

USING BIOMETRICS TO DELIVER CASH PAYMENTS TO WOMEN: EARLY RESULTS FROM AN IMPACT EVALUATION IN PAKISTAN¹

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Summary

Pakistan's Benazir Income Support Program (BISP) provides unconditional cash transfers to women in 7 million of the country's poorest households. Beginning in 2017, BISP adopted biometric verification as a part of its payment delivery system, which required female beneficiaries to collect funds in person and was accompanied by additional changes in payment point location and increased reliance on human cash-out agents. The goal of these reforms—collectively referred to as the Biometric Verification System (BVS)—was to streamline the payment process and help ensure that women beneficiaries received their funds.

This evaluation uses the staggered rollout of BVS to rigorously quantify its impact on beneficiaries' control of cash, amount of money received, and experience collecting benefits during the early implementation of these reforms. It provides important lessons for the BISP scheme and for other policymakers considering the use of this technology for the delivery of social benefits.

BVS Reforms

The BVS reforms involved a number of concurrent changes to the delivery system that were implemented gradually across districts between 2017 and 2019, including:

- **New authentication technology:** Under the new system, beneficiaries confirm their identity at payment points by providing fingerprints that are matched against the national ID database; this

¹ This note was prepared by Julia Clark (World Bank), Muhammad Haseeb (University of Geneva), Amen Jalal (London School of Economics), Bilal Siddiqi (University of California [UC]–Berkeley, CEGA), and Kate Vyborny (Duke University), based on early results from a study by Haseeb, Jalal, Siddiqi, and Vyborny supported by the World Bank's Identification for Development (ID4D) initiative and Development Impact Evaluation department (DIME), under the leadership of Vyjayanti Desai and Ariana Legovini. This study was approved by Duke Institutional Review Board (IRB) 2020-0285 and the analysis was preregistered with the Experiments in Governance and Politics (EGAP) registry (20200212AB). It would not have been possible without the collaboration of Pakistan's Benazir Income Support Program, including BISP Secretary Ali Raza Bhutta, former Director General of Monitoring and Evaluation Shujaat Farooq, the Director General Cash Transfers Noor Rehman, and the Management Information System (MIS) team, and guidance from the World Bank's Social Protection and Jobs team, including Gul Najam Jamy, Amjad Zafar, Nina Rosas, and Priyanka Kanth. Alex Quispe and Neha Zaigham provided excellent research assistance. This note also benefited with inputs of helpful comments from Guadalupe Bedoya, Seth Garz, Alan Gelb, Harish Natarajan, Robert Palacios, Kanwaljit Singh, Sandip Sukhtankhar, and participants in workshops at Duke University, Warwick University, UC–Berkeley, the World Bank, IPA, the University of East Anglia, and the American Economic Association annual meetings.

replaced the previous credentials and authentication mechanism which required them to provide debit cards and enter PINs.

- **In-person collection requirement:** Because fingerprints are used for authentication, beneficiaries must come individually to collect payments; previously many women would send male relatives or community members to withdraw money on their behalf.
- **Increased use of retail payment agents:** Most beneficiaries now collect benefits at point-of-sale (PoS) locations with agents that operate the biometric readers; in the past, many used ATMs, but most of these are not biometrically enabled, and therefore, not used in the new system.

The impact of the transition to BVS includes both the direct effects of the biometric technology itself, as well as the effects of changing who collects the money and how.

Main Findings

- **Collecting benefits:** BVS more than tripled the probability that women collect cash directly (an increase of 46 percentage points).² Furthermore, it does not appear to reduce access to benefits, including for low-mobility women.
- **Women's control over cash:** For the majority of women who did not personally collect cash under the previous system, the new system increased their likelihood of deciding how the cash is used (an increase 9 percentage points).
- **Amount of money received:** On average, BVS did not significantly change the amount of money beneficiaries took home. While the switch from debit card to fingerprint authentication increased the amount of cash received for some beneficiaries, the greater reliance on human retail agents also led to an increase in side payments (by 1.3 percent of the expected payment) that largely canceled out any gains.
- **Delivery process:** Initially, the new system more than doubled the probability of beneficiaries' reported difficulties in withdrawing cash in a single attempt (an increase of 22 percentage points), but this effect dissipated over time. However, although a majority of beneficiaries still stated they were satisfied with the payment system under BVS, there was a significant and persistent decrease in satisfaction (from 72 to 54 percentage points).

Policy Implications

- **Putting cash directly into the hands of female beneficiaries helps ensure they control how it is used or managed.** Pakistan's case shows that Biometric verification at the point of delivery can be one mechanism to achieve this, particularly in contexts where it is not feasible to pay directly into women-owned accounts or ensure direct collection by women through other means. However, the technology comes with certain risks that should be carefully weighed against other options.
- **Introducing changes to the payment process can create new challenges that must be anticipated and addressed.** Proactive measures are needed to reduce the difficulties and inconveniences beneficiaries face in withdrawing cash, and ensure that payment processes are designed with their needs and preferences in mind. This could include providing a choice in payment methods, increasing the availability of cash collection points, and/or paying benefits directly to agents from bank or mobile money accounts. In all cases, accessible exception handling and grievance redress mechanisms are needed to address issues and prevent exclusion from benefits due to technology or process failures.
- **Increasing human involvement in the cash delivery process can create new opportunities for rent-seeking.** Changes to the payment process that increase or decrease agent involvement require careful consideration, and appropriate safeguards and mitigation measures to ensure accessibility and convenience for beneficiaries while reducing leakage.

2 As described in more detail below, in-person collection by women did not reach 100 percent during the study period as the BVS forms were not yet fully implemented across districts at this time.

Introduction

Governments have expanded cash transfer programs to hundreds of millions of recipients in the developing world over the past decades; these programs continue to increase in their size and scope (World Bank 2018). There is substantial evidence demonstrating positive impacts of these programs on recipients' well-being.³ However, a key challenge facing these programs is how to deliver funds effectively to recipients and ensure they reach identified beneficiaries. Funds may be taken by individuals outside the household (e.g., "leakage" of benefits captured by officials). They may also be misdirected by individuals inside the household, which is a particular concern for programs that target women. Although targeting women in cash transfer programs has documented benefits for women's empowerment (Almas et al. 2018), paradoxically, the funds may not reach the least empowered women if intercepted by male household members during the delivery process. Additionally, recipients may incur money, time, or hassle costs in accessing funds that reduce the net benefits they receive, or in extreme cases, prevent them from collecting benefits at all.

Beginning in 2017, Pakistan's Benazir Income Support Program (BISP) transitioned to a new biometric verification system (BVS) to deliver cash, with the goal of streamlining the payment process and ensuring targeted beneficiaries received their funds. As in Pakistan, biometric systems have come into increasing use worldwide for a range of purposes, from finance to health care to social protection.⁴ To date, however, there is mixed evidence on the impact of the adoption of biometric verification in delivering public assistance programs,⁵ and no quantitative studies have assessed the causal impact of the use of these systems for unconditional cash transfers or their specific use to ensure delivery directly to women.

Understanding the causal impact of BVS for BISP beneficiaries is important for informing future directions for the program and for other government programs worldwide. In this study, we use the staggered rollout of the transition to the BVS system to quantify its effects. While previous evaluations have studied and documented the positive impact of the BISP cash transfer on beneficiaries' overall welfare,⁶ this study is the first to measure the causal impact of changes in the payment system on intermediate outcomes for women, including control over cash, the amount of money received, and the overall payment experience.⁷

This note provides initial results from this analysis and key takeaways for policy makers in Pakistan and other countries considering the use of similar systems. The complete and detailed results of this study will be published in a forthcoming working paper by Haseeb, Jalal, Siddiqi, and Vyborny.

The Benazir Income Support Program and BVS Adoption

BISP was launched in 2008 as Pakistan's signature safety net program, and provides a range of social protection services to 7 million recipients across Pakistan. The key service is the provision of an unconditional cash transfer, which is delivered quarterly to women from eligible families. Women in Pakistan face many constraints and often have limited agency in making major or even minor choices over their own lives: for example, in our beneficiary sample, only around half of women are allowed to go alone to any nearby destination including a market, clinic, or friend's home. The BISP

3 See Manley et al. 2020; Bastagli et al. 2019; Millan et al. 2019 for reviews of the evidence.

4 See, for example, Gelb and Clark 2013; Gelb and Metz 2018; Field et al. 2019; Gine, Goldberg, and Yang 2012; Bossuroy, Delavallade, and Pons 2019, and Dhaliwal and Hanna 2017.

5 Muralidharan, Niehaus, and Sukhtankar 2016 found that biometric smartcards used for a workfare program in India delivered a faster, more predictable, and less corrupt payment process without adversely affecting program access, but Muralidharan, Niehaus, and Sukhtankar 2020 found requiring biometric authentication in the distribution of subsidized food did not reduce leakage, slightly increased transaction costs for the average beneficiary, and reduced benefits received by the subset of beneficiaries who had not previously registered for an ID.

6 See, for example, Cheema et al. 2014, 2015, 2016b, 2020; Ambler and De Brauw 2017, 2019; Nawaz and Iqbal 2020.

7 A subsequent paper by Haseeb, Jala, Siddiqi, and Vyborny will extend these findings to studying the effect of BVS reform on downstream outcomes such as schooling, nutrition, and mobility.

program was designed to target female heads of the poorest households in the country, giving them more control over the funds than if they were directed to the male head of household. The program has had considerable documented success in reducing poverty and increasing women’s empowerment. However, challenges remain in reaching intended beneficiaries, delivering the service efficiently, and preventing leakage of funds. BISP has introduced several reforms to improve these outcomes. These included the transition from the initial selection of recipients through discretionary targeting to a Proxy Means Test (Poverty Score Card)-based targeting system, which improved the quality of targeting, and experiments with different payment methods and locations.⁸

Pre-BVS Payment Delivery Methods

Since the inception of the program, BISP has made several reforms to improve its approach to payment delivery, to ensure that the funds actually reach the selected recipients. Initially, the Pakistan post office distributed cash to recipients. This system faced high levels of leakage and petty corruption, with reports of postmen demanding a portion of the cash from recipients before they would deliver the funds (Khan and Qutub 2010; Cheema et al. 2014, 2015). For this reason, the government began transitioning to debit card-based payments in selected districts in 2012. Under this system, beneficiaries received a card (Figure 1) that could be used at an ATM or a human payment agent known as a “Point of Service (PoS)”; PoS agents are typically mobile money agents who provide this service as a side activity.

Figure 1. Pre-treatment: Debit cards



Source: World Bank.

While the debit card system is thought to have reduced petty corruption compared to the post office system, it raised new delivery challenges. For example, beneficiaries frequently lost cards or forgot their personal identification number (PINs). When this occurred, the card would be blocked and beneficiaries faced a difficult process to get it unblocked through the BISP office (Cheema et al., 2015). Cards and PINs were also misappropriated from beneficiaries through theft or fraud. For example, reports suggest that fraudsters were able to purchase BISP cards and PINs from beneficiaries; offer assistance with withdrawing funds, and then abscond with the card; or steal the card and forge the beneficiary’s signature, in cases where a payment agent’s machine was not PIN-enabled and a signature was used for verification. The debit card-based system also allowed beneficiaries’ family members to withdraw funds on their behalf. In some cases, this may have added convenience; in others, it may have resulted in male family members intercepting (and controlling) funds intended to be delivered to female recipients.

⁸ For more information and analysis on these reforms, see Cheema et al. 2015 and Haseeb and Vyborny 2022.

In summary, neither the post office nor the debit card system fully addressed the concerns of funds being leaked or intercepted by actors outside or within the target beneficiary's household. In 2016, our baseline year, once the debit card system had been rolled out across the country, only 20 percent of women in our sample reported that they collected the transfer themselves. Moreover, 18 percent of beneficiaries reported that they (or the family members or agents who withdrew money on their behalf) had to unwillingly pay an illegal "fee" or side payment the last time they received funds (an average of 213 Pakistan rupees [PKR] before BVS). Only 87 percent of beneficiaries received three or more of the expected four yearly payments, and on average they received only about 74 percent of the total yearly expected payment amount (approximately 13,906 PKR out of 18,800 PKR) (Cheema et al. 2016a).

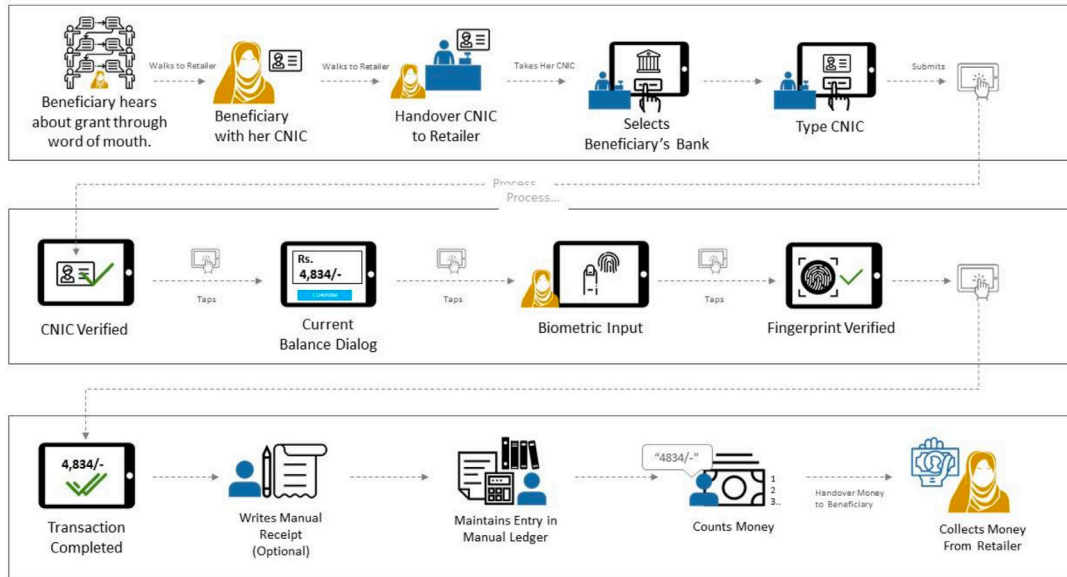
Introduction of BVS

In a renewed effort to address these issues, BISP started transitioning to BVS in 2017, equipping payment points throughout the country with devices to authenticate a beneficiary's identity by verifying their thumbprint against the Computerized National Identity Card (CNIC) database before authorizing cash payment. This study focuses on the transition from the debit card system to this new BVS-based system, which involved a number of changes in the way that beneficiaries collected their benefits, summarized in Table 1 and described below (Figure 2). Unpacking the effects of these different components is important to understanding the mechanisms underlying the impact of BVS on women's control of benefits and the quality of service delivery.

Table 1. Implications of BVS Rollout for BISP

Component	Pre-BVS	Post-BVS	Potential Impact of Change
Confirming beneficiary identity	Debit card + PIN	Biometric verification using thumbprint; no debit card	<ul style="list-style-type: none"> • May reduce leakage/fraud to unintended recipients • May reduce issues with card loss, PIN errors, and card blocking • May increase exclusion if beneficiaries have difficulty providing fingerprints
Female beneficiary present to receive cash	Not required; other family member or representative may withdraw for one or multiple recipients	Required, consequence of biometric verification	<ul style="list-style-type: none"> • May increase women's control over cash • May increase travel and time costs as women must come personally • May lead to exclusion, if some women face social or safety constraints in reaching payment points
Payment point type and location	Mixture of ATMs and human retail agents	Primarily human retail agents	<ul style="list-style-type: none"> • Agents may guide beneficiaries through withdrawal, versus ATMs which are confusing for illiterate recipients • Agents may demand side payments in exchange for disbursing funds, especially where they face limited competition

Figure 2. Payment Process under BVS



Source: Karandaz (undated), reprinted with permission.

Biometric verification replaces debit card/PIN

Payment agents were equipped with biometric readers (Figure 3) that connect with the CNIC database operated by the National Database & Registration Authority (NADRA) to confirm the beneficiary's identity and authorize the agent to make the payment. The use of biometric verification may reduce capture of funds by unauthorized individuals, for example through theft, sale or misuse of the BISP bank card (World Bank 2017). Eliminating debit cards might also reduce problems with card loss or problems with PIN errors, and debit cards being captured by ATMs or blocked due to excessive incorrect PIN entries, which were commonly reported under the debit card system (Cheema et al. 2015). However, it could also cause unintended exclusion or difficulty of withdrawal (Muralidharan et al. 2020), if adequate exception handling and grievance redress mechanisms are not in place to accommodate beneficiaries who may have difficulty giving fingerprints (such as elderly persons and manual laborers), or address various technical problems with the fingerprint readers, applications, or database connections.

Figure 3. Treatment: Biometric Verification



Source: World Bank.

Beneficiaries must be present at the payment point to withdraw funds

Because fingerprints are used at the point of cash withdrawal, the new system requires that the beneficiary herself be present. Having women collect benefits directly was one of the major motivations for these reforms, and a major change from the pre-BVS system in which male family members or agents often picked up cash for beneficiaries (Figure 4). In our baseline data, only about 20 percent of beneficiaries were present when their cash was collected.

BVS could potentially decrease the capture of funds by male household members through multiple mechanisms. Attending cash withdrawal might also increase women’s knowledge about the transfer, including the exact amount due and how much was withdrawn, increasing their ability to negotiate how the funds are used within the household. In addition, the simple presence of the female beneficiary during the withdrawal process may also increase the strength of the messaging to male family members that the transfer is intended for her.

However, requiring beneficiaries to come in person also creates a challenge—each beneficiary must now face the time and hassle of traveling personally to the payment point. Traveling in public is often challenging for women in Pakistan due to safety concerns and restrictive gender norms (Field and Vyborny 2016; Sajjad et al. 2018; Field and Vyborny 2020). Under the debit card system, many beneficiaries willingly sent family members or other representatives with their cards, with a single representative often collecting funds for multiple beneficiaries in a village to save time and money.

The additional cost or hassle of individual collection could be compounded by limited availability of payment points in more remote areas where beneficiaries have to travel long distances; pre-BVS, 16 percent of beneficiaries reported that the person who picked up the payment traveled for over an hour (Cheema et al. 2015). For this reason, it is possible that some women in inaccessible, unsafe, or socially conservative parts of the country might be unable to access their payments due to these constraints, resulting in exclusion from the program.

Figure 4. Men in Line to Withdraw BISP Cash Pre-treatment



Source: Pakistan Today newspaper, reprinted with permission.

Many recipients switch from ATM to human retail agents

Under the debit card system, beneficiaries were able to withdraw their payments either from an authorized payment point operated by a human retail agent (PoS), or an ATM. Agents are typically mobile money agents contracted by telephone operators, who in turn are contracted by BISP's partner banks. Before the BVS transition, about 33.45 percent of the respondents in our sample used ATMs to withdraw the payment. Because only some of these ATMs are biometrically enabled, 19.4 percent of beneficiaries switched from using an ATM to a human retail agent under BVS.⁹

The increased reliance on PoS agents could have multiple effects. On the one hand, it may increase their monopoly power, and thus, their ability to demand side payments (illegal, informal “fees”) in exchange for disbursing cash, particularly in areas where competition across human retail agents is weak¹⁰. On the other hand, agents might also guide beneficiaries through withdrawal, which may be easier to use for illiterate recipients than ATMs.¹¹

BISP was aware of some of the potential challenges of human retail agents before changing the delivery process, and worked with its partner banks to try to ensure sufficient coverage of payment points during and after the transition. Therefore, the transition may have been accompanied by an increase in the number of payment points in some areas. This component of the rollout could be a factor in affecting outcomes directly, in addition to the introduction of biometric technology. Future work by the research team will quantify this effect using geolocated payment point data.

Data and Methodology

As shown in Figure 5, the BVS rollout occurred across the country between early 2017 to late 2019; each district switched to BVS as local administration and banks were ready to do so, based on their administrative preparations. The endline data was collected in March 2019, when 91 districts were under the BVS system.

Simply comparing areas with and without BVS could lead to biased conclusions about the impact of the new system, because areas adopting BVS might be systematically different to begin with. Similarly, a simple comparison of outcomes before versus after BVS adoption could lead to biased conclusions because there could be trends for other reasons not related to the new system. We address this by using the staggered rollout of BVS reform to study the effects of the new system using a difference-in-differences analysis.¹² This compares the change in outcomes over time for BISP beneficiaries in areas that adopted BVS later (after the 2019 survey), versus those who adopted BVS earlier (between 2017–2019).

The primary data used in this analysis are panel survey data provided by BISP and Oxford Policy Management (OPM).¹³ This is a household level panel survey with four rounds spanning from 2013–2019. OPM sampled BISP-eligible and -ineligible households; we restrict our sample to BISP beneficiary households only. We focus our analysis on the balanced panel of 3,074 BISP beneficiary households in 63 districts that are surveyed in both 2016 (pre-BVS) and 2019 (during BVS rollout).¹⁴

9 Our data shows that the number of active ATMs decreased from 6,166 in 2016 to 379 in 2019, while the number of active PoS agents saw rapid growth from 1,712 in 2016 to over 10,700 in 2019.

10 In the baseline data, on average, the beneficiaries were 8.16 and 10.03 kilometres away from the nearest ATM and PoS agent, respectively.

11 The beneficiaries did not receive any financial literacy support from BISP.

12 Difference-in-differences compares average change over time in the outcome variable across treatment and control groups. The estimates require two key assumptions: the parallel trend assumption and the stable unit treatment value assumption. The parallel trend assumption states that in the absence of treatment the difference between control and treatment groups should be constant over time and the stable unit treatment assumption requires that there should not be any spillovers across treatment and control groups (please see Angrist and Pischke (2008) for further details).

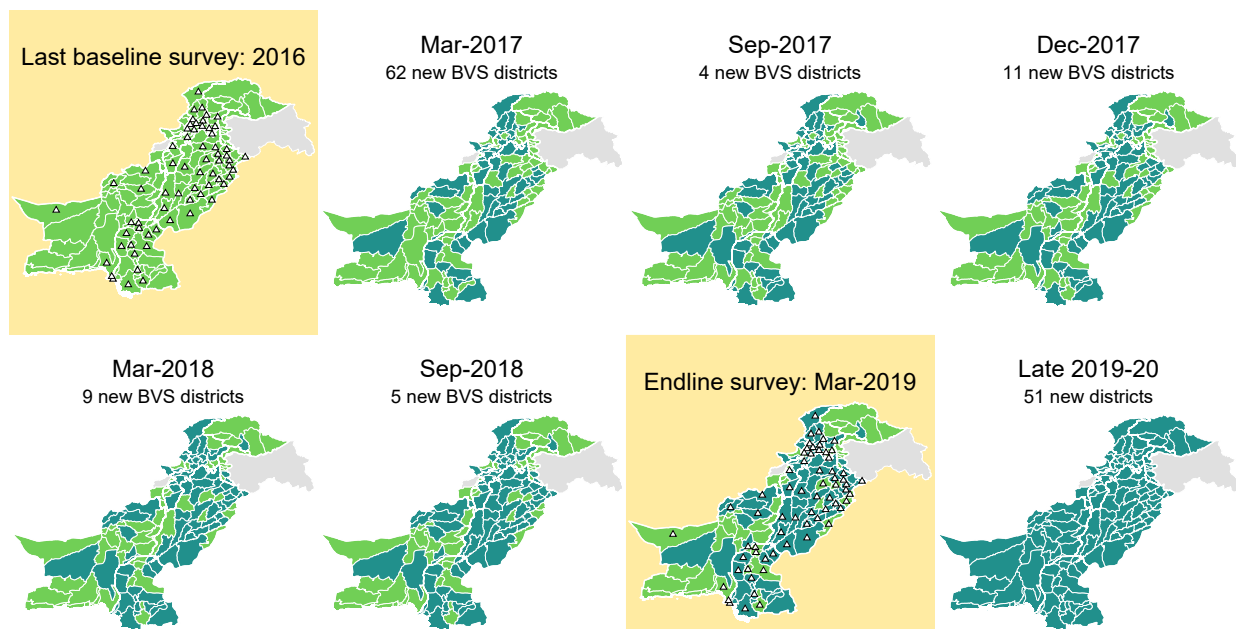
13 BISP also provided data on BISP recipients' deposits, withdrawals, and payment points from its Management Information System (MIS) that are being used to analyze how variation in beneficiaries' access to payment points and competition between payment points affect cash delivery and leakage.

14 Some households dropped out of follow-up rounds of the survey, but dropout from the later round of the survey is not correlated with the BVS rollout timing.

Data from multiple rounds of surveys before BVS was implemented allow us to check whether outcomes of interest were different or trending differently between the early- and late-adopting districts before the intervention. This is not the case—areas that began the BVS transition early are statistically similar overall and have similar pre-trends to those who began the BVS transition late. This supports the conclusion that our estimates represent the causal effect of the “treatment” of the transition from the debit card-based delivery system to the one that uses BVS.¹⁵

It is important to note that within districts that officially switched to BVS during the 2017–2019 period, not all payment points were able to immediately adopt this technology. Therefore, non-BVS districts in the graphs below represent those where no payment points had adopted BVS, while BVS districts are those where some or all had made the transition as of late 2019. In addition, BISP has taken many steps to further improve the functioning of the payment system after the last round of survey data was collected in 2019 that are not captured in the survey data or analyzed here. Thus, the results outlined in this note represent the *short-term impact* of the initiation of the new system in a district, rather than the longer-term effect once the switch to BVS is 100 percent complete in an area.

Figure 5. BVS Rollout



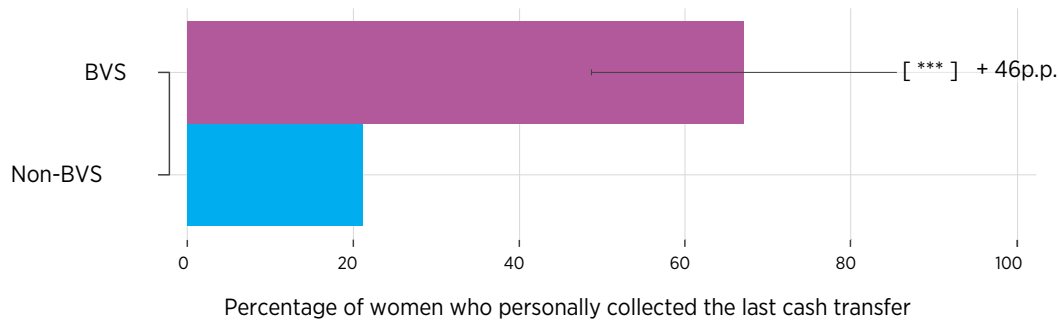
Results

BVS significantly increased the number of women who personally collected their benefits, and does not reduce access to benefits, including for low-mobility women.

BVS increased the percent of beneficiaries who were present when their cash was collected to over 65 percent (Figure 6). As noted above, this number does not reach 100 percent because not all payment points immediately implemented the BVS technology as it was rolled out in a district. It is likely that this number has increased significantly since our endline survey.

¹⁵ For transparency, the study team registered a pre-analysis plan for analysis before the Principal Investigators had access to the 2019 wave of data (EGAP 20200212AB); this specifies all the outcome variables which will be examined. This note includes key outcomes from that pre-analysis plan; a forthcoming working paper will include results for all the outcomes specified.

Figure 6. BVS Increased the Number of Women Who Personally Collected Cash

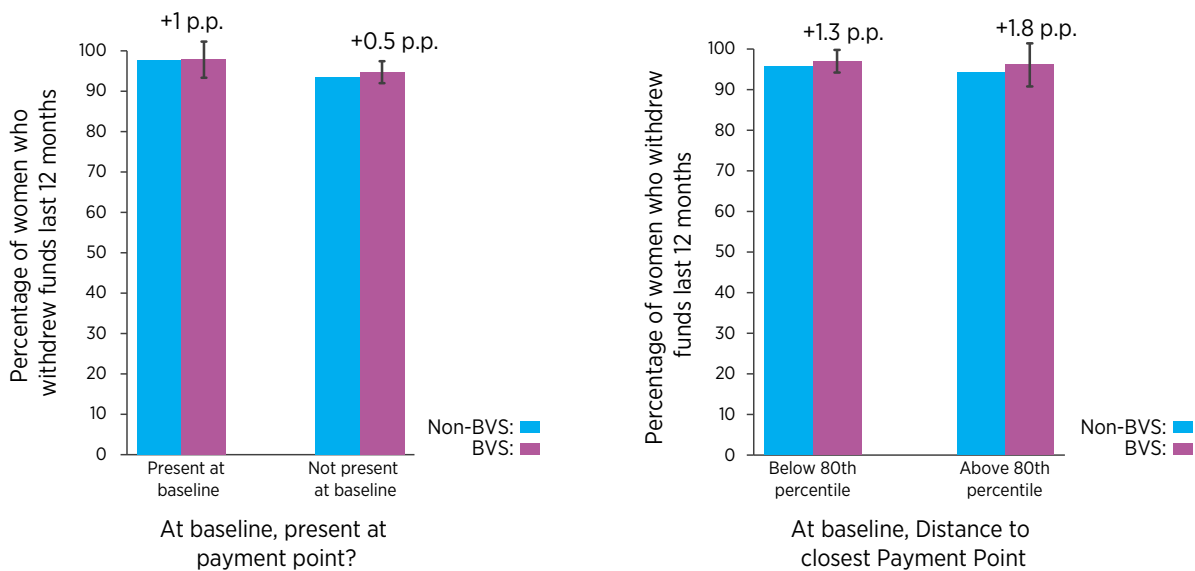


Note: Number of households (HHs) = 3,074. The graph shows regression coefficients from a difference-in-differences estimate controlling for household and province-year fixed effects. Standard errors are robust and clustered at the district level. Graph labels show change in percentage points (p.p.), with asterisks [*] denoting statistical significance (*p < .1, **p < .05, ***p < .01). Data source: OPM Panel Data.

As noted above, an important concern about requiring women's presence at the payment point is some women might be effectively excluded from withdrawing their funds due to social or safety constraints limiting their ability to reach the payment point. In addition, it is possible that certain groups (e.g., elderly, manual laborers, etc.) will face difficulties with biometric verification that could lead to failed transactions.

To test whether these issues occurred under BVS, we first split the data into two groups: (1) women who were present for cash withdrawal at baseline under the old system, and (2) those who were not. Beneficiaries in the first category were used to traveling to a payment point in person, and the primary change under the BVS system was the introduction of biometrics for authentication, rather than debit cards.¹⁶ For the second category, the BVS transition additionally required them to change their collection behavior, coming in person to receive the cash. As shown in Figure 7, there is no significant change in women's ability to collect their benefits successfully, including for women who were not used to traveling to the payment point. Examining effects for beneficiaries who live more than 16.3 kilometers (km) from the nearest payment point (the 80th percentile in terms of distance) gives a similar result, with no statistically significant difference in accessibility post-treatment (Figure 7, Panel B).

Figure 7. BVS Does Not Reduce Access to Benefits, Including for Low-Mobility Women



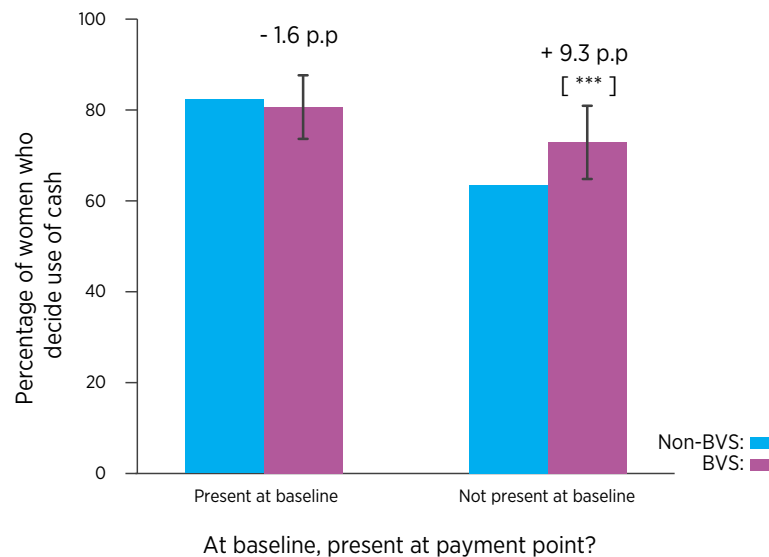
16 We do not observe whether the beneficiary travelled alone or in a group or with a chaperone to receive funds from a payment point.

By requiring beneficiaries to collect cash in person, BVS increased women’s control over the cash transfer.

To test whether the BVS rollout increased women’s control over the BISP cash, we use a self-reported measure from the OPM survey. Survey enumerators ask BISP beneficiaries to name one person “who in general decides how the money you personally receive from the BISP cash transfer is spent.” We then examine whether the BVS rollout increases the probability that the respondent names herself as the main decision-maker.

Among women who were *not* present for cash withdrawal at baseline, BVS increased control of cash from 65 to 74 percent, a 9 percent (9 percentage point) increase (Figure 8) that is statistically significant at the 99 percent level. For those beneficiaries who withdrew cash personally at baseline, 80 percent say they decide how to use the funds at baseline. The BVS transition does not change this, consistent with expectations that the mechanism which increases control is participating personally in payment withdrawal (rather than the technology itself). Given that 75 percent of sampled beneficiaries (around 2,296 women) do not withdraw cash personally at baseline, this suggests that over 500,000 female BISP beneficiaries experienced an increase in control over cash due to the reform. Future research will explore whether this leads to any detectable changes in other indicators of women’s empowerment or on how BISP funds are spent.

Figure 8. For Women Who Previously Did Not Withdraw in Person, BVS Increased Control over Cash

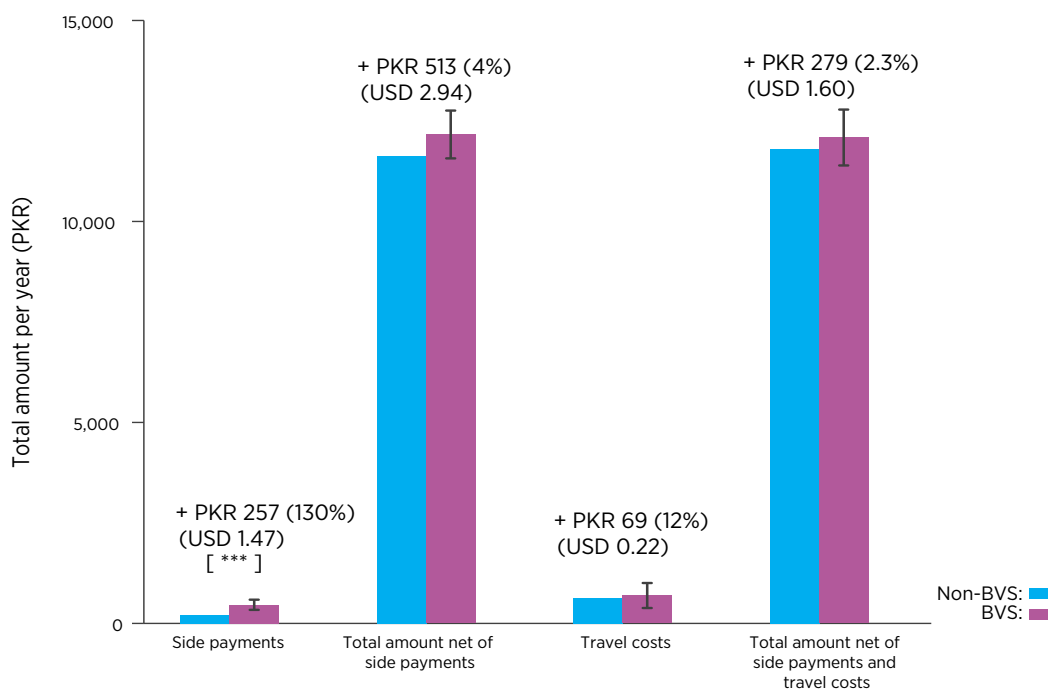


Note: Number of HHs—collected personally at baseline = 778. Number of HHs—did not collect personally at baseline = 2,296. The graph shows regression coefficients from a difference-in-differences estimate controlling for household and province-year fixed effects. Standard errors are robust and clustered at the district level. Graph labels show change in percentage points (p.p.), with asterisks [*] denoting statistical significance (*p < .1, **p < .05, ***p < .01). Data source: OPM Panel Data.

On average, BVS did not significantly change the net amount of money that women take home—for some, it slightly increased the amount of cash received; however, increased reliance on human retail agents also led to a small increase in side payments that canceled out these benefits.

Figure 9 shows the overall impact of the BVS transition on the funds received by beneficiaries over the last year, the amount spent on travel to collect the payment, and side payments or illegal fees paid during collection¹⁷. For the average beneficiary, the BVS transition does not lead to a statistically detectable change in net amount received, although the point estimate is positive. BVS also does not change the reported travel costs that each beneficiary or her representative incurred in collecting the payment.¹⁸ Together, these findings provide evidence that the system is not imposing significant additional costs on beneficiaries to access the full funds to which they are entitled.

Figure 9. On Average, BVS Does Not Change the Net Amount of Cash Received by Beneficiaries



Note: Number of HHs = 3,074. The graph shows regression coefficients from a difference-in-differences estimate controlling for household and province-year fixed effects. For reference, BISP households on average have a per-adult equivalent monthly consumption expenditure of PKR 3,064 or -US\$18.5 (OPM 2016 report). The asterisks [*] denote statistical significance (*p < .1, **p < .05, ***p < .01). Absence of asterisks implies that we found no statistically detectable effect. Data source: OPM Panel Data.

At the same time, we see that BVS does lead to a small but statistically significant increase in reported side payments (an increase of about 257 PKR per year, or 1.3 percent of the payment amount—Figure 9). Overall, it appears this was primarily caused by the increased reliance on human retail agents under the BVS system. In Figure 10, for example, we can see that nearly half of the respondents in BVS districts in the endline report pay a side payment, and nearly all are to retail agents. BISP has worked to address this issue, but there are limitations on their capacity to monitor PoS agents in the field.¹⁹

17 USD amounts in Figure 9 are according to the exchange rate of February 8, 2022.

18 Note that there still be an increase in travel costs due to each beneficiary having to travel separately, rather than a group of beneficiaries sending a single representative with all their cards; this is not captured in these data.

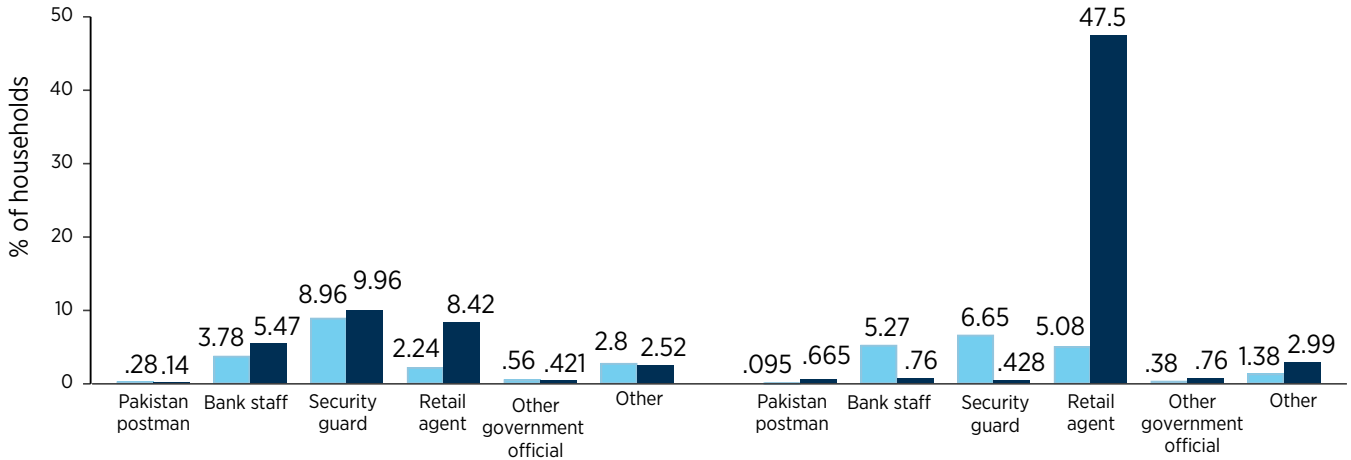
19 For example, there are thousands of agents operating across the country and a short period of time in between payment tranches. In addition, there is a lack of a direct accountability between BISP and the agents, as they are contracted by telephone companies, who are themselves contracted by the banks that BISP has contracted to implement the payment system.

Figure 10: Descriptive Statistics: Most Side Payments Go to Retail Agents

Note:

- 19% of baseline households (n=548) report having to pay side payments
- 48% of endline households (n=1,354) report having to pay side payments

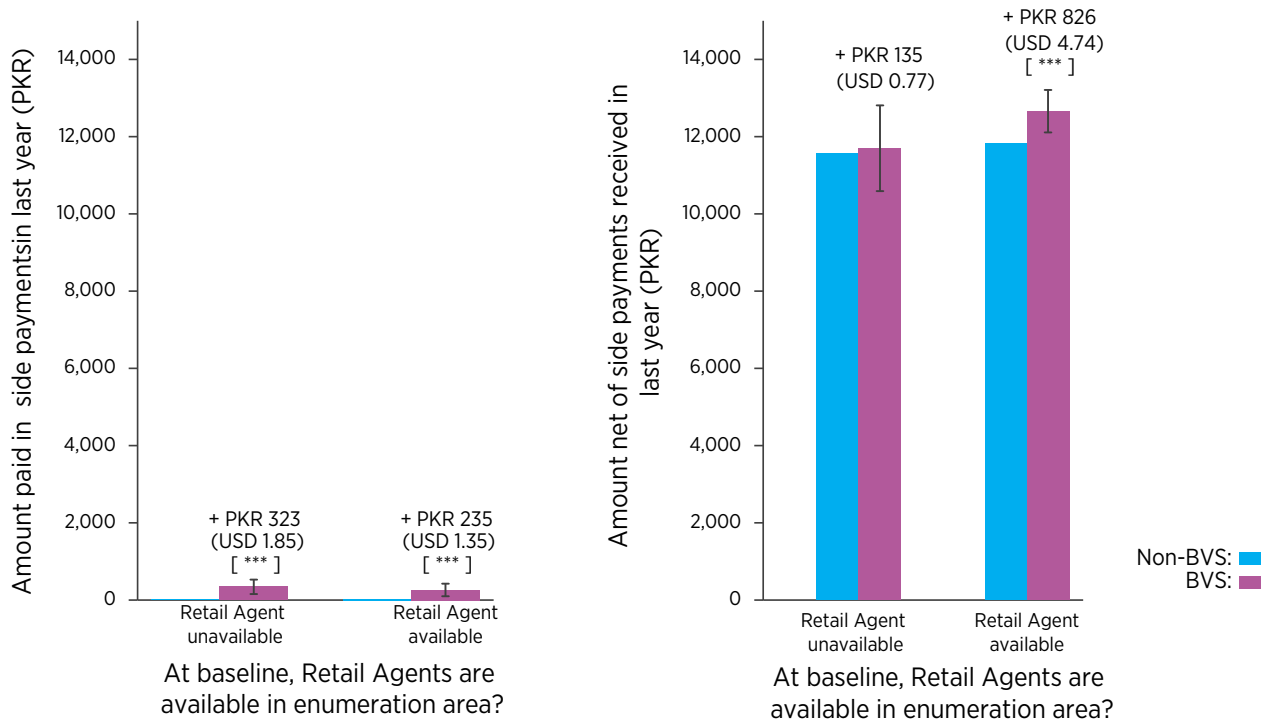
■ Baseline (2016)
■ Endline (2019)



Note: Number of HHS = 3,074. Data source: OPM Panel data.

Splitting the sample into two groups—those who previously collected payments from a human agent, and those who previously collected from an ATM and switched to a human agent—helps unpack these results. Although both groups experienced a small but statistically significant increase in side payments, this was larger for beneficiaries who switched from an ATM to a human agent, as shown in Figure 11. Furthermore, beneficiaries who already used human retail agents— i.e., those for whom the intervention only added biometric verification—experienced a statistically significant *increase* in the net amount of money received net of this side payment (826 PKR per year).

Figure 11. Payment Effects Differ for Areas Using Human Retail Agent Versus ATM at Baseline

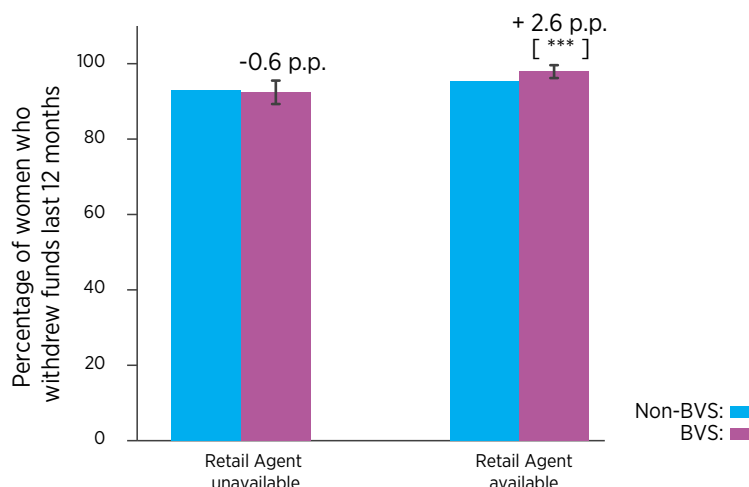


Note: Number of HHs without retail agents in enumeration area at baseline = 863. Number of HHs with retail agents in enumeration area at baseline = 2,211. The graph shows regression coefficients from a difference-in-differences estimate controlling for household and province-year fixed effects. Standard errors are robust and clustered at the district level. The asterisks [*] denote statistical significance (*p < .1, **p < .05, ***p < .01). Data source: OPM Panel Data.

In addition, for beneficiaries where the reform added only biometric verification, there is a small but significant increase in the proportion of beneficiaries who receive any amount of money (Figure 12). The reason for this effect of biometric verification on the receipt of money is unclear; it could occur because some beneficiaries whose cards were blocked, stolen, or lost under the debit card system were able to access funds again after the BVS transition obviated the debit card system. More research is needed to explore this finding further.

These findings suggest that increased reliance on human retail agents added opportunities for leakage, which canceled out the small increase in cash received as a result of switching from debit card authentication to biometric verification.

Figure 12. In Areas Using Retail Agents at Baseline, BVS Led to a Small Increase in Probability of Receiving Any Funds



At baseline, Retail Agents are available in enumeration area?

Note: Number of HHs without retail agents in enumeration area = 863. Number of HHs with retail agents in enumeration area = 2,211. The graph shows regression coefficients from a difference-in-differences estimate controlling for household and province-year fixed effects. Standard errors are robust and clustered at the district level. Graph labels show change in percentage points (p.p.), with asterisks [*] denoting statistical significance (*p < .1, **p < .05, ***p < .01). Data source: OPM Panel Data.

BVS increased some challenges collecting funds in the short term and decreased beneficiary satisfaction for women newly collecting payments in person.

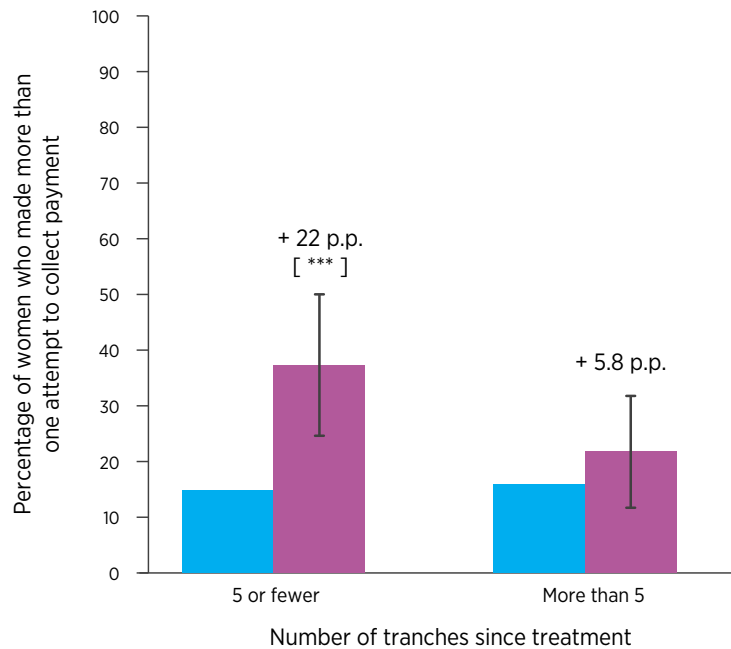
Before the BVS transition, around 18 percent of recipients reported they had to make multiple attempts to withdraw the last transfer they received; the transition leads to an average 10 percentage point increase in this number. However, this increase seems to disappear over time (Figure 13), suggesting it was due to temporary challenges with the new system. While these issues are important in terms of beneficiary experience and hassle, the above results demonstrate that they did not cause an overall reduction in beneficiaries’ ultimate ability to collect their benefits.

Beneficiaries may fail to withdraw cash on the first attempt for a number of reasons, some of which may be related to the BVS technology (such as a failure in fingerprint verification, device malfunction, or loss of connection with the central system), and others to the switch in payment modalities (such as congestion of recipients at the payment point or agents running out of cash). Approximately 2.8 percent of respondents reporting payments under the BVS system reported that they had problems directly related to the biometric reader the last time they withdrew cash; 9.5 percent reported having to return due to a long queue, which could itself occur because of technology failures, or because of delays as payment agents or recipients learn how to use the new system, particularly in the early phases of rollout.²⁰

20 The mean failure rates should be interpreted with caution when comparing them to failure rates reported from other contexts: some recipients may report a problem with a long queue, which is itself due to technology issues; in addition, the survey question asks about “the last time you withdrew cash,” which might lead enumerators or respondents to exclude occasions when the respondent did not successfully withdraw funds at all due to technology failures.

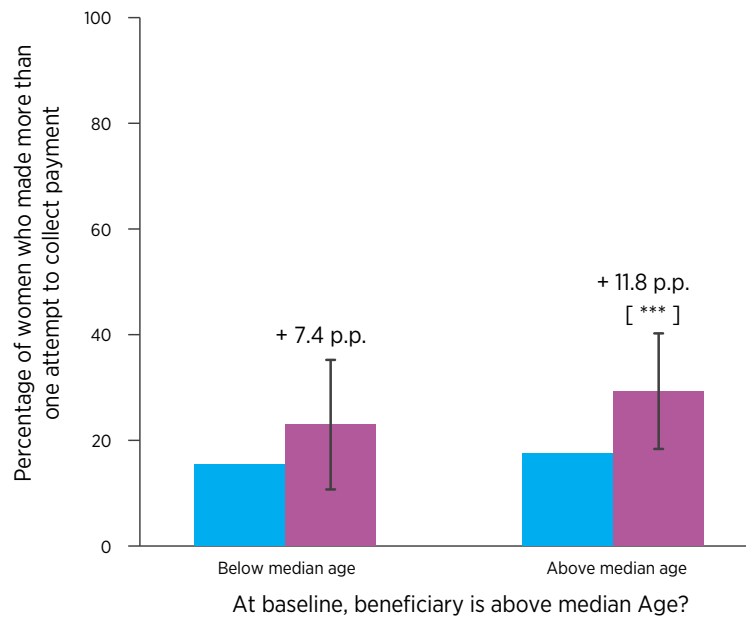
These effects are larger for older beneficiaries (Figure 14), which could be the result of multiple factors such as eroded fingerprints or other difficulties with the technology.

Figure 13. BVS Increased the Percentage of Beneficiaries Who Had to Make More Than One Attempt to Collect Payment, But These Effects Dissipate Over Time



Note: The graph shows regression coefficients from a difference-in-differences estimate controlling for household and province-year fixed effects. Standard errors are robust and clustered at the district level. The asterisks [*] denote statistical significance (*p < .1, **p < .05, ***p < .01). Data source: OPM Panel Data.

Figure 14. Older Beneficiaries Were More Likely to Report Multiple Attempts



Note: The graph shows regression coefficients from a difference-in-differences estimate controlling for household and province-year fixed effects. Standard errors are robust and clustered at the district level. The asterisks [*] denote statistical significance (*p < .1, **p < .05, ***p < .01). Effects are significantly different between groups (p < 0.1). Data source: OPM Panel Data.

Overall, beneficiaries' reported high levels of satisfaction with the BISP payment method, with most women saying they are "very satisfied"; however, BVS decreased the proportion of women who reported they are very satisfied from 72 to 54 percent, on average. This effect does not disappear after several payment tranches, suggesting that it may not be entirely driven by temporary difficulties with the new technology, which were eliminated over time (see Figure 13). We might expect that beneficiaries who experience increased control over BISP cash would improve satisfaction and thus mitigate this effect; however, this effect is no smaller for beneficiaries who did not control cash at baseline.

Having to collect payments in person could itself reduce satisfaction, due to the hassle, cost or insecurity of travel. The estimated effect on satisfaction appears somewhat larger for women who were collecting funds in person for the first time than those who had collected funds in person before; however, this difference is not significantly different, so these results are inconclusive. Importantly, the satisfaction question was asked of the beneficiary, whether or not she was the one to collect the funds; because the BVS transition led many women to withdraw funds personally who otherwise would not travel to the payment point, the reform may have simply led to greater beneficiary awareness of the hassles involved, which previously were only observed by a male family member. Future research will explore this in greater detail by exploring how these effects differ depending on the accessibility of nearby payment points.

Policy Implications and Future Research

The results of the study have three important implications for policy makers considering the adoption of similar technologies and processes for delivering public assistance programs, and particularly those intended to reach low-mobility women.

First, putting cash directly into women's hands can help ensure that they control how it is used.

For programs like BISP that are intended to reach the most marginalized women, delivering funds directly to them can intensify the empowerment benefits of transfer. When benefits have frequently collected by male members of households, this study demonstrates that using biometric verification at the point of delivery is one method to ensure collection by women because the nature of the technology requires the presence of a specific individual.

At the same time, the use of biometric verification at the point of transaction requires careful consideration given the cost, as well as potential data protection concerns and exclusion risks, and may not be appropriate or advisable depending on the context.²¹ For example, it may be possible to increase women's agency over cash benefits by making payments directly into bank or mobile money accounts that they directly access and control; however, constraints on women's mobility combined with limited coverage of financial services may also make these options infeasible in some settings.

Second, changes to the payment process—particularly changing locations or mandating in-person collection when people could previously send representatives—can create new challenges for beneficiaries that must be anticipated and addressed.

Any changes to the payment process should be carefully considered to avoid introducing new barriers or hassles and ensure they align with beneficiary's needs and preferences. If biometric verification or any digital technologies are

21 For a deeper discussion of the potential benefits and risks of biometric technology, see the ID4D Practitioner's Guide (<http://id4d.worldbank.org/guide>) and the forthcoming Biometrics Handbook.

used at the point of service delivery, appropriate exception handling and grievance redress mechanisms must be in place to avoid denial of services due to a technical failure.

Increasing payment point coverage could address the hassle of required in-person collection. Another potential approach could be increasing the number of mobile agents who visit beneficiaries in their villages, reducing the hassle they may experience in traveling. Karandaaz, a leading organization working on payment systems in Pakistan, has advocated such an approach (Karandaaz 2020). Anecdotally, some payment agents have taken the initiative to do this themselves; however, this is not a formal policy and GPS "ring-fencing" controls on payment devices are designed to reduce device mobility to combat fraud.

Since the period of data covered in this study, BISP has already taken multiple steps to help to combat this issue, including expanding the number and coverage of human payment points, enhancing monitoring procedures, and providing an alternative payment approach through the bank branch in cases of fingerprint failure. In addition, BISP has worked with NADRA to update the fingerprint records of beneficiaries who had problems with biometric verification.

Third, increasing human involvement in the delivery chain may have unintended consequences, creating new opportunities for leakage.

For BISP areas that switched from ATMs to retail agents who operate biometric readers, these new agents appear to have increased demands for side payments from beneficiaries.²² Policies and strategies must be in place to help reduce or offset incentives and opportunities for rent seeking among payment agents. This could include increasing coverage and competition between payment agents to reduce their relative power, and implementing top-down and/or bottom-up safeguards and sanctions, such as audits of payment points, awareness raising campaigns, and social accountability measures. The effectiveness of such strategies needs to be carefully tested and evaluated.²³

The results of study show that the adoption of the BVS by the BISP cash transfer program had clear benefits in terms of women's control over resources. At the same time, it also had challenges that BISP has been actively working to address since the completion of the study baseline. Further research on BISP's ongoing efforts to improve the payment process will provide additional lessons for other counties seeking to design effective and inclusive delivery systems for social benefits.

22 It is possible that increased competition between payment agents can limit their ability to demand side payments. We are evaluating this in on-going work.

23 Another option that has been discussed would be to introduce more biometric ATMs, which could confirm the identity of the beneficiary without introducing human retail agents who may be able to demand side payments. However, switching from human payment agents to biometric ATMs could also have unintended consequences. In the case of Pakistan, many BISP recipients face difficulties when withdrawing from ATMs without the support of an agent because most are illiterate and do not know how to use ATMs. In addition, if the biometric verification fails on a given attempt, the beneficiary may have no source of information on how to proceed. In addition, biometric ATMs would require substantial new infrastructure at payment points, which could be costly, particularly in countries with low connectivity and sparse ATM coverage to begin with.

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