Interoperability, social learning, and consumer demand: Experimental evidence from an interoperable payment system in Pakistan*

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Abstract

Interoperability is often proposed as a solution to market power in platform markets. In this paper, I measure interoperability's effect on consumer demand for and consumer communication about mobile money platforms in Pakistan. In a field experiment, I vary consumer perceptions of interoperability by randomizing whether study participants receive a pamphlet describing Raast, a new government-run payments switch that makes cross-platform transactions faster, safer, and cheaper. I estimate null effects on consumer demand. This result appears to be driven by consumers valuing their knowledge and experience with a platform more than the speed, safety, and cost of payment infrastructure. In contrast, I estimate substantial positive effects on communication. These effects are concentrated among unregistered consumers communicating about smaller platforms. Among unregistered consumers, the 'interoperability information' closes 93% of the gap in communication between the dominant platform and their main competitor. Considered together, these results can be explained by a model where consumers are motivated by network effects to communicate about a given platform and develop brand preferences based on how much they have heard about a given platform. This model implies that delaying the introduction of interoperability reduces its efficacy in combating market power, because, during the period of incompatibility, consumers would develop a brand preference for the dominant platform which would persist even after interoperability is introduced.

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1 Introduction

Platforms, which facilitate interactions between users, are becoming increasingly integral to the global economy.[1] Unfortunately, platform markets are often characterized by high market concentration (Rietveld and Schilling, 2021). These high levels of concentration could reduce competition and entry, leading to higher prices and lower product quality (Scott Morton et al., 2019).

The high concentration of platform industries is commonly attributed to the inherent network effects[2] between platform users. Network effects are inherent to platforms since the value of a platform to one user depends upon whom the user can interact with on the platform. As a result, the value of the platform to the user is increasing in the adoption of additional users. When users cannot interact across platforms (i.e., platforms are not interoperable), platforms with more users will have a competitive advantage over smaller platforms. As the canonical model of Katz and Shapiro (1985) underlines, platforms will have insufficient incentives to make their platform interoperable[3] under these conditions.

An oft-proposed solution to this issue is for governments to encourage interoperability between platforms, but there is limited empirical evidence on interoperability policies. The European Commission recently proposed mandating certain forms of interoperability (e.g., interoperable messaging services) between large digital platforms (Brown, 2020). By ensuring that consumers can easily interact across platforms, platform interoperability should decrease the importance of platform size in consumer's adoption decisions. Thus, interoperability ought to increase competition and entry in a market. However, there is little empirical evidence on whether consumers react as expected to the introduction of interoperability policies.[4]

In addition to the direct effect of interoperability on consumer demand, interoperability alters the incentives for peer-to-peer communication, influencing social learning about platforms. A large interdisciplinary literature demonstrates the importance of social learning for technology adoption (e.g., Rogers (1963), Granovetter (2005), Bursztyn et al. (2014), Bailey et al. (2022)). Without interoperability, network effects provide an incentive for consumers to convince others to join their preferred platform rather than another platform, advantaging the initially dominant platform. By enhancing network effects overall and equalizing them between platforms, interoperability should increase communication overall and shift communication toward smaller platforms relative to larger ones.

[1] Farronato et al. (2020) notes that, at least, 7 of the top 10 most valuable businesses globally are platforms.

[2] Network effects are an example of adoption complementarities between consumers.

[3] Some scholars refer to platform interoperability as platform compatibility. I will use interoperability throughout this paper.

[4] Brunnermeier et al. (2023) examines the effects on supply-side investments and equilibrium adoption, but does not isolate the demand-side response. Annan and Klobudu (2024) identifies a positive demand-side response but only on the extensive margin among mobile money users.

In this project, I focus on a specific platform industry, mobile money in Pakistan. Mobile money is a particularly important platform technology because it has the potential to expand financial inclusion. Examining the spread of mobile money in Kenya, Jack and Suri (2014) and Suri and Jack (2016) find that mobile money increases household income, savings, and resilience to shocks. However, most mobile money markets are dominated by a few large platforms (InterMedia, 2020). As a result, an increasing number of countries are mandating interoperability between mobile money platforms.[5]

To identify the effect of platform interoperability on consumer demand and communication, I experimentally vary access to information about a recent interoperability policy. A randomly-selected 50% of study participants receive a pamphlet detailing how Pakistan's government-run interoperable instant payments system (named Raast) has made cross-platform mobile money transactions faster, more secure, and fee-free. Then, I estimate the effect of this 'interoperability information' on consumer demand for mobile money platforms of differing size.

I estimate null effects of the treatment on consumer demand for mobile money platforms, regardless of firm size. Respondent decisions regarding registering a mobile money account with or receiving a mobile money transfer with the dominant platform, their main competitor, or an entrant platform appear to be unaffected by the 'interoperability information'. This finding conflicts with the prediction of traditional models that interoperability will increase the market share of (initially) smaller platforms.[6]

I estimate substantial increases in the willingness-to-share information about mobile money platforms with peers. Respondents are 6.8 pps (13% of the control mean) more likely to share any mobile money platform information with a peer. There is a 10.8 pp increase in sharing of the dominant platform's pamphlet[7] and a 9.6 pp increase in sharing of the competitor platform's pamphlet (both about 25% of the control mean). The effects are entirely accounted for by participants communicating to villagers without a mobile money account (15.8 pp increase in sharing any information). The largest effect is on unregistered consumers sharing smaller platforms' pamphlets with other unregistered consumers (21.5 pp increase in sharing of the competitor platform's pamphlet; 18.0 pp increase in sharing of the entrant platform's pamphlet). When the sender and receiver are unregistered, receiving the 'interoperability information' closes the gap in communication about the dominant and competitor platform by 93% with the gap falling from 13.8 pps in the control group (40.0% sharing the dominant platform's pamphlet vs. 26.2% sharing the competitor) to 1.0 pps (48.7% sharing the dominant vs. 47.7%

[5]For example, only 4 of 42 African countries included in Brunnermeier et al. (2023)'s dataset had any interoperability as of 2015, but by 2021, 21 of 42 countries had some form of interoperability between mobile money platforms.

[6]It is important to note that this result does not conflict with Annan and Klobudu (2024)'s finding that interoperability increases cross-platform transfers among mobile money users.

[7]Each platform's pamphlet contains information on how to register an account with that platform.

sharing the competitor).

A potential reason for the null effects on consumer demand is that Raast only marginally improved mobile money interoperability in Pakistan, but I estimate null effects even among respondents who should have updated substantially about platform interoperability. Prior to Raast, there was partial interoperability between mobile money platforms in Pakistan, and the State Bank of Pakistan (SBP) had mandated fee-free on-platform and cross-platform mobile money transactions up to $\approx$ \$100 per month as a response to the Covid-19 pandemic.[8] These policies raises the possibility that consumer demand did not change because consumer beliefs about interoperability did not change. To assess this possibility, I estimate treatment effects among respondents who (ex-ante) preferred on-platform transaction because of speed and security[9] and respondents who did not know that cross-platform transfers were fee-free (68% of respondents). Even among these subsamples who should have updated substantially about interoperability upon receiving the 'interoperability information', I estimate null effects on consumer demand.

Given this evidence, it is more likely that the null effects on consumer demand are explained by consumers valuing their knowledge and experience with a platform more than the speed, safety, and cost of transaction infrastructure. When asked, respondents report that their main reasons for their platform adoption choices are knowledge of how to use the platform and the ease-of-use of the platform. Very few respondents report that network effects or interoperability drove their decision. Thus, it is likely that interoperability does not significantly change consumers' valuation of mobile money platforms in this context. It is important to note that enhancing interoperability may have greater direct effects on consumer demand in settings with lower ex-ante interoperability (e.g. markets where users cannot interact across platforms at all prior to an interoperability policy).

The substantial effects on consumer communication indicate that network effects play a significant role in social learning processes. Higher communication by those receiving the 'interoperability intervention' is consistent with interoperability increasing consumer's incentive to communicate about a platform in order to benefit from the greater network effects associated with peer adoption. The large effects on communicating to unregistered consumers about smaller platforms coheres with interoperability particularly enhancing network effects for smaller platforms and thus, making consumers more willing to share information about smaller platforms. This influence of network effects on consumer communications suggests that enhancing network effects could be an effective policy for promoting technology diffusion. On the other hand, this influence could distort social

[8] The SBP's policy was only meant to be temporary but was still in place when Raast launched.

[9] According to qualitative interviews, on-platform transfers only take a few minutes, while cross-platform transfers without Raast take from 30 minutes to multiple hours and are more likely to fail completely. With Raast, cross-platform transfers are near instantaneous and less likely to fail, so these respondents should have updated about the speed and security of cross-platform transfers after hearing about Raast.

learning processes, causing hype cycles and consumer harm.[10]

To jointly explain the consumer demand and communication results, I add 'information capital' to a model of platform interoperability, allowing me to capture how consumer preferences depend upon the knowledge and skills they gain through communication/usage of a platform. Specifically, I model 'information capital' as a taste-based preference for a given platform that is increasing in past periods of communication/usage[11] of the platform and is persistent across time. Due to network effects, consumers build up relatively more 'information capital' with the dominant firm when platforms are incompatibility. When interoperability is introduced, these consumers may stick with the dominant firm since their 'information capital' makes them prefer using the dominant firm even in the absence of network effects. In contrast, if interoperability is introduced early on in the technology diffusion process, consumers learn about both the dominant firm and their competitors, so the dominant firm does not have an 'information capital' advantage. This model fits my results where experienced users are unmoved by the 'interoperability information' while the inexperienced shift their communication toward smaller firms.

The majority of past empirical work on platform interoperability focused on the supply-side. Björkegren (2022) estimates that a interoperability policy would have reduced investments in towers, lowering access for rural consumers. Brunnermeier et al. (2023) uses the staggered rollout of mobile money interoperability policies across African countries to estimate that interoperability decreased mobile money fees, but also decreased platform investments in mobile money infrastructure (e.g., towers), lowering financial inclusion. This paper suggests that policymakers need to balance the negative effects on supply-side investment of introducing interoperability early with the demand-side benefits of avoiding the entrenchment of consumer preferences.

This paper also contributes to the literature on social learning and technology adoption. I add to the literature showing how consumer preferences can build up over time and contribute to market power. The idea of 'information capital' builds upon Bronnenberg et al. (2012)'s use of 'preference capital' built up by past usage of product to explain geographic variation in market shares in the United States. As I do, Bronnenberg et al. (2012) finds that these persistent consumer preferences that accrue over time substantially influence demand; Bronnenberg et al. (2012) estimates that 40% of differences in firm market share across cities in the United States could be explained by 'preference capital'. I also contribute to the literature on how strategic communication can shape information diffusion. Banerjee et al. (2012) demonstrates through a field experiment how strategic communication can stall the diffusion of rivalrous goods. My paper examines the flip-side of this

[10] These distortions might explain individuals appear to make consistent errors when adopting high network effects technologies such as meme stocks or multi-level marketing schemes.

[11] For simplicity, the model focuses on communication, but it would be trivial to re-write the model with learning-by-doing externalities that produce the same results.

phenomenon; how strategic communication can drive diffusion of a technology that exhibits network effects/complementarities.

In the next section (Section 2), I outline a theoretical framework for consumer demand and communication in a platform market. Then, I describe the design of the experiment in rural Pakistan (Section 3) and the study's empirical framework (Section 4). Next, I present (Section 5) and discuss (Section 6) the results form the experiment. Finally, I outline the model with 'information capital', derive policy-relevant results (Section 7), and conclude (Section 8).

2 Theoretical framework

Drawing upon Bianchi et al. (2023), I outline a theoretical framework to analyze the demand-side effects of interoperability policies (Section 2.1). Then, I present a novel framework for endogenous communication about platform technologies inspired by Chandrasekhar and Jackson (2018).

2.1 Consumer demand

In this section, I present a framework for understanding consumer demand in platform markets with partial interoperability. Then, I consider what this framework implies about the effects of interoperability policy on consumer demand.

The net utility of consumers from adopting a given mobile money platform can be characterized as

$$U_i^F = \tau_i^F + \beta N^F + \kappa N^{-F} - p \tag{2.1}$$

[12]

The first term, τ_i^F, represents consumer i's idiosyncratic taste for a given platform, F. The second term, $\beta(N^F)$, captures the within-platform network effects between consumer i and the other users of the platform, N^F, while the third term, $\kappa(N^{-F})$, represents the cross-platform network effects between consumer i's use of platform F and the users using other platforms $-F$. Since consumers prefer more users to interact with, I assume $\beta(.)$ and $\gamma(.)$ are increasing functions of N^F and N^{-F}, respectively. Based on the evidence that users prefer transacting within rather than across platform, I assume that $\beta \geq \kappa$. The final term is the cost of adopting a platform, p, which I assume is homogeneous across platforms and consumers.[13]

This framework allows us to see the market power larger platforms have over smaller ones. Consider

[12] I assume that consumers single home, meaning that they only use one mobile money platform. This assumption reflects the fact that multi-homing is rare in my context. Only 6% of study participants multi-home.

[13] Note that any heterogeneity in cost across platforms and consumers can already be captured by τ.

two platforms, A and B, where A has a larger installed base of users than B (i.e. $N^A > N^B$). The difference between the utility the consumer derives from A and the utility from B will be:

$$U_i^A - U_i^B = (\tau_i^A - \tau_i^B) + (\beta - \kappa) * (N^A - N^B) \tag{2.2}$$

Even if a consumer prefers the smaller platform ($\tau_i^B > \tau_i^A$), they may opt for the larger platform due to the difference in network effects $(\beta - \kappa) * (N^A - N^B)$.

Within this framework, a interoperability-enhancing policy increases the value of adopting mobile money platform and shrinks market power. By definition, a interoperability-enhancing policy increases cross-platform network effects, κN^{-F}, raising the value for all mobile money platforms. interoperability also shrinks the gap between within-platform and cross-platform network effects, which reduces the market power of larger firms.

2.2 Consumer communication

While Section 2.1 highlights the immediate effects on consumer demand, an extensive literature shows that communication between peers can shape preferences over time (e.g., Rogers (1963), Granovetter (2005), Bursztyn et al. (2014), Bailey et al. (2022)). In this section, I outline a framework for endogenous communication decisions and analyze the influence of interoperability policy.

I describe the utility of consumer i (the sender) sharing information about platform F with another consumer j (the receiver) as:;

$$V_i^F = \frac{\partial a_j^F}{\partial s_{ij}^F}(\alpha U_j^F + \beta a_i^F + \gamma a_i^{-F}) + \sigma_i^F \tag{2.3}$$

where a_j^F is the probability that receiver j adopts the platform being shared about.[14] I assume $\frac{\partial a_j^F}{\partial s_{ij}^F} > 0$, because sharing about a given platform to a given person ($s_{ij}^F = 1$) raises their likelihood of adopting that platform. The final term σ_i^F represents the respondents taste for communicating platform F. The three terms within the parentheses represent the benefits to the sender if the receiver adopts.

The first term captures the sender's desire to share information that benefits the receiver (altruism). The level of altruism is determined by $\alpha \in (0, 1)$, where $\alpha = 1$ means the sender is fully altruistic and $\alpha = 0$ means the sender is fully self-interested.

The second term and third term capture how platform network effects provide an additional incentive

[14] Assume that sharing only affects the adoption probability of the platform being shared about.

to share information. Since network effects mean that the sender benefits from the adoption of the receiver, the sender may be motivated to share information with the receiver to induce the receiver to adopt and increase their benefit from using the platform. The sender gets benefits from within-platform network effects, β, to the degree they are likely to adopt the platform they are sharing, a_i^F. The sender gets the smaller γ from cross-platform network effects to the degree they are likely to adopt one of the platforms that they are not sharing, a_i^{-F}. Given the dependence of these terms on the sender's adoption likelihoods, I pre-registered testing for heterogeneity by sender registration status.

By providing an additional incentive to communicate, network effects would encourage diffusion of the technology. This incentive to communicate could provide an additional explanation for the fast growth of platform technologies in recent years. Additionally, it provides a framework for understanding why many recent successful firms attribute their exponential growth to the use of referral systems which create artificial adoption network effects (Lobel et al., 2017).

However, when platforms are partially incompatible, these platform network effects will increase communication about larger firms more than they increase communication about smaller firms, potentially enhancing the market power of larger firms. By definition, larger firms will have more senders who have adopted the platform $a_i^F = 1$, while smaller firms will have more senders that have adopted a different platform $a_i^{-F} = 1$. When within-platform network effects β are greater than off-platform network effects γ, the incentive to communicate due to platform network effects will be larger on average for the larger firms since the more numerous adopters of the larger firm will be more motivated to share the larger firm relative to the smaller firm. One would expect this more frequent communication to increase the perceived value of the larger firm relative to the smaller firm. Within the framework of Section 2.1, this could be modeled as increasing the taste for the larger firm relative to the smaller firm $\tau_i^A - \tau_i^B$ and providing additional market power for the larger firm.

A interoperability-enhancing policy should increase communication about all platforms, and should have larger effects on smaller platforms. By increasing the receiver's payoff from adopting a platform (as outlined in Section 2.1), it amplifies the altruistic motivations of the sender. Additionally, it increases network effects between the sender and the receiver if they end up adopting different firms. Both of these forces increase the sender's payoff from sharing information about a given platform. Since there are more mobile money users not on smaller platform $N^A > N^B$, (meaning more people to transact with cross-platform if using the smaller platform) and the average sender is more likely to not adopt the smaller platform, $E(a^A) > E(a^B)$, (meaning that the sender is more likely to transact cross-platform with the receiver if sharing information about smaller platform) increasing cross-platform network effects, γ, should increase communication about smaller firms more.

Now, I turn to testing the implications of this framework through through an experiment that

randomizes the provision of interoperability information to mobile money consumers in rural Pakistan.

3 Study design

In this section, I detail the study protocols. I describe the participant sampling (Section 3.1), experimental intervention (Section 3.2), balance tests, and descriptive statistics (Section 3.3). The final section outlines how I measure the primary outcomes (Section 3.4).

3.1 Participant sampling

I partnered with Gallup Pakistan to sample 25 respondents from 18 villages in the Mandi Bahuaddin, Gujranwala, and Hafizabad districts of Punjab, Pakistan (total of 450 respondents) in January 2024. I required that the villages have access to the towers and mobile money agents necessary to use each of the mobile money platforms considered in the experiment (JazzCash, Telenor EasyPaisa, and HBL Konnect).

In each of the 18 villages selected by Gallup Pakistan, two surveyors sampled 25 study participants. The surveyors sampled households using circular random sampling. In each household, the surveyors prioritized surveying the household head or the spouse of the household head. In addition, I required that study participants were of working age (18-65 years old) and had the potential to register a mobile money account. Surveyors ensured villagers had the potential to register a mobile money account by checking whether they had a Pakistani Computerised National Identity Card (CNIC) and a phone SIM card.

3.2 Intervention: Information on the introduction of an instant interoperable payments in Pakistan

To create exogenous variation in perceptions of mobile money platform interoperability, I randomize 50% of participants to receive a pamphlet with information about Pakistan's new government-run instant interoperable payments, Raast. I stratify randomization at the village-level.

In the following subsections, I outline why one should expect information about Raast to increase perceptions of platform interoperability. I describe how Raast increased interoperability when it was launched. Then, I summarize the evidence that most consumers have low awareness of the interoperability improvements brought about by Raast. Finally, I describe how the 'interoperability information' given to the treatment group ameliorates these knowledge gaps.

3.2.1 Background on Raast

The State Bank of Pakistan (SBP) developed Raast to address concerns around interoperability, cost, user experience, and security in digital payments. Raast addresses these issues by enabling instantaneous and secure digital payments between consumers, businesses, and government entities across all Pakistani financial institutions with no fee charge. The State Bank of Pakistan launched Raast in January 2021 and rolled out peer-to-peer transactions in February 2022.

By requiring platforms to connect through Raast, the SBP essentially mandated a higher level of interoperability. According to qualitative interviews in our study areas, cross-platform transfers without Raast failed fairly often and could take hours to complete. With Raast, interviewees reported that cross-platform transfers were instantaneous and rarely failed. Thus, by connecting all financial institutions through Raast, the SBP enhanced the ability for mobile money users to make fast and secure transfers with users on different platforms.

In terms of transaction fees, it is important to note that the SBP had waived mobile money transaction fees prior to the launch of Raast. The SBP implemented this policy in March 2020 (as a response to the Covid-19) and it was still in place when Raast launched. While this means Raast did not affect fees in the short-run, Raast may still affect an informed consumer's expectations over what cross-platform fees would be in the future.

3.2.2 Consumer awareness of Raast and priors on platform interoperability

Despite the government's efforts to promote awareness, relatively few consumers know about or use Raast. The nation-wide Karandaaz Financial Inclusion Survey (KFIS) found that only 11% of Pakistani adults were aware of Raast as of August-September 2022 (Karandaaz, 2022). In my sample (surveyed in March 2024), 29% of respondents had heard of Raast. This low awareness creates an opportunity to shift consumer beliefs by providing information about Raast.

Given these low knowledge levels, it is unsurprising that most consumers perceive that on-platform network effects are higher than cross-platform network effects Table A1. 12% of our sample did not even know it was possible to transfer money across platforms. 36% say they would only transact on-platform, 14% strongly prefer it, and 8% slightly prefer it. Only 29% of respondents value transacting cross or on-platform as equivalent.

The main reason for preferring on-platform transfers is convenience, followed by safety (Table A1). 38% of respondents cite convenience and 10% cite safety. Only 3% of respondents cite transaction fees as a reason. Despite the low concern around transaction fees, 68% thought the fee on cross-net transactions was greater than 0 and 26% thought it was greater than the on-net fee. These numbers indicate scope for the 'interoperability information' to increase the perceived cross-platform network

effects of my sample.

3.2.3 The 'interoperability information' treatment

The 'interoperability information' or 'Raast' pamphlet stresses the ability of Raast to improve the experience of cross-platform transfers. It is titled the "Raast makes it easy to send money to different mobile money providers". It mentions that cross-platform transfers through Raast will be secure, fast, and 0 fee, and stresses the ability to transact between any mobile money providers. In addition, the pamphlet provides instructions on how to use Raast. Appendix A.3 contains pictures of the pamphlet in Urdu as well as the content of the pamphlet in English.

The pamphlet should increase perceptions of interoperability because it addresses consumers' main concerns about cross-platform transfers. By making transfers secure, fast, and free, Raast addresses the convenience, security, and transaction fee concerns that consumers cited as the main reasons that they prefer to transfer money on-platform.

3.3 Balance test and descriptive statistics

In Table 1, I assess whether the randomization yields balance between the treatment and control group across 10 demographic variables. The F-test p-value on the joint significance of the differences is .918, suggesting that the experimental groups are balanced.

The median respondent in my sample is a male household head who earns income by working for wages. We have more males (77%) than females in the sample since most of our surveyors were male, and many families were uncomfortable having female members talk to our male surveyors 1-on-1.

Surprisingly, 75% of our sample has a registered mobile money account. This is far higher than the 19% nation-wide registration estimated by Karandaaz Financial Inclusion's 2022 survey (Karandaaz, 2022). A potential reason for this is the requirement that villages have access to the towers and mobile money agents necessary to use each of the mobile money platforms considered in the experiment. This requirement may have restricted the pool of villages to better-developed areas with relatively high mobile money penetration.

3.4 Measurement of outcomes

In this section, I describe how I measure consumer demand for mobile money platforms and consumer communication about mobile money platforms.

3.4.1 Consumer demand outcomes

To measure the effect of platform interoperability on consumer demand for mobile money, surveyors elicit respondents' preferences over registering for mobile money. Using the Becker-Degroot-Mashak (BDM) mechanism, surveyors elicited respondents willingness-to-pay to be registered for three major mobile money platforms in Pakistan (EasyPaisa, JazzCash, or HBL Konnect). The willingness-to-pay (WTP) measure included negative prices (i.e. willingness-to-accept adoption subsidies) since I suspected that some respondents would have relatively low WTPs. I exclude cases where the respondent already had an account with a given platform.[15] To reduce noise, I winsorize the top and bottom 10% of reported WTPs as I pre-specified Section 4.1. Since willingness-to-pay measures may still be noisy, surveyors also directly ask respondents if they would want to be signed up for a new account at the end of the survey. To account for increases in the value of mobile money for respondents with a mobile money account, I also ask respondents whether they would like to receive their compensation as a mobile money transfer with a given platform or as mobile airtime,[16] To assess demand for mobile money in general, I use the maximum of these outcomes across all relevant platforms.

To assess the effect on platform competition, I separately estimate the respondent's preferences for a dominant platform and their main competitor platform. This approach is informed by the duopolistic nature of Pakistan's mobile money market. In our sample, 42% are registered with EasyPaisa, 35% are registered with JazzCash, and only 5% are registered with any other platform. Since network effects are likely to be local for mobile money platforms (e.g., transacting with a small group of friends, neighbors, and business associates), I categorize JazzCash or EasyPaisa as the locally dominant platform for a given respondent based on their answer to the question "What is the most popular mobile money service among people you transact with?". 49% of respondents answer EasyPaisa to this question and 38% answer JazzCash. For the 13% of respondents who do not answer EasyPaisa or JazzCash, I determine the dominant platform by comparing the percentage of registered EasyPaisa and JazzCash users in the respondent's village. With this definition, EasyPaisa is the locally dominant platform for 54% of respondents and JazzCash is locally dominant for 46% of respondents. I define the 'competitor platform' as whichever of EasyPaisa and JazzCash is not the dominant platform.

To understand whether platform interoperability lowers barriers to entry, I measure the respondent's demand for an 'entrant platform'. I use HBL Konnect as the 'entrant platform'. HBL Konnect is a mobile money platform run by Habib Bank Limited (a major Pakistani bank). It was only launched in 2018, nearly a decade after the launch of EasyPaisa and JazzCash. While HBL Konnect provides

[15] Some respondents wanted to register a second account with platforms where they already had an account so they could use an account for their business or another family member. For simplicity, I exclude willingness-to-pays for a second account with the same platform from my analysis.

[16] Mobile airtime can be used to make calls, send text messages, or browse the internet on your phone.

similar services to EasyPaisa and JazzCash (e.g., transfers, savings accounts, etc.), it has far lower adoption (3% vs. 35-42%) and name recognition (55% vs. 94-96%) in my sample and country-wide (Karandaaz, 2022). However, there are reasons to prefer HBL Konnect to EasyPaisa and JazzCash. HBL Konnect provides higher returns on savings than the two major platforms (18% annual return compared to 7-8% returns). I provide basic information about all three mobile money platforms to all respondents and mention this advantage of HBL Konnect, so that even respondents previously unaware of HBL Konnect have a reason to consider adopting the platform. [17]

To compare consumer preferences across mobile banking platforms, I separately construct consumer demand outcomes for the dominant, competitor, and entrant firms. I construct the willingness-to-pay for these firms using the BDM elicitation described above. Additionally, I use whether the respondent chose to register on-the-spot. As with overall demand, I exclude cases where the respondent is already registered with a given firm (55% of cases for dominant firms; 22% of cases for competitor firms; 0% of cases for the entrant firm). To ensure that selection bias due to this exclusion does not drive the across platform results, I also include respondent's reports of the hypothetical 'best' platform for them since I do not need exclude any platforms from this outcome.

3.4.2 Consumer communication outcomes

To measure how platform interoperability affects social learning, surveyors elicit respondents' preferences over sharing information about mobile money platforms with two assigned neighbors. Each respondent is assigned one neighbor who they listed as someone they transact with and one neighbor who they did not list.[18] After being informed of the names of their neighbors, respondents are informed that one of their sharing decisions will be randomly chosen to be implemented, so that they are incentivized to be truthful about all sharing decisions.[19]

In each sharing decision, the surveyor asks whether the respondent would want to share a given pamphlet with one of their assigned neighbor. The alternative to sharing the pamphlet is sharing 'No pamphlet'. Prior to the respondent making any decisions, the surveyor tells them that, if shared, the pamphlet will be sent via SMS from Gallup Pakistan to the neighbor. The surveyor stresses that there will be no mention of the respondent or the targeting of the neighbor, which allows us to avoid signaling concerns.

The pamphlets that respondents have the opportunity to share contain information on how to register with one of the three mobile money platforms that this experiment focuses on. In Appendix A.3, I provide pictures of the pamphlets along with the English translations of the content. Each pamphlet

[17] Refer to Appendix A.3.1 for basic mobile money and platform information provided to each respondent.
[18] Refer to Appendix A.5 for more details on the neighbor assignment procedure.
[19] This method of eliciting truthful preferences over a multiple decisions is similar in spirit to the BDM method.

provides instructions on how to register a mobile money account with the relevant platform. Besides the names of the platforms, the numbers used to register an account, and the color of the pamphlets, the instructions are identical across the three pamphlets.[20]

4 Empirical Framework

I identify the impact of interoperability information on consumer demand and communication by estimating the following equation via ordinary least squares (OLS):

$$Y_{ij} = \beta_0 + \beta_1 \textit{Interoperability info}_i + X_{ij} + \epsilon_i \tag{4.1}$$

i denotes a respondent and j denotes a neighbor. Y_{ij} is the outcome of interest.[21] $\textit{Interoperability info}_i$ equals 1 when the respondent receives the pamphlet on mobile money platform interoperability (the 'Raast pamphlet'), and is 0 otherwise. X_{ij} is a vector of recommendation-level covariates selected via the double lasso approach of Belloni et al. (2013) as implemented by Ahrens et al. (2019). Standard errors, ϵ_i, are clustered at the respondent-level.

β_1 estimates the effect of 'interoperability information' intervention on the relevant outcomes. More specifically, it estimates the difference in the outcomes between the respondents who received the Raast pamphlet and those who did not. Since the Raast pamphlet should primarily raise respondent's perception of platform interoperability, I interpret β_1 as the effect of increased platform interoperability.

Given the high rate of mobile money account registration in my sample, I analyze the results separately by respondent's registration status and neighbor's registration status. For consumer demand, I separately estimate effects on those with no registered account and those with a registered account. For communication, I split the sample by whether the neighbor has a registered account known to the respondent.

4.1 Pre-analysis plan

I registered this RCT in the AEA RCT Registry on March 6th.[22] I submitted a pre-analysis plan on March 30th when I had access to 25% of the control group's data. In the pre-analysis plan, I pre-registered my intention to analyze the results by the registration status of the respondent and their neighbor.

[20] I exclude from my analysis choices over sharing a given platform's pamphlet if the neighbor was known by the participant to be registered with that platform. 19% of recommendations are excluded by this criteria.

[21] For the consumer demand outcomes, the j subscript is superfluous since outcomes are at the respondent-level.

[22] Link to AEA registry.

Initially, I had planned to include analysis of a cross-randomized treatment in which respondents received information about the proportion of mobile money users in their district using EasyPaisa, JazzCash, and HBL Konnect. The intention was to shift perceptions of the level of complementarites each platform offered.

I exclude these results from the paper because the intervention did not shift perceptions of the level of network effects each platform offered. The treatment did not affect any of the consumer demand or communication outcomes. In contrast, consumer's beliefs about which mobile money platform was most popular in their transaction network was highly predictive of consumer demand. These results suggest that the treatment failed because respondents (rightly) concluded that district-level information should not alter their beliefs about the local network effects that matter for them. Refer to Appendix A.5.1 for more information on this treatment.

5 Results

In this section, I present the results of the experiment. I begin by showing that the 'interoperability information' had no effect on initial consumer demand, but large effects on communication. Then, I show how the increase in sharing of the dominant platform is concentrated among users, while the increase in sharing of the competitor platform is concentrated among non-users.

5.1 Consumer demand

I estimate null effects of the 'interoperability information' on consumer demand for mobile money platforms and preferences across mobile money platforms. Table 2 presents the results for consumer demand for any mobile money platform and Table 3 presents results for the dominant platform (i.e. the largest in one's transaction network), the competitor platform (i.e. the second largest), and the entrant platform (i.e. the newest and smallest).

In the control group, the majority of respondents have a willingness-to-pay for a mobile money account above 0, but few want to register on-the-spot or receive their compensation in mobile money rather than airtime. Only 9% require an adoption subsidy to adopt a mobile money account, 30% would register a free mobile money account but would not pay, and 61% have a positive willingness to pay for a mobile money account. The average willingness-to-pay is 17 PKR (.07 USD). When surveyors ask whether respondents will register on-the-spot with assistance from the surveyor, only 9% say yes. This number is higher among those without a registered account (14% vs. 7% among those with a registered account). These relatively low numbers suggest that most respondents feel confident in their ability to register an account without assistance from the surveyor. When asked whether they want to receive their survey compensation in mobile money transfer or mobile airtime, only 17% desire mobile

money. Unsurprisingly, those with a registered account are more likely to prefer mobile money (19% vs. 13% among those without a mobile money account).

Table 2 shows that the 'interoperability information' treatment does not substantially change these consumer preferences. Respondents receiving the 'Raast pamphlet' are not significantly more likely register on-the-spot (1 pp more likely; s.e. = 2.6 pps) or choose mobile money over airtime (3.6 pp less likely; s.e. = 3.2 pps). However, given the low baseline rates, I cannot rule out relatively large treatment effects as a percentage of the control mean. Similarly, I do not find a significant effect on willingness-to-pay to be registered for a mobile money account (-.34 PKR; s.e.= 2.3 PKR). In this case, the estimates are precise enough to rule out effects of over $\approx 30\%$ of the control mean.

In terms of preferences among platforms, as expected, there is a strong preference for the dominant platform in the control group. Among respondents not yet registered for a given platform, 8% of respondents want to register with the dominant platform among their transaction network on-the-spot, while only 2% want to register with their main competitor and only 3% want to register with the entrant. Similarly, the average willingness-to-pay is highest for the dominant platform (11 PKR), though there is a substantial gap between the competitor platform (9 PKR) and the entrant platform (2 PKR). In terms of reported 'best' registration option, control group respondents report the dominant firm 51% of the time, the competitor firm 34% of the time, and the entrant firm 7% of the time.[23]

As Table 3 shows, there are null effects on consumer preferences for the dominant, competitor, and entrant platform. The percentage of respondents registering on-the-spot for the dominant firm falls by .4 pps (s.e.= 3.8 pps), for the competitor firm rises by 1.1 pps (s.e.= 1.8 pps), and the entrant firm falls by .5 pps (s.e.= 1.5 pps). I find similar null effects on willingness-to-pay. The willingness-to-pay for the dominant firm falls by 1.3 PKR (s.e.= 3.2), the willingness-to-pay for the competitor firm rises by only .7 PKR (s.e.= 2.4), and the willingness-to-pay for the entrant firm falls by 2.1 PKR (s.e.= 2.9). Finally, the reports of the 'best' registration option are nearly equivalent across the treatment and control groups. The percentage reporting the dominant firm as the best option rises by 1.6 pps (s.e.= 4.8 pps), the percentage reporting the competitor firm rises by .1 pps (s.e.= 4.3 pps), and the percentage reporting the entrant firm falls by 1.1 pps (s.e.= 2.1 pps). Given the initial gap of 17 pps between the percentage reporting the dominant platform relative to the competitor platform, the 95% confidence intervals on these estimates rule out the possibility that the 'interoperability information' completely closed the gap between the dominant and competitor platforms. Even when I separately estimate treatment effects for unregistered and registered respondents, I do not find any significant changes in consumer demand for the dominant, competitor, or entrant platforms.

[23]The remaining respondents report 'no mobile wallet' as the best option

5.2 Consumer communication

In contrast to the consumer demand results, platform interoperability information increases willingness to communicate about mobile money platforms. These effects are completely driven by sharing of the dominant and competitor platform. There is no effect on sharing of the entrant platform. I present these results in Table 4.

The majority of control group respondents are willing-to-share at least one of the pamphlets with registration instructions, and willingness-to-share is higher for the pamphlets of larger firms. 53% of respondents are willing to share at least one pamphlet. 43% of respondents share the pamphlet of the dominant platform in their transaction network, 36% share the pamphlet of the competitor platform, and 29% share the pamphlet of the entrant platform.

Table 4 shows that the 'interoperability information' treatment increases overall sharing, driven by sharing of information about the dominant and competitor platforms. Learning about platform interoperability increases sharing of any pamphlet (6.8 pps; 12.8% of the control mean; p-value $<$ .05). The effects are concentrated among the dominant platform (10.8 pps; p$<$ .01) and competitor platform (9.6 pps; p$<$ .01). In contrast, there is a null effect on the entrant platform (-.6 pps; s.e. = 2.5 pps). Given the effect sizes, one can conclude that the effect on communication about the dominant and competitor is significantly larger than the effect on the entrant platform.

5.2.1 Consumer communication results by sender and receiver registration status

In this section, I outline the results by registration status of the sender (the respondent) and their receiver (their assigned neighbor). The effect of communication on the competitor firm is concentrated among unregistered senders and receivers, while the effect of communication on the dominant firm is concentrated among registered senders and receivers.

The effect on overall sharing and sharing of the competitor firm's pamphlet in Table 4 is driven by sharing to unregistered receivers. Respondents who receive the 'interoperability information' are 15.1 pps (s.e.= 5.1 pps) more likely to share any pamphlet to a receiver without a registered account (Table 4; Panel 2). This estimate is significantly greater than the 0.7 pp (s.e.= 4.1 pps) effect on sharing to registered receivers. Similarly, the treatment senders are 13.8 pps more likely to share the competitor firm's pamphlet with an unregistered receiver, while they are only 2.3 pps more likely to share the competitor firm's pamphlet with a registered receiver.

In contrast, interoperability information affects sharing of the dominant pamphlet slightly more when one is sharing to a registered receiver. interoperability information increases sharing to unregistered receivers by 8.8 pps (s.e.= 5.0 pps) and sharing to registered receiver by a statistically indistinguishable 10.5 pps (s.e.= 6.9 pps).

Turning to the sender's registration status, Table 6 and Table 5 shows that sharing of the competitor pamphlet is concentrated among unregistered senders. 'interoperability information' increases sharing among unregistered senders by 18.6 pps (s.e.= 7.2 pps). In contrast, registered senders only increase sharing of the competitor firm's pamphlet by 1.9 pps (s.e.= 4.3 pps).

The treatment effect on sharing of the dominant pamphlet is concentrated among registered senders. 'interoperability information' increases sharing of the dominant firm's pamphlet by 10.9 pps (s.e.= 5.0 pps) among registered enders, while it only increases sharing by 4.9 pps (s.e.= 4.9) among unregistered senders.

The largest effect on sharing of the competitor firm's pamphlet occurs when an unregistered sender shares to an unregistered receiver, while for the dominant firm's pamphlet, the largest effect is when a registered sender shares to a registered receiver. In Table 5, I estimate that the interoperability information causes a 21.5 pp (s.e.= 8.2 pps) increase in sharing of the competitor firm pamphlet from an unregistered sender to an unregistered receiver. In addition, there is even a 18 pp effect (s.e.= 7.4 pps) on sharing of the entrant firm's pamphlet among this subgroup. In Table 6, I estimate that interoperability information increases sharing of dominant firm's pamphlet by 15.3 pps (s.e.= 6.5 pps) when a registered sender is sharing to a registered receiver.

6 Discussion

The results on mobile money adoption suggest that interoperability policies can fail to directly influence consumer demand for a platform technology. This finding conflicts with the implications of the theoretical framework in Section 2. Given the popularity of mobile money interoperability policies (Brunnermeier et al., 2023), it is important to understand why increasing perceptions of interoperability failed to have the desired effect on adoption and competition in this setting.

While one possible explanation for the null effects is that the intervention was under-powered, I do not find evidence in support of this hypothesis. To evaluate whether a relatively small impact of the treatment on perceptions of interoperability drives my results, I investigate the effect on respondents with particularly low ex-ante perceptions of interoperability. In Table A2 and Table A3, I investigate whether there are effects on consumer demand among the respondents that did not know that cross-net fees were 0 (68% of respondents), did not know that on-net fees were the same as off-net fees (26% of respondents), or strongly preferred transferring transferring on-net (62% of respondents). Even among these subsamples, there are no significant effects of the treatment on consumer demand for mobile money platforms.

Another explanation is that network effects are not a major driver of adoption decisions. This explanation coheres with the reasons unregistered respondents give for not having a mobile money

account. The primary reasons given were “I do not understand this service" (18%), “Using mobile money is too difficult" (25%), and “I do not know how to register" (27%). These explanations imply that knowledge of how to use mobile money rather than network effects drives adoption decisions. Similarly, 65% of control group respondents cite “ease-of-use" as a reason for picking their ‘best registration option’, while only 5% cite “people I transact with use the service”. Within the theoretical model in Section 2, this evidence implies that the taste-based differences between platforms, $\tau_A - \tau_B$ from Equation 2.2, are driven by knowledge about and ability to use platform easily, and that these taste-based differences carry more weight than the differences in network effects, $(\beta - \kappa) * (N^A - N^B)$.

The communication results suggest that network effects is an important factor in communication about platforms and that interoperability policy can reduce the advantage of the dominant firm. Given that consumer’s valuation of mobile money platforms was unaffected, it is unlikely that the increase in communication was driven by altruism for the receiver, the αU_j^F term in Equation (2.3). Instead, it is likely that these communication shifts were driven by the sender expecting to benefit from the adoption of the receiver, $\beta a_i^F + \gamma a_i^{-F}$, in Equation (2.3). Consistent with the fact that interoperability policy affects cross-platform network effects, γa_i^{-F}, more than on-platform network effects, βa_i^F, increases in sharing are greater for the competitor firm and the entrant firm relative to the dominant firm when sharing is among unregistered villagers.

The results among registered villagers imply that interoperability policy will have little effect when villagers have entrenched preferences. Registered villagers are more likely to have entrenched preferences because they use and communicate about the platform they are registered with more. Since ex-ante most registered villagers are registered with the dominant firm, most registered villagers will have more knowledge and ability-to-use the dominant firm. Even when interoperability is introduced, the consumers’ accrued knowledge and skills with the dominant firm could still make consumers are unwilling to switch platforms. This entrenchment of preferences could explain why we do not see effects on demand or communication among registered villagers. In the next section, I expand on this theme by incorporating ‘information capital’ into my theoretical framework.

7 Information capital and policy implications

In this section, I incorporate ‘information capital’ into my theoretical framework and analyze the optimal timing of interoperability policy. I define ‘information capital’ as the platform-specific knowledge and skills that consumers gain by communicating about and using a given platform. I introduce ‘information capital’ into my theoretical framework to capture respondents’ reports that knowledge and ease-of-use drive their platform choice (Section 6). ‘Information capital’ is similar to

the concept of 'preference capital' in Bronnenberg et al. (2012). Just as with 'preference capital', 'information capital' is persistent across time. More precisely, I incorporate 'information capital' by modeling the taste-based preferences for a platform as an increasing function of communication/learning about a platform. For example, the taste-based preference for platform A at time t is $\tau_t^A(S_{t-1}^A)$, where $\tau_t^A(.)$ is an increasing function of S_{t-1}^A, the number of consumers communicating about platform A in the previous period.

To analyze the timing of interoperability policy, I consider a three-period model. At $t = 0$, platform A is larger than platform B (i.e. $N^A > N^B$), but there are no taste-based differences between the platforms in terms of consumer demand ($\tau_A = \tau_B$) or communication ($\sigma^A = \sigma^B$)). At $t = 1$, consumers can communicate about platform A or B.[24] At $t = 2$, consumers make adoption decisions.

I consider the efficacy of 'early' vs. 'late' interoperability policy in terms of reducing the market power of the dominant firm. Since the platforms are equivalent besides the larger installed user base of A at $t = 0$, the dominant firm and the competitor firm should provide equal consumer utility under interoperability absent market power. Thus, I define market power as the difference in consumer utility from adopting platform A in $t = 2$ relative to adopting platform B in $t = 2$ (Equation (2.2)). I compare market power when interoperability is mandated "early" (before $t = 1$) vs. "late" (after $t = 1$ but before $t = 2$).

Late interoperability causes consumers to accrue more 'information capital' with the dominant firm, leading them to prefer the dominant firm even under full interoperability. In $t = 1$, consumers communicate more about the dominant firm, $S^A > S^B$, because adoption of the dominant firm by the receiver results in higher network effects, on average, for the receiver and the sender (refer to Section 2 for details). The higher communication means that consumers accrue more 'information capital' with the dominant firm, $\tau^A(S^A) > \tau^B(S^B)$. Even when interoperability eliminates the dominant firm's advantage in network effects, consumers still prefer the dominant platform due to the difference in 'information capital'. Essentially, incompatibility can cause communities to be 'trapped' in a potentially sub-optimal equilibrium where consumers' strong preference for the dominant platform prevents learning about other platforms even after interoperability is introduced. This case reflects the results among registered consumers, where they did not start communicating about competitor firms even after being informed about enhanced interoperability due to Raast.

With early interoperability, consumers do not accrue disproportionate 'information capital' with the dominant firm, so the dominant firm does not have market power in $t = 2$. Consumers perceive the firms as equivalent prior to communication about the platforms. Thus, consumers communicate equal amounts about each platform, $S^A = S^B = S$, resulting in equal amounts of 'information

[24]The model results are identical if we replace communication with information-seeking.

capital' with each platform, $\tau^A(S) = \tau^B(S)$. Since network effects are equal under interoperability as well, the dominant platform will not have any advantage over the competitor platform in this case. This case reflects the results among unregistered consumers, where there is a near equal amount of communication about the dominant and competitor platform among those informed of enhanced interoperability due to Raast. While this experiment did not gather the follow-up data to verify that this shift in communication ultimately shifted demand, it seems likely that communication would affect consumer demand given that consumers report that knowledge of how to use a platform is the main factor in their choice of platform.

The main policy implication of this model is that interoperability policies will be more effective when introduced earlier in the technology diffusion process. As a preliminary test, I analyze the effect of the 'interoperability information' among 'high-adoption' and 'low-adoption' communities in my sample (Table 7). Among high-adoption communities ($> 70\%$ registered), interoperability information increases sharing of the dominant firm's pamphlet (14.4 pps; s.e.= 5.2pps) more than sharing of the competitor firm's pamphlet (2.8 pps; s.e.= 2.8). Among low-adoption communities, I get the opposite pattern; 'interoperability information' increases sharing of the competitor firm's pamphlet (13.9 pps; s.e.= 5.6 pps) more than the dominant firm's pamphlet (-2.0 pps; s.e.= 7.5 pps). These results are consistent with interoperability policy combating market power more effectively earlier on the technology diffusion process.

8 Concluding remarks

In this paper, I find that providing information about platform interoperability increases consumer communication about the technology but does not directly affect consumer demand. The non-effect on consumer demand can be explained by interoperability being outweighed by knowledge and ease-of-use of a platform in consumer's adoption decisions. It is important to note that Pakistan already had partial interoperability between mobile money platforms, so interoperability may have greater direct effects on consumer demand in settings with lower baseline levels of interoperability.

The effect on communication suggests that interoperability policy does influence social learning about platforms. By increasing network effects between consumers, interoperability policy encourages communication and learning about the technology. Over time, this social learning likely affects consumer demand for platforms.

In terms of the effect on communication of larger vs. smaller platforms, I find mixed results. Among registered consumers, there is not a shift towards communication about smaller platforms. However, there is a substantial shift towards smaller platforms among unregistered consumers.

To explain these results, I incorporate 'information capital', accrued through communication, into a

model of consumer's demand for platforms. This model suggests that introducing interoperability earlier may be necessary to avoid consumer's developing entrenched preferences for the dominant platform. Given that past research has found that introducing platform interoperability 'too early' can dull incentives for firm investments, policymakers will need to carefully weigh the demand and supply-side implications of interoperability policies. Future research could model how supply-side decisions, demand-side social learning, and interoperability policy interact and provide guidance on the optimal timing of interoperability-enhancing policies.

This paper also suggests policymakers should incorporate social learning forces into their analysis of technology diffusion, consumer protection, and firm competition. In technology diffusion policy, policymakers could create 'artificial' network effects through referral programs to encourage the diffusion of beneficial technologies. To protect consumer harms, policymakers could pre-emptively identify and monitor markets for 'high-network effects' technologies (e.g. meme stocks, multi-level marketing schemes) where social learning may be distorted. Lastly, competition policy analysts could incorporate social learning into their models of consumer demand to better predict the effect of competition policy on market power.

References

Ahrens, Achim, Christian B. Hansen, and Mark E Schaffer, "PDSLASSO: Stata module for post-selection and post-regularization OLS or IV estimation and inference," *Statistical Software Components*, 1 2019.

Annan, Francis and Edem Klobudu, "Reducing Disparities in Digital Financial Marketplace through Platform Interoperability: Micro Evidence from," *FIT IN Initiative Working Papers*, 2024.

Bailey, Michael, Drew Johnston, Theresa Kuchler, Johannes Stroebel, and Arlene Wong, "Peer Effects in Product Adoption," *Am. Econ. J. Appl. Econ.*, 2022, *14* (3), 488–526.

Banerjee, Abhijit V., Emily Breza, Arun G Chandrasekhar, Esther Duflo, and Matthew O Jackson, "Come Play With Me: Experimental Evidence of Information Diffusion and Rival Goods," 2012.

Belloni, Alexandre, Victor Chernozhukov, and Christian Hansen, "Inference on treatment effects after selection among high-dimensional controls," *Review of Economic Studies*, 2013, *81* (2), 608–650.

Bianchi, Milo, Matthieu Bouvard, Renato Gomes, Andrew Rhodes, and Vatsala Shreeti, "Mobile payments and interoperability: Insights from the academic literature," *Inf. Econ. Policy*, 2023, *65* (November), 101068.

Björkegren, Daniel, "Competition in network industries: Evidence from the Rwandan mobile phone network," *RAND J. Econ.*, 2022, *53* (1), 200–225.

Bronnenberg, Bart J, Jean-Pierre H Dubé, and Matthew Gentzkow, "The Evolution of Brand Preferences: Evidence from Consumer Migration," *Am. Econ. Rev.*, 2012, *102* (6), 2472–2508.

Brown, Ian, "Interoperability as a tool for competition regulation," *Files.Osf.Io*, 2020, p. 2.

Brunnermeier, Markus K, Nicola Limodio, and Lorenzo Spadavecchia, "Mobile Money, Interoperability, and Financial Inclusion," 2023.

Bursztyn, Leonardo, Florian Ederer, Bruno Ferman, and Noam Yuchtman, "Understanding Mechanisms Underlying Peer Effects: Evidence From a Field Experiment on Financial Decisions," *Econometrica*, 2014, *82* (4), 1273–1301.

Chandrasekhar, Arun G. and Matthew O. Jackson, "A Network Formation Model Based on Subgraphs," *SSRN Electronic Journal*, 2018.

Farronato, Chiara, Jessica Fong, and Andrey Fradkin, "Dog eat dog: Measuring network effects using a digital platform Merger," 2020.

Granovetter, Mark, "The impact of social structure on economic outcomes," *Sociol. Econ. Life, Third Ed.*, 2005, *19* (1), 46–61.

InterMedia, "Financial Inclusion Insights Survey Pakistan," 2020.

Jack, William and Tavneet Suri, "Risk sharing and transactions costs: Evidence from Kenya's mobile money revolution," *American Economic Review*, 1 2014, *104* (1), 183–223.

Karandaaz, "Karandaaz Financial Inclusion Insights Survey," Technical Report 2022.

Katz, Michael L and Carl Shapiro, "Network Externalities, Competition, and Compatibility," *Am. Econ. Rev.*, 1985, *75* (3), 424–440.

Lobel, Ilan, Evan Sadler, and Lav R. Varshney, "Customer referral incentives and social media," *Management Science*, 2017, *63* (10), 3514–3529.

Rietveld, Joost and Melissa A. Schilling, "Platform Competition: A Systematic and Interdisciplinary Review of the Literature," *J. Manage.*, 2021, *47* (6), 1528–1563.

Rogers, E.M., *Diffusion of Innovations*, New York, NY: The Free Press., 1963.

Scott Morton, Fiona, Theodore Nierenberg, Pascal Bouvier, Ariel Ezrachi, Bruno Jullien, Roberta Katz, Gene Kimmelman, A. Douglas Melamed, and Jamie Morgenstern, "Committee for the Study of Digital Platforms Market Structure and Antitrust Subcommittee," Technical Report May 2019.

Suri, Tavneet and William Jack, "The long-run poverty and gender impacts of mobile money," *Science*, 2016, *354* (6317), 1288–1292.

Tables

Table 1: Balance across treatment status

	Control group		**Treatment group**		C=T
	Mean	SD	Mean	SD	p-val
Age (in completed years)	31.59	8.38	31.15	8.05	0.563
Male	0.77	0.42	0.77	0.42	0.952
Household head	0.62	0.49	0.61	0.49	0.755
Primary income: wages	0.50	0.50	0.50	0.50	0.999
Primary income: Selling agricultural goods	0.13	0.34	0.14	0.34	0.920
Primary income: Selling non-ag. goods	0.07	0.26	0.08	0.27	0.742
Has non-mobile bank account	0.36	0.48	0.30	0.46	0.171
Has mobile bank account	0.75	0.43	0.73	0.44	0.708
Has smartphone	0.90	0.30	0.87	0.34	0.315
F-test p-value					0.918
Observations	224		226		

This table includes the study participants in the experiment. The data in this table is from the surveys directly with the respondents prior to the experiment. The control group is the respondents randomly assigned to not receive the 'interoperability information'. The treatment group is the respondents randomly assigned to receive the 'interoperability information'. The first column contains the variable names. The second column contains the means for the control group and the third column the standard deviations. The fourth column contains the means for the treatment group and the fifth column the standard deviations. The p-value in the last column tests for differences between the control and treatment groups. The F-test p-value reported at the bottom of the table is for the joint significance of the differences between the types of receivers for all of the variables reported in the table. The final row shows the number of study participants in each group.

Table 2: Effect of platform interoperability on consumer demand

	(1) Register on-the-spot	(2) Highest WTP	(3) Prefers mobile money over airtime
Panel A: All			
Platform interoperability information	0.010	-0.343	-0.036
	(0.026)	(2.330)	(0.032)
Control Mean	0.085	17.411	0.174
N	450	450	450
Panel B: Unregistered			
Platform interoperability information	0.029	1.148	-0.008
	(0.063)	(3.377)	(0.061)
Control Mean	0.143	18.214	0.125
N	116	116	116
Panel C: Registered			
Platform interoperability information	0.016	-0.636	-0.015
	(0.027)	(2.868)	(0.036)
Control Mean	0.065	17.143	0.190
N	334	334	334

Notes: Observations are at the respondent-level. Covariates are flexibly selected using double lasso approach of (Belloni et al., 2013; Ahrens et al., 2019). The first panel includes all study participants. The second panel includes those with no registered mobile banking wallet prior to the experiment. The third panel includes those with a registered mobile wallet prior to the experiment. In each panel, the first row is the coefficient on a dummy variable for whether the study participant received the platform interoperability informational pamphlet. Standard errors are in parentheses below the coefficients and are clustered at the sender-level. The third row reports the control group mean for the outcome variable. The outcome variable in the first column is whether the respondent registered a mobile banking account with a platform that they are not yet registered with at the end of the survey; in the second column, it is the respondent's willingness-to-pay to be registered for a mobile banking account of a platform that they are not yet registered with; in the third column, it is whether the respondent preferred receiving their compensations in mobile money rather than airtime.

Table 3: Effect of platform interoperability on consumer demand by firm type

	(1) Reg. dominant	(2) Reg. competitor	(3) Reg. entrant	(4) WTP dominant	(5) WTP competitor	(6) WTP entrant	(7) Best dominant	(8) Best competitor	(9) Best entrant
Panel A: All									
Platform interoperability information	0.019	0.018	-0.005	-1.773	-0.597	-2.057	0.016	0.001	-0.011
	(0.032)	(0.020)	(0.015)	(2.191)	(2.124)	(2.925)	(0.048)	(0.043)	(0.021)
Control Mean	0.121	0.040	0.031	12.098	10.616	1.607	0.505	0.338	0.068
N	450	450	450	450	450	450	446	446	446
Panel B: Unregistered									
Platform interoperability information	0.050	-0.003	-0.000	-5.238	-3.012	3.706	0.021	-0.106	0.040
	(0.045)	(0.034)	(0.000)	(4.204)	(3.926)	(5.981)	(0.095)	(0.080)	(0.038)
Control Mean	0.054	0.054	0.000	9.821	7.679	-9.643	0.519	0.315	0.056
N	116	116	116	116	116	116	112	112	112
Panel C: Registered									
Platform interoperability information	-0.000	0.037	-0.006	-0.827	-0.553	-4.911	0.025	0.021	-0.020
	(0.039)	(0.024)	(0.016)	(2.563)	(2.530)	(3.327)	(0.055)	(0.051)	(0.025)
Control Mean	0.143	0.036	0.042	12.857	11.595	5.357	0.500	0.345	0.071
N	334	334	334	334	334	334	334	334	334

Notes: The outcome variable in Col. 1-3 is whether the respondent registered a mobile banking account at the end of the survey with the dominant (Col 1; Dominant means the most popular with the respondent's transaction network), competitor (Col 2; Competitor means the other major firm that is not the dominant firm), or entrant firm (Col 3; Entrant means the smallest firm included in this study, HBL Konnect). I exclude observations where the respondent is already registered with the relevant platform. In Col. 4-6, the outcome is the respondent's willingness-to-pay to be registered for the dominant (Col. 4), competitor (Col. 5) or entrant (Col. 6) firm if they are not yet registered with that platform. In Col. 7-9, the outcome variable is which firm the respondent reported as their 'best registration option'. Refer to notes in Table 2 for further details.

Table 4: Effect of platform interoperability information on communication by neighbor registration status

	(1) Shares any	(2) Shares dominant firm	(3) Shares competitor firm	(4) Shares entrant firm
Panel A: All				
Platform interoperability information	0.068	0.108	0.096	-0.006
	(0.034)	(0.009)	(0.006)	(0.821)
Control Mean	0.531	0.427	0.364	0.286
N	900	579	716	900
Panel B: Registered receiver				
Platform interoperability information	0.007	0.105	0.023	-0.031
	(0.874)	(0.131)	(0.643)	(0.326)
Control Mean	0.556	0.495	0.449	0.349
N	520	199	336	520
Panel C: Unregistered receiver				
Platform interoperability information	0.151	0.088	0.138	-0.003
	(0.003)	(0.077)	(0.004)	(0.943)
Control Mean	0.500	0.393	0.296	0.204
N	380	380	380	380

Notes: Observations are at the respondent-neighbor recommendation-level. Covariates are flexibly selected using double lasso approach of (Belloni et al., 2013; Ahrens et al., 2019). The outcome variable in Col. 2-5 is whether the respondent shared the registration instructions pamphlet of a platform with a given neighbor who is not known to be registered with that platform when asked whether they preferred to share this pamphlet or no pamphlet. The outcome variable in Col. 1 is whether any of these pamphlets were shared. Dominant means the most popular with the respondent's transaction network. Competitor means the other major firm that is not the dominant firm. Entrant means the smallest firm included in this study, HBL Konnect. In each panel, the first row is the coefficient on a dummy variable for whether the study participant received the platform interoperability informational pamphlet. Standard errors are in parentheses below the coefficients and are clustered at the sender-level. The third row reports the control group mean for the outcome variable.

Table 5: Effect of platform interoperability information on communication among unregistered senders

	(1) Shares any	(2) Shares dominant firm	(3) Shares competitor firm	(4) Shares entrant firm
Panel A: Unregistered sender				
Platform interoperability information	0.090	0.049	0.186	0.063
	(0.184)	(0.497)	(0.009)	(0.272)
Control Mean	0.491	0.388	0.309	0.196
N	232	178	196	232
Panel B: Unregistered sender; Unregistered receiver				
Platform interoperability information	0.112	0.087	0.215	0.180
	(0.196)	(0.306)	(0.009)	(0.015)
Control Mean	0.508	0.400	0.262	0.154
N	138	138	138	138
Panel C: Unregistered sender; Registered receiver				
Platform interoperability information	0.066	0.226	0.006	0.058
	(0.526)	(0.286)	(0.969)	(0.489)
Control Mean	0.468	0.350	0.414	0.255
N	94	40	58	94

Notes: This table only includes unregistered respondents. The first panel includes all study participants. The second panel includes only communication decisions from study participants without a registered mobile money account to neighbors without a registered mobile money account. The third panel includes includes only communication decisions from study participants without a registered mobile money account to neighbors with a registered mobile money account. In each panel, the first row is the coefficient on a dummy variable for whether the study participant received the platform interoperability informational pamphlet. Refer to Table 4 for additional details.

Table 6: Effect of platform interoperability information on communication among registered senders

	(1) Shares any	(2) Shares dominant firm	(3) Shares competitor firm	(4) Shares entrant firm	(5) Shares own firm	(6) Shares other firm
Panel A: Registered sender						
Platform interoperability information	0.054	0.109	0.019	-0.034	0.070	0.025
	(0.159)	(0.031)	(0.666)	(0.255)	(0.221)	(0.555)
Control Mean	0.545	0.443	0.384	0.315	0.416	0.407
N	668	401	520	668	309	495
Panel B: Registered sender; Registered receiver						
Platform interoperability information	0.008	0.153	-0.006	-0.030	0.132	-0.015
	(0.863)	(0.050)	(0.909)	(0.386)	(0.177)	(0.778)
Control Mean	0.576	0.532	0.457	0.371	0.490	0.481
N	426	159	278	426	107	293
Panel C: Registered sender; Unregistered receiver						
Platform interoperability information	0.153	0.089	0.095	-0.067	0.006	0.053
	(0.018)	(0.169)	(0.135)	(0.194)	(0.924)	(0.433)
Control Mean	0.496	0.389	0.313	0.229	0.382	0.318
N	242	242	242	242	202	202

Notes: This table only includes senders with a registered mobile money account. The first panel includes all study participants with a registered mobile money account. The second panel includes only communication decisions from study participants with a registered mobile money account to neighbors who do not have a registered mobile money account. The third panel includes only communication decisions from study participants with a registered mobile money account to neighbors with a registered mobile money account. In each panel, the first row is the coefficient on a dummy variable for whether the study participant received the platform interoperability informational pamphlet. Refer to Table 4 for additional details.

Table 7: Effect of platform interoperability information on communication by village-level ex-ante adoption

	(1) Shares any	(2) Shares dominant firm	(3) Shares competitor firm	(4) Shares entrant firm
Panel A: Low-adoption community				
Platform interoperability information	0.029	-0.020	0.139	-0.050
	(0.625)	(0.791)	(0.013)	(0.187)
Control Mean	0.480	0.448	0.227	0.149
N	300	194	246	300
Panel B: High-adoption community				
Platform interoperability information	0.071	0.144	0.028	-0.017
	(0.069)	(0.005)	(0.529)	(0.617)
Control Mean	0.557	0.417	0.433	0.353
N	600	385	470	600

Notes: Refer to Table 4 for details. The first panel includes villages with above-median ($> 70\%$) adoption, while the second panel includes villages with below-median adoption.

Appendix

A.1 Additional summary statistics

Table A1: Preferences for on-net vs. off-net transfers

	(1) All	(2) Treatment group	(3) Control group
Only on-net	0.482	0.509	0.455
	(0.500)	(0.501)	(0.499)
Strongly prefers on-net	0.142	0.142	0.143
	(0.350)	(0.349)	(0.351)
Slightly prefers on-net	0.0822	0.0841	0.0804
	(0.275)	(0.278)	(0.272)
No preference between on-net and off-net	0.293	0.265	0.321
	(0.456)	(0.443)	(0.468)
Prefers on-net reason: Did not know off-net is possible	0.120	0.128	0.112
	(0.325)	(0.335)	(0.316)
Prefers on-net reason: Tx fees	0.0356	0.0487	0.0223
	(0.185)	(0.216)	(0.148)
Prefers on-net reason: Convenience	0.378	0.403	0.353
	(0.485)	(0.492)	(0.479)
Prefers on-net reason: Safety	0.0956	0.0796	0.112
	(0.294)	(0.271)	(0.316)
Observations	450	226	224

Notes: Means are in the first row; Standard deviations are below in parentheses. The first column contains all respondents. The second column contains the respondents assigned to the treatment group.The third column contains the respondnts. assigned to the control group.

A.2 Heterogeneity by prior interoperability knowledge/views

Table A2: Effect of interoperability information on participant preferences by prior interoperability knowledge

	(1) Register on-the-spot	(2) Highest WTP	(3) Prefers mobile money over airtime
Panel A: Thinks cross-net fee greater than 0			
Platform interoperability information	0.001	-1.272	-0.010
	(0.032)	(2.651)	(0.042)
Control Mean	0.089	18.535	0.178
N	308	308	308
Panel B: Thinks cross-net fee greater than on-net fee			
Platform interoperability information	0.090	1.736	-0.127
	(0.051)	(5.317)	(0.073)
Control Mean	0.105	6.842	0.333
N	119	119	119
Panel C: Strongly prefers on-net to cross-net			
Platform interoperability information	0.014	-0.810	-0.104
	(0.035)	(3.116)	(0.045)
Control Mean	0.097	14.776	0.216
N	281	281	281

Notes: Observations are at the respondent-level. Covariates are flexibly selected using double lasso approach of (Belloni et al., 2013; Ahrens et al., 2019). The first panel includes respondents who, prior to the intervention, thought fees on cross-platform mobile money transfers were greater than 0. The second panel includes those who, prior to the intervention, thought fees on cross-platform transfers were greater than fees for on-platform transfers. The third panel includes those who, prior to the intervention, strongly preferred on-platform transfers to cross-platform transfers including those who thought cross-platform transfers were impossible or reported that they would only transfer on-platform. In each panel, the first row is the coefficient on a dummy variable for whether the study participant received the platform interoperability information pamphlet. Standard errors are in parentheses below the coefficients and are clustered at the sender-level. The third row reports the control group mean for the outcome variable. The outcome variable in the first column is whether the respondent registered a mobile banking account at the end of the survey; in the second column, it is the respondent's willingness-to-pay to be registered for a mobile banking account; in the third column, it is whether the respondent preferred receiving their compensations in mobile money rather than airtime.

Table A3: Effect of interoperability information on participant preferences by prior interoperability knowledge and firm type

	(1) Reg. dominant	(2) Reg. competitor	(3) Reg. entrant	(4) WTP dominant	(5) WTP competitor	(6) WTP entrant	(7) Best dominant	(8) Best competitor	(9) Best entrant
Panel A: Thinks cross-net fee greater than 0									
Platform interoperability information	-0.024	0.001	0.000	-1.569	-2.161	-2.545	-0.042	0.016	0.016
	(0.035)	(0.026)	(0.016)	(2.200)	(2.150)	(3.339)	(0.057)	(0.051)	(0.028)
Control Mean	0.115	0.051	0.025	13.822	13.185	3.822	0.490	0.348	0.058
N	308	308	308	308	308	308	304	304	304
Panel B: Thinks cross-net fee greater than on-net fee									
Platform interoperability information	-0.011	0.011	-0.003	-0.440	-2.672	-5.897	0.117	-0.092	0.012
	(0.054)	(0.038)	(0.025)	(3.877)	(2.969)	(6.591)	(0.091)	(0.082)	(0.045)
Control Mean	0.105	0.035	0.035	7.719	5.053	-9.123	0.473	0.309	0.109
N	119	119	119	119	119	119	115	115	115
Panel C: Strongly prefers on-net to cross-net									
Platform interoperability information	0.056	0.010	-0.003	-0.038	-0.433	-7.140	0.061	-0.049	-0.019
	(0.042)	(0.024)	(0.020)	(2.601)	(2.653)	(3.625)	(0.059)	(0.052)	(0.031)
Control Mean	0.119	0.037	0.045	10.672	8.493	3.507	0.523	0.341	0.083
N	281	281	281	281	281	281	277	277	277

Notes: The outcome variable in Col. 1-3 is whether the respondent registered a mobile banking account at the end of the survey with the dominant (Col 1; Dominant means the most popular with the respondent's transaction network), competitor (Col 2; Competitor means the other major firm that is not the dominant firm), or entrant firm (Col 3; Entrant means the smallest firm included in this study, HBL Konnect). In Col. 4-6, the outcome is the respondent's willingness-to-pay to be registered for the dominant (Col. 4), competitor (Col. 5) or entrant (Col. 6) firm. In Col. 7-9, the outcome variable is which firm the respondent reported as their 'best registration option'. Refer to notes in Table A2 for further details.

A.3 Pamphlets

The designers at Gallup Pakistan designed each of the pamphlets.

The first part of the Raast pamphlet focuses on the benefits in terms of cross-platform payments. The pamphlet describes how Raast will make cross-platform payments easier by banishing transaction fees, making payments faster, and enabling use with any mobile money provider. The second part of the pamphlet describes how to register your mobile banking account with Raast and use Raast to make a payment.

The EasyPaisa, JazzCash, and HBL Konnect pamphlets provide instructions on how to register an account with these firms. The instructions provided are nearly identical for each firm. The only difference is the names and numbers of the firms as well as the color of the pamphlets.

Figure A1: Raast pamphlet

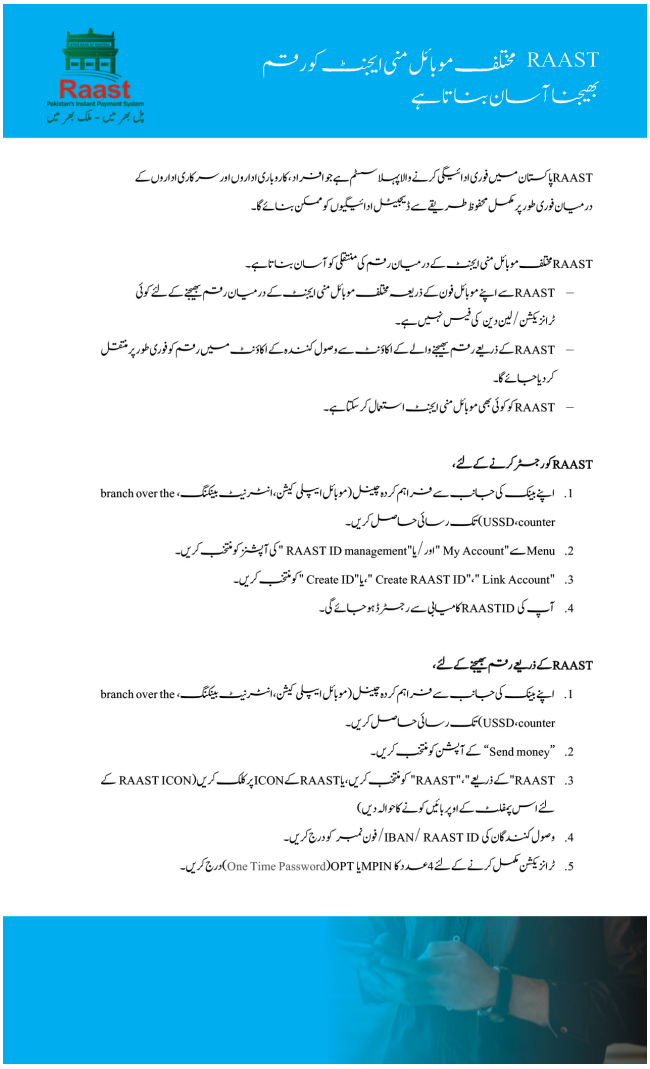

Figure A2: EasyPaisa pamphlet

easypaisa

ایزی پیسہ موبائل بینکنگ اکاؤنٹ کیسے کھولیں؟

آپ USSD، فون ایپس یا آسان موبائل اکاؤنٹ (AMA) پلیٹ فارم کے ذریعے ایزی پیسہ اکاؤنٹ کھول سکتے ہیں۔

اگر آپ کے پاس ٹیلی نار کی سم کارڈ ہے تو، آپ USSD کے ذریعے ایزی پیسہ اکاؤنٹ کھول سکتے ہیں:

1. اکاؤنٹ کھولنے کے لئے اپنے فون سے #786* ڈائل کریں۔
2. اپنا شناختی کارڈ اور انگوٹھا/شناختی کارڈ جاری ہونے کی تاریخ درج کریں۔
3. 5 ہندسوں کا پن کوڈ بنائیں۔
4. اپنے بنائے ہوئے پن کوڈ کو دوبارہ درج کریں۔

اگر آپ کے پاس اسمارٹ فون ہے تو، آپ موبائل فون ایپ کے ذریعے بھی ایزی پیسہ اکاؤنٹ کھول سکتے ہیں:

1. ایزی پیسہ آسان ایپ ڈاؤن لوڈ کریں۔
2. فون پر ایپ کھولیں۔
3. اپنا شناختی کارڈ اور انگوٹھا/شناختی کارڈ جاری ہونے کی تاریخ درج کریں۔
4. 5 ہندسوں کا پن کوڈ بنائیں۔
5. اپنے بنائے ہوئے پن کوڈ کو دوبارہ درج کریں۔

کسی بھی سم کارڈ یا فون سے، آپ آسان موبائل اکاؤنٹ (AMA) پلیٹ فارم کے ذریعے اکاؤنٹ کھول سکتے ہیں۔
ایزی پیسہ آسان موبائل اکاؤنٹ کھولنے کے لئے مندرجہ ذیل اقدامات پر عمل کریں:

1. اکاؤنٹ کھولنے کے لئے اپنے فون سے #2262* ڈائل کریں۔
2. "آسان موبائل اکاؤنٹ کے لئے رجسٹر کریں" کو منتخب کریں۔
3. دی گئی آپشنز کی فہرست میں سے ایزی پیسہ منتخب کریں۔
4. اپنا شناختی کارڈ اور انگوٹھا/شناختی کارڈ جاری ہونے کی تاریخ درج کریں۔
5. اگلے 60 دنوں میں قریبی موبائل بینکنگ ایجنٹ یا بینک برانچ جا کر اکاؤنٹ کی بائیومیٹرک تصدیق کریں۔

اسٹیٹ بینک آف پاکستان (SBP) اور پاکستان ٹیلی کمیونیکیشن اتھارٹی (PTA) کی جانب سے آسان موبائل اکاؤنٹ (AMA) ایک ایسا اقدام ہے جس کا مقصد تیز، آسان، محفوظ اور کم قیمت پر موبائل بینکنگ اکاؤنٹس کھولنے کی سہولت فراہم کرنا ہے۔

Figure A3: JazzCash pamphlet

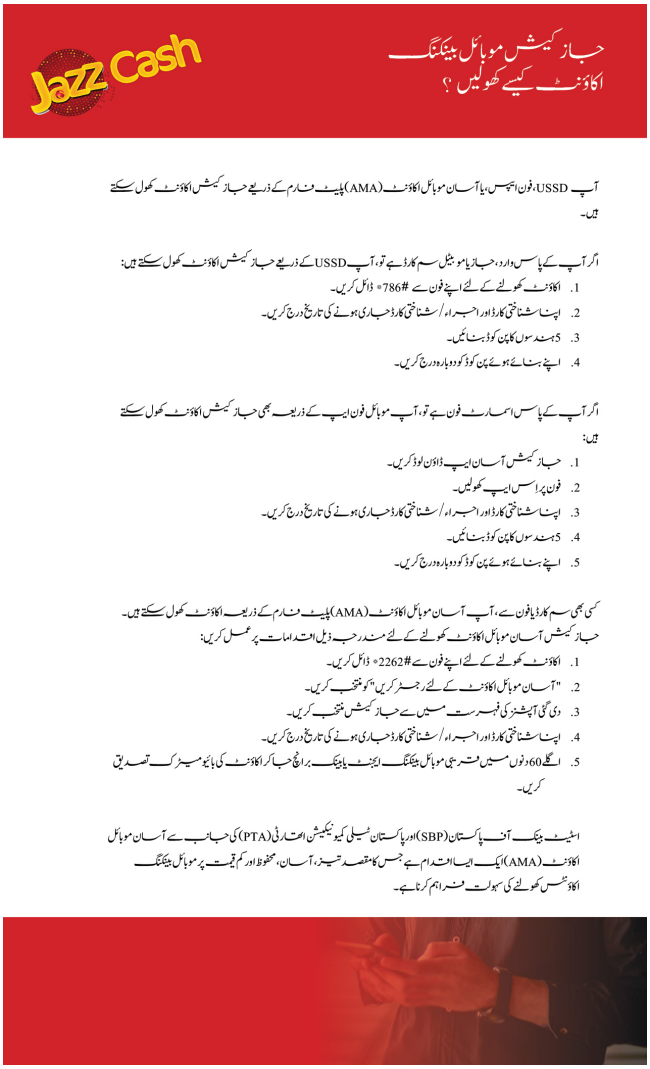

Figure A4: HBL Konnect pamphlet

A.3.1 Basic mobile banking firm information read by field officers to senders

"Many households also send money to or receive money from other mobile money users through their mobile wallets. EasyPaisa and JazzCash are the two major mobile money services in Pakistan. HBL Konnect is a relatively new mobile money service in Pakistan. If you open a mobile savings account, you often earn profit on these deposits. For example, if one keeps 2,500 PKR in a EasyPaisa savings account for over one year, they could expect to earn an additional 175 PKR in profit.

If one keeps 2,500 PKR in a JazzCash savings account for over one year, they could expect to earn an additional 188 PKR in profit.

If one keeps 2,500 PKR in a HBL Konnect savings account for over one year, they could expect to earn an additional 458 PKR in profit."

A.4 Treatment Group: Script

Field officers read: "Here is a pamphlet on how a new government payment system RAAST makes it easier to send money between mobile money providers." Then, they hand respondent RAAST pamphlet. Then, read "Recently, the State Bank of Pakistan implemented Raast, a payment system that enables fast and secure transfers between mobile banking providers. With Raast: There is no transaction fee for sending money between different mobile money providers via your mobile phone. The money will be transferred instantly from the sender's account to the receiver's account."

A.5 Neighbor assignment

In each village, surveyors asked the first two villagers interviewed to provide four names of people outside of their household who they transfer money with. These two villagers (the "listers" of the village) were randomly assigned two of the four listed names as their "neighbors" who would receive the pamphlet recommendations.

For the remaining 23 senders in a village, surveyors asked them to provide two names of people outside of their household who they transfer money with. Each of these respondents was assigned one of the two names as a receiver (their "strong tie" receiver). The other receiver was drawn from the pool of villagers listed by the "listers" in their village.

A.5.1 District-level adoption informational treatment

50% of respondents were randomized into the 'adoption information' group. These respondents received information about the district-level market shares of the three mobile money platforms considered in the experiment.

Table A4: Effect of adoption information on participant preferences

	(1) Firm best	(2) WTP	(3) Prefers bonus with firm
High Prior	-0.089	10.389	-0.041
	(0.062)	(4.266)	(0.061)
Low Prior	0.047	5.406	0.083
	(0.061)	(4.098)	(0.063)
Adoption info	-0.056	0.032	0.017
	(0.045)	(5.002)	(0.046)
Low Prior*Adoption info	0.024	-5.109	-0.067
	(0.087)	(5.530)	(0.088)
High Prior*Adoption info	0.140	-0.136	0.022
	(0.086)	(6.095)	(0.087)
Control Mean	0.353	4.388	0.317
N	672	672	672

Notes: Observations are at the study participant-firm level. The first row is the coefficient on a dummy variable for whether the study participant's prior on adoption of the firm in their district was 10% above the truth (High Prior). The third row is the coefficient on a dummy variable for whether the study participant's prior on adoption of the firm in their district was 10% below the truth (Low Prior). The fifth row is the coefficient on a dummy variable for whether the study participant was randomly assigned to receive the district-level 'adoption information' (Adoption Info). The seventh row reports the coefficient on the interaction between Low Prior and Adoption Info. The ninth row reports the coefficient on the interaction between High Prior and Adoption Info. Standard errors are in parentheses below the coefficients and are clustered at the sender-level. The outcome variable in the first column is whether the respondent reported that the firm was their best registration option. In the second column, it is the study participant's willingness-to-pay for the firm. In the fourth column, it is whether the respondent preferred to receive their bonus with the firm.

Table A5: Effect of adoption information on communication

	(1) Shares pamph	(2) Prefers pamph
High Prior	-0.116	-0.049
	(0.057)	(0.042)
Low Prior	-0.059	0.033
	(0.042)	(0.040)
Adoption info	0.045	0.030
	(0.058)	(0.034)
Low Prior*Adoption info	-0.023	-0.102
	(0.065)	(0.058)
High Prior*Adoption info	-0.030	0.012
	(0.079)	(0.058)
Control Mean	0.442	0.241
N	1344	1344

Notes: Observations are at the recommendation-firm level. The outcome in the first column is whether the study participant shared the pamphlet of this firm to an assigned neighbor. The outcome in the second column is whether the study participants preferred to share this firm with the assigned peer over all other firms. Refer to Table A4 for other details.