

Cashing Out: Digital Payments and Resilience Post-demonetization

Nanjundi Karthick Krishnan
University of Michigan
USA
nkkrishn@umich.edu

Ramgopal Chandrasekaran
University of Michigan
USA
ramgopal@umich.edu

Aditya Johri
George Mason University
USA
johri@gmu.edu

Joyojeet Pal
University of Michigan and Microsoft
Research India
joyojeet@gmail.com

ABSTRACT

We explore how different segments of the population in India coped, in terms of business transactions, with the sudden decision of the government to stop accepting certain legal tender bills, popularly referred to as demonetization. The decision to demonetize was followed by a large-scale push for adoption of digital payments. Behavioral changes during such shocks do have specific nuances different from those during normal times. Using the concept of resilience, we examine the drivers of behavior change that differentiated those that were able to make the switch compared to those that weren't. Those technologically more adept were more resilient to the shock, in terms of being able to navigate through new means of exchange. Also, rural poor showed greater resilience than urban poor, a function of the level of homogeneity in those societies with respect to technology adoption and the ability to cope without changing cash practices. We also found that those who had bank accounts and relied largely on those accounts for daily transactions, without being aware of alternate modes, were impacted the most. From a policy perspective this research cautions against unintended consequences of purely access-driven incentives to behavior change, advocating instead a holistic approach.

CCS CONCEPTS

- Social and professional topics - Professional topics - Computing and business - Economic impact
- Applied computing - Law, social and behavioral sciences - Economics

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than the author(s) must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from Permissions@acm.org.

ICTD '19, January 4–7, 2019, Ahmedabad, India

© 2019 Copyright is held by the owner/author(s). Publication rights licensed to ACM.

ACM ISBN 978-1-4503-6122-4/19/01...\$15.00

<https://doi.org/10.1145/3287098.3287103>

KEYWORDS

Resilience, Crisis, Systemic Shocks, Demonetization, Behavior Change, Technology Adoption, Digital Refugees, Subjective Well Being, Digital Cash, Cash Livelihoods

ACM Reference format:

N. Krishnan, A. Johri, R. Chandrasekaran and J. Pal. 2019. Cashing Out: Digital Payments and Resilience Post-demonetization. In Proceedings of The Tenth International Conference on Information and Communication Technologies and Development (ICTD '19), January 4–7, 2019, Ahmedabad, India, 16 pages. <https://doi.org/10.1145/3287098.3287103>

1 INTRODUCTION

On the night of November 8, 2016, at 8:00 pm Indian Standard Time, the Prime Minister of India announced via a televised speech that two of the most used currency notes INR 500 and INR 1,000, comprising almost 86% of the cash flows in the economy, will become invalid as of midnight. The Prime Minister provided two primary reasons for this drastic measure: reducing corruption and preventing terrorism.

For the next few weeks there was an intense cash crunch and financial uncertainty, as citizens and businesses tried to exchange notes at banks. The public was reassured that new notes will be reissued in lieu of the older currency and no one would lose money. By most accounts, the implementation of the actual mechanism to exchange old notes was slow, extremely disruptive to the normal routine of consumers and businesses, and created an overall cash crunch and uncertainty in the economy.

At the time of demonetization, cash transactions were the mainstay of the economy. As a response to the ensuing chaos, the government announced that the primary reason for demonetization was to move India towards the future by making all monetary transactions digital and that this was in line with his “Digital India” vision. In particular, they proclaimed, India will now capitalize on the tremendous growth of mobile phones in the country and move towards the use of mobile-based electronic or digital payments.

There was during this period, a significant rise in mobile phone based digital payments, particularly in major urban centers. Different segments of the population, however, responded to both

the demonetization and the subsequent push towards digital payment differently. People, especially those whose livelihood and daily life depended solely on cash, had to respond to the crisis and often adapt to survive.

Given the significance of demonetization as a major economic event in India, it has attracted a slew of empirical research. Most of this work has focused on consumers [7] [8], the economy in general [9] [10], and also on its effect within specific sectors of the economy including healthcare [11], microfinance [12], retail [13], informal labor [14], and real estate [15].

As yet, there is limited research on demonetization as a context for putting forth digital transactions in India [16]. A more nuanced understanding of how people respond to crises but more critically to the idea that the solution to a crisis is technological in nature has implications for both the design and implementation of technological solutions but also for reflective policy making. The study aims to examine resilience in times of such crises and examine how technology (digital cash more specifically) adoption and broader behavior change play a role. We argue that the citizens' adoption of technology in the post-demonetization period can be instructive in understanding the broader aspects of behavior switching during crisis periods, relating to their individual ability to cope and adapt, as well as to the structural conditions that enable or encourage such resilient behavior.

2 RELATED WORK

2.1 Resilience

The concept of resilience has its roots in ecological studies dating back to the 1970s. The ecologist, Holling (1973) [19] introduced resilience as the capacity to persist in overlapping natural systems during random events over time. He proposed that “resilience determines the persistence of relationships within a system and is a measure of the ability of these systems to absorb changes of state variables, driving variables, and parameters, and still persist” [19].

Although it has roots in natural sciences, the idea of resilience has taken a strong hold within the social sciences as well particularly to explain the response to adverse situations [20] [21] [22]. In recent years, the idea of resilience and resilient systems has been an especially fertile area of study across fields and disciplines ranging from resilience of cyber systems to attacks and resilience of children to psychological abuse.

Resilience is defined as *‘ability to withstand and rebound from crisis and adversity’*. It has been shown in both individuals and the collectives they are part of, helping manage the environment of uncertainty that accompanies shock events [23]. It is both a collective as well as an individual attribute, since it exists beyond an individual's natural ability to cope, to how a social system adapts and reacts to the crisis. Adaptation refers to the ways in which individuals or systems evolve to deal with the event at hand.

Within the HCI, CSCW, and ICTD communities, resilience has emerged as both a guiding principle and explanatory idea to understand how technology shapes and supports response to

adverse situations. One area of research where the concept has been applied with some regularity is the study of the role of technology in natural disasters such as earthquakes, floods, or wildfires. For instance, Shklovski et al. [24] studied the 2007 Southern California wildfires and showed how technology was used for information seeking and communication among geographically dispersed people building resilience in the system to respond to the wildfires. Beyond the work on disasters and resilience, the other area that has been studied is that of disruption in the lives of those living or serving in conflict regions such as refugees. Mark, Semaan et al. [25] [26] showed how Iraqis adapted their use of technologies during the second Gulf War.

The existing CSCW literature on resilience largely focuses on large-scale events such as wars and natural disasters where there is an explicit focus on the use of technologies as a means of communication and aid thus supporting resilience. However, resilience is a broader perspective that explains behaviors, actions and decisions of individuals and the collective in the face of adversity. In the case of demonetization, we are interested in exploring the heterogeneity amongst individuals with livelihoods dependent on cash as they reacted to a crisis of cash shortage. The aim thus is to understand factors, both technology adoption and behavioral traits related, that separated those that exhibited greater resilience from the rest.

2.2 Resilience and Crisis

Adversities have different forms. Of those, crisis events are often defined by their deviation from the normal flow of events, particularly major shock events that often involve significant structural and individual efforts to maintain status quo, or cope with changes post-event. Crises are also, as was the case with demonetization, manmade. They can be both localized and systemic.

A vast body of work has examined crises in organizations and many scholars argue that crises are central to the evolution of organizations [27]. By going through a crisis, an organization or a worker emerges as stronger. Within the organizational literature, studies have focused largely on individual organizations and how they cope during the crisis [28] [29], how their leaders react in crises [30], the role that social approval may play in the reactions to crises [31], and how the individual and social sense-making processes are to various actors' reactions to the crisis events [32].

While much organization-centric crisis research tends to be about localized events, systemic crises such as economic/monetary crises are less common and therefore also less understood. In contrast to organizational crisis, systemic crises tend to have cross-cutting impacts on actors who comprise an economic and social ecosystem [33, 34]. Technology adoption in such ecosystem crises also differ in that there isn't necessarily just a single available option of technology change or technology replacement, but rather a scenario in which some traditional means of functioning must be replaced either temporarily or permanently, with another option.

The demonetization case offers one such scenario in which there was a cash crunch, and citizens had multiple means of

mitigating the effects of that cash crunch. While the government was keen on promoting digital payments (the prime minister explicitly asked the nation to take up digital payments) [35], both casual citizens and businesses had means of riding out the cash shortage period by resorting to other means including credit transaction, reduced consumption, or purchase consolidation [36].

For economic systems, the ability to withstand the impact of the crisis depends on both the institutions' preparedness for shock events, as well as individual actors' ability to adapt. Similar to other forms of crises in modern societies, in many ways economic crises also have a component where a critical infrastructure breaks down. In the case of demonetization, this was the lack of availability of cash. While rare, these breakdowns can be catastrophic. Ideally public authorities would be prepared to respond to a crisis but they often lack the ability to cope with these rare events. Therefore, in the immediate aftermath of a crisis, an effective response that exhibits resilience depends largely on the behavior of citizens.

2.3 Resilience and Response Behavior

There are no agreed upon definitions of resilience but there is consensus that resilience can be viewed and studied at multiple levels – individuals, teams, organizations, or systems. At an individual and personal level, studies have highlighted several traits related to resilience such as personal character, focus on optimism, personal strength, and perseverance [37]. Resilience has also been considered as a positive outcome that can occur despite adversity or serious threat, for instance, Masten and Wright (2010) [22] describe resilience as “an outcome in spite of serious threats to adaptation or development (p. 228).”

From a process perspective, even at the individual level resilience is understood to include not just psychological factors but also the interaction between the context and the person and the outcome of that interaction [22]. Within the person-context interaction realm, Pooley and Cohen [37] define resilience as, “The potential to exhibit resourcefulness by using available internal and external resources in response to different contextual and developmental challenges (p. 34).” From their perspective, resilience is a function of a person's ability to learn and use that knowledge to transform their circumstances while continuing to function [37]. In the demonetization context, individual level resilience is characterized by the ability to switch behaviors or adopt alternate mechanisms. This is a function of the individual's economic and social context as well as their own propensity to adopt digital payment options and other alternatives.

Our work sits at the intersection of crisis events and technology adoption. While there has been a massive body of work technology adoption, much of it has been driven by the work on technology acceptance models [48], which have been better suited for technology adoption situations in non-exceptional situations [49]. As a result, these have focused inordinately on perceived usefulness and the perceived ease-of-use of the new technology [50].

In the behavior change and technology adoption literature, distinctions have been proposed between 'digital natives' and

'digital refugees'. Digital natives are essentially people born in the digital age who are comfortable with using technology as they have grown up using these technologies [38]. Digital refugees, a concept drawing on older notions of 'luddites' or 'late adopters' has been proposed as including those who have incorporated technology in their lives due to the societal context [39] [40].

While the coinage of 'digital natives' and 'digital refugees' was originally aimed at explaining behaviors with respect to use of computers and other technology gadgets in everyday settings, the nomenclature (and indeed the term refugee itself), has its relevance while studying shock or crisis scenarios.

In order to analytically frame our empirical work, we focus on behavior change that results in resilience as our interest was to understand individual mechanisms. Social behavior change models, which cover broader space than technology adoption, have been used in various domains. The field of development communication has explored a top-down diffusion method of behavior change communication as well as the more participatory bottom-up method of behavior change through social interaction and community mentoring [41].

Much of the work in public health relates to health decisions – in which individual and environmental factors play a role in behavior change – but is applicable more broadly. Behavior modification models reflect on an individual's stimulus to change while the health belief models looks at external barriers to change, and social learning theory suggests the need for skills and access to reinforcement mechanisms as a means to sustained behavior change [42].

An important trend has been the emergence of layered approaches such as Piotrow's 'Steps to Behavior Change' model [43], which propose awareness, access, and action as the key to behavior change. In the demonetization case, Prime Minister Modi directly attempted to influence the behavior change by using a technocratic and authority-based perspective promoting the digital payment behavior as superior, but also of normative significance as being good for the nation [44]. In this paper we use a basic version of Piotrow's model to understand the key factors that enabled individuals (specifically urban and rural poor in livelihoods that depend on cash) to adapt to alternate methods of transaction during the demonetization crisis, and use it to consider the drivers that determine resilience.

2.4 Resilience in the ICTD Context

There has been little explicit use of resilience as a theoretical frame for examining technology adoption in low-resource settings. Past studies in ICTD contexts have shown that the factors influencing technology adoption can be vastly different based on demographics, frequency of technology access [1]. Broad-based attempts to transform technology adoption face various institutional and individual technology adoption challenges. Low adoption in financial technologies can be explained by actors' lack of access to institutions [2], or trust in them [3], comfort with the existing forms of exchange [4], or a perceived risk of loss with new technologies that actors are unwilling to absorb [5]. For a number of new mobile users, a more fundamental challenge is

thinking of the device as a transactional rather than communications device [6]. While these works do not explicitly use resilience, the underlying concepts of risk-perception or willingness to rethink a technology as offering different affordances are foundational to the works on crisis behavior discussed here.

Likewise, there are works that examine resilience in an ICTD context where technology adoption provides a useful means of framing. In a recent paper, Vyas et al. [17] examine resilience among low-income people to understand how individuals who are economically constrained tackle adversity and highlight three facets of resilience: resilience as an integral part of everyday lives, a spirited phenomenon, and a social and care-focused process. This work and related studies such as Heltberg et al. (2013) [18] point out that financial hardship affects people differently during a crisis than at normal times. These works have important implications for the willingness to either adapt to new technology, or survive despite its imposition, concepts which we hope to address here. A study of urban merchants to understand their adoption of digital payment platforms showed that merchants that adopted well were able to ride through the cash crisis much better than those that didn't, and offered certain key characteristics that influenced adoption [44].

The motivation for this study is however to focus on some of the domain and context specific gaps in the literature. In terms of domain, technology adoption in a crisis is coerced or enforced by the need rather than by a rational choice. Hence technology adoption and behavior change in times of crisis and how this relates to resilience is an open question on which not much literature has been focused. Similarly in terms of demonetization, the coverage has largely been urban centers and consumer trends. This study is designed to focus on rural Indian livelihoods and use urban poor with similar livelihoods as a measure of contrast.

2.5 Defining Resilience for the Context

As explained above in the broad literature scan across the domains of resilience, crisis, behavior change and technology adoption, the definition of resilience varies based on the context as well as the unit of analysis. Hence it was imperative to consolidate the differing perspectives and arrive at a definition of 'resilience' for the context and question this paper aims to address. The cash shortage crisis due to demonetization affected almost all citizens as consumers and in terms of livelihoods. The focus of this study is the poor, cash-dependent livelihoods in rural India.

Broadly there were two ways that individuals could have ridden over the crisis, (a) by adopting digital payment mechanisms to keep their livelihoods going despite the cash crunch and/or (b) by adapting to the low cash environment drawing on the support of their immediate social network (their customers, suppliers and peer-vendor groups) and setting up alternate mechanisms of exchange with them. In this context,

resilience is thus defined as '*the extent to which an individual is able to cope with the crisis by adopting a technology alternative or adapting to the new business environment, thus minimizing impact on average livelihood income*'.

3 RESEARCH DESIGN

3.1 Perceived Impact as a Measure of Resilience

Change in income or volume of transactions are hard measures of the impact of demonetization on livelihoods. The study was designed to measure impact through a recall-based survey. In such a context, psychological factors borne out of the experiences during that time are bound to influence the respondent's self reported impact on their livelihoods. The experience of the individual with respect to their struggle to access cash, their barriers to using alternate modes of transactions or the pain in keeping hold of the customer base are some such factors. Secondly, hard economic impact is not solely determined by an individual's digital cash adoption or non-adoption. Factors like consumer attributes, demand-supply fluctuations to name a few, also contribute to hard economic impacts. To overcome the psychological biases of the respondents as also to acknowledge that these factors are as important as the hard impact on livelihood, the research focused on measuring perceived impact to change in income and change in volume of transaction, as well as perceived recovery in the six month period since the event. Note also that perceived changes to income and volume of transactions were all zero or negative, through the study, as we were studying a negative shock to the system.

Enunciating perceived measures has been widely used in behavioral economics, psychology and other social sciences broadly covered under the concept of 'Subjective Well Being' (SWB) [45]. Amongst many other aspects, SWB has been employed to look beyond hard economic outcomes into the emotions of the individual going through a process or experiencing a context [46]. As the study on demonetization aims to understand resilience mechanisms related to digital cash adoption and underlying individual attributes as were relevant to exhibited resilience of the poor, the subjective hardship measure is better suited for the study.

3.2 The Demonetization Event and Study Timelines

Demonetization was announced at 8:00 pm Indian Standard Time on November 8th, 2016 via a televised speech by the Prime Minister of India. In a nutshell, by that midnight, all INR 500 and INR 1000 currency notes would become invalid tender and may not be used for transactions. Indians were provided a period to deposit the cash they held into their bank accounts in exchange for new currency notes of different denomination.

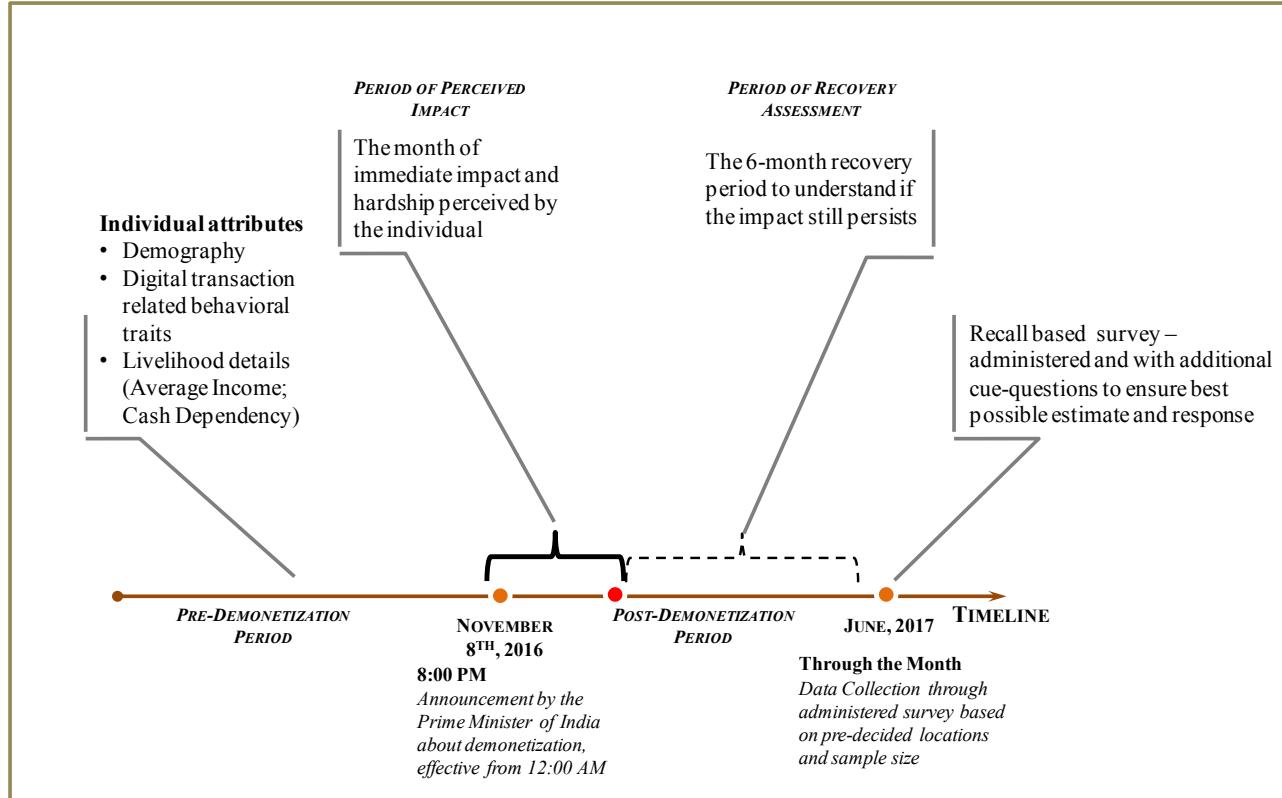


Figure 1: Timeline of Events Relevant to the Study

Post this announcement, for the next 30-60 days, Indian citizens stood in long queues at ATMs and Banks to withdraw cash for daily use as well as to deposit old notes for new ones. The process was slow, disrupted the normal routine and created a cash crunch in the economy.

A cash crisis of this nature resulted in both a demand and supply side shock for livelihoods dependent on cash transactions. As access to cash became costlier, consumers decided to hoard them for essential transactions like food, milk and medicines thereby affecting demand. So was the case with suppliers that needed to be paid. Access to cash was also important for these individuals in managing their own households daily purchases. There was hence a constant need for decisions on whether to sell goods or decline a transaction during that time. Those that were resilient were once that managed to use alternate means of transactions to keep their livelihoods going. This study was conducted approximately 6 months after demonetization as shown in Figure 1.

3.3 Research Instrument

We conducted an initial round of field research including semi-structured interviews. This round of research took place in May 2017 and included 40 interviews in two villages and one city of Tamil Nadu (not the once chosen for the study). These interview were with individuals belonging to the four livelihoods studied, those manning the Government run Common Service Centers and with bank officials who had rolled out the Digital Village scheme.

The objective of these interviews was to obtain a 360 degree view of the environment and the extent of adoption and adaptation strategies followed by the poor and marginalized. Interviews were recorded and detailed field notes were prepared. One of the key outcomes of the initial round of interviews was that the penetration of digital payments technology in these rural areas was very low and hence to achieve the objective of studying the contrast of resilience through adoption and adaptation, it would be best to target villages where Digital Village programs were implemented.

The interviews also helped identify the relevant questions for a close-ended survey. The survey instrument had 32 questions divided into six sections. These included an understanding of basic demographics, nature of their livelihoods and individual attributes (relating to income, digital cash behaviors, technology access, financial literacy, use of cash and financial behavior) and financial behavior. The survey was administered in person by members of the research team. Respondents were asked to recall experience of economic behavior at the time of demonetization and their perception of the impact it had on their livelihoods. The full survey instrument is available as Appendix 1. An initial pilot survey was conducted to test the questionnaire before the finalization of the survey.

3.4 Data Collection

The primary site of this research was rural Tamil Nadu, a southern Indian state. Sampled urban centers were used to provide points of comparison. Our interest in Tamil Nadu was due to a

longer-standing body of work on economic development in the state. However, it is important to note that Tamil Nadu is relatively neutral to the central government as the parties that have traditionally ruled the state are regional parties and not allied with the central government's ruling party, the Bharatiya Janata Party (BJP), nor to its main rival the Indian National Congress (INC).

The survey was conducted in two urban centers – Chennai, the state capital, and Trichy, a second-tier city, and two rural locations - Seekarajapuram and Kandalavadi. Both rural locations were selected since they were villages adopted by public sector banks under the digital village scheme of the Government of India. Livelihoods largely dependent on cash namely wage labor, street vendors, small shop owners and farmers (only in villages) were studied. The sample distribution is provided in Table 1.

Sampling for individual respondents:

In each location, an initial assessment was carried out to identify areas where people from the required livelihoods would be available. In a random selection from amongst those areas, the field study was conducted. In each selected area respondents were also selected randomly.

| Livelihoods | Location | | | | |
|-------------------|-----------------|----------------|---------------------------|------------------------|------------|
| | City 1: Chennai | City 2: Trichy | Village 1: Seekarajapuram | Village 2: Kandalavadi | Total |
| Wage Labor | 52 | 51 | 31 | 24 | 158 |
| Small Shop Owners | 47 | 45 | 32 | 42 | 166 |
| Street Vendors | 43 | 54 | 21 | 10 | 128 |
| Farmers | - | - | 20 | 33 | 53 |
| Total | 142 | 150 | 104 | 109 | 505 |

Table 1: Livelihoods - Location wise Final Sample

Respondent selection in the villages: The village market place that coincided with the main bus-stop was the location where the survey was conducted. Every third street vendor and fourth shop owner willing to respond to the survey was chosen. To survey wage labor, the field team visited the distinct areas of the village and surveyed every third household that had a wage labor and was willing to respond to the survey. Farmland is mostly concentrated in few areas of the village. Each of these areas was visited and a random sample from amongst farmers willing to respond, were interviewed.

Respondent selection in the cities: The city layout with different commercial areas with a high propensity of street vendors and small shop owners were enumerated. A few of these areas were chosen at random and, every third street vendor and fourth shop owner willing to respond to the survey was chosen. To survey wage labor, the interviewer visited random construction sites, fast food / bakeries / tea-stalls and machine-tooling /

mechanic shops, where a significant number of wage labor are employed. A random selection of willing respondents was surveyed.

The process across all livelihoods was continued till a desired number of respondents (15% higher than planned sample) were interviewed.

4 FINDINGS

4.1 Two-stage Analysis Approach

We followed a step-wise approach to understand how perceived impact on livelihoods is driven by the components of digital cash adoption behavior and the underlying individual attributes that drive these behavioral components.

Step 1: Perceived Impact as function of Behavior Change Components namely awareness, access and action. This step was aimed at understanding the importance of the key behavior drivers and their effect on the various resilience measures defined in section 3.1 above.

| Digital Cash Behavioral Adoption Components | Levels | | | |
|---|---|--|--|---|
| | Level 0 | Level 1 | Level 2 | Level 3 |
| Awareness (Information and Knowledge) | Not aware that a bank account is required | Aware of the need for bank account and card transactions | Aware of process of card and/or mobile transactions | Practical familiarity with digital payment mechanisms |
| Access (Infrastructure and Services) | No bank account | Having a bank account but no mobile phone | Having both a bank account and a mobile phone / technology for digital payment | - |
| Action (Practice) | Bank account was not operational | Bank account was operational | Digital payments (Mobile, Card and/or Internet Transactions) were carried out | - |

Table 2: Classification of Behavioral Components

Step 2: Each of the behavior change components as a function of individual attributes like tech-literacy, financial literacy & credit behavior, access to government communications, political behavior, credit worthiness and access to outside credit. This step provides a mapping from what policy makers can influence to how it improved the various components of behavior change. In each step, fixed effects were introduced to control for rural / urban locations, average income, level of education, age, and gender.

4.2 Resilience related Findings from Step 1

The linear regression uses the resilience measures namely perceived change in income and perceived change in volume of transaction as dependent variables. The three pre-demonetization behavioral components are categorical variables explained in Table 2. Each of these categories (through dummy variables) were independent variables of the regression. The overall results of the linear regression model of stage 1 are summarized in Table 3. Key results from the regression analysis are as follows:

Rural-Urban Resilience Divide: Amongst the demographic factors, the rural / urban divide is particularly significant. On average, the rural livelihoods perceived a 19.37% lower loss on their income and a 21.12% lower reduction on their transaction volume compared to urban livelihoods. It is clear that rural

livelihoods were much more resilient to the shock than urban poor were. This is an intuitive finding, since the rural economy may be more related to in-network transactions and small currency note transactions which are less affected.

The result corroborates with field level interactions conducted with the respondents. The small vendors, small shop owners and wage labors in the urban center lost a lot of their business as many of their regular customers moved to larger retail stores and shops in order to pay using digital cash. Accentuating this perception is the heterogeneity in the society in terms of income levels, literacy and digital cash adoption. The perceived impact hence was greater in urban areas.

| VARIABLES | (1) Perceived Change in Income (Range: -100 to 0) | (2) Perceived Change in Transaction Volume (Range: -100 to 0) |
|---|--|--|
| Average Income (pre-demonetization) | 0.128 (0.110) | 0.194* (0.0958) |
| If Rural (Urban = 0) | 19.37*** (5.213) | 21.12*** (4.534) |
| <i>Awareness of Cashless Transactions</i> | | |
| Cashless Awareness Level 1 (bank account is required + Card) | -10.11 (7.198) | -8.595 (7.349) |
| Cashless Awareness Level 2 (Cards and Mobile Transaction) | 7.126 (5.812) | 6.957 (6.578) |
| Cashless Awareness Level 3 (Familiar with mechanism of mobile payment) | 16.30** (7.179) | 10.60 (9.255) |
| <i>Access to Alternate Options</i> | | |
| Access to Alternate Options Level 1 (Bank A/C but no Mobile) | -13.76* (6.382) | -4.005 (6.580) |
| Access to Alternate Options Level 2 (Bank A/C and Mobile) | -15.02* (7.362) | -6.369 (6.452) |
| <i>General Banking Practice</i> | | |
| Banking Habit Level 1 (Operational Bank Account but No Digital Txn) | 12.40** (4.908) | 16.34 (9.921) |
| Banking Habit Level 2 (Digital - Card/Mobile/Internet Txn) | 18.80*** (4.204) | 18.09** (7.753) |
| <i>Livelihood's Dependence on Cash</i> | | |
| Medium Dependence on Cash | -17.12** (5.739) | -8.526** (3.437) |
| High Dependence on Cash | -21.38*** (5.660) | -23.94*** (5.066) |
| <i>Demographic Factors</i> | | |
| Female (Male = 0) | -1.200 (5.968) | -0.267 (4.696) |
| Education: Middle-to-High School | 8.066** (3.383) | 5.804** (2.573) |
| Education: College Graduate and Above | 2.972 (3.276) | 1.429 (3.763) |
| Age: Between 40 and 60 | 4.371 (3.769) | 2.170 (2.585) |
| Age: Above 60 | 4.464 (3.931) | 6.502*** (1.972) |
| Constant | -39.24*** (9.725) | -44.00*** (8.872) |
| Observations | 505 | 505 |
| R-squared | 0.458 | 0.547 |

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 3: Results from Step 1 Linear Regression

This quote from one of our urban respondents highlights the challenge of transacting due to the lack of technology adoption, which made people reduce their purchases only to what was strictly necessary.

It wasn't that hard for us to manage transactions when consumers bought in bulk, but customers mostly consumed only necessary goods around that period. Children did buy notebooks and pens but the quantity

sold was much lower than what we would otherwise sell.

Toys and the like hardly sold

S. Stationery Shop Owner, Chennai

For rural livelihoods, resilience was achieved broadly through an adaptation mechanism, whereby small community social networks made access to credit or barter trade easier. The adoption mechanism was muted because amongst rural consumers there was lesser prevalent culture of cashless transaction. This was in part because there was no supply-side driver for digital cash adoption – i.e., there were very few pre-existing retail establishments that transacted using digital payments or cards and hence consumer didn't have an alternative that provided a switching stimuli.

Cash Dependence and Digital Cash Adoption: Livelihoods that depended more on cash perceived greater impact of demonetization than those that reported lesser dependence on cash. On average livelihoods that had a medium dependence on cash reported a 17.12% higher loss of income and an 8.53% higher reduction on transaction volume compared to those livelihoods that had a low dependence on cash. Similarly on average livelihoods that had a high dependence on cash reported a 21.38% higher drop in income and a 23.94% higher reduction on transaction volume compared to the livelihoods that had low dependence on cash.

Is this result driven by digital payment adoption behaviors? In urban centers most definitely. Individuals in medium and high cash dependence livelihoods, show progressively lower levels of awareness, access and action on digital cash adoption in the empirical survey data. Lower the digital cash adoption traits, higher the cash dependence of the livelihood and greater the impact during demonetization.

However, this is not true of rural livelihoods. There was no significant difference in digital cash adoption traits amongst livelihoods with varying cash dependence. Progressively higher impact of demonetization on livelihoods more dependent on cash seems to be due to more fundamental economic factors like reduced consumer demand. Thus the cash crisis itself and cash dependence among consumers and business owners was not an immediate indicator of digital transaction adoption in rural areas, even though it was an indicator of perceived hardship. A quote from an interviewed vegetable vendor highlights how people and businesses adapted without fundamentally changing their practices.

Customers did come, as it was easier for them to buy from street vendors, who were just near their houses, than to buy from Nilgiris, Reliance and other stores, which are a considerable distance away. We had some issues conducting transactions, but in general consumer didn't mind spending their change in our place. We had issues buying the vegetables though. The intermediaries charged a higher price and an artificial scarcity was created.

N. Vegetable seller, City

Practical Awareness Drives Resilience: High level of practical awareness on the exact steps involved in conducting mobile transactions increased resilience (i.e. changed behavior

related to digital cash). On average respondents with practical awareness of the usage of mobile payment options and other modes of digital transaction showed a perceived income loss of 16.3% lower than those that were unaware.

Basic awareness, such as awareness of what credit cards are and that online payments are possible but without functional knowledge of use, does not increase the propensity to adopt digital cash. We also found anecdotally in interviews that there was active resistance to digital cash use among vendors who were aware of non-cash payment methods, but did not want to use them for a range of reasons.

During the first two weeks, demonetization was a big problem for us. We do not encourage card machine swiping as we have to account for it and pay taxes.

S, Cloth Merchant, Trichy

This finding also supports reports that the post-demonetization increase in digital cash use has been largely because of increased use by the early adopters through more transactions rather than through new [47]. Thus digital natives, who not only are aware of the technology but understand the practical application of the technology, are particularly resilient to the shock due to their increased use of digital cash.

Banking Access and Digital Refugees: We found that individuals with access to formal banking had a significantly higher perceived drop in income compared to those that did not have a bank account. On average, those that had a bank account (access) reported a 13.76% higher impact on income compared to those that didn't have one. Similarly on average those that had both a bank account and a mobile phone reported a 15.02% higher impact on income compared to those that didn't have even a bank account.

The results suggests that those who were entirely unbanked were relatively less impacted and consequently also less motivated to adopt digital cash. Those that largely entered the formal banking system persuaded by government policy and coerced by social norms prior to demonetization, did not have the requisite digital cash adoption behavior traits (akin to the definition of 'digital refugees' in the literature [39]). They had their cash in banks but were not already digital transaction users. In the aftermath of demonetization as a result of the cash crunch at banks, they did not have access to their money as noted by the quote of a villager above.

It was good that the village was adopted by the State Bank of India, but there were some issues when it came to withdrawing cash. For example, the ATM at the village is open only from 9-5, when the watchman watches over it. Sometimes if the watchman goes somewhere else, we have to walk almost a kilometer to the next ATM.

S, Village

Such people were likely to be more impacted by the shock compared to not just the 'digital natives', but also those that remain unbanked.

4.3 Recovery and Persistence of Impact

Six months had lapsed since demonetization when the recall survey was administered. Hence understanding how these individuals had recovered in the present provided insights into the persistence of the shock. Also such analysis highlighted the mechanisms underlying adoption / adaptation strategies followed by them to ensure greater resilience. Recovery in terms of perceived impact on income and volume of transactions was elicited as ordinal values and hence a logistic regression model was used. Some key results are provided as follows:

Banking Access Drives Persistence of Impact: Those that had banking access were on average expected to have recovered lesser than those that didn't have banking access. All things equal, there was a 12.5% probability (i.e., low odds of 1:7) that a person who recovered better in terms of income was banked. There was a 25% chance (i.e., low odds of 1:3) that someone who recovered better in terms of transaction volume was banked. This reinforces the digital refugee argument made in section 4.2 and suggests that the effects of not knowing alternate modes of transaction has persistent impact on resilience.

The Gender Impact: There were 70 women interviewed out of the total sample of 505 in our study. The distribution of livelihoods by gender is provided in Table 4 for reference. There was no significant impact of gender on either resilience measure; perceived impact on income or volume of transactions. However women showed a very high propensity to recover compared to men. On average there was a 92% (i.e., high odds of 13:1) chance that an individual who recovered better six months post demonetization was a female.

| Livelihoods | Urban | | Rural | |
|------------------|-----------|------------|-----------|------------|
| | Female | Male | Female | Male |
| Wage Labor | 6 | 97 | 28 | 27 |
| Street Vendor | 19 | 86 | 1 | 30 |
| Small Shop Owner | 11 | 73 | 4 | 70 |
| Farmers | - | - | 1 | 52 |
| Total | 36 | 256 | 34 | 179 |

Table 4: Gender Distribution in Sample

The study was not designed to explore gender specific mechanisms and hence it is unclear what is driving this huge disparity. We acknowledge that this finding is important and significant, and hence provide this as motivation for a deeper examination on gender, resilience and ability to recover from shocks.

4.4 Key Results from Step 2

For each of the behavioral components logistic regressions were used to analyze the influence of the individual characteristics. Results of the logistic regression are attached in the Appendix 3.

Technology Literacy and Digital Cash Adoption: We find that respondents who had greater technology awareness are significantly more likely to adopt digital cash across locations.

This suggests that the early adopters of technology are indeed more likely to fit the demographic of digital natives in this context.

Government programs and Digital Cash Adoption: We find that those aware of government programs and public relations activities are more likely to have access to bank accounts. This corroborates with the notion that government programs have been effective in bringing many that were unbanked into the formal banking ecosystem. This has largely remained access focused and not necessarily digital cash adoption focused and therein lies a major challenge.

5 KEY POLICY IMPLICATIONS

Each of the above results is significant for the digital cash adoption case in India but can also be viewed more broadly from the perspective of behavior changes during crisis to foster greater resilience to shocks.

5.1 Key Takeaways

To put the results in context, we would first need to understand how to interpret the findings. The study is a difference-in-difference study with multiple independent variables. Hence the coefficients in the regression need to be interpreted in a nuanced manner. Here are some of the broad trends that need to be studied independent of each other (i.e., *ceteris paribus*).

Firstly, digital natives, defined as those who had high awareness and access to digital transactions and those who used these transactions prior to demonetization, were the least affected. Those that had only access but weren't aware of digital transactions or had not used it before were the worst affected. This trend holds across both urban and rural livelihoods. Secondly, for a similar person in rural and urban in terms of digital payment behavior traits, on average the rural livelihood was much less affected compared to the urban livelihood.

The thought experiment to be carried out while interpreting the results is: '*Given X and Y with similar characteristics except along the dimension of interest, was one more impacted and hence less resilient than the other.*' It is hence not appropriate to mix the digital adoption argument with the rural - urban argument but see them as two distinct trends.

These results focus our attentions on two distinct takeaways.

Urban Distress and Rural Resilience: Demonetization has had a far greater impact on urban poor compared to the rural poor in similar livelihoods. Corroborated with qualitative interviews, it is observed that those in urban areas who were unable to adapt to digital modes of transaction lost significant business as the urban consumer switched to larger shops that provided the digital transaction option. Apart from the economic shock of losing consumers, the psychological distress of observing larger shops being able to adopt accentuates the perceived impact. In comparison, those in rural areas did face economic hardships but were able to retain consumers through other alternatives like credit sales. Rural consumers themselves had lower digital payment adoption and hence such homogeneity in the society

helped reduce the impact. More generally, disparities in society leave the poor and marginalized more vulnerable to the shock.

Access, No Panacea to Resilience: Much of the behavior change literature focuses on the positive contribution of each of the behavior change components namely access, awareness and action to the ultimate adoption by individuals. The digital cash adoption during demonetization is an anomaly to this belief. Digital natives showed maximum resilience during the shock, which is not surprising but reinforces the strong linkage of digital cash adoption as a shock absorber during demonetization. However as a result of demonetization those that had entered the formal banking system prior to demonetization but knew little of alternate banking practices, were left without access to their own cash and found the barrier to switch high.

During routine times and in normal course of action individuals with access are bound to take the infrastructure or service (like bank accounts in this case) primarily because it was provided to them for free. They also possibly even use it infrequently and lock-in some of their resource in the asset. But when an exogenous shock hits the process requiring greater, more frequent and much more technical usage of the said asset, the behavioral gap is a step too far for these individuals to bridge. This is also substantiated by the findings of the study that, those with awareness of the practical mechanisms of mobile payments, showed significantly higher resilience during the shock.

5.2 Policy Implications

The results direct us to consider certain context specific implications specific to digital cash adoption in India as well as to more broader implications for technology adoption, behavior change and resilience.

For Digital Cash Adoption in India: Programs like the Jan Dhan Yojna and Digital Villages were intended to bring many into the banking system and provide them improved digital infrastructure to undertake banking and business transaction. This may have had many benefits in terms of empowerment and improved ease of living, but these programs focusing on access alone have made those that opted-in vulnerable to a shock like demonetization.

The paper is in no way discrediting large programs that help 'bank the unbanked', but making a substantive point that access to services and infrastructure provided in normal times does not guarantee resilience in times of shocks where the very service or infrastructure is affected.

Access provided during normal times may have created a false sense of security, that unraveled in times of a cash crisis. Sustained technology and financial literacy campaigns and promotion of user-friendly technologies for the poor to complement this improved access are important to insulate them from future economic shocks of similar nature.

For ICTD Practitioners and Policy Makers: Adoption of healthy and sustainable behaviors in the society requires 'teaching them how to fish'. Holistic approach to education and understanding of technology is critical to have a society with many more digital natives. More the people in a society that are

coerced to adopt new technology, lower the resilience of the society. Behavior change is sustainable and resilient to shocks only when individuals are treated in a holistic manner; meaning, it is important to build practical awareness, provide access as well as ensure that these behaviors are inculcated and incentivized.

6 CONCLUSION

In the context of demonetization, almost 86% of the cash in circulation in the Indian economy was declared invalid precipitating a fiscal crisis. This study illustrates how different segments of cash-dependent populations coped with the crisis and how digital cash adoption played a role in determining their resilience to the shock.

We found an interesting case of those with banking access being more affected than those that didn't due to lack of digital cash adoption. More broadly, technology is getting ever cheaper and access is more widespread. The risk of digital refugees suffering the unintended consequences of having access but not being aware beyond the basic functionality of the technology is very real.

While the results of our research suggest that people with no access are less vulnerable and much better-off than those that have been coerced to adapting because of cheaper access and persuasive social norms, the nature of the implications are quite the opposite. Access is important and empowers marginalized societies in normal situations, but access complemented with appropriate awareness of the underlying systems and processes ensures resilience through greater human agility during a crisis.

REFERENCES

1. Medhi, I., A. Ratan, and K. Toyama, *Mobile-banking adoption and usage by low-literate, low-income users in the developing world*. Internationalization, design and global development, 2009: p. 485-494.
2. Etim, A.S., *Mobile banking and mobile money adoption for financial inclusion*. Research in Business and Economics Journal, 2014. 9: p. 1.
3. Tobbin, P., *Towards a model of adoption in mobile banking by the unbanked: a qualitative study*. info, 2012. 14(5): p. 74-88.
4. Chauhan, S., *Acceptance of mobile money by poor citizens of India: Integrating trust into the technology acceptance model*. info, 2015. 17(3): p. 58-68.
5. Osei-Assibey, E., *What drives behavioral intention of mobile money adoption? The case of ancient susu saving operations in Ghana*. International Journal of Social Economics, 2015. 42(11): p. 962-979.
6. Chipchase, J., et al. *Mobile essentials: field study and conceiving*. in *Proceedings of the 2005 conference on Designing for User eXperience*. 2005. AIGA: American Institute of Graphic Arts.
7. Krishnan, D. and S. Siegel, *Effects of Demonetization: Evidence from 28 Slum Neighborhoods in Mumbai*. 2017.
8. Dharmapala, D. and V.S. Khanna, *Stock Market Reactions to India's 2016 Demonetization: Implications for Tax Evasion, Corruption, and Financial Constraints*. 2018.

9. Zhu, H., et al., *Short-term effects of India's demonetization on the rural poor*. *Economics Letters*, 2018.
10. Bhavnani, R. and M. Copelovitch, *The Political Impact of Monetary Shocks: Evidence from India's 2016 Demonetization*. 2018.
11. Sarkar, A.K. and M.D. Dutta, *Effects Of Demonetization On Healthcare And Pharmaceutical Industry With Future Managing Strategies*.
12. Jha, B., *Impact of Demonetisation on Microfinance Institutions in India—A Study*. AAYAM: AKGIM Journal of Management, 2017. 7(1): p. 15.
13. Rani, G., *Effects of demonetization on retail outlets*. International journal of applied research, 2016. 2(12): p. 400-401.
14. Sinha, A. and D. Rai, *Aftermath of demonetization on rural population*. International Journal of Research in Economics and Social Sciences (IJRESS), 2016. 6(11): p. 223-228.
15. Joshi, V., *Impact of Demonetization on Indian Economy with Respect to Real Estate Sector*. 2018.
16. Chandrasekhar, C. and J. Ghosh, *The Financialization of Finance? Demonetization and the Dubious Push to Cashlessness in India*. *Development and Change*, 2018. 49(2): p. 420-436.
17. Vyas, D. and T. Dillahunt, *Everyday resilience: Supporting resilient strategies among low socioeconomic status communities*. *Proceedings of the ACM on Human-Computer Interaction*, 2017. 1(CSCW): p. 1-21.
18. Heltberg, R., et al., *Coping and resilience during the food, fuel, and financial crises*. *The Journal of Development Studies*, 2013. 49(5): p. 705-718.
19. Holling, C.S., *Resilience and stability of ecological systems*. *Annual review of ecology and systematics*, 1973. 4(1): p. 1-23.
20. Hutchinson, M. and P. Dorsett, *What does the literature say about resilience in refugee people? Implications for practice*. *Journal of Social Inclusion*, 2012. 3(2): p. 55-78.
21. Luthar, S.S., D. Cicchetti, and B. Becker, *The construct of resilience: A critical evaluation and guidelines for future work*. *Child development*, 2000. 71(3): p. 543-562.
22. Masten, A. and M. Wright, *Resilience over the lifespan: Developmental perspectives on resistance, recovery, and transformation (pp. 213–237)*. New York, NY: Guilford. 2010.
23. Walsh, F., *The concept of family resilience: Crisis and challenge*. *Family process*, 1996. 35(3): p. 261-281.
24. Shklovski, I., L. Palen, and J. Sutton. *Finding community through information and communication technology in disaster events*. in *Proceedings of the ACM 2008 Conference on Computer Supported Cooperative Work (CSCW 2008)*. 2008. Citeseer.
25. Mark, G. and B. Semaan. *Resilience in collaboration: technology as a resource for new patterns of action*. in *Proceedings of the 2008 ACM conference on Computer supported cooperative work*. 2008. ACM.
26. Mark, G.J., B. Al-Ani, and B. Semaan. *Resilience through technology adoption: merging the old and the new in Iraq*. in *Proceedings of the SIGCHI conference on human factors in computing systems*. 2009. ACM.
27. Aldrich, H., *Organizations evolving*. 1999: Sage.
28. Crandall, W., J. Parnell, and J. Spillan, *Crisis management: Leading in the strategy landscape*. 2014, Los Angeles, CA: Sage.
29. Fink, S., *Crisis management: Planning for the inevitable*. 1986: American Management Association.
30. Combe, I.A. and D.J. Carrington, *Leaders' sensemaking under crises: Emerging cognitive consensus over time within management teams*. *The Leadership Quarterly*, 2015. 26(3): p. 307-322.
31. Bundy, J. and M.D. Pfarrer, *A burden of responsibility: The role of social approval at the onset of a crisis*. *Academy of Management Review*, 2015. 40(3): p. 345-369.
32. Weick, K.E., *The collapse of sensemaking in organizations: The Mann Gulch disaster*. *Administrative science quarterly*, 1993: p. 628-652.
33. Ranciere, R., A. Tornell, and F. Westermann, *Systemic crises and growth*. *The Quarterly Journal of Economics*, 2008. 123(1): p. 359-406.
34. Tsikliras, A.C., U.R. Sumaila, and K.I. Stergiou, *Parallels in economic and ecosystem crises*. *Ethics in Science and Environmental Politics*, 2013. 13(1): p. 23-25.
35. Pachare, S.M., *Demonetization: Unpacking the Digital Wallets*. *We'Ken-International Journal of Basic and Applied Sciences*, 2016. 1(4): p. 180-183.
36. Shukla, M. and M.S. Bose, *Impact of Digitalization in Economy and The effects of Demonetization: An Overview*. ELK Asia Pacific Journals-978-93-85537-02-8 NMC, 2017.
37. Pooley, J.A. and L. Cohen, *Resilience: A definition in context*. *Australian Community Psychologist*, 2010. 22(1): p. 30-37.
38. Palfrey, J.G. and U. Gasser, *Born digital: Understanding the first generation of digital natives*. 2011: ReadHowYouWant. com.
39. Coombes, B., *Generation Y: Are they really digital natives or more like digital refugees*. *Synergy*, 2009. 7(1): p. 31-40.
40. Khoza, S.B. and S. Manik, *The recognition of 'digital technology refugees' amongst post graduate students in a Higher Education institution*. 2016.
41. Waisbord, S., *Family tree of theories, methodologies and strategies in development communication*. *Rockefeller Foundation*, 2001. 99.
42. Elder, J.P., G.X. Ayala, and S. Harris, *Theories and intervention approaches to health-behavior change in primary care*. *American journal of preventive medicine*, 1999. 17(4): p. 275-284.
43. Piotrow, P.T., et al., *Health communication: lessons from family planning and reproductive health*. 1997.
44. Pal, J., et al. *Digital Payment and Its Discontents: Street Shops and the Indian Government's Push for Cashless Transactions*. in *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. 2018. ACM.
45. Diener, E., *Subjective well-being*. *Psychological bulletin*, 1984. 95(3): p. 542.
46. Kahneman, D. and A.B. Krueger, *Developments in the measurement of subjective well-being*. *Journal of Economic perspectives*, 2006. 20(1): p. 3-24.

47. Tyagi, C., *8 months after demonetisation, Paytm refuses to let momentum down* in *Economic Times*. 2017, BCCL: New Delhi.
48. Davis, F. D. (1989). "Perceived usefulness, perceived ease of use, and user acceptance of information technology." *MIS quarterly*: 319-340.
49. Venkatesh, V. and F. D. Davis (2000). "A theoretical extension of the technology acceptance model: Four longitudinal field studies." *Management science* 46(2): 186-204.
50. Venkatesh, V., M. G. Morris, G. B. Davis and F. D. Davis (2003). "User acceptance of information technology: Toward a unified view." *MIS quarterly*: 425-478.

helpful

4. Have you ever taken a loan?
 - Yes
 - No
5. Have you ever defaulted on a loan
 - No
 - A few times, but I have been able to repay once I got some income
 - I have significant debt that was waived off or yet to be repaid

Section 4: Pre-demonetization Awareness of Alternate Banking Possibilities

1. Were you aware of modes of money-based transactions that do not involve cash?
 - Yes
 - No
 If NO, skip rest of the questions in this section.
 If YES, continue with this section.
2. Were you aware that bank account is mandatory to use these alternate modes?
 - Yes
 - No
 If NO, skip rest of the questions in this section.
 If YES, continue with this section.
3. Were you aware of the following types of transactions you can do with a bank account?

| Transaction Mode | Yes | No |
|---|-----|----|
| Net Banking | | |
| Card Transactions | | |
| Mobile money transfers (like Digital Wallet, USSD, UPI) | | |

4. If YES to Mobile money transfers (in question 4.3), which of the mobile money transfer mechanisms were you aware of?

| Mobile Money Transfer Modes | Yes | No |
|--|-----|----|
| Digital Wallet (like PayTM, Airtel Money etc.) | | |
| USSD | | |
| UPI | | |

Section 5: Pre-Demonetization Access and Usage of Alternate Banking Options

1. Did you have a bank account prior to demonetization?
 - Yes
 - No
 If NO, move to Question 5.3, If YES, then continue.
2. Was your bank account operational just before demonetization?
 - Yes
 - No
3. Did you have access to the Internet before demonetization?
 - No
 - Yes

If NO, move to Question 5.6, If YES, then continue.

4. Did you have a smart phone before demonetization?

- Yes
- No

Mobile Phone Model (if possible):

5. Which amongst the following transaction modes would you have used prior to demonetization?
 - Debit or Credit Cards
 - Internet / Online Transaction
 - Mobile based Money Transfer
 - Check
 - If other, please specify _____

If YES to 'Mobile based Money Transfer' continue, else SKIP to Section 6

6. What mode of mobile based money transfers if any would you have used prior to demonetization?
 - USSD
 - UPI
 - PayTM or Other Digital Wallets
 - If other, please specify _____

Section 6: Some additional final questions

1. Are you comfortable using computers, mobile phones and/ or other similar instruments?
 - No, I don't know to use any of those instruments
 - Yes, I can manage but I am not very comfortable
 - Yes, I am extremely comfortable with basic functions of computer and/or mobile phones
2. Do you have access to Newspapers, TV, radio and other means of mass communication for purposes of News consumption?
 - No
 - Yes
3. Do you keep yourself informed of state and national politics related news?
 - No, I don't know much about politics
 - Yes, I do know about some of the major happenings or announcements that are discussed within the community
 - Yes, I am very politically aware and have an opinion on the state and national politics
4. If your business is related to agriculture, how were you affected by the drought of 2016?
 - Not Applicable
 - Insignificant impact
 - Significant but manageable impact
 - Significant and high level of impact

~ **THANK YOU** ~

APPENDIX 2: LOGISTIC REGRESSION OUTPUT FROM STEP 1

| Logistic Regression | (3) | (4) |
|--|--|---|
| VARIABLES | Perceived Income Recovery in 6 months | Perceived Transaction Volume Recovery in 6 months |
| Average Income (pre-demonetization) | <i>Odds Ratio</i> | <i>Odds Ratio</i> |
| If Rural (Urban = 0) | 1.023** (0.0102) 1.530 (0.999) | 1.001 (0.0129) 6.309 (7.203) |
| <i>Awareness of Cashless Transactions</i> | | |
| Cashless Awareness Level 1 (<i>bank account is required + Card</i>) | 1.004 (0.377) | 0.780 (0.463) |
| Cashless Awareness Level 2 (<i>Cards and Mobile Transaction</i>) | 1.982 (1.995) | 2.477 (2.189) |
| Cashless Awareness Level 3 (<i>Familiar with mechanism of mobile payment</i>) | 3.408* (2.392) | 0.161 (0.232) |
| <i>Access to Alternate Options</i> | | |
| Access to Alternate Options Level 1 (<i>Bank A/C but no Mobile</i>) | 0.145* (0.148) | 0.324*** (0.137) |
| Access to Alternate Options Level 2 (<i>Bank A/C and Mobile</i>) | 0.283 (0.297) | 0.734 (0.441) |
| <i>General Banking Practices</i> | | |
| Banking Habit Level 1 (<i>Operational Bank Account but No Digital Txn</i>) | 1.433 (1.338) | 1.063 (0.946) |
| Banking Habit Level 2 (<i>Digital - Card/Mobile/Internet Txn</i>) | 2.598 (1.931) | 3.399*** (1.584) |
| <i>Dependence on Cash of the Livelihood</i> | | |
| Medium Dependence on Cash | 1.218 (0.650) | 4.407 (5.770) |
| High Dependence on Cash | 2.086 (1.482) | 10.14 (16.07) |
| <i>Demographic Factors</i> | | |
| Female (Male = 0) | 12.99*** (11.23) | 1.804 (0.787) |
| Education: Middle-to-High School | 0.537* (0.171) | 0.662 (0.246) |
| Education: College Graduate and Above | 0.692 (0.682) | 1.094 (0.792) |
| Age: Between 40 and 60 | 1.112 (0.404) | 2.345 (1.358) |
| Age: Above 60 | 0.592 (0.381) | 2.113 (1.334) |
| Constant cut1 | 0.0894*** (0.0694) | 0.944 (1.521) |
| Constant cut2 | 0.382 (0.338) | 3.168 (5.061) |
| Observations | 505 | 505 |
| Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 | | |

APPENDIX 3: LOGISTIC REGRESSION OUTPUT FROM STEP 2

| Ordered LOGIT Model | | | |
|--|------------------------------------|-------------------------------------|---------------------------|
| VARIABLES | Awareness of Cashless Transactions | Access to Alternate Banking Options | General Banking Practices |
| | <i>Odds Ratio</i> | <i>Odds Ratio</i> | <i>Odds Ratio</i> |
| If Rural (Urban = 0) | 1.668 (-0.973) | 2.600** (-1.15) | 2.976*** (-1.118) |
| Average Income (pre-demonetization) | 1.027* (-0.014) | 1.065** (-0.0282) | 1.02 (-0.0161) |
| <i>Individual Attributes</i> | | | |
| Tech Literacy - Ability to use Technology | 4.185*** (-1.208) | 5.604*** (-2.889) | 2.228*** (-0.611) |
| Political Awareness | 1.252 (-0.243) | 1.082 (-0.268) | 0.978 (-0.139) |
| Access to Govt. Schemes and Programs | 2.249*** (-0.601) | 6.695** (-5.843) | 3.165** (-1.739) |
| Credit Behavior (Banks Vs Loan Sharks Habit) | 0.679 (-0.161) | 0.787 (-0.248) | 0.91 (-0.379) |
| Awareness of Other Credit Options and Comparison | 1.380* (-0.24) | 1.158 (-0.279) | 1.458 (-0.374) |
| Credit Worthiness | 1.217 (-0.303) | 1.219 (-0.537) | 0.584 (-0.203) |
| <i>Dependence on Cash of the Livelihood</i> | | | |
| Medium Dependence on Cash | 2.896 (-1.943) | 2.122 (-1.273) | 1.104 (-1.112) |
| High Dependence on Cash | 3.535** (-2.197) | 2.643* (-1.536) | 0.589 (-0.583) |
| <i>Demographic Factors</i> | | | |
| If Female (Male = 0) | 1.211 (-0.416) | 1.307 (-0.498) | 2.179 (-1.202) |
| Education: Middle-to-High School | 1.219 (-0.459) | 1.101 (-0.414) | 1.25 (-0.468) |
| Education: College Graduate and Above | 0.711 (-0.548) | 1.405 (-1.695) | 0.662 (-0.482) |
| Age: Between 40 and 60 | 1.904 (-0.9) | 1.012 (-0.435) | 2.423* (-1.159) |
| Age: Above 60 | 2.221* (-1.006) | 1.18 (-0.459) | 1.02 (-0.563) |
| Constant cut3 | 912.3*** (-1251) | | |
| Constant cut1 | 1.471 (-1.878) | 10.91** (-11.45) | 1.082 (-2.203) |
| Constant cut2 | 80.76*** (-120.4) | 357.4*** (-438.3) | 3.475 (-7.279) |
| Observations | 505 | 505 | 505 |
| Robust see form in parentheses: *** p<0.01, ** p<0.05, * p<0.1 | | | |