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Can Digital G2P Transfers Drive Financial Inclusion and Digital Payments? Evidence from India

Alan Gelb, Anit Mukherjee, and Brian Webster

Abstract

Does channeling government-to-person (G2P) payments through bank accounts encourage financial inclusion and use? This paper explores the factors that have driven the adoption of digital payments in India by beneficiaries of PMGKY, the large-scale COVID-19 relief program launched in May 2020. India's 2013 move to pay social benefits through direct transfers into bank accounts significantly increased account ownership, but uptake of digital payments has been slower, although it has accelerated more recently through smartphone-based apps. Recipient survey data shows that personal and household attributes influence the likelihood of adopting digital payments. Smartphone ownership and digital literacy improve the odds while being a woman reduces them. The strength of the local digital payments ecosystem also exerts significant influence on household adoption; favorable personal and ecosystem factors are needed for widespread use. The historical progression shows that G2P transfers create an entry point but that widespread access to low-cost mobile telecommunications, interoperability, and the entry of new players offering convenient payments interfaces have been vital to the growth of digital payments.

KEYWORDS
digital, payments, India

JEL CODES
G20, G53, O10, O16, O33, O35

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Abbreviations

DBT	Direct Benefit Transfer
e-KYC	Electronic Know Your Customer
G2P	Government-to-Person
GoI	Government of India
GSMA	Global System for Mobile Communications Association
ID	Identity
MSC	MicroSave Consulting
NGO	Non-Governmental Organization
P2B	Person-to-Business
P2P	Person-to-Person
PESP	Primary Education Stipend Program
PMGKY	Pradhan Mantri Garib Kalyan Yojana
PMJDY	Pradhan Mantri Jan-Dhan Yojana
UPI	Unified Payments Interface
USSD	Unstructured Supplementary Service Data
QR	Quick Response
SMS	Short Message Service

1. Introduction

Social protection programs have increasingly been moving away from giving out cash to disbursing benefits through digital mechanisms such as smartcards, e-vouchers and bank or mobile money accounts (Gelb et al., 2020). This trend has been accelerated by the Covid-19 pandemic and lockdowns, which saw a huge increase in the number of households and people receiving benefits (Gelb and Mukherjee, 2020). Millions of new bank or mobile money accounts were opened in some countries. An additional benefit seen from this transition is that government-to-person (G2P) social assistance payments delivered through financial accounts can serve as a gateway to other financial services such as formal saving, person-to-person (P2P) or person-to-business (P2B) digital payments. The accumulation of financial records for beneficiaries can expand access to small business loans, thereby deepening financial inclusion and better enabling households to withstand shocks (World Bank and BIS, 2016).

Nevertheless, there is considerable evidence that most grants are cashed out, especially in poorer countries, and that many beneficiaries function in a cash-only environment despite the modernization of G2P payments (Gronbach, 2020). Studies indicate that moving towards wider use of digital payments would require several things, including the establishment of a broader digital payment ecosystem including small local shops and informal traders, as well as financial and technological education of beneficiaries and the development of appropriate financial products. Drawing on Findex data, others find that the probability that opening an account to receive benefits results in the use of other financial services is small (Stuart, 2016). In a survey of beneficiaries of Colombia's emergency Covid-19 grant which was provided through (often new) mobile accounts, a regression-discontinuity analysis finds that the probability that eligible beneficiaries used digital payments was higher than that of non-beneficiaries but that the change was from a low base and not large in absolute terms (Gallego et al., 2021). An early study of Bangladeshi mothers receiving PESP stipends by mobile money found that almost all preferred this modality to receiving cash payments at schools, but there were few signs of the use of saving or payment services (Gelb et al., 2019). On the other hand, in a small survey of social beneficiaries in Machakos, Kenya, a country with a relatively established digital payments ecosystem, found that quite a number used mobile money for a range of purposes and that some had linked the bank accounts established to receive social payments to M-Pesa mobile wallets (Odera et al., 2020).

This paper draws on a September 2020 survey of people benefiting from India's massive PMGKY COVID-19 social assistance program to consider the factors that have shaped their use of digital payments in the context of rapid growth in the volume and value of such payments. Section 2 outlines the timelines for financial inclusion and digital payments in India since 2010. Section 3 considers personal attributes and contextual factors, including the depth of the local ecosystem. Section 4 details the results from logistic regressions to test these hypotheses and Section 5 comments on implications for the broader question of the relationship between G2P payment modalities and the use of financial services.

2. Financial inclusion and digital transformation in India: a brief chronology

Although it has not rationalized its sprawling program of schemes and benefits, India has made major investments to modernize delivery and encourage financial inclusion. The first building block was the Aadhaar ID system, which was launched in in 2009.[1] By 2013 over half a billion people were enrolled in Aadhaar, with gains continuing apace (Abraham et al., 2017). In addition to this milestone, 2013 also witnessed the introduction of the Direct Benefit Transfer (DBT) program;[2] this unified payment arrangements for multiple G2P schemes, with benefits delivered through Aadhaar-linked bank accounts. DBT was followed in 2014 by the Pradhan Mantri Jan-Dhan Yojana financial inclusion initiative,[3] which resulted in the opening of some 400 million new accounts, half of them owned by women. The introduction of e-KYC facilitated this by sharply reducing the cost of customer due diligence.[4] The 2016 launch of Unified Payments Interface (UPI) then ensured payments interoperability across all accounts (Carriere-Swallow, 2021); by that date, Aadhaar, the first of the building blocks, had reached over a billion enrollees. As shown in Figure 1, by 2017, financial inclusion (as measured by bank account ownership) had increased to 80 percent of the adult population (Demirgüç-Kunt et al., 2018).

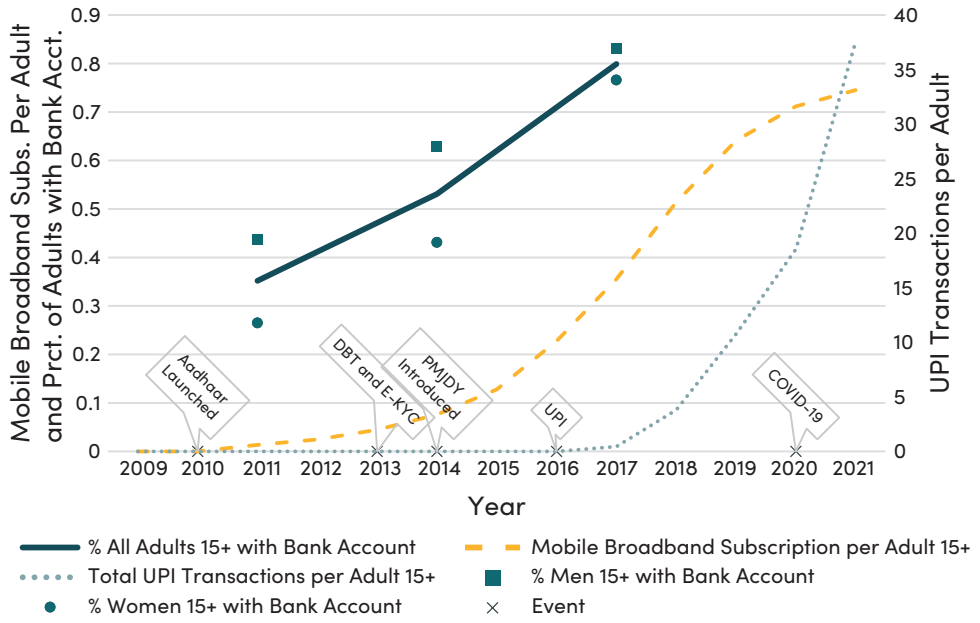
1 Aadhaar is a nation-wide digital ID system which assigns individuals a 12-digit number linked to biometric information. Its interoperable nature makes it an effective tool for establishing identity in multiple contexts. See Mukherjee and Maruwada (2021). https://www.cgdev.org/publication/fast-tracking-development-building-blocks-approach-digital-public-goods

2 Direct Benefit Transfer allows for the automatic dispersal of government transfers to individuals electronically through direct deposit or similar means. See Patnaik (2013). https://socialprotection.org/discover/publications/india%E2%80%99s-direct-benefit-transfer-and-public-distribution-system-can-they-work

3 The Pradhan Matri Jan Dhan Yojana (PMJDY) was designed to boost financial inclusion by allowing for the opening of bank accounts linked to mobile numbers using Aadhaar identification. See Mukherjee and Maruwada (2021).

4 e-KYC allows for the identification of people electronically. In India, the process is facilitated by Aadhaar. See GoI Unique Identification Authority of India. https://uidai.gov.in/ecosystem/authentication-devices-documents/about-aadhaar-paperless-offline-e-kyc.html

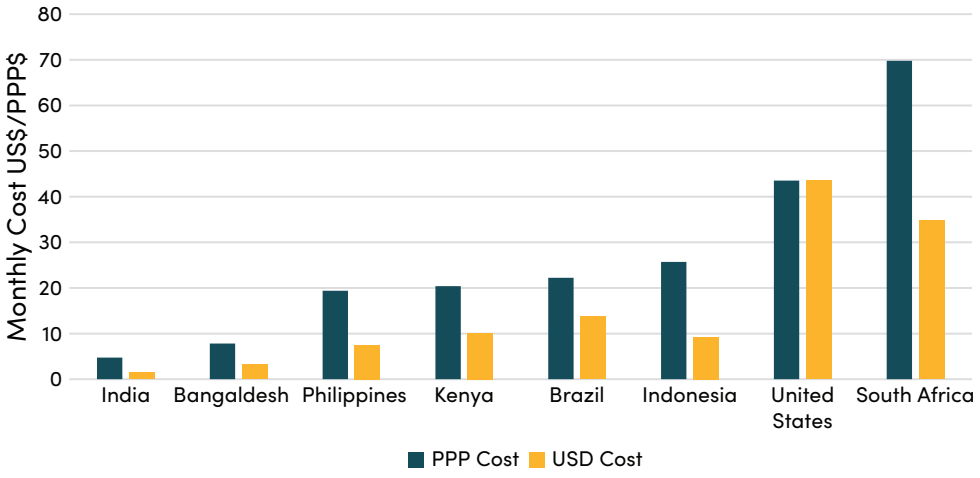
FIGURE 1. Development of digital finance in India



*Data obtained from the World Bank and International Telecommunication Union, 2/11/2022 and 2/10/2022 respectively.
**2021 figures are estimates, assuming 1.23% growth in adult population and 6% growth in broadband subscriptions.

At the same time, ongoing reforms in the telecommunications sector opened up space for digital communications. Mobile broadband subscriptions soared (Figure 1) as data prices fell to about the lowest in the world (Figure 2). This was a result of exceptionally strong market competition, especially from the provider Reliance Jio which provides basic smartphones for a 20 dollar deposit and data plans for about a dollar a month (McMahon, 2020).

FIGURE 2. Country cost of connectivity (2019 Monthly cost of high usage phone plan: 140 mins, 70 sms and 1.5 gb)



*Data obtained from the International Telecommunication Union, 2/10/2022.
**Data measured in 2019 US and PPP Dollars.

Nevertheless, as shown in Figure 1, despite high bank account ownership, the shift to DBT, the promotion of Rupay card-based payments and growing mobile connectivity, India remained a largely cash-based economy until the demonetization of November 2016. This temporarily increased the volume of digital payments, but they partially fell back towards previous levels as cash was re-introduced into the economy (Mukherjee and Wadhwa, 2017). In response to limited progress in reducing the cash economy, the High Level Committee on the Deepening of Digital Payments, headed by Nandan Nilekani, was formed in early 2019 by the Reserve Bank of India to recommend measures to stimulate acceptance and grow the digital payments ecosystem (Reserve Bank of India, 2019). The Committee's report came later that year, just as the payment system was beginning to take off. According to UPI data, digital transactions only totaled about two million a month at the end of 2016, and by the close of 2017 the figure had grown to roughly 100 million. Just prior to the COVID-19 pandemic, however, over a billion payments a month were being made through digital wallets.

The onset of the pandemic sustained the high growth rate in digital payments. By July 2021, three billion transactions a month were being conducted through digital wallets (NPCI, 2022); these were largely through smartphone-based apps, such as Google Pay, PhonePe and PayTM, that offered convenient and low-cost QR code-based transactions and easy merchant onboarding without the need to purchase dedicated terminals or other special equipment. By late 2021, the scale of digital payments had increased to the point where macroeconomic effects were observable, such as a slow-down in the demand for physical cash and a reduction in cash-based black-market activity (Shetty, 2021).

As shown in Figure 1, the large-scale use of digital payments has lagged the expansion in financial inclusion by some six or seven years. It has not been driven by the modality of G2P payments, although DBT would have opened a financial entry point for beneficiaries. Rather, a combination of (i) increasing access and lower costs of telecommunications, (ii) low-cost interoperability through the UPI, and (iii) the entry of new players, often tech companies that provided convenient, low-cost payments interfaces, have been instrumental in the acceleration of digital payments.

The take-up of digital payments has not been uniform across localities (GoI & MEIT, 2021). Network externalities on both the business and consumer sides have driven acceptance in some areas while in others this has lagged. Few actors, especially small merchants serving limited markets, will see the benefit of joining a sparse payments network, but at a certain tipping point few can justify not participating in dense, all-pervasive ones. A problem of local collective action emerges as actors are willing to join only if others do. Metcalfe's Law argues that networks become exponentially more valuable as more people connect to them (Zhang et al., 2015) implying local surges in the development of the ecosystem. As an example of such a process, Ligo et al. found that only 42 percent of small merchants in Jaipur, Rajasthan had adopted digital payments in 2019. Few regarded supply-side factors, such as the cost of devices or connections to the internet, to be particularly constraining. Rather, the most prevalent reason for not accepting digital payments was a perceived lack of demand within their customer base.

The nature of digital payments adoption across states has been heterogenous as well. Analysis of the September 2020 survey data indicates that different types of digital transactions are more or less prevalent depending on the state, as shown in Table 1. These differences do not necessarily follow patterns based on socio-economic conditions. The states of Uttar Pradesh and Bihar, for instance, are both home to large populations of internal migrants (Mukherjee, 2020). Yet households in Uttar Pradesh that use digital payments report making digital P2P transfers, a popular method of sending and receiving remittances, at roughly half the rate that similar households in Bihar do. The states of Gujarat and Tamil Nadu are divergent in digital payment use as well, despite similar economies. Both have high concentrations of small shops and other commercial business, but digital payment using households in Gujarat are far more likely to report purchasing household items using digital payments than households in Tamil Nadu.

TABLE 1. Reported digital payment use in India by state and transaction type (Percentages reflect the portion of households reporting digital payment use that engage in each type of transaction)

	State					
Transaction Type	Full Sample	Uttar Pradesh	Bihar	Gujarat	Tamil Nadu	Delhi
Basic Utilities Payments (Water, Cooking Gas, Electricity, etc.)	45.4%	36.4%	53.7%	36.4%	33.3%	72.2%
Advanced Utilities Payments (TV, Internet, Mobile Recharge, etc.)	51.1%	81.8%	61.0%	90.9%	54.2%	66.7%
Shopping (Household Items at the Market/Online)	28.6%	0.0%	22.0%	72.7%	8.3%	24.1%
Person-to-Person Transfer	49.4%	27.3%	58.5%	4.6%	31.3%	13.0%

Note: Column totals include multiple responses across transaction types.

When the COVID-19 pandemic struck, the Indian Government responded by launching a massive program of direct economic relief known as the Pradhan Mantri Garib Kalyan Yojana (PMGKY). Initiated in March of 2020, PMGKY provided additional support through a range of existing in-kind and cash transfer programs, including a new transfer benefiting over 200 million women owners of Jan Dhan accounts.[5] The sheer size of the program and the need for social distancing created an unprecedented trial by fire of India's digital financial infrastructure, one which is likely to have ramifications for the future of digital payments in India, and financial inclusion as a whole.

5 Cash transfers under the PMGKY generally ranged in value from $6.60 to $26.30 depending on the particular benefit. See Gelb et al. 2021. https://www.cgdev.org/publication/social-assistance-and-information-initial-phase-covid-19-crisis-lessons-household-survey

3. Factors that may shape the use of digital payments in India

Findex surveys provide a good indication of how global patterns of financial inclusion are shaped by a combination of personal attributes and country-level factors. Gelb et al. 2020 analyzed the 2017 survey: being male, well-educated, in a high-income quintile, and in the labor force increases the likelihood of owning a financial account. So does possession of a foundational ID credential and ownership of a mobile phone. When all these factors are positive, the probability of financial inclusion (as measured by account ownership) is 80 percent for the global sample. When all the factors are negative, the probability falls to only 7 percent. Part of the overall gender gap in financial inclusion is driven by the association of gender with other attributes, such as the lower probability that a woman will own a mobile or be in the labor force.

Many of the same factors might be expected to influence the probability that an individual in India will use digital payments. For PMGKY beneficiaries included in the September 2020 survey, all households will be covered by Aadhaar and all will have at least one bank account; all respondents also indicated that there was at least one mobile phone in their household. Nevertheless, beneficiary individuals and households will vary across a range of personal attributes, including access to a smartphone. This is likely to be critical for digital payments—in contrast to Africa, India has promoted smartphones as the way of the future and largely by-passed USSD-based digital payments through feature phones. The September 2020 survey of PMGKY recipients found that 71 percent of households possessed at least one smartphone, but this still left 29 percent of households with only feature phones. Very few of these used digital payments—considering households in which at least one member used digital payments, only 5 percent did not own a smartphone (Gelb et al., 2022).

Findex results indicate the importance of literacy. Even though they may engage through icons, mobile apps still rely on text to communicate instructions and messages and on written numbers to define transactions. Research on cultures of orality finds that people who cannot decode written numbers can sometimes perform complex financial calculations, but that they rely on the physical characteristics of banknotes and coins to do so (Hudson Mathews et al., 2017); they therefore have difficulty in a de-materialized, digital, environment.

These two factors—smartphone ownership and literacy—are important elements of the gender divide in Indian society. A 2020 survey by the Global System for Mobile Communications Association (GSMA) indicated that 41 percent of adult males in India owned a smartphone, compared to 25 percent of adult females (Carboni et al., 2021).[6] At the household level, the September 2020 survey of PMGKY recipients identified a clear gender hierarchy. In 87 percent of cases, the first smartphone purchased by a family is owned by a man. While the second smartphone is generally owned by

6 Despite women owning smartphones at nearly half the rate of men, the current gap represents an improvement. In 2019 37 percent of Indian men owned smartphones whereas only 14 percent of women did so.

a woman, the majority of subsequent smartphones are owned by men as well (Gelb et al., 2022). Moreover, only 66 percent of adult females in India were literate in 2018, as opposed to 82 percent of adult males (World Bank Data, 2022). The literacy gap may also translate into differential usage of technology. GSMA found that among those with access to a mobile phone but who did not use mobile internet, 16 percent of women cited illiteracy as the primary reason, versus 13 percent of men (Carboni et al., 2021).

It is not clear that these are the only mechanisms through which gender can influence digital payment use. Women's financial inclusion in general can be impeded by an array of factors such as lower workforce participation and social seclusion. The various attributes intersect with each other in ways that can make identifying specific causes and effects challenging (Gelb et al., 2020). What is clear is that no matter the exact processes at work, gender appears to be influencing the willingness or the ability of users to adopt digital payments. Some estimates in 2020 found that 15 percent of Indian men had a mobile money wallet, versus 4 percent of women (Carboni et al., 2021). The available evidence, therefore, suggests that gender should be considered in its own right as a potential factor in the likelihood of digital payments adoption as well as because of its association with literacy and smartphone ownership.

Finally, in addition to personal or household attributes, we would expect that the probability that an individual or household adopts digital payments will depend on the depth and dynamism of the local digital payments ecosystem. As described above, that determines much of the value proposition of having a mobile wallet.[7]

4. Data and estimates for digital payment use

In order to test these factors for digital payment adoption by households in India, we utilize survey data gathered by MicroSave Consulting (MSC) during the early phases of the COVID-19 pandemic. Designed to better understand the effectiveness of benefit delivery under the PMGKY, MSC conducted two surveys, one in June 2020 and the other in September 2020 (previously referenced), each with just over 5,080 respondents across 18 states. Respondents were all members of households receiving social assistance in the form of at least one cash transfer as well as in-kind food assistance. The surveys covered a range of topics related to the distribution and realization of PMGKY benefits as well as information on channels of communication and the use of digital payments. Gelb et al. (2021) and Gelb et al. (2022) provide details of the surveys, data and results. Table 2 provides an overview of the September survey which this paper draws from.

7 These theorized influences on digital payments uptake are broadly in line with those identified by Harihareswara and Miller (2021), which takes a decision tree approach to the subject. They, however, emphasize lack of trust in providers as a key constraint on demand for digital payment services. https://www.cgdev.org/publication/analysis-binding-constraints-digital-financial-inclusion-india-using-decision-tree

TABLE 2. September 2020 survey summary statistics

Demographic Category	Number of Respondents	Percentage of Respondents
All Respondents	5,081	100.0%
Male	3,569	70.2%
Female	1,512	29.8%
Urban	1,586	31.2%
Rural	3,495	68.8%
Holds PHH ration card	4,054	79.8%
Holds AAY ration card	1,027	20.2%
Household Has at Least 1 Smartphone	3,607	71.0%
Household Lacks a Smartphone	1,474	29.0%
Household Has at Least 1 Feature Phone	4,420	87.0%
Household Lacks a Feature Phone	661	13.0%
Household Has at Least 1 Bank Account	5,081	100.0%
Household Lacks a Bank Account	0	0.0%

From the September 2020 survey, we construct a series of binary variables. The dependent variable indicates if digital payments are used by at-least one member of each respondent's household (Y_i). Such payments could include transactions conducted through Google Pay, PhonePe, Pay TM, internet banking, USSD platforms such as *99#, or similar services independently identified by the respondent. The survey results confirm that the most frequent references are to the first payment-app channels.

We then assemble four binary explanatory variables; whether the survey respondent is female (F_i), whether any member of the respondent's household owns a smartphone (S_i), whether the respondent reports being able to read SMS messages (R_i), and reports being able to write SMS messages (W_i).[8]

There is some tension between measures at the household and individual levels. The survey data measures digital payment use and smartphone ownership at the household level, and literacy and gender at the level of the individual respondent. While imperfect, responses by an individual household member regarding literacy are probably an indication of the overall educational attainment of the household. Furthermore, while we cannot reliably identify the gender of all digital payment users within a household from the survey responses, the gender variable consistently yields a statistically significant negative effect on household adoption, suggesting that this variable at least mimics the likely effect of the gender of the individual user. However, given that women and girls make up 48 percent of India's population (World Bank Data, 2022), but just under 30 percent of the survey respondents, it is possible that the surveyed women are disproportionately from relatively

8 Urban-rural location was also included in regressions but was not significant and was therefore dropped from the reported models.

progressive households and are therefore more likely to report digital payments usage. It may, therefore, be best to interpret any resulting gender coefficients as lower-bound estimates.

To capture the local digital payments ecosystem we construct a measure of the intensity of digital payments use within states ($I_{i,state}$) from detailed location-specific transactions data released by PhonePe, the second largest wallet provider, for the 3rd quarter of 2020, the approximate time of the survey.[9] To obtain a per head measure, we then divide these transaction totals by the adult population of each state, as derived from registration data from the Unique Identification Authority of India.[10] This produces a measure of average digital payment use for each of the survey's 18 geographic areas. This data does not encompass the entire volume of digital payments from all providers; however, as the second largest mobile payments provider in India's very competitive market, the Phone Pe data provides the best location-specific proxy for such transactions corresponding to the survey period that we have been able to obtain. The measure indicates wide variation in the per-head measure of transactions, with some areas more advanced than others. We therefore have at least two unobservable factors at the state level: the competitive position of Phone Pe in the overall payments market, and the spatial distribution of the sample relative to the variation in within-state payment density. Phone Pe data shows considerable variation in payment intensity across states, with Telangana, Karnataka and Delhi among the higher intensities; it may not be a coincidence that the former two states are home to India's major technology hubs.

Model 1 estimates the probability that at-least one member of an individual respondent's household uses digital payments (Y_i) based on if the respondent is female (F_i), and the intensity of digital payment use in the respondent's state ($I_{i,state}$). Due to the concerns regarding unobserved state-level effects, we estimate the regression with and without errors clustered at state level. Their inclusion makes little difference to coefficients or levels of significance. All results reported use clustered errors.

1. $Y_i = \beta_0 + \beta_1 F_i + \beta_2 I_{i,state}$
   Model 2 adds smartphone ownership at the household level (S_i) as an independent variable.
2. $Y_i = \beta_0 + \beta_1 F_i + \beta_2 I_{i,state} + \beta_3 S_i$
   Model 3 introduces the adeptness of the phone user as a potential factor by including the respondent's ability to read SMS messages (R_i).
3. $Y_i = \beta_0 + \beta_1 F_i + \beta_2 I_{i,state} + \beta_3 S_i + \beta_4 R_i$
   Model 4 uses a similar approach, replacing (R_i) with the respondent's ability to write SMS messages (W_i).
4. $Y_i = \beta_0 + \beta_1 F_i + \beta_2 I_{i,state} + \beta_3 S_i + \beta_4 W_i$
   Model 5 employs both (R_i) and (W_i) to examine the combined effects of reading and writing.

9 The detailed data released by PhonePe (2020) include UPI, cards, and wallets. See Phone Pe Pulse, Beat of Progress. https://www.phonepe.com/pulse/explore/transaction/2020/3/

10 UIDAI data was preferred over census data as it is more up to date. See Government of India, Unique Identification Authority of India (2021). State/UT wise Aadhaar Saturation (Overall) All Age Groups. https://uidai.gov.in/images/state-wise-aadhaar-saturation.pdf

5. $Y_i = \beta_0 + \beta_1 F_i + \beta_2 I_{i,state} + \beta_3 S_i + \beta_4 R_i + \beta_5 W_i$

   Finally, model 6 removes smartphone ownership (S_i) as an independent variable.

6. $Y_i = \beta_0 + \beta_1 F_i + \beta_2 I_{i,state} + \beta_3 R_i + \beta_4 W_i$

Coefficients and their corresponding p-values are provided in Table 3 below. Gender and local payments intensity are both significant and with expected sign, but with modest predictive power. Introducing smartphone ownership improves the model fit, as do reading and writing SMS messages, individually or in combination—while reading and writing are correlated, multi-collinearity is not so extreme as to obscure their individual effects. As expected, as other attributes are added the gender coefficient falls to little over half its initial level. Removing household smartphone ownership erodes the predictive power of the model but coefficients are stable; they are stable also to the removal of the ecosystem variable.

TABLE 3. Summary of logistic model estimates

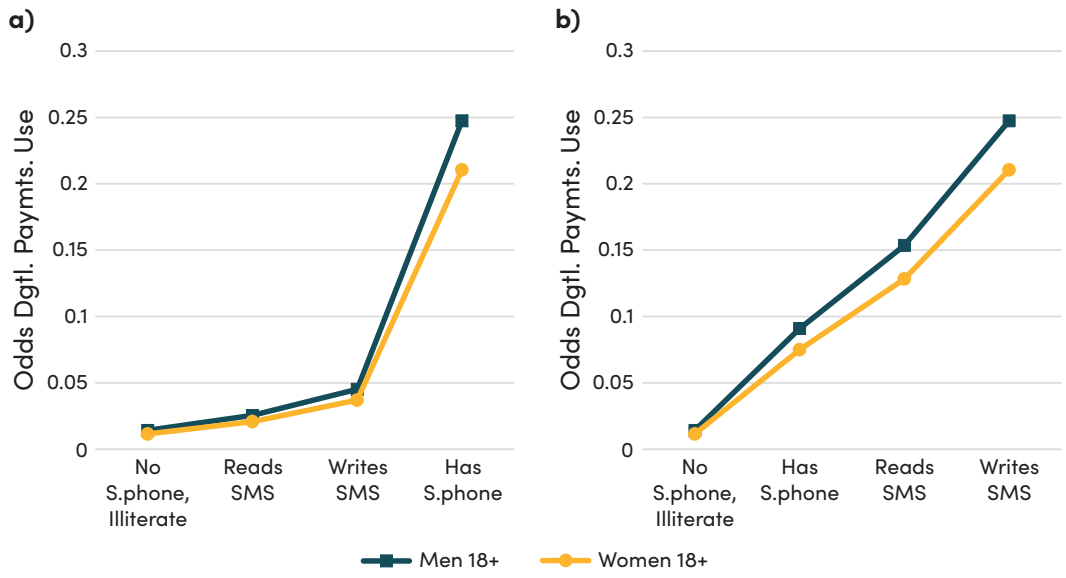
Variable	Model					
	1	2	3	4	5	6
Respondent is Female (F)	−0.3686871*** (0.000)	−0.2826039*** (0.000)	−0.2514669* (0.016)	−0.2330112* (0.024)	−0.2099766* (0.041)	−0.2476273* (0.026)
Digital Payment Intensity in Respondent State (I)	0.2803049** (0.001)	0.2667846** (0.003)	0.2747441** (0.004)	0.2790024** (0.003)	0.283212** (0.004)	0.2982137** (0.002)
Household Member Owns Smartphone (S)		2.222988*** (0.000)	2.032094*** (0.000)	1.987624*** (0.000)	1.937851*** (0.000)	
Respondent Can Read SMS (R)			0.8645022** (0.001)		0.5955612* (0.012)	0.7306792** (0.002)
Respondent can Write SMS (W)				0.807044** (0.002)	0.594514* (0.024)	0.7826161** (0.005)
Constant	−2.234636*** (0.000)	−4.069503*** (0.000)	−4.567107*** (0.000)	−4.322415*** (0.000)	−4.636237*** (0.000)	−3.244637*** (0.000)
Observations	5,081	5,081	4,543	4,543	4,543	4,543
Pseudo R-*squared*	0.0984	0.1720	0.1920	0.1948	0.2012	0.1508
Probability > Chi-*squared*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001

*p<0.05 **p<0.01 ***p<0.001

Considering personal and household attributes, smartphone ownership is the most powerful single enabler of digital payments use, followed by literacy. Using Model 5, in the state of Gujarat, which is 9th in digital payments intensity out of the 18 states, a non-literate male reporting on a household without a smartphone has only a 1.4 percent probability of indicating use of digital payments. A fully literate man in this situation has a 4.5 percent likelihood. However, if the household has a smartphone, the probability of using digital payments increases to 9.1 and 15.4 percent respectively,

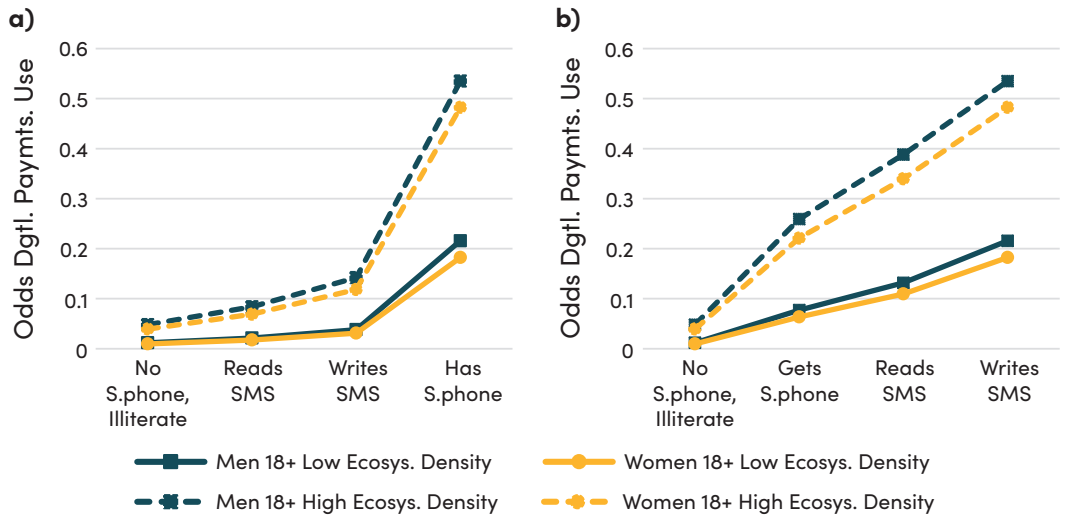
if the respondent can also write SMS the probability would be 24.8 percent. Both smartphone access and literacy increase the probability of digital payments usage and their effects are magnified when both are present (See Figures 3a and 3b). For women respondents, the likelihood of reporting the use of digital payments follows a similar pattern, but with a smaller range of probability.

FIGURE 3a and 3b. Odds HH uses digital paymts. (State of Gujarat: least to most able)



The local ecosystem also has a strong impact on the likelihood of digital payments use. To reduce the effect of extreme values, we divide the 18 states included in our survey into terciles according to the value of the Phone Pe index ($I_{i,state}$) and take the averages for the first and the third terciles to represent more and less developed ecosystems. From Model 5, this ecosystem difference has roughly the same impact on the probability of using digital payments as the total of personal and household attributes. Moreover, the two sets of effects interact with each other. A respondent with favorable personal attributes (male, literate and with a smartphone), but living in a poorly developed ecosystem has a likelihood of 21.6 percent of reporting digital payments, versus 53.5 for a peer in an advanced ecosystem. The local ecosystem effect is not as strong, however, when personal attributes are not favorable (See Figures 4a and 4b). For a female respondent, not literate and in a household with no smartphone, the probability of reporting the use of digital payments in the two ecosystems are only 1.0 and 3.9 percent. Personal/household attributes and ecosystem effects are highly complementary, one set has little impact without the other.

FIGURE 4a and 4b. Odds HH uses digital paymts. (Low & high ecosys. density: least to most able)



In order to explore the potential influence of different subgroups on digital payments usage, we add supplementary binary variables to Model 5, with the resulting coefficients reported in Table 4. In addition to the gender effects explored above, households in which only female members hold bank accounts are less likely to report using digital payments. The effect is even stronger among this subgroup of households when the only bank accounts held were opened under the Jan Dhan financial inclusion program (i.e., PMJDY accounts). Not only do these results suggest another plausible context in which gender influences digital payment use, they indicate as well that households that are financially included solely through a government sponsored initiative will be less likely to take full advantage of the opportunities their accounts present.

Among households that own smartphones, ownership of multiple smartphones increases the likelihood of digital payments use, but less so than the impact of possessing at least one smartphone. The results, therefore, indicate that device ownership has decreasing marginal returns to digital financial inclusion.

We find no evidence of age impacting uptake, as whether or not a household contains a pension recipient does not alter the likelihood of digital payments use to a statistically significant degree. This remains true even when the households in question are only one or two members in size, limiting the potential influence of multigenerational households.

TABLE 4. Model 5 supplementary variables

Variable	Coefficient	Z-Value	P-Value
Household Only Has Female Held Bank Accounts	–0.9377077	–1.81	0.070
Household Only Has Female Held PMJDY Accounts	–1.624717	–2.22	0.026
Household Receives Pension	–0.1674701	–1.14	0.254
Household of 1 or 2 Members Receives Pension	–0.1273977	–0.38	0.706
Household Holds Multiple Smartphones*	0.8986504	5.54	0.000

Note: *Sample limited to the 71 percent of households that possess at least 1 smartphone.

5. Conclusions

India's experience confirms that providing G2P payments through financial accounts can offer beneficiaries an entry point into the wider use of financial services. Indeed, its progress in financial inclusion has been one of the most successful in the developing world and has largely been driven by policies to deliver social benefits through bank accounts (DBT) and to encourage the opening of such accounts (PMJDY) as well as to reduce the cost of doing so (e-KYC). In addition, mobile penetration has accelerated, and the cost of data has been brought down to probably the lowest in the world.

Nevertheless, it confirms that there can be a long lag between widening financial access, as measured by the proportion of adults with accounts, and the move away from a cash-based economy. This lag has extended for about seven years so far, and the transition to digital payments is by no means complete. The policy measures and technological innovations needed to create a compelling payment ecosystem almost all lie outside the realm of social protection and G2P payments. These alone will not be able to drive digital payments more broadly.

The results also confirm the complementarity of factors at the personal and household level and those relating to the local payments ecosystem, as set out by Gronbach (2019). The two sets of factors contribute roughly equally to the probability of participating in digital payments. For a high probability, both need to be favorable; neither has much impact without the other. It is necessary to "jump the gap" between a low-level equilibrium where few use digital payments so that people and businesses feel little incentive to adopt them, and a high-level equilibrium where many use them, creating strong incentives for adoption. As India demonstrates, ecosystem takeoffs are likely to be non-uniform, stronger in some areas than others, depending on the concentration of purchasing power and features of the local economy and population.

Countries have adopted a range of policies to help jump the gap, including, for example, support for merchant onboarding and (possibly temporary) reductions in fees and sales taxes for digital transactions to reduce incentives for the cash economy. Interoperability through the UPI has

been one key element in India but there have been others, including the emergence of major tech innovators competing to offer convenient payment platforms in a low-cost data environment. In this respect (though not in others), the QR-code based payments mechanisms in India follow the very successful model that has come to dominate payments in China (Klein, 2019).

India's low-cost data distinguishes it from many other developing countries, particularly in Africa, where data costs remain high, creating a barrier to access, especially for the very poor. But on the other hand, its bet on smartphone-based payments mechanisms as the way of the future does constitute an obstacle to the wider use of digital payments by the considerable number of people who only have feature phones, at least in the interim.

The results also reinforce the importance of personal and household attributes. Social transfer beneficiaries are often among the poorest and most marginalized in the world. Women are often among the most disadvantaged, with lower literacy and sometimes large gaps in mobile ownership (and in the case of India, an adverse household hierarchy in the ownership of smartphones) and strong social conventions that constrain their individual agency. These groups are less likely to transition rapidly from owning financial accounts to the wider use of financial services and digital payments; some may never transition. Measures to ensure ubiquitous access to affordable smartphones and data can play a useful role. Minimizing the costs of digital financial services is vital as well, and governments should refrain from taxing such activities (Ndulu et al., 2021).

Localization of content and applications in e-Government initiatives and G2P payments are critical to encourage and support beneficiaries in using digital systems (GoI, 2014). Such efforts include platform design, incorporating local languages, greater use of symbols and demonstrations through easily accessible online videos. Phone Pe's app, for example, is available in 10 regional languages apart from English (which is only spoken by some 10 percent of the population), and large technology companies see a business opportunity to create products and services specifically for those with limited digital capacity (Anandan, 2018). Gender concerns must be incorporated as well, both in terms of specific inequalities in mobile (or smartphone) access and literacy, and in the broader societal context that women must navigate. The nature of such interventions will be dependent upon local conditions. As a generalized approach, however, governments may be well served by partnering with local NGOs and community organizations, as is happening in Odisha, India where women's self-help groups are being leveraged to deepen financial inclusion among other things. (Mission Shakti, 2022).

In the final analysis, it is not just the size of the bandwagon that makes people want to jump onto it—the ground they have to leap from matters too.

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