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“Does Interoperability in Mobile Financial Services  
improve Financial Inclusion of Low-Income Urban  
Women in Bangladesh?”

Maliha Rahanaz & Zaki Wahhaj

# Does Interoperability in Mobile Financial Services improve Financial Inclusion of Low-Income Urban Women in Bangladesh? \*

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## Abstract

Mobile financial service (MFS) providers have expanded the range of financial services available to low-income populations in developing countries. However, MFS account ownership do not guarantee improved financial inclusion and economic empowerment. Actual use may be limited by lack of interoperability across different financial service providers and lack of awareness and knowledge. We investigate empirically the effects of interoperability and MFS training on low-income urban women in Bangladesh by exploiting the recent introduction of interoperability in digital financial services in the country, and a randomised MFS training intervention for female domestic workers. The experimental design allows us to investigate whether the effects of interoperability are heterogeneous across customers with different levels of MFS knowledge as predicted in the theoretical literature.

## 1 Introduction

In recent years, mobile financial service (MFS) providers have greatly expanded the range of financial services available to low-income populations in developing countries. The last decade has also seen rapid growth in registered MFS users across a number of regions, and increased use of MFS for the payment of wages, and transfer of social welfare benefits. At the same time, there is growing evidence that access to mobile financial services help low-income households in developing countries improve welfare through reduced vulnerability to shocks and episodes of hunger ([Batista and Vicente](#)

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[2023]; Jack and Suri [2014]; Jack and Suri [2011]) and changes in consumption, savings and investment behaviour (Breza et al. [2020]; Lee et al. [2021]).

However, MFS account ownership and digital payments do not, on their own, guarantee improved financial inclusion and economic empowerment. The extent to which the growth in MFS user registrations translate into actual use of the range of financial services on offer may be limited by barriers typically faced by economically marginalised individuals: lack of awareness and knowledge, access/control of digital devices, lack of trust in the service provider, and vulnerability to exploitation by intermediary agents. The lack of interoperability across different financial service platforms can also limit the types of transactions that MFS account holders can perform. Relatedly, the introduction of interoperability may not benefit all MFS users uniformly, not least because of lack of awareness and information among economically marginalised populations.

In this paper, we investigate empirically how the introduction of interoperability and training on the use of mobile financial services affect MFS transactions and labour market outcomes of low-income urban women in Bangladesh. For this purpose, we exploit the recent introduction of platform interoperability in digital financial services in Bangladesh together with an intervention that involved MFS training to female domestic workers using an experimental design.

Female domestic workers constitute a sizeable fraction of urban women in paid work in Bangladesh – about 90% of the estimated 10.5 million employed in the domestic work sector are women (Bailur et al. [2019]). They are typically low-skilled migrants from rural areas driven to the city by financial pressures, lack formal employment contracts and find employment through informal channels (Ashraf et al. [2019]). Our study population consists of female domestic workers registered with HelloTask, a mobile app-based platform that matches domestic workers with clients in need of housemaid services. The workers receive wages for work obtained through HelloTask via a mobile money account (MMA) and, thus, already had some familiarity with mobile financial services at the beginning of the study. However, baseline data revealed that they made limited use of their MMA beyond cashing out wages, and had an unmet demand for better understanding of offers and services available from MFS providers.

A selection of domestic workers who were active on a gig economy platform (HelloTask) and had consented to take part in the study were randomly assigned to either receive the offer of a two-day training on the use of MFS services or not. The training was rolled out between September 2022 and January 2023. The Bangladesh government launched an Interoperable Digital Transaction Platform (IDTP) in November 2022. The system allows digital transactions among banks, MFS providers and payment service providers (PSP) for a nominal fee, and direct transactions between clients of different MFS providers and banks once they are registered on the platform without paying a fee.

We hypothesize that the introduction of interoperability in Bangladesh will increase

competition among MFS providers, and lead to lower transaction fees and a wider range of services aimed at clients with limited access to formal financial institutions (e.g. access to credit and insurance, payment of school/utility/medical fees, purchase of bus/train tickets, through MFS accounts) and thus improve financial inclusion for our study population. However, based on the existing theoretical literature (discussed in the next section) these effects are likely to be heterogeneous, with customers with better MFS knowledge more likely to benefit from competition induced by interoperability. Our experimental design allows identification of these heterogeneous effects. More specifically, we combine event study and RCT evaluation approaches to analyse the effects of interoperability, MFS training and their interaction.

About 81% of study participants in the treatment arms took up the offer of MFS training. We find that, soon after the introduction of interoperability, domestic workers exposed to the MFS training worked fewer hours via the gig economy platform and increased their mobile money balances. We find that participants in the control arm experienced similar behavioural changes but six months later than those exposed to the treatment. Thus, the intervention appears to have *accelerated* behavioural changes in employment and mobile money account use. We find limited effects on different types of mobile money transactions around the time of introduction of interoperability, suggesting that the observed effects may have occurred even in the absence of interoperability.

One possible explanation for these changes is that the financial literacy training provided through the intervention encouraged participants to pursue other income-generating opportunities that led to a reduction in work via the gig economy platform. The increase in mobile money account balances may reflect earnings from these other activities, or better financial management as a result of financial literacy training.

The remainder of the paper is organised as follows. We discuss the related literature in Section 2, and provide a background on mobile financial services, interoperability and employment in the domestic work sector in Bangladesh in Section 3. Description of the intervention and the experimental design follows in Section 4. We describe the datasets used in our analysis in Section 6, followed by the econometric specification in Section 7. We report on and discuss the results in Section 8. Section 9 concludes the paper.

## 2 Literature

We contribute to the empirical literature on the impact of MFS interoperability on potential users with low financial inclusion. According to the existing literature, these effects are theoretically ambiguous. While interoperability can potentially reduce transaction fees for consumers by increasing competition among MFS providers, [Bianchi et al. \[2023\]](#) argues that if consumers lack the ability to access and compare pricing in-

formation, competition between providers will be weak. [Stahl \[1989\]](#) and [Varian \[1980\]](#) show theoretically that if consumers are heterogeneous in this respect, then poorly informed consumers may be charged higher fees. Consequently, increased competition may lead to increased exploitation of poorly informed consumers ([Bianchi et al. \[2023\]](#)). [Rhodes \[2015\]](#) argues that an expansion in the range of consumer services – as should happen after interoperability – should result in a fall in transaction fees as new users will have lower valuation of existing services.

While MFS interoperability is presently being implemented in many developing countries, there remains limited evidence regarding its causal effects on financial inclusion and broader development outcomes. We aim to fill this gap in the literature. In addition, given the theoretical results regarding the potentially heterogeneous effects of interoperability across different consumer types, our experimental design will shed light on how interoperability interacts with demand-side interventions aimed at improving MFS knowledge among those with low financial inclusion. The existing evidence suggests knowledge could play a critical role. For example, [Annan \[2022\]](#) finds that, when users are aware about the fees charged by the MFS providers' agents, the fees they pay decreased by 40% thus leading to increases in transactions performed.

Engagement with financial technology can accelerate learning and mental accounting that can lead to changes in consumption, saving, and investment behaviour. [Breza et al. \[2020\]](#) report strong learning effects among workers in a treatment group receiving monthly wage payments into mobile money accounts. Workers learned to use the various MFS services without assistance and learned to avoid illicit fees. Female workers with less control over expenditures at baseline, fewer savings, and inexperience of financial technology were seen to have the largest decrease in consumption.

## 3 Study Context and Background

### 3.1 Mobile Financial Services and Interoperability in Bangladesh

Bangladesh is one of the 7 countries with the highest population without a bank account. But 69% of the unbanked population have access to a mobile phone ([Demirgüç-Kunt et al. \[2022\]](#)). This setting has provided the opportunity for dramatic growth in mobile financial services. Mobile money account ownership among adults increased from just 3% in 2014, to 21% in 2017 and 54% in 2021 ([Demirguc-Kunt et al. \[2018\]](#); [Demirgüç-Kunt et al. \[2022\]](#)). According to data from Bangladesh Bank, the number of registered users of mobile money grew by 203% between December 2015 and October 2020 ([Hazra and Priyo \[2021\]](#)).

Mobile account ownership among women in Bangladesh lags behind that of men. In 2017, the gender gap was nearly 30% points ([Demirguc-Kunt et al. \[2018\]](#)). Between

2017 and 2021, the gender gap narrowed sharply. However, in 2021, there was still a sizeable gender gap in account ownership of 20%, and a 15% gender gap in digital payments among account holders ([Demirgüç-Kunt et al. \[2022\]](#)).

Currently, there are 9 MFS providers in Bangladesh approved by Bangladesh Bank (the central bank) but three providers dominate the market: bKash, a subsidiary of BRAC Bank, occupies 48% of market share; Nagad, operating under the Bangladesh Post Office, occupies 28% of market share; and Rocket, offered by Dutch Bangla Bank Limited, occupies 21% of market share. While the core services offered by all the MFS providers are identical, Nagad users benefit from the lowest cash-out cost while bKash users enjoy the largest agent network across Bangladesh.

A well-developed MFS ecosystem has enabled the proliferation of digitizing wages for 1.9 million garments workers in urban Dhaka, half of whom are women ([Baur-Yazbeck and Roest \[2019\]](#)). The sustainability of MFS use among the poor and marginalized will greatly depend on their knowledge and the cost of maintaining an MFS account ([Rahman \[2021\]](#)). Hence, transaction costs such as send money charges and cash-out charges play a crucial role in the adoption of MFS ([Parvez et al. \[2015\]](#); [Bianchi et al. \[2023\]](#)). Interoperability eliminates the reliance on a single MFS provider, allowing users the freedom to switch to other MFS providers depending on agent network, transaction fees charged, reliability/security, and connectivity ([Insights \[2017\]](#); [Rahman \[2021\]](#)).

The Bangladesh government launched an Interoperable Digital Transaction Platform (IDTP), called "Binimoy" on 13th November 2022. The system allows digital transactions among banks, MFS providers and payment service providers (PSP) for a nominal fee. The system also allows direct transactions between clients of different MFS providers and banks once they are registered on the platform without paying a fee. Bangladesh Bank introduced new regulation allowing financial institutions and government entities to acquire licenses for MFS businesses with the aim of lowering entry barriers.<sup>1</sup>

## 3.2 Female Domestic Workers and The HelloTask Platform

Female domestic workers constitute a sizeable fraction of women in paid work in Bangladesh – about 90% of the estimated 10.5 million employed in the domestic work sector are women ([Bailur et al. \[2019\]](#)) – with limited access to formal financial institutions. These women predominantly use MFS for domestic money transfers. The use of other services remains low mainly due to a lack of awareness, knowledge, and tailored financial training. Only 20% of them are aware of the transaction costs and

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<sup>1</sup>Under the previous Bangladesh Mobile Financial Services Regulation (2018), MFS providers could not function as a wing of a scheduled bank or its subsidiary with the parent entity holding 51% or more of the ownership.

fees of the MFS service they use, and only 10% of them compare MFS providers before selecting one (Barooah et al. [2018]; Insights [2017]). These women are often budget-constrained, sensitive to cost and thus have the potential to benefit from an increased range of financial services offered through mobile money accounts and lower transaction fees.

HelloTask operates a mobile app to match female domestic workers to work opportunities in Dhaka city. Individuals and households requiring domestic help can use the app to hire a domestic worker at an hourly rate or subscribe to a regular service that involves a monthly fee. Domestic workers are matched with clients via the HelloTask app. To receive payment for their services, the domestic workers are required to open a mobile money account with a specific MFS provider that HelloTask works with for wage disbursement. Henceforth, we refer to the MFS provider that HelloTask works with for wage disbursement as 'HelloTask Payment Platform' (or HPP).<sup>2</sup> As shown in Table 1, the HPP has lower fees for sending money and cashing out, and a higher interest rate on savings than the market leader (bKash). But it also has a substantially smaller network of users and mobile money agents across the country. As discussed in Section 6.1, in the majority of cases, HelloTask's domestic workers withdraw their earnings from their HPP accounts immediately upon receipt and do not use the account for other purposes.

Table 1: **Comparison between bKash and the HelloTask Payment Platform**

	bKash	HPP
Send-money charge	BDT 5	BDT 0
Cash-out charge per BDT 1000	BDT 18.50 per	BDT 9
Savings interest rate	1.4% (BDT 5,000) to 4% (BDT 50,000+)	5% (BDT 5,000) to 7.5% (BDT 50,000+)
# of registered users	50.5 million	24 million
# of mobile money agents	272,000	240,000

Source: Transfers Working Group, ISCG, Mapping of Mobile Financial Services in Bangladesh.

Note: Figures are from March 2022.

## 4 Intervention and Experimental Design

The study population consists of female domestic workers, employed via HelloTask, living in 5 major slums areas across Dhaka city (Bashundhara, Dhanmondi-Mohammadpur, Malibag-Khilgaon, Mirpur and Uttara). To be recruited by HelloTask, interested women must own or have access to any type of mobile phone, including feature phones. The wages earned by these domestic workers are paid into a mobile money account.

<sup>2</sup>We do not reveal the name of the MFS provider that HelloTask currently uses for wage disbursement to avoid comparisons between different service providers based on the study findings.

To draw the study sample, HelloTask produced a list of 780 domestic workers actively working at their platform. From this list, we randomly selected a sample of 563 domestic workers across the 5 slums in Dhaka city. Each of the study participants was randomly assigned to one of three experimental arms stratified within slums: (i) T2 - offer of a two-day MFS training; (ii) T1 - offer of the MFS training and the option to switch to the MFS provider bKash for future wage payments; (iii) C - no MFS training.

The rationale for offering participants in T1 the option to switch to bKash for future wage payments is that bKash has a wider network of MFS agents than the MFS provider that HelloTask currently uses for wage disbursement. We randomly selected 170 domestic workers to be in T1, 167 domestic workers to be in T2, and 226 domestic workers to be in C. We invited the domestic workers in arms T1 and T2 to attend the two-day MFS training starting from September 2022.

The MFS training modules were adapted from the HerFinance Digital Wages Curriculum developed by the HERfinance Digital Wages Program. There are 6 training modules: Introduction to Mobile Financial Services, Using Mobile Financial Services, Financial Planning and Managing Money, Budgeting, Savings, and Talking About Finances With Family. The original versions of these modules were prepared to facilitate training sessions among garment factory workers. We worked with our implementation partner, HelloTask, to adapt the modules to the context of female domestic workers in Bangladesh. The modules were further adapted via discussions with the HelloTask field force and from the researchers' experience with female domestic workers during focus group discussions (FGDs). Furthermore, the original modules were updated to include the various other MFS providers presently operating in Bangladesh. We updated the transaction charges/fees and interest rates on savings. We provided information on the universe of services available from different mobile money providers - differentiating between the existing mode of payment and the new mode of wage payment we offered to domestic workers in T1. The training made no reference to introduction of interoperability but participants made aware of variation in transaction fees across MFS providers.

The two-day training sessions were conducted in HelloTask hubs (venue training). These hubs are privately owned/rented by HelloTask to use for their day-to-day business and training activities. The hubs are located inside the slum regions across Dhaka city thus ensuring familiarity and accessibility for the study participants.

We developed a MFS training calling protocol, where we called and informed, a week before, each domestic worker in T1 and T2 about the invitation to attend the training. A dedicated team at HT continued to make reminder calls 24 hours before the training and then finally on the day of the training.

By December 2022 we had provided training to 156 domestic workers. To reach the remaining participants, we subsequently initiated door-to-door training conducted by



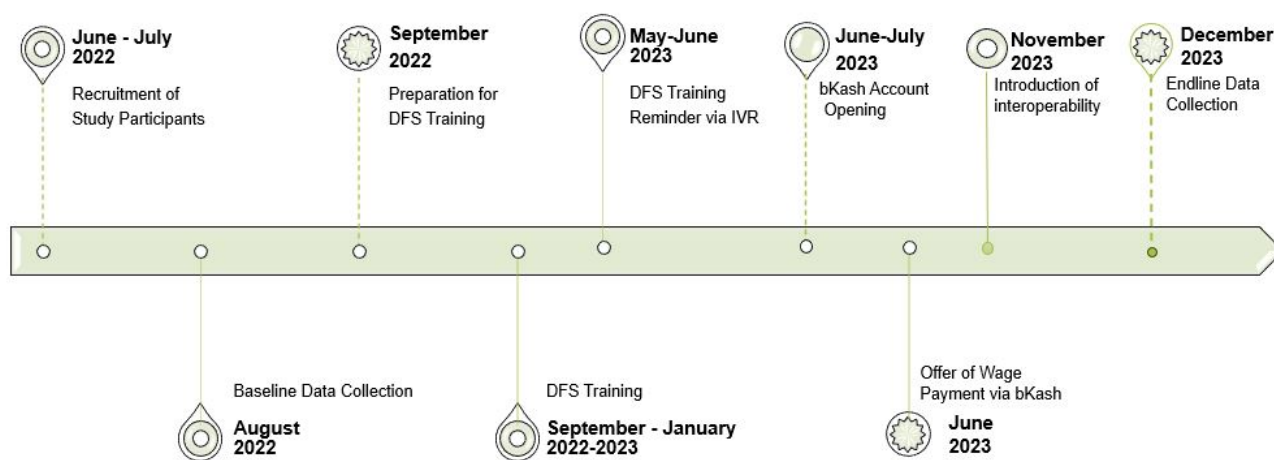
HelloTask's field agents who attended the hub training and had previous experience working with the study participants. By January 2023, we provided training to another 116 domestic workers via door-to-door training, reaching 272 of the 337 domestic workers (81%) in T1 and T2.

To continue the MFS training over the period of the study and to reach the participants (71) who did not attend the training, we worked with HelloTask to design "MFS Training refreshers" using IVR (Interactive Voice Response) telephone calls. We prepared condensed versions of the 6 training modules. To test participants' knowledge and understanding of the modules, we also prepared an "MFS Quiz" with two multiple choice questions (MCQ) for each module. The calls were administered to all the 337 participants in T1 and T2 between May 2023 to September 2023. The refresher training was completed by 27%, and partially completed by another 32%, across the two treatment arms.

In June 2023, in line with our research design, we offered participants in T1 the offer of wage payment via bKash. If participants agreed to be paid via the new mode of payment, we asked for the number associated with that mobile money account and recorded it. If they did not have this mobile money account, we offered guidance on how to open these accounts, followed up to ensure that these accounts were opened, and then recorded the number associated with these accounts. Of the 170 study participants in T1, 110 were successfully contacted with the offer of switching to bKash for future wage payments and 30 of them (27%) opted to switch. Study participants in T2, who were also invited to the MFS training, continued to receive payment via their existing mode of payment.

In separate work, we show – using an instrumental variables approach – that the two modes of training had similar impacts on knowledge related to mobile money accounts ([Rahanaz et al. \[2024\]](#)). We also find no significant changes in mobile money transactions between the two treatment arms around the date of the switch offer ([Rahanaz et al. \[2024\]](#)). Therefore, for the subsequent analysis in this paper, we pool together participants across the two treatment arms and those who were offered door-to-door training and those who were not.

The timeline of the intervention and data collection activities, and the introduction of interoperability are shown in the figure below.



## 5 Theory of Change

In this section, we discuss the possible ways in which the introduction of platform interoperability and MFS training can interact to influence financial and employment behaviour of the female domestic workers included in the study.

As noted in Section 3, HelloTask pays domestic workers employed by its clients through a mobile money account – that we call HPP – but the wage recipients rarely use their HPP account for any purpose other than to withdraw their earnings. However, a large proportion of our study participants were registered users of at least one other mobile money account at baseline: for example, nearly half had a mobile money account with bKash (see Table 2), the MFS provider with the largest market share and the largest network of agents in Bangladesh.

We hypothesize that the introduction of platform interoperability would encourage the domestic workers to retain their wages in their HPP accounts for future financial transactions – such as remittances – rather than withdrawing the money from the account immediately upon receipt.

Additionally, by reducing transaction costs between different mobile money platforms, the introduction of interoperability would make wage payments into the HPP accounts, and thus employment through HelloTask, more attractive for the domestic workers,

Domestic workers who obtained the MFS training would have greater awareness of the introduction of platform interoperability and its advantages, and thus the hypothesized

effects described above should be greater for those that received the training compared to those who did not.

The offer of platform switching for wage payment in T1 should also increase the attractiveness of the HelloTask platform and increase employment via the platform; and increase use of bKash for financial transactions.

## **6 Description of the Data**

To address our research questions, we make use of three types of data. We describe each of these briefly below.

First, we make use of a baseline survey of the households of the study participants conducted in July and August 2022. In each household, two interviews were conducted, one with the head of the household and another with the female domestic worker. The questions in the survey covered individual and household demographic characteristics, savings, remittances, consumption, business and capital investments, employment activities, decision-making within the household, and awareness, knowledge and usage of mobile money.

Second, we make use of administrative data on the study participants from HelloTask. This includes administrative data on DFS training – training status, training date, and type of training received – and data on employment activities obtained via the HelloTask app – days and hours worked, wages earned and payment method. This data is available for the period June 2022 to September 2023.

Third, we make use of administrative data on mobile money transactions by the study participants – deposits, withdrawals, remittances sent and received – obtained from the MFS provider bKash. This data is available for the period June 2021 to February 2024.

The study participants' consent on the use of the employment and mobile money administrative data was obtained at the time of the baseline survey and at the start of the DFS training.

### **6.1 Survey Summary Statistics**

We conducted baseline data on the 564 female domestic workers recruited for the study using a household survey involving individual interviews with the domestic worker and the household head. Summary statistics on the study participants are provided in Table 2.

The typical female domestic worker in our sample is in her mid-thirties and lives with her husband and one child in a nuclear family. About 15% of the households are female-headed. The women are on average about 34 years of age and more than 65% are

Table 2: Baseline Survey Summary Statistics

	Mean	SD	Min	Max	Count
<b>A. Individual Characteristics</b>					
Age	34.77	8.08	15	80	563
Respondent is married	0.68	0.47	0	1	563
Respondent is household head	0.35	0.48	0	1	563
Completed primary education	0.44	0.5	0	1	563
Completed secondary education	0.19	0.39	0	1	563
Has access to personal phone	0.95	0.22	0	1	563
<b>B. Knowledge of Mobile Money</b>					
Ever used mobile money account	0.83	0.37	0	1	563
Has a bKash mobile money account	0.48	0.5	0	1	563
Has other (Nagad/ROCKET) mobile money account	0.63	0.48	0	1	563
Knows basic services of mobile money account: deposit, withdrawal, send money	0.95	0.22	0	1	563
Knows can save money in mobile money account	0.05	0.21	0	1	563
<b>C. Usage of Mobile Money</b>					
Deposits money in mobile money account	0.03	0.18	0	1	563
Sends money using mobile money account	0.55	0.5	0	1	563
<b>D. Remittance/Savings</b>					
Received remittance in the last 6 months	0.39	0.49	0	1	563
Received remittance using mobile money account	0.23	0.42	0	1	563
Sent remittance in the last 6 months	0.48	0.5	0	1	563
Sent remittance using mobile money account	0.34	0.47	0	1	563
Has any savings in the last 12 months	0.7	0.46	0	1	563
<b>E. Household Characteristics</b>					
Household size	3.58	1.57	0	13	563
Number of children in the household	1.52	1.18	0	7	563
Domestic worker is primary earner	0.17	0.37	0	1	563
Weekly per capita consumption (BDT)	224.22	260.22	6	3750	563

married. About 44% of these women have completed primary education (i.e. completed class 1 to class 5) and less than 20% have completed secondary education level (i.e. completed class 6 to class 12). The mean monthly income earned by the women was about BDT 7,500 <sup>3</sup> and about 17% of these women were the primary earner in the household. The weekly per capita consumption is BDT 224. Almost all the women in our sample have access to a personal phone. Nearly two-thirds of the women have moved to Dhaka city in search of work-related opportunities. And about half of these women have worked at least once with HelloTask as a domestic worker.

In order to understand the prevalence of DFS, we asked various questions related to awareness, usage and knowledge regarding mobile money. We find that about 83% of women in our sample have used a mobile money account at some point in their lives. Nearly half the respondents have a bKash account and nearly two-thirds has an account with another MFS provider. Furthermore, a sizeable fraction maintains multiple mobile money accounts. Although the majority of these women are familiar with the basic services available through a mobile money account (deposits, withdrawals, send money), their usage of these services remains low. Firstly, despite high awareness regarding mobile money, less than 5% have ever deposited money into their mobile money account. Secondly, while half of these women have performed a send money transaction, 22% reported that someone else performs this transaction on their behalf; and 27% reported that a mobile money agent performed the send money transaction on their behalf.

More than one third of these women have sent and/or received remittances in the last 6 months to/from those living outside of the household. Among them, more than one third used a mobile money account to send money while less than one third used a mobile money account to receive money. The low usage of mobile money accounts to receive money appears to be related to limited knowledge: at baseline, 31% were aware that they can receive their wages from HelloTask on their mobile money accounts but fewer than 10% knew that they could receive transfers from other sources.

More than two thirds of the women have reported to have any savings in the last 12 months, with about 42% regularly saving with formal sources such as banks, about 13% savings with informal sources such as under the mattress, in the cupboard, places in the house, clay-pot, while less than 1% report saving in a mobile money account. Women reported that the major reason they do not save in mobile money account is the need to immediately cash-out money from their accounts. This is indicative that these women view mobile money account as an intermediary step to accessing cash rather than a device to store money for future use and/or to earn interest on.

We report the baseline summary statistics by treatment/control arm in Tables 4 and 5 in

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<sup>3</sup>BDT (Bangladesh Taka) is the local currency. At the time of the survey in July-August 2022, the foreign exchange rate was about 95 BDT = 1 US dollar.

the Appendix. Table 4 shows that differences in mean values across arms are statistically insignificant for most characteristics. We obtain statistically significant differences at the 5% level when comparing three of the 69 pairs of values – MFS account ownership other than bKash, having any savings, and weekly per capita consumption – which is close to the expected rate of random statistically significant differences. Table 5 shows the normalised differences across the mean values in the same variables. All pairs are below the threshold of 0.25 recommended by [Imbens and Rubin \[2015\]](#) as an indicator for good balance.

## 6.2 Summary Statistics on Mobile Money Transactions

Table 3 provides summary statistics on mobile money transactions conducted by bKash account holders in our sample of study participants for the period June 2021 to February 2024. The figures indicate that the respondents conduct, on average, 0.77 cash-in transactions and 0.88 cash-out transactions per month with an average monthly value of about BDT 1,500 (equivalent to approximately USD 16) for both types of transactions. Furthermore, they conduct an average of 0.44 send-money transactions and 0.56 receive-money transactions per month using their bKash accounts, with average monthly values of about BDT 1,800 and 1,500 respectively.

Table 3: bKash Transactions Summary Statistics

	mean	sd	min	max
Cash-in freq	0.77	1.92	0	37
Cash-out freq	0.88	1.87	0	39
Money sent freq	0.44	1.37	0	26
Money received freq	0.56	1.51	0	21
Disbursements freq	0.15	0.52	0	6
Cash-in amount	1511.25	4772.99	0	91970
Cash-out amount	1536.41	4036.66	0	65585
Money sent amount	1797.72	7090.29	0	148980
Money received amount	1528.35	6614.43	0	152295
Disbursements amount	382.50	1654.63	0	27307
Observations	6102			

Note: bKash transactions by month from June '21 to Feb '24.  
Amounts are in Bangladesh Taka.

These figures highlight that the bKash account holders in our sample use these accounts frequently to send and receive money and that the amounts involved are not insignificant.

## 7 Econometric Specification

We use monthly administrative data and an event study approach (Miller [2023]) to investigate how the introduction of interoperability affects financial transactions and labour market decisions by study participants randomly assigned to receive MFS training. For the event study analysis, we estimate the following equation:

$$y_{it}^s = \alpha + \sum_{j=-m}^n \gamma_j D_{i,t-j} + \sum_{j=-m}^n \zeta_j (D_{i,t-j} \times T_i) + \eta_i + \delta_t + \varepsilon_{it} \quad (1)$$

where  $y_{it}^s$  is outcome of type  $s$  by domestic worker  $i$  in month  $t$ ,  $\delta_t$  represents month fixed-effects and  $\eta_i$  represents individual fixed-effects,  $D_{i,t-j}$  is a binary variable that equals 1 if the event (introduction of interoperability) occurred  $j$  months before month  $t$  (or after month  $t$  if  $j$  is negative),  $T_{i,t-j}$  is an indicator for the treatment status of  $i$  in period  $t-j$  (equal to 1 if  $i$  is treated during or prior to that period and 0 otherwise), and  $\varepsilon_{it}$  is an error term.

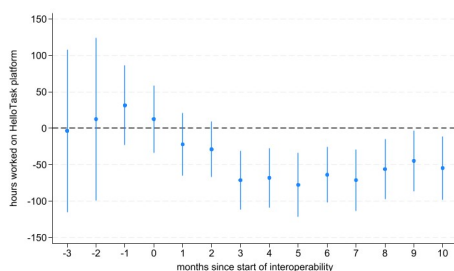
The terms  $\alpha$ ,  $\gamma_j$ ,  $\zeta_j$ , and  $\beta$  are parameters to be estimated. We plot the estimates of  $\gamma_j$ , and  $\zeta_j$  for different values of  $j$  to show the effects of interoperability and their interaction with MFS training over time.

## 8 Results

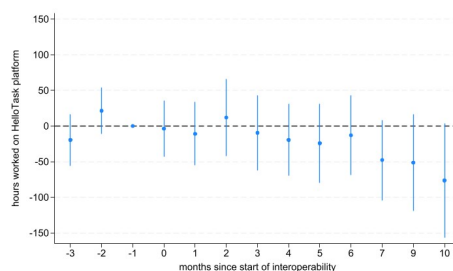
In figures (1)-(6), we plot the point estimates and 95% confidence intervals for equation (1) for 6 different outcomes. Within each figure, panel (a) shows the point estimates of the effects of interoperability – for each month relative to the start of interoperability – for domestic workers in either treatment (corresponding to the sum of the parameters  $\gamma_j + \zeta_j$  in equation 1)); and panel (b) shows the corresponding point estimates for domestic workers in the control arm (corresponding to the parameter  $\gamma_j$  in equation 1). In each panel '0' on the horizontal axis corresponds to the month of start of interoperability (November 2022).

We interpret the point estimates in panel (b) as the lead and lag effects of interoperability for domestic workers who were not offered the MFS training. It is evident from the plots in this panel across the five figures that there was little change in any of the outcomes with the exception of MFS account balance and hours works for HelloTask: we see a steady increase in account balance, and a downward trend in hours worked, starting, respectively, 6 months and 7 months after the introduction of interoperability (figures 1 and 6).

Turning to the estimates in panel (a), we see a decline in hours worked for HelloTask following the introduction of interoperability onwards, relative to the value for the control

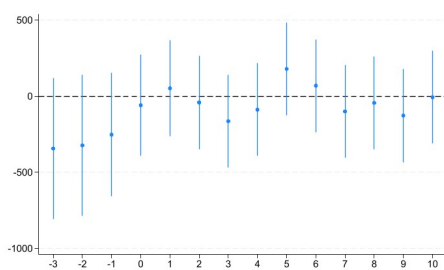


(a) Average Treatment Effect

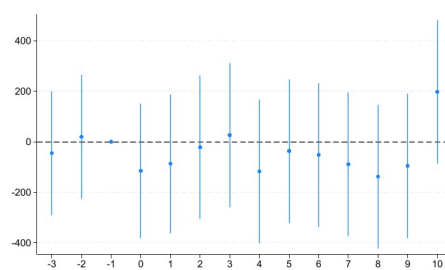


(b) Effect of Interoperability on Untreated

Figure 1: Hours Worked for HelloTask



(a) Average Treatment Effect



(b) Effect of Interoperability on Untreated

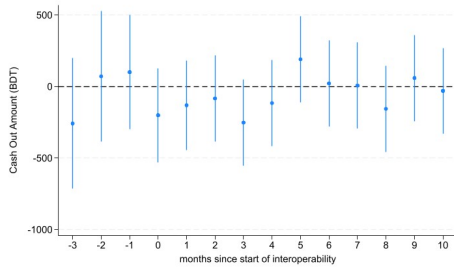
Figure 2: bKash Account Cash In

group in month 0 (figure 1). We do not see any effects on mobile money transactions except in the case of MFS account balance which shows an increase from the month after the introduction of interoperability (figure 6).

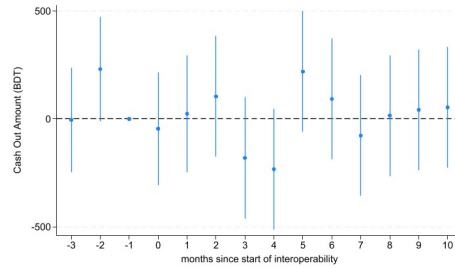
Thus, for domestic workers in the control arm and those exposed to either treatment, we observe changes in the same two outcomes, in the same direction, following the introduction of interoperability: hours worked for HelloTask and mobile money account balance. However, those exposed to the MFS training begin to experience these changes about six months earlier than those in the control arm, soon after the introduction of interoperability. Thus, one possible interpretation of these results is that the intervention *accelerated* these changes in behaviour.

Both of the observed effects are contrary to the hypotheses discussion in Section 5. If interoperability, and increased awareness of it through MFS training, had encouraged domestic workers to retain wages in HPP accounts for future financial transactions, this would lead to lower savings in their alternative (bKash) mobile money account. But we see the opposite. Similarly, if interoperability and increased awareness through MFS training had made wage payments into HPP accounts more attractive to domestic workers, we would expect to see an increase in hours worked via the HelloTask app.



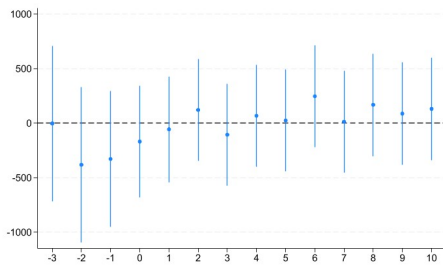


(a) Average Treatment Effect

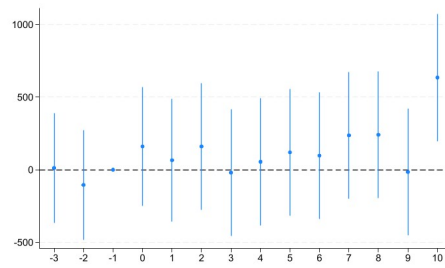


(b) Effect of Interoperability on Untreated

Figure 3: bKash Account Cash Out



(a) Average Treatment Effect



(b) Effect of Interoperability on Untreated

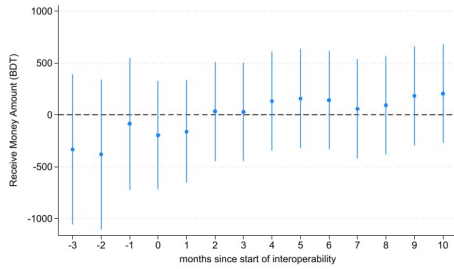
Figure 4: bKash Account Money Sent

Instead, we see the opposite.

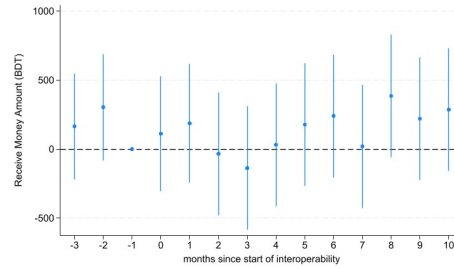
One possible explanation for these changes is that the financial literacy training provided through the intervention encouraged participants to pursue other income-generating opportunities that led to a reduction in work via the HelloTask app. The increase in bKash account balances may reflect earnings from these other activities, or better financial management as a result of financial literacy training.

An alternative, but closely related, interpretation is that the reduction in work via the HelloTask app and the increase in bKash account balances is a normal pattern in the life-cycle of domestic workers who register to work on the HelloTask app and financial literacy training *accelerated* these life-cycle patterns.

The introduction of interoperability does not play a central role in either of these two possible explanations of the results.

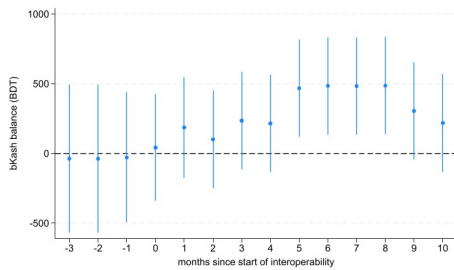


(a) Average Treatment Effect

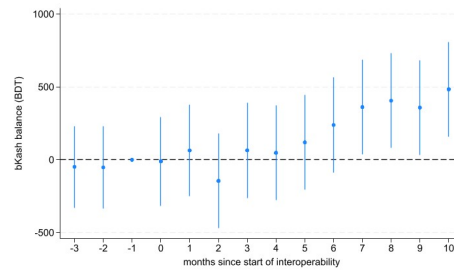


(b) Effect of Interoperability on Untreated

Figure 5: bKash Account Money Received



(a) Average Treatment Effect



(b) Effect of Interoperability on Untreated

Figure 6: bKash Account Balance

## 9 Conclusion

We investigate the effects of MFS training and platform interoperability on an economically marginalised group: women employed in the domestic work sector in Bangladesh. We implement an MFS training intervention with an experimental design and exploit the recent introduction of digital transactions platform interoperability in Bangladesh.

Contrary to our hypotheses, MFS training led to a reduction in labour supplied via a gig economy platform for housemaid services that pays wages through mobile money accounts. We find little change in mobile money transactions among domestic workers through bKash mobile money accounts, the MFS provider with the largest market share in Bangladesh, except for a steady increase in account balances.

Domestic workers in the control arm - who were not exposed to MFS training - experienced similar behavioural changes to those in the treatment arms but with a delay of about six months. Thus, MFS training appears to have *accelerated* changes in employment and mobile money account usage.

A possible explanation for these changes is that the financial literacy training provided through the intervention encouraged participants to pursue other income-generating

opportunities that led to a reduction in work via the gig economy platform. The increase in mobile money account balances may reflect earnings from these other activities, or better financial management as a result of financial literacy training.

Given the limited effect on mobile money transactions around the time of introduction of interoperability, we cannot rule out that the observed changes would have occurred even if interoperability had not been introduced.

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## 10 Appendix - Tables

Table 4: Baseline Balance Check: Mean and Standard Errors by Arm

Variable	(1) Control		(2) T1		(3) T2		t-test Difference	t-test Difference	t-test Difference
	N	Mean/SE	N	Mean/SE	N	Mean/SE	(1)-(2)	(1)-(3)	(2)-(3)
Age	226	34.181 [0.556]	170	34.641 [0.604]	167	35.605 [0.603]	-0.460	-1.423*	-0.964
Respondent is married	226	0.677 [0.031]	170	0.676 [0.036]	167	0.683 [0.036]	0.001	-0.006	-0.006
Age at marriage	223	15.170 [0.178]	168	15.161 [0.212]	167	15.210 [0.207]	0.010	-0.039	-0.049
Relationship to household head: household head	226	0.363 [0.032]	170	0.335 [0.036]	167	0.359 [0.037]	0.028	0.004	-0.024
Completed primary education	226	0.442 [0.033]	170	0.441 [0.038]	167	0.425 [0.038]	0.001	0.017	0.016
Completed secondary education	226	0.221 [0.028]	170	0.176 [0.029]	167	0.156 [0.028]	0.045	0.066	0.021
Has access to personal phone	226	0.938 [0.016]	170	0.959 [0.015]	167	0.952 [0.017]	-0.021	-0.014	0.007
Mean monthly income (BDT)	186	7375.652 [287.203]	127	7630.654 [383.644]	124	7604.871 [343.149]	-255.001	-229.219	25.783
Ever used mobile money account	226	0.854 [0.024]	170	0.847 [0.028]	167	0.796 [0.031]	0.007	0.058	0.051
Has a bKash mobile money account	226	0.473 [0.033]	170	0.518 [0.038]	167	0.461 [0.039]	-0.044	0.012	0.057
Has others (Nagad/ROCKET) mobile money account	226	0.659 [0.032]	170	0.576 [0.038]	167	0.647 [0.037]	0.083*	0.013	-0.070
Deposits money in mobile money account	226	0.027 [0.011]	170	0.029 [0.013]	167	0.048 [0.017]	-0.003	-0.021	-0.018
Sends money using mobile money account	226	0.566 [0.033]	170	0.582 [0.038]	167	0.509 [0.039]	-0.016	0.057	0.073
Received remittance in the last 6 months	226	0.429 [0.033]	170	0.365 [0.037]	167	0.353 [0.037]	0.064	0.076	0.011
Sent remittance in the last 6 months	226	0.456 [0.033]	170	0.506 [0.038]	167	0.485 [0.039]	-0.050	-0.029	0.021
Has any savings in the last 12 months	226	0.743 [0.029]	170	0.653 [0.037]	167	0.695 [0.036]	0.090*	0.049	-0.042
Amount given to spouse (BDT)	72	5690.278 [430.335]	32	4621.875 [652.596]	39	5102.564 [492.419]	1068.403	587.714	-480.689
Amount received from spouse (BDT)	87	6452.966 [596.029]	45	6327.778 [853.832]	60	7465.000 [847.448]	125.188	-1012.034	-1137.222
Age of the household head	226	40.186 [0.760]	170	39.794 [0.795]	167	40.743 [0.839]	0.392	-0.557	-0.948
Household size	226	3.619 [0.099]	170	3.418 [0.120]	167	3.701 [0.128]	0.202	-0.081	-0.283
Number of children in the household	226	1.575 [0.079]	170	1.406 [0.087]	167	1.587 [0.094]	0.169	-0.012	-0.181
Domestic worker is the primary earner in the household	226	0.142 [0.023]	170	0.200 [0.031]	167	0.174 [0.029]	-0.058	-0.032	0.026
Weekly per capita consumption (BDT)	226	202.949 [9.587]	170	221.702 [17.112]	167	255.565 [29.850]	-18.752	-52.615*	-33.863

Table 5: Balance Check: Normalised Differences and F-Test for Joint Orthogonality

Variable	Normalized difference (1)-(2)	Normalized difference (1)-(3)	Normalized difference (2)-(3)	F-test for joint orthogonality
Age	-0.056	-0.175	-0.123	1.520
Respondent is married	0.001	-0.012	-0.013	0.009
Age at marriage	0.004	-0.015	-0.018	0.016
Relationship to household head: household head	0.058	0.007	-0.050	0.178
Completed primary education	0.003	0.035	0.032	0.067
Completed secondary education	0.111	0.166	0.056	1.461
Has access to personal phone	-0.093	-0.061	0.033	0.458
Mean monthly income (BDT)	-0.062	-0.059	0.006	0.196
Ever used mobile money account	0.019	0.153	0.132	1.286
Has a bKash mobile money account	-0.088	0.025	0.113	0.609
Has others (Nagad/ROCKET) mobile money account	0.171	0.026	-0.144	1.562
Deposits money in mobile money account	-0.017	-0.115	-0.096	0.740
Sends money using mobile money account	-0.032	0.115	0.147	1.030
Received remittance in the last 6 months	0.131	0.155	0.024	1.426
Sent remittance in the last 6 months	-0.100	-0.059	0.042	0.501
Has any savings in the last 12 months	0.198	0.109	-0.089	1.925
Amount given to spouse (BDT)	0.290	0.170	-0.143	1.101
Amount received from spouse (BDT)	0.022	-0.169	-0.183	0.659
Age of the household head	0.036	-0.050	-0.089	0.320
Household size	0.132	-0.052	-0.176	1.490
Number of children in the household	0.145	-0.010	-0.154	1.297
Domestic worker is the primary earner in the household	-0.157	-0.088	0.067	1.199
Weekly per capita consumption (BDT)	-0.103	-0.191	-0.108	1.981