or institutions which use them. Common examples of benefits include reduced cost, greater convenience, enhanced transparency, or the speed of transactions. For the poor, digital finance can be an especially important gateway to engage in the formal financial sector (Ali, 2022). As more governments declare their intentions to transform into cashless societies (corepay.net, 2021), achieving digital financial inclusion is growing in importance. If this transition occurs too rapidly and without adequate planning and support for marginalized communities, there is a risk of creating more exclusion (Cnaan et al., 2021).

Digital literacy refers to the skills necessary for a person to identify and use technology effectively and confidently. Similarly, a person's level of financial literacy, or education, can be assessed according to their knowledge and capabilities to make effective use of financial products and services. Combined, having adequate digital financial literacy is critical to an individual or business's ability to make informed and effective decisions relating to their use of digital financial products and services. Both digital and financial literacy are strongly correlated with education, with populations with access to higher-quality education systems expected to be more capable users of digital finance. Indeed, several studies have argued in favour of the importance of financial and digital literacy to promote wider use of digital financial services (Yang, Wu and Huang, 2023; Liew, Lim and Liu, 2020; Ullah et al., 2022). Digital financial literacy has also been found to have a significant positive impact on financial well-being (Pawan Ashok Kamble, Mehta and Rani, 2023).

While we do not deny the important influence digital and financial literacy can have on promoting financial inclusion, in this paper, we argue that this link may be more ambiguous than is generally recognized in the literature. More specifically, the results of our study suggest that levels of education and literacy are not robustly correlated with greater levels of digital finance usage. Further, we find that levels of distrust in the financial system strongly undermine participation and sometimes rises with an individual's education or level of financial knowledge.

In simple terms, trust can be defined as the level of a person's belief in the honesty and reliability of another person or institution. As with any consumer activity, trust between the client and customer is a fundamental element of each transaction. In the banking sector, nurturing consumer trust is especially important due to the inherently intangible nature of the products and services it delivers. Studies have shown that boosting individuals' trust can have a positive impact on driving the adoption of formal financial services (Baidoo and Akoto, 2019). Effective regulation of financial services that promote consumer trust is therefore an important component of developing a stable financial sector. However, as argued by Llewellyn (2005), regulation of the financial sector alone is not enough to inspire consumer trust in financial firms. It is therefore essential that financial service providers include building trust among clients as a core business strategy.

Developing consumer trust in digital services can be more difficult due to the lack of any human connection. The direct relationship between microfinance providers and their clients has been regarded as one of the success factors driving the microfinance industry (Godfroid, 2019; Doering, 2018; Drexler and Schoar, 2014; Siwale and Ritchie, 2011). These relationships are an important factor in establishing trust between the client and financial institutions (Uzzi and Lancaster, 2003). Siwale and Godfroid (2021) point out the dangers of digitizing the microfinance industry, arguing that the loss of loan officer-client relationships may indeed hinder financial inclusion. However, to date, there is limited research which explores how digitalization of financial services, particularly those aimed at poor or vulnerable clients such as microfinance, impacts levels of client trust.

Several studies have been conducted to examine what factors influence a person's desire or willingness to use digital financial services. For example, Ha, Sensoy and Phung (2023) found that both financial literacy and perceived trust play important roles in influencing the adoption of mobile money in Vietnam. Jain and Raman (2022) found that a person's perceived benefits of using digital financial services were a stronger influencing factor than their perceived risk. While such studies demonstrate links between financial literacy and trust as factors that impact digital finance usage, there remains a gap in the literature to fully understand the impact that a person's level of education or financial literacy has on their perceived risks associated with digital finance. Understanding this connection is of growing importance as the finance industry continues to experience a digital revolution. Furthermore, there are important implications to understanding how these links will impact policy and practice in developing countries which are actively supporting the development of digital services as a pathway towards greater financial inclusion among vulnerable population segments.

3. Data

Data for this study was gathered over a four-week period between March and April 2023 in Indonesia and Bangladesh, with 1,000 survey responses collected in each country for a total sample size of 2,000. These countries were selected due to their status as developing countries where financial inclusion is regarded as a high priority, as well as their relative stage of digital transformation. In Bangladesh, the digital economy is emerging (Bhuiyan et al., 2023). In contrast, Indonesia's digital economy is considered to be more advanced, likely propelled by a significant proportion of the population regarded as young and digitally savvy (Negara and Meilasari-Sugiana, 2022). Digital financial services are becoming increasingly popular in both countries due to rapid digital transformation (Akhter and Khalily, 2020; Angelina and Rahadi, 2020).

In each country, locations with a high proportion of low-income households were targeted. In Indonesia, surveys were conducted in 87 villages in West Java, whereas in Bangladesh 81 villages in the Louhajang Upazila of the Munshiganj District were targeted. The survey instrument contained 57 questions organized to collect insights into several variables, including household composition, demographics, financial behaviours, livelihoods, and usage of digital technology, including attitudes and usage of mobile payment apps.

The data only offer an approximate representation of the entire adult populations in both countries. Eligible participants were identified through a series of selection criteria questions. These criteria encompassed meeting specific conditions: being at least 18 years old and less than 61 years old, having a maximum average household income (equivalent to USD 300 per month in the local currency), possessing consistent access to a smartphone and reliable internet connectivity, and serving as the primary financial manager within their household. Prior to collecting their responses, all eligible participants were briefed on the study's details and asked for their consent to participate.

Data collectors employed a systematic random sampling approach to select respondents in both countries. Beginning from a designated point, they identified an eligible household within a single structure. Upon completing the survey, the collectors bypassed the subsequent two structures before screening the third to identify another eligible household. If the household met the criteria, the collector conducted the survey; otherwise, they proceeded to the next immediate structure in search of an eligible household. Following this method, enumerators skipped every two structures to locate and survey eligible households.

Table 1 presents descriptive statistics for our estimation sample, which is slightly below 1,000 in Bangladesh due to missing values on some variables. The average age of respondents in Indonesia was approximately 40, while in Bangladesh it was slightly lower at around 35. Roughly 80% of respondents in both countries were married, with males constituting about 60% of respondents in Bangladesh and 50% in Indonesia. Household size tended to be larger among respondents in Bangladesh, averaging 4.4 persons per household compared to approximately 3 people per household in Indonesia.

Table 1. Descriptive Statistics –Bangladesh and Indonesia

	Bangladesh					**Indonesia**				
	Obs	Mean	St Dev	Min	Max	Obs	Mean	St Dev	Min	Max
Use Payments App	949	0.643	0.479	0	1	1,000	0.381	0.486	0	1
Financial Lit Score	949	2.540	0.566	0	3	1,000	2.408	0.624	0	3
Have Degree	949	0.036	0.186	0	1	1,000	0.011	0.104	0	1
Distrust Score	949	0.345	0.475	0	1	1,000	0.119	0.324	0	1

Log HH Income	949	9.755	0.388	8.699	10.308	1,000	14.882	0.286	13.764	15.319
Female	949	0.404	0.491	0	1	1,000	0.500	0.500	0	1
Age	949	35.33	10.67	18	60	1,000	39.86	10.018	18	80
Square of Age	949	1361.0	816.7	324	3600	1,000	1689	846.41	324	6400
Married	949	0.827	0.378	0	1	1,000	0.873	0.333	0	1
Widowed/Widower	949	0.018	0.133	0	1	1,000	0.051	0.220	0	1
1 Adult in HH	949	0.004	0.065	0	1	1,000	0.091	0.288	0	1
2 Adult in HH	949	0.394	0.489	0	1	1,000	0.737	0.440	0	1
3 Adult in HH	949	0.282	0.450	0	1	1,000	0.134	0.341	0	1
4 Adult in HH	949	0.224	0.417	0	1	1,000	0.034	0.181	0	1
1 Child in HH	949	0.231	0.422	0	1	1,000	0.362	0.481	0	1
2 Child in HH	949	0.352	0.478	0	1	1,000	0.383	0.486	0	1
3 Child in HH	949	0.306	0.461	0	1	1,000	0.224	0.417	0	1
4 Child in HH	949	0.101	0.302	0	1	1,000	0.026	0.159	0	1
5 Child in HH	949	0.008	0.091	0	1	1,000	0.004	0.063	0	1
White Collar Job	941	0.022	0.148	0	1	1,000	0.556	0.497	0	1
Blue Collar Job	941	0.121	0.326	0	1	1,000	0.062	0.241	0	1
Self Employed	941	0.146	0.353	0	1	1,000	0.151	0.358	0	1

Note: The table gives key descriptive statistics from our estimation sample. Estimates for Bangladesh appear in the left panel and estimates for Indonesia appear on the right. Due to some missing observations for Bangladesh, there are slightly fewer than 1,000 observations for all markers. The leftmost columns give sample sizes, with means, standard deviations, and minimum/maximum values appearing rightward. Standard deviations for dummy variables are given by $\sqrt{\hat{p}(1-\hat{p})}$ where $\hat{p}$ is the fraction of the dummy variable equal to one.

The key variables that are the primary focus of our analysis were the use of mobile payment apps, financial literacy score, having completed a university degree, and level of distrust in digital financial transactions. Mobile payment apps are defined as digital platforms which are designed for the purpose of facilitating financial transactions such as making payments, donations, or purchase of online goods through a mobile device (i.e. a smartphone). Common mobile payment apps in Bangladesh include Bkash, Nagad and Rocket. In Indonesia, common apps include Gopay, OVO, ShopeePay, and DANA. To determine the level of digital access, survey respondents were asked the following question:

- *"If you have a smartphone, what types of APPs are INSTALLED on your phone?"*
    - *Mobile payment apps*
    - *E-commerce apps*
    - *Mobile banking apps*
    - *Social media apps*
    - *Games*
    - *Video apps (i.e. YouTube, etc.)*

In Bangladesh, about 60% of respondents reported having a mobile payment app on their phone, whereas the number of respondents with a mobile payments app installed on their phone in Indonesia was only 40%.

Financial literacy can be defined as the level of knowledge, skills, and understanding a person has of financial concepts that enables them to make informed and effective decisions about their finances. To assess the level of financial literacy among respondents we followed the methodology proposed by Klapper et al. (2015) which advocates for asking specific questions relating to four core concepts: risk diversification, inflation, interest rate and interest compounding. These questions are commonly used within the literature to measure financial literacy (Grohmann, Klühs and Menkhoff, 2018). Considering the context of our study, involving low-income households in developing countries, we used a simplified version of this methodology, using on the following questions:

- *"Suppose you put 100,000 takas into a <no fee, tax-free> savings account with a guaranteed interest rate of 2% per year. You do not make any further payments into this account and you do not withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made?"*
    - *1,02,000 taka*
    - *Less than 1,02,000 taka*
    - *More than 1,02,000 taka*
    - *Do not know*
- *"An investment with a high return is likely to be high risk."*
    - *True*
    - *False*
- "*High inflation means that the cost of living is increasing rapidly."*
    - *True*
    - *False*

Based on responses to these questions, a financial literacy score was developed for each country. The financial literacy scores for Bangladesh and Indonesia were very similar, with the number of questions (out of 3) answered correctly averaging 2.5 and 2.4, respectively.

The level of general education was also included as an additional variable to complement financial literacy. Both education and financial literacy capture an individual's general background knowledge and could be used as factors contributing to their overall level of human capital. In our study, to examine education, respondents were asked to specify their level of education, with "having completed a university degree" being one of the response options.

The final key variable in our analysis was the level of distrust in the digital finance system. To assess this, respondents were asked:

- *"How likely do you think it is that your information or money in a banking transaction may be stolen by virus, fraudulent websites or fraudulent apps?"*
    - *Extremely likely*
    - *Quite likely*
    - *Slightly likely*
    - *Neither*
    - *Slightly unlikely*
    - *Quite unlikely*
    - *Extremely unlikely*

Using the highest category (*Extremely likely*) as a dummy variable for our analysis, our results indicate that respondents in Bangladesh have a higher level of extreme distrust (about 35%) than those in Indonesia (about 12%).

4. Baseline Models and Estimates

To model the relationships between mobile payment app use and our covariates, we begin with simple linear probability models of the form below:

$$y = \alpha + \beta_1 Literacy + \beta_2 Education + \sum_{j=1}^{k} \theta_j Control_j + \varepsilon$$

Here y is our outcome variable (in this case a dummy for having a mobile payment installed), with $Literacy$ and $Education$ indicators of human capital from Table 1. The model also uses a suite of $j = 1, \ldots k$ demographic controls denoted $Control_j$. Parameters α, β_1, β_2, and θ_j fit the model and are estimated by Ordinary Least Squares with heteroskedasticity-robust covariance.

Our results, outlined in Table 2, show that a +1 unit improvement in the financial literacy score is associated with an 11% increase in mobile payment app use in Bangladesh. These results are significant at the alpha = 1% level. However, the opposite impact is observed in Indonesia, with results showing a 4% decrease in mobile payment app use. It is worth noting that correlations are weaker in Indonesia, with the results only being significant at the alpha = 10 per cent level.

Interestingly, when measured against having a university degree, we find that this variable is associated with higher mobile payment app use in Indonesia, with an increase of about 25%-35% observed. In the case of Bangladesh, no significant relationship between these variables is observed.

Taken together, these results suggest that a person's knowledge and understanding, as a measure of financial literacy or general education, increases mobile payment app usage. However, our results are not robust. This suggests that there may be other important factors at play which could be powerful determinants of a person's willingness to adopt mobile payment apps.

Table 2. Model Outputs: Determinants of Mobile Payment Application Use

	Bangladesh			**Indonesia**		
	M1	M2	M3	M1	M2	M3
Financial Lit Score	**0.111*** **	**0.105*** **	**0.111*** **	**-0.044***	**-0.042***	**-0.029**
	0.029	0.029	0.029	0.025	0.024	0.024
Have a University Degree	**0.083**	**0.070**	**0.048**	**0.356*** **	**0.284** **	**0.255** **
	0.076	0.077	0.077	0.137	0.119	0.115
Log HH Income		0.053	0.080*		0.259***	0.264***
		0.041	0.042		0.049	0.048
Female		-0.024	-0.006		0.011	0.02
		0.032	0.038		0.03	0.029
Age		-0.004	-0.01		-0.055***	-0.034***
		0.009	0.010		0.010	0.010
Age Squared		0.000	0.000		0.001***	0.000**
		0.000	0.000		0.000	0.000
Married			-0.05			-0.114
			0.057			0.094
Widow/widower			-0.107			-0.017
			0.139			0.097
1 Adult in HH			0.370*			0.475***
			0.205			0.100
1 Adult in HH			0.194***			0.375***
			0.061			0.056
1 Adult in HH			0.139**			0.411***
			0.060			0.063
1 Adult in HH			0.171***			0.389***

			0.06			0.090
1 Child in HH			0.150			0.455***
			0.302			0.055
1 Child in HH			0.064			0.413***
			0.300			0.053
1 Child in HH			0.180			0.418***
			0.300			0.055
1 Child in HH			0.207			0.294***
			0.302			0.101
1 Child in HH			0.019			0.677***
			0.354			0.226
White Collar Worker			0.025			-0.202***
			0.103			0.038
Blue Collar Worker			0.011			-0.172***
			0.052			0.063
Self Employed			0.012			-0.095*
			0.047			0.053
Constant	0.357***	0.003	-0.459	0.482***	-2.118***	-3.195***
	0.076	0.435	0.552	0.062	0.731	0.744
r2	0.019	0.026	0.054	0.009	0.078	0.133
F	8.71	4.004	2.668	4.753	16.435	7.852
N	949	949	941	1000	1000	1000

Note: The table presents estimates from linear probability models capturing the effects of covariates on the use of a mobile payment app. Estimates for Bangladesh appear in the left panel and estimates for Indonesia appear on the right. Key estimates are presented in bold. Model 1 (leftmost columns) presents raw associations, Model 2 (centre columns) uses basic demographic controls, and Model 3 (rightmost columns) uses an extended set of demographic controls. All models are estimated by ordinary least squares with robust covariance. Standard errors appear below each estimate. Symbols *, **, and *** depict statistical significance at 10%, 5%, and 1% respectively.

5. The Role of Trust

Considering the broad range of factors which play a role in a person's ability or willingness to adopt digital financial services, such as access to adequate technology, reliability of ICT infrastructure, the perceived benefits, or cultural norms, financial literacy and trust stand out as just a few factors in a much broader equation. However, as the development of the digital economy continues to transform financial systems, it can be assumed that issues relating to trust, including perceptions of security and reliability of digital financial services, may become more prevalent.

With this in mind, we now estimate the model including data on trust:

$$y = \alpha + \beta_1 Literacy + \beta_2 Education + \beta_3 Trust + \sum_{j=1}^{k} \theta_j Control_j + \varepsilon$$

When examining the results with levels of distrust in digital financial services included as a variable, we find that higher levels of distrust in digital financial services is strongly associated with less use of mobile payment apps. In Bangladesh, this results in an 11%-12% decrease in app usage, whereas in Indonesia the results are slightly stronger showing a decrease of 16%-17%. These results are highly significant in both countries across all models.

Table 3. Model Outputs: Trust and Mobile Payment Application Use

	Bangladesh			Indonesia		
	M1	M2	M3	M1	M2	M3
Financial Lit Score	**0.104*** **	**0.097*** **	**0.102*** **	**-0.032**	**-0.03**	**-0.017**
	0.028	**0.029**	**0.029**	**0.025**	**0.025**	**0.025**
Have a University Degree	**0.091**	**0.077**	**0.055**	**0.365*** **	**0.291** **	**0.262** **
	0.075	**0.076**	**0.076**	**0.134**	**0.115**	**0.112**
Distrust in Banking App Security	**-0.118*** **	**-0.120*** **	**-0.109*** **	**-0.159*** **	**-0.168*** **	**-0.162*** **
	0.033	**0.033**	**0.033**	**0.043**	**0.043**	**0.040**
Log HH Income		0.058	0.083*		0.271***	0.277***
		0.041	0.042		0.049	0.048
Female		-0.029	-0.012		0.011	0.02
		0.032	0.038		0.029	0.029
Age		-0.006	-0.01		-0.055***	-0.034***
		0.009	0.01		0.010	0.010
Age Squared		0.000	0.000		0.001***	0.000**
		0.000	0.000		0.000	0.000
Married			-0.055			-0.132
			0.057			0.096
Widow/widower			-0.106			-0.036
			0.141			0.098
1 Adult in HH			0.350*			0.438***
			0.209			0.115
1 Adult in HH			0.190***			0.354***
			0.061			0.079
1 Adult in HH			0.137**			0.392***
			0.06			0.083
1 Adult in HH			0.171***			0.369***
			0.06			0.108
1 Child in HH			0.133			0.472***
			0.344			0.055
1 Child in HH			0.057			0.436***
			0.343			0.054
1 Child in HH			0.164			0.432***
			0.343			0.054
1 Child in HH			0.184			0.319***
			0.344			0.1
1 Child in HH			0.011			0.722***
			0.39			0.245
White Collar Worker			0.007			-0.202***
			0.101			0.038
Blue Collar Worker			-0.003			-0.176***
			0.052			0.063
Self Employed			0.015			-0.093*
			0.047			0.053
Constant	0.416***	0.036	-0.406	0.472***	-2.317***	-3.387***
	0.077	0.434	0.577	0.062	0.732	0.744
r2	0.033	0.04	0.065	0.02	0.09	0.144
F	10.609	5.544	3.126	8.477	17.425	7.992
N	949	949	941	1000	1000	1000

Note: The table presents estimates from linear probability models capturing the effects of covariates on the use of a mobile payment app. Estimates for Bangladesh appear in the left panel and estimates for Indonesia appear on

the right. Key estimates are presented in bold. Model 1 (leftmost columns) presents raw associations, Model 2 (centre columns) uses basic demographic controls, and Model 3 (rightmost columns) uses an extended set of demographic controls. All models are estimated by ordinary least squares with robust covariance. Standard errors appear below each estimate. Symbols *, **, and *** depict statistical significance at 10%, 5%, and 1% respectively.

While it may seem natural that a person's distrust in digital financial services will have a major impact on their willingness to adopt mobile payment apps, our results point to a more distinct relationship between levels of trust and financial literacy or education. This connection is further highlighted by the slight attenuation of estimates on financial literacy and education, as observed in our results.

Shapley Decompositions

To empirically study the relative importance of our three variables we present Shapley value decompositions of the R-squared term in each regression. The Shapley value is a useful technique for attributing variation in the explained component of a model to each covariate. It is an exhaustive decomposition yielding percentage contributions that are strictly positive and add up to 100%. The estimates are obtained by systematically including and excluding each covariate and averaging the marginal change in fit over all possible inclusion/exclusion possibilities (Shorrocks, 1982).

Table 4 shows the decompositions for each of our three variables of interest. In each case we use Model 3 as this also allows us to quantify the relative impacts of the control set as well.

Table 4. Shapley Value Decompositions: Key Variables

	Bangladesh		**Indonesia**	
Factor	Shapley value	Per cent	Shapley value	Per cent
Literacy	0.01702	26.27%	0.00229	1.59%
Degree	0.00186	2.87%	0.00590	4.09%
Distrust	0.01518	23.44%	0.01158	8.03%
Controls	0.03071	47.42%	0.12443	86.3%
TOTAL	0.06477	100.00%	0.14420	100.00%

Note: The table gives Shapley value decompositions of the R-squared term from regression equations using the indicator of having a banking app installed as the dependent variable. The Shapley Value is an additive contribution of that covariate (or set of covariates) to the overall R-squared term, such that the overall sum of Shapley Values equals the total explained variation in the model. Estimates for Bangladesh appear on the left with values for Indonesia on the right. The *percent* column expresses each Shapley value as a proportion of the total R-squared term for that regression model.

By using the Shapley Value we are able to get a better understanding of how important each variable is in relation to other covariates. Through this method we can observe that in Bangladesh distrust is just about as important a variable as financial literacy, accounting for 26% and 23% of variation respectively. Having a degree in Bangladesh has minimal impact, with a value of only about 3%. In the case of Indonesia, the distrust variable (8%) is twice as important as having a university degree (4%). However, financial literacy is relatively less important at less than 2%.

5.1 Who Trusts the Financial System?

Having identified the importance of trust as a predictor of mobile payment app use alongside financial literacy and education variables, we next examine what factors are associated with greater levels of trust. To do this, we re-estimate our original model using our trust marker as the LHS variable. Higher values here imply more distrust.

$$Distrust = \alpha + \beta_1 Literacy + \beta_2 Education + \sum_{j=1}^{k} \theta_j Control_j + \varepsilon$$

Our results show that in Indonesia, people with higher levels of financial literacy also exhibit a 7% increase in their level of distrust in digital financial services. However, in Bangladesh we observe the opposite impact with financial literacy scores having a positive impact on distrust (between -6% and -8%). In the case of education, we observe that having a degree slightly increases levels of distrust in both Bangladesh (6%) and Indonesia (4%-5%), although these are not significant at standard levels. Notably, we also observe that household income, which could reflect human capital and background knowledge, is also associated with more distrust in digital financial services (3%-5% in Bangladesh and 7%-8% in Indonesia).

Table 5. Distrust in the Security of Digital Financial Services

	Bangladesh			Indonesia		
	M1	M2	M3	M1	M2	M3
Financial Lit Score	**-0.063****	**-0.069****	**-0.078*****	**0.075*****	**0.071*****	**0.072*****
	0.028	**0.028**	**0.028**	**0.015**	**0.015**	**0.015**
Have a University Degree	**0.064**	**0.059**	**0.061**	**0.053**	**0.043**	**0.040**
	0.086	**0.088**	**0.088**	**0.118**	**0.121**	**0.124**
Log HH Income		0.049	0.029		0.073**	0.078**
		0.042	0.043		0.035	0.036
Female		-0.043	-0.057		-0.002	0.002
		0.032	0.039		0.02	0.021
Age		-0.015	-0.003		0.003	0.004
		0.009	0.011		0.006	0.006
Age Squared		0.000*	0.000		0.000	0.000
		0.000	0.000		0.000	0.000
Married			-0.043			-0.111
			0.062			0.070
Widow/widower			0.009			-0.118**
			0.151			0.059
1 Adult in HH			-0.187			-0.229
			0.289			0.201
1 Adult in HH			-0.03			-0.127
			0.06			0.193
1 Adult in HH			-0.017			-0.115
			0.059			0.194
1 Adult in HH			-0.002			-0.118
			0.061			0.200
1 Child in HH			-0.153			0.105***
			0.394			0.036
1 Child in HH			-0.072			0.139***
			0.393			0.037
1 Child in HH			-0.152			0.089**
			0.393			0.035
1 Child in HH			-0.216			0.150**
			0.394			0.075
1 Child in HH			-0.070			0.278
			0.425			0.200
White Collar Worker			-0.171*			0.002
			0.100			0.027
Blue Collar Worker			-0.129***			-0.022
			0.049			0.046
Self Employed			0.028			0.010
			0.050			0.035
Constant	0.503***	0.274	0.493	-0.063*	-1.186**	-1.187**
	0.073	0.443	0.618	0.034	0.528	0.578
r2	0.006	0.017	0.037	0.022	0.026	0.038
F	2.745	2.719	1.895	12.555	4.971	1.910
N	949	949	941	1000	1000	1000

Note: The table presents estimates from linear probability models capturing the effects of covariates on our trust variable. Estimates for Bangladesh appear in the left panel and estimates for Indonesia appear on the right. Key estimates are presented in bold. Model 1 (leftmost columns) presents raw associations, Model 2 (centre columns) uses basic demographic controls, and Model 3 (rightmost columns) uses an extended set of demographic controls. All models are estimated by ordinary least squares with robust covariance. Standard errors appear below each estimate. Symbols *, **, and *** depict statistical significance at 10%, 5%, and 1% respectively.

While these results are not all significant, they are still robust and thus point towards a less understood relationship between a person's human capital (i.e. knowledge and skills) and their level of trust in the security of digital financial services. Our results indicate that as people become more educated and financially literate, their trust in digital financial services may decline. Such phenomena could potentially undermine efforts to advance financial inclusion, especially digital financial inclusion, through programs aimed at enhancing human capital (i.e. financial literacy or general education).

6. Does Gender Matter?

Several studies have examined the relationship between gender and financial services and have highlighted that men and women often have different interests, preferences, or motivations for using formal financial services (Forster, Happ and Maur, 2018; Capelle-Blancard and Reberioux, 2021; Farrell et al., 2016). Considering this, we have also included a gender perspective in our analysis to see if men and women demonstrate different trust perceptions towards digital financial services in relation to their level of financial literacy and education.

From our results, levels of distrust generally translate into reduced mobile payment app use among men. In other words, if a man has a higher distrust in digital financial services, he is more likely to not use mobile payment apps. This result is consistent across both countries, with an effect size of 16% in Bangladesh and 12%-17% in Indonesia. See Tables 6 and 7.

On the other hand, our results show that in the case of Bangladesh, even if women have higher levels of distrust, they are still more likely to use these apps. Effect sizes are about -5% in Bangladesh compared to the much more significant -20% in Indonesia. When considering the impact of education and financial literacy, both variables appear to reduce distrust in digital financial services among women more than men.

Table 6. App Use, Human Capital, and Trust: Key Estimates - Men

Mobile Payment App Use	**Bangladesh**			**Indonesia**		
	M1	M2	M3	M1	M2	M3
Financial Lit Score	0.074**	0.058	0.055	-0.047	-0.036	-0.014
	0.037	0.037	0.037	0.035	0.034	0.033
Have a University Degree	0.084	0.065	0.076	0.324*	0.209	0.244
	0.088	0.088	0.094	0.19	0.171	0.189
Distrust in Banking App Security	-0.157***	-0.161***	-0.157***	-0.123**	-0.156**	-0.173***
	0.042	0.042	0.042	0.062	0.065	0.060
Distrust in Banking App Security	**Bangladesh**			**Indonesia**		
Financial Lit Score	-0.054	-0.057	-0.066*	0.066***	0.064***	0.068***
	0.038	0.038	0.038	0.022	0.022	0.021
Have a University Degree	0.013	0.011	0.032	0.209	0.18	0.156
	0.100	0.100	0.100	0.194	0.207	0.215

Note: The table presents estimates from linear probability models for (i) mobile payment app use and (ii) trust in bank app security using the male-only subsample. Estimates for Bangladesh appear in the left panel, and estimates for Indonesia appear on the right. Model 1 (leftmost columns) presents raw associations, Model 2 (centre columns) uses basic demographic controls, and Model 3 (rightmost columns) uses an extended set of demographic controls. All models are estimated by ordinary least squares with robust covariance. Standard errors appear below each estimate. Symbols *, **, and *** depict statistical significance at 10%, 5%, and 1% respectively.

Table 7. App Use, Human Capital, and Trust: Key Estimates - Women

Mobile Payment App Use	**Bangladesh**			**Indonesia**		
	M1	M2	M3	M1	M2	M3
Financial Lit Score	0.141***	0.144***	0.160***	-0.015	-0.02	-0.02
	0.045	0.045	0.047	0.036	0.037	0.037
Have a University Degree	0.102	0.115	0.09	0.400**	0.362**	0.326**
	0.145	0.148	0.14	0.184	0.151	0.142
Distrust in Banking App Security	-0.058	-0.059	-0.045	-0.196***	-0.185***	-0.168***
	0.054	0.054	0.056	0.059	0.056	0.057
Distrust in Banking App Security	**Bangladesh**			**Indonesia**		
Financial Lit Score	-0.086**	-0.085**	-0.108***	0.086***	0.080***	0.077***
	0.041	0.041	0.041	0.021	0.022	0.022
Have a University Degree	0.171	0.185	0.099	-0.135***	-0.150***	-0.135***
	0.172	0.176	0.19	0.025	0.028	0.042

Note: The table presents estimates from linear probability models for (i) mobile payment app use and (ii) trust in bank app security using the male-only subsample. Estimates for Bangladesh appear in the left panel, and estimates for Indonesia appear on the right. Model 1 (leftmost columns) presents raw associations, Model 2 (centre columns) uses basic demographic controls, and Model 3 (rightmost columns) uses an extended set of demographic controls. All models are estimated by ordinary least squares with robust covariance. Standard errors appear below each estimate. Symbols *, **, and *** depict statistical significance at 10%, 5%, and 1% respectively.

While this research has not specifically examined the reasons as to why these different attitudes towards mobile payment apps exist between men and women, we can speculate what factors may be influencing these results. For example, women being more likely to use mobile payment apps than men regardless of their level of distrust in digital financial services may be due to women generally having less access to traditional banking services. Various socio-economic (i.e. lower income, cultural factors, etc.) or structural (i.e. lack of formal identification) may impact the ability of women more than men to access physical banking services, leaving mobile payment apps as a convenient and accessible alternative (Mazumder, Subham Dastidar and Bhandari, 2017; Govindapuram, Bhupatiraju and Sirohi, 2022). Furthermore, use of mobile payment apps may be preferable among women due to their ability to enable financial independence, thus facilitating economic empowerment through greater control over their finances (Dorfleitner and Nguyen, 2022).

7. Conclusion

While it is commonly assumed that there is a positive correlation between financial literacy or education and digital financial inclusion, this viewpoint may be oversimplified. Based on survey data collected from Bangladesh and Indonesia, our models have revealed that in Bangladesh, these factors indeed contribute to a higher adoption rate of mobile payment apps. However, in Indonesia, a more affluent and developed country by comparison, the outcomes are less straightforward and, in some cases, even contradictory. Moreover, we find that distrust

in digital financial services tends to increase with higher levels of literacy and education, particularly in Indonesia. Given that trust in the banking system strongly influences banking app usage in both nations, our findings suggest that educational initiatives emphasizing the security of these systems are likely to be most effective in promoting digital financial inclusion. Additionally, trust appears to be more significant in contexts with higher overall educational attainment and is a more significant factor for men than women in our analysis.

This research has substantial implications for stakeholders interested in creating a more inclusive financial system through the expansion of digital financial products and services, including policymakers, practitioners (such as financial service providers), and civil society. It underscores the potential necessity to reassess both the content and delivery methods of educational programs, ensuring they effectively address concerns related to the security of digital transactions. Additionally, the research amplifies consumer concerns regarding the security and privacy of digital financial services, possibly warranting policy adjustments in areas of consumer protection or collaborative efforts with the industry to implement initiatives aimed at bolstering trust in digital financial services. Lastly, our findings emphasize the need for further research to gain a deeper understanding of the underlying factors influencing the adoption (or rejection) of digital financial services.

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