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Influence of demonetization on various sectors of the Indian economy

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Abstract

Background: India demonetized the currency in November 2016, scrapping 86.9 percent of the currency in circulation. This policy disrupted most economic activities because India was predominantly a cash economy.

Purpose: The study aims to analyze the impact of demonetization on the informal-formal sector and the Indian stock markets, where investment reflects investors' confidence. Another purpose is to know the usefulness of demonetization in the proliferation of digitalization.

Study design/methodology/approach: The study incorporates primary data to determine the impact on informal and formal workers' income and the acceptance of digitalization in rural-urban areas in Faridabad, Haryana. A survey was conducted, and samples for informal-formal workers and rural-urban households were collected and analyzed using the F test and the ANOVA model using an independent dummy or qualitative variables. The secondary data of the Indian stock market were empirically tested and forecasted using the Autoregressive Conditional Heteroskedasticity (ARCH) model.

Finding/Conclusions: The empirical analysis reveals that after demonetization, informal workers' earnings dropped significantly, and there is a substantial income disparity between informal-formal workers. A wide gap persists in adopting digital transactions due to low awareness of digital instruments in rural areas compared to urban areas. On the contrary, no significant impact is noticed in the Indian stock market as the forecasted value of shares trading depicts positive growth. The study identifies the gaps in policy implementation. It exposes the implementation of macroeconomic policies ensuring the protection of the interest and livelihood of economically vulnerable populations. The spread of awareness towards electronic transactions may help to promote digitalization

Limitations/future research: The study is limited to a few areas. Hence, the scope of future research rests on macro-level data where comparison could be conducted between rural and urban areas across various states in India.

Keywords
informal sector; demonetization; digitalization; rural development; stock market; ARCH model; ANOVA model.

Introduction

India is the fifth-largest and fastest-growing economy in the world (WEF, 2021). However, the Indian economy is a large informal and largely rural economy that suffered from black money, fake currency, and lack of digitalization. To address these challenges, the Government of India (GoI) announced a demonetization policy effective from midnight of November 8, 2016 (RBI, 2017). Demonetization makes a currency unit lose its legal tender status (Taqi, 2018; Sutar, Dhalmahapatra & Chakraborty, 2022). The policy scraped existing INR 500 and INR 1000 bills and introduced new INR 500 and INR 2000 bills (Lahiri, 2016). However, all scrapped bills were allowed to be exchanged at the banks until December 30, 2016, and cash withdrawal was limited to INR 20,000 per week at the bank counter (RBI, 2016). The policy also significantly defined the limit to withdraw INR 2000 per card per day from ATMs (Automatic Teller Machines) up to November 18, 2016. The limit was raised to INR 4,000 on November 19, 2016. However, there were no restrictions on non-cash methods for purchases or transfer of funds to promote e-banking and e-commerce to minimize the informal economy (RBI, 2016). From the national security point of view, the crucial objective of demonetization was to curb terrorism spread through the flow of high denominations of fake Indian currency (Lahiri, 2016; Prakash, 2019). The statistics released by RBI revealed that around 99.3 percent of the demonetized currency was received in the banking system. The remaining 0.7 percent (INR 160,500 Million) could not be traced (Ashwani & Nataraj, 2018). Thus, it divulges that such steps proved to be unfruitful in combating black money, which was another objective of demonetization (Bose, 2019). The announcement of demonetization disrupted the informal economy (Jawed, Dhaigude & Tapar, 2019). In India, the cash shortage affected many in the informal economy because a significant number of transactions, including very high-value transactions such as purchasing a car or a house, were conducted in cash. The sudden cash shortage impacted vulnerable sectors such as farmers, casual workers, micro and small traders, and low-income households (Viswanathan, Jaikumar, Sreekumar & Dutta, 2021). It caused a fall in economic activities (Ghosh, 2017). As per the RBI reports, the impact of demonetization started diluting in January 2017 and dissipated by mid-February, indicating the pace of remonetization (RBI, 2017). Further, the implementation of demonetization led to a short-term marginal downward trend in the Indian stock markets. However, it showed an upward trend gradually (Ashwani & Nataraj, 2018).

The sixth anniversary of demonetization was on November 8, 2022. The debate about its success or failure continues inconclusively. Raghuram Rajan, former governor of the Reserve Bank of India (RBI), stated that the short-term costs of demonetization outweigh its long-term benefits (Ashwani & Nataraj, 2018). Karmakar and Narayanan (2020) also counted that such macroeconomic policy has short-run and long-run impacts. On the other hand, some economists such as Paul Krugman, Manmohan Singh, Amartya Sen, P Chidambaram Kaushik Basu, Jean Dre`ze, Jayati Ghosh, Prabhat Patnaik, Arun Kumar, and Larry Summers did not consider this policy commendable (Jawed *et al*., 2019; Mohindra & Mukherjee, 2018).

Table 1 Chronology of various countries that implemented demonetization

Year	Country	Motive
1967	Singapore	to mitigate high money laundering risk.
1982	Ghana	to control hyperinflation
1985	Myanmar	to control hyperinflation
1987	Myanmar	to control hyperinflation
1988	Australia	to prevent counterfeiting
1990	Brazil	to control hyperinflation
1991	Soviet Union	to fight against unearned income, smuggling, and corruption.
1993	Brazil	to control hyperinflation
1993	Iraq	to finance the fiscal deficit.
1993	Russia	to control hyperinflation
1999	Singapore	to mitigate high money laundering risk.
2009	North Korea	to curb black money.
2012	Denmark	to prevent counterfeiting
2013	Greece	to manage fiscal and banking crises.
2014	Singapore	to mitigate high money laundering risk.
2015	Australia	to prevent counterfeiting
2015	Cyprus	to manage fiscal and banking crises.
2015	Pakistan	to fight corruption and black money.
2015	Zimbabwe	to control hyperinflation
2016	Euro Region	to create a common currency for the EU.
2016	Venezuela	to control hyperinflation

Source: Singh & Prajapati (2020)

Demonetization has been used worldwide as an effective tool to curb black money. It was used in economies where most economic activities were handled in high denomination bills (Lahiri, 2020). After World War II (1939-1945), Britain and other European countries demonetized high-denomination bills to stop unrestricted wealth gain (Lahiri, 2020). The United States and the European Central Bank demonetized large denomination

bills in 1969 and 2017, respectively. Many other countries, such as Ghana, Nigeria, Myanmar, Russia, North Korea, South Africa, and Zimbabwe, had also demonetized their currency (Chattopadhyay, 2019; Kayıkçı, 2022). Table 1 presents historical announcements on demonetization.

Demonetization was implemented in India twice before 2016. Demonetization of 1946 withdrew INR 1,000 and INR 10,000. Similarly, INR 1,000, INR 5000, and INR 10,000 bills were again demonetized in 1978 (Gautam & Jain, 2019; Sivathanu, 2019). The motive of such action was to combat black money and to stop the circulation of fake currencies (Goel, 2018). Hence, demonetization in 2016 was not a novel concept in India.

Various works of literature have already assessed the impact of demonetization. However, there is a research gap in the literature on the effects of demonetization on informal workers, who contribute around 50 percent of the total Indian GDP. There is no study on the influence of demonetization in India on informal sector employees, i.e., this is the first study on this topic. Furthermore, the proliferation of digitalization after an announcement of demonetization is measured using primary data to get a ground-level picture by ascertaining the awareness rate among chosen samples in rural and urban areas of Faridabad. Also, the stock market is considered a barometer of investors' sentiments. The research question is whether this policy has any long-term impact on the stock market. Thus, this paper includes all three aspects to conclude that impact of policy implementation could be moderated if the vulnerable section of society is assured with basic income. Secondly, digitalization could be highly promoted if people are aware of digital payment techniques.

We tested these gaps through the following hypotheses:

$H_{1(null)}$: Demonetization has not affected the informal workers more than formal workers.

$H_{2(null)}$: No infrastructural and economic bottleneck exists between urban and rural areas.

$H_{3(null)}$: Demonetization had no considerable effect on the Indian Stock market.

With this background, the paper is divided into six sections. Section one focuses on the objective of demonetization and discusses its impact on the general price level. Section two throws light on its theoretical concepts of demonetization. Section three will assess the impact of demonetization. Section four focuses on the methodology adopted for empirical analysis. Section five highlights the findings and their association with future policy, and the last section concludes the paper.

1. Demonetization: a necessity or casualty

Demonetization is a liquidity shock to economies thriving on cash transactions (Singh & Ghosh, 2021). It is the act of stripping the money supply from the economy. Its ripple effects lead to low consumption, investment, production, and employment. Nevertheless, it was implemented in 1946, 1978, and 2016 to revitalize the economy (Gautam & Jain, 2019). According to Anoop, Narayan and Reddy (2018), demonetization aims to promote a cashless economy. Financial inclusion via the promotion of alternative means of payment (mobile payment technology) gives a safety net during a cash crisis (Pal, De' & Herath, 2020). Many studies confirmed that a cashless economy boosts private consumption and GDP growth (Mukhopadhyay, 2016). The reports of RBI indicate that post-demonetization, there has been a sharp rise in the number of accounts (272,000 Million to 728,340 Million) under the Pradhan Mantri Jan Dhan Yojana (PMJDY) and a surge in digital transactions (RBI, 2017; Fouillet, Guérin & Servet, 2021; Jawed *et al*., 2019). However, Singh & Prajapati (2020) found that infrastructural bottlenecks (less availability of bank branches, agricultural credit society, and ATMs) were perceived as hindrances to encouraging digital transactions. Hence, there is a long way to promote digitalization catering to all small sections of Indian states.

Furthermore, considering the inflationary impact, the data on food inflation showed a sharp decline of about 240 bps between October 2016 and January 2017, reflecting the combined effect of record pulses production, significant winter arrivals of vegetables, and compression in demand due to demonetization (RBI, 2017). Inflation excluding food and fuel was marked unaffected. Hence, the headline CPI inflation fell by around 100 bps to 3.2 percent in January 2017, the lowest inflation reading since the publication of the all-India CPI inflation series (RBI, 2017) shown in Table 2.

However, with the recovery of demand from the latter part of Q4 of 2016-17, inflation risks to CPI excluding food and fuel and headline inflation are,

therefore, showed remarkable height. Hence, the policy led to a fall in price, but it showed remarkable growth after some time.

Table 2 CPI Inflation

Category	Nov 2015	Dec 2015	Jan 2016	Oct 2016	Nov 2016	Dec 2016	Jan 2017
Fuel & light	5.3	5.4	5.3	2.9	2.8	3.8	3.4
Clothing and footwear	5.8	5.7	5.7	5.2	5.0	5.0	4.7
Housing	5.0	5.1	5.2	5.1	5.0	5.0	5.0
Miscellaneous*	3.8	4.0	3.9	4.7	4.8	4.7	5.1
CPI-excluding Food-fuel	4.7	4.9	4.7	4.9	4.9	4.9	5.1

Source: RBI (2017)

*Includes household goods and services; health; transport and communication; recreation and amusement; education; and personal care and effects.

Conclusively, the macroeconomic policy of demonetization proves to be both a necessity and a casualty. This is because, on one side, it acted as a tool to fight against corruption and terrorism and increased digital payments; on the other side, it negatively affected those who were dependent on cash. Next, we discuss the theoretical aspect of demonetization.

2. Theoretical concept of demonetization: a liquidity shock

From a macroeconomic perspective, liquidity means the availability of funds on short notice. If money fails to meet the demand of people with ease, then it may be termed a liquidity shock. (Dornbusch, Fischer & Startz, 2011). Liquidity shock due to monetary policy or any other reason has its origin in the past as well; some of the most popular crises are the Great Depression of 1930, the financial crises of 2008-09 (Lucas, 2014), the Asian crisis in 1998, the German banking and currency crisis in 1931 and the crisis in the euro area that started in 2010 (Bindseil & Winkler, 2012). Similarly, there was a government shutdown in the USA in 2013. In this case, there was a temporary drop in liquidity through a cut in employee paychecks. Due to this, spending dropped sharply, and consumption was met by short-term liquidity (Gelman, Kariv, Shapiro, Silverman & Tadelis, 2020). Christiano (1994) suggested that the federal reserve (the central bank of the U.S.A.) needs to maintain the money supply. It needs to apply the monetary policy so that it does not obstruct income, employment, and aggregate spending. It should positively create shock in financial markets by increasing the money supply, due to which the nominal interest rate could fall and employment and output rise. On the contrary, when the federal reserve decreases the money supply, the interest rate increases, which may depress the economy in terms of GDP, investment, and employment contraction. This process that affects interest rates, investment, and output is termed the liquidity effect. Lucas (2014) suggested that a sudden reduction in the money supply leads to deflation and a reduction in spending. This happens because a sudden loss of liquidity leads people to reduce spending to rebuild a desired ratio of cash to spending flows.

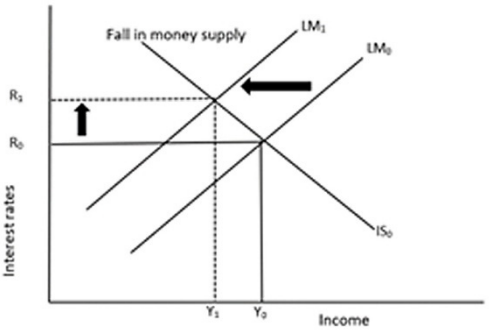

Figure 1 Demonetization and equilibrium of IS/LM curve
Source: Branson (2019)

Seeley (2017) posited that the IS-LM (investment-savings and liquidity preference-money supply) model is a helpful tool to assess the impact of different policy actions and external shocks and helps to know the effect of policies on output and interest rates. Figure 1 illustrates the impact of the decrease in the money supply. As a result of the fall in money supply, the income dropped from Y_0 to Y_1, and an increase in interest rates from R_0 to R_1 may lead to falling in investment and loss of production.

Chodorow-Reich, Gopinath, Mishra & Narayanan. (2020) highlighted the positive relationship between cash in hand and tax evasion. It is hypothesized that keeping cash reduces the effective tax rate contributing to tax evasion. Sabnavis, Sawarkar and Mishra (2016) also highlighted that if the supply of unaccounted money is taken from the money market through monetary policy, it will help to remove unaccounted money because black money holders will not be able to deposit the stack of unaccounted money in the bank and that money will become scrap. Chanda (2016) also counted that demonetization is a valuable tool to combat black money and helps to redistribute wealth. Hoarders will try to launder their money by overpaying their daily wage workers. If hoarders purchase

properties from black money, the resale value will drop. This can, in return, also impact the real estate market and the respective employment in the real estate market. Overall, this can also have a spiraling influence on economic activities and job creation. Effectively, this can impact the construction sector and the associated informal economy related to the construction sector. Waknis (2017) studied the decrease in money supply due to demonetization from the Indian perspective connecting it with the informal sector. They concluded that a reduction in money supply led to less cash availability and, consequently, a fall in output production within the informal sector. This was accelerated by a decrease in the demand for output by consumers due to a fall in cash availability. Accordingly, the informal economy had a significant impact on employment, output, real interest rate, and aggregate price level.

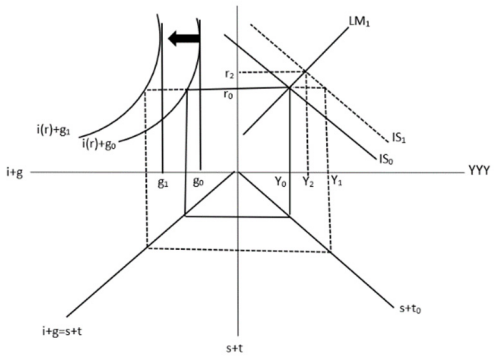

Figure 2 Increase in government spending and impact on income
Source: Branson (2019)

Moreover, such impact may be ameliorated if the government increases its expenditure or purchases in the economy; this is shown in Figure 2. The government purchases may be diverted towards social security transfer, especially for informal sectors, and considerable investments to promote digitalization in rural areas so that the parity between urban and rural could be maintained. In Figure 2, the change in government spending from g_0 to g_1 leads to an increase in income from Y_0 to Y_2 with higher interest rates r_2. Hence, fiscal policy may prove to be a helpful tool to increase income which was diminished due to the monetary policy of demonetization.

Furthermore, Arora, Kaur and Kaur (2019) studied the impact of demonetization on a business cycle. The authors have chosen Hawtrey's business cycle model. Business cycles occur due to changes in effective demand through changes in bank credit. Credit creation increases the money supply, which further changes effective demand and, consequently, the business cycle in the economy. Hence, monetary factors affect economic activities, and it was concluded that demonetization leads to a decline in economic growth. Moreover, a strong relationship was perceived between money stock (M3) and the Index of Industrial Production (IIP), a proxy of economic activities, where changes in money supply significantly fluctuate IIP hence, dwindling growth rates. This further validates Hawtrey's theory that liquidity conditions determine economic activities and economic growth, which is also applicable in India (Arora *et al*., 2019).

According to Roy (2019), the announcement of demonetization negatively impacted the M1 money supply in the ambiance of a stable economic environment. Demonetization decreased cash circulation and increased bank deposits with no credit expansion (Basu, Basu & Nag, 2018). The author analyzed macroeconomic policy using the AD (Aggregate Demand) and AS (Aggregate Supply) models. They assessed how uncertainty due to demonetization led to adverse macroeconomic consequences internally and externally. On the demand side, aggregate consumption and investment start falling due to the lack of cash, particularly in an economy that thrives on cash transactions. On the supply side, monetary shock disrupts the foreign exchange market leading to the depreciation of exchange rates. Consequently, rise in the price of imported goods and the price level.

Table 3 Rate of Interest (2012-2020)

Year	Rate of Interest* (%)
2012	8.00
2013	7.50
2014	8.00
2015	6.75
2016	6.25
2017	6.25
2018	6.00
2019	6.00
2020	4.00

* for the quarter ending September
Source: RBI Annual Repor (2012 – 2020)

Moreover, demonetization also had a partial impact on the Indian economy. Some of the partial effects were related to the liquidity flow and availability within the economy. This was because people could deposit cash but could not withdraw their money, so the deposits in the bank started to increase. Further, it did not affect other aspects of

monetary policy, such as the overall liabilities of the RBI and the market interest rate (Chodorow-Reich *et al*., 2020). The consistencies of interest rates are illustrated in Table 3.

Thus, after discussing the theoretical aspect of demonetization moving forward to the sectoral impact using primary and secondary data.

3. Impact of demonetization

The Indian economy is cash-driven (Chauhan & Kaushik, 2017). The announcement of demonetization caused tremendous hardship to the cash-dependent sectors, supplemented with a drop in growth rates (Basu *et al*., 2018). The impact of demonetization is analyzed on principal sectors like formal-informal, rural-urban, and the stock market in the following sub-sections.

3.1. Informal and formal sector

In India, 85 percent of the total workers are informal (excluding the agricultural workforce); overall, it is over 90 percent of the entire workforce (ILO, 2019). In developing economies, the informal employment share is 85.8 percent in Africa, 68.2 percent in Asia and the Pacific, 68.6 percent in the Arab states, and 25.1 percent in Europe and Central Asia (ILO, 2018).

As per the report of NCEUS (2007), the informal workers are primarily devoid of social security and job protection, and it also comprises the workers engaged in the formal sector without any employment and social security benefits. In addition, informal employment means insecure worker relations, low wages, and short-term worker arrangements wherein the workers are not protected by worker laws and do not benefit from social welfare systems (Bhattacharya, 2019). On the contrary, formal workers are hardly poor and are supplemented with social security benefits. They are salaried and white-collar workers. Table 4 shows the maximum employment of informal which is five times higher than formal employment.

Table 4 Size of Formal and Informal employment in India, 2017-18

Type	Non-farm employment in millions			
	Manufacturing	Non-Manufacturing	Services	Total
Formal	8.6	3.1	31.1	42.8
Informal	47.7	55.9	113.4	217

Source: ILO (2019)

Moreover, the colossal cash dependency of the informal sector in India and the sudden withdrawal of currency have left this sector appalled. This situation shocked the demand and supply (Kameswaran & Muralidhar, 2019). As per Karmakar and Narayanan (2020), the people who do not hold bank accounts failed to deposit their hard-earned money in the bank safely, and thus all money got scraped. Therefore, the study was undertaken in the presence of informal and formal workers in Faridabad, Haryana, to assess the influence on informal and formal workers after demonetization.

3.2. Rural and urban divide

The rural and urban areas are specified by settlement and occupation. Rural people depend on agriculture, and urban people are involved in industries (Tacoli, 1998). The people living in rural areas are highly dependent on cash for their daily transactions, especially farmers and daily wage workers (Shahare, 2017). The present study is about the sectoral impact of demonetization. This section focuses on how macroeconomic policy promotes digitalization and awareness in e-banking facilities in rural and urban areas. According to the 2011 Indian census reports, India has 833 million (70 percent of the population) rural population, and the remaining 377 million live in urban areas (Shahare, 2017). Adopting Information and Communication Technologies (ICTs) and digitalization are major contributors to enhanced productivity and efficiency (Maiti, Castellacci & Melchior, 2020). The government of India launched the "Digital India" program in 2015 to promote technology and access to government services through the internet (Maiti et al., 2020). RBI launched 'Vision-2018' in June 2016 to promote electronic payments and settlements. After demonetization, India experienced a 20 percent rise in prepaid payments in the retail sector (Balaji & Balaji, 2017). Figure 3 shows the changes in digital transactions over time.

Digital transactions in Figure 3 have shown a continuous increase since November 2016 and a remarkable increase since June 2019. Even the RBI data showed that post-demonetization, transactions in India increased by 133 percent, and an additional 1.5 million people started using debit cards (Balaji & Balaji, 2017). However, ATMs, credit cards, and debit cards were not popular in rural areas (Shahare, 2017). Sudden cash shortage coupled with low electronic payments led to decreased purchasing power, particularly in the rural population.

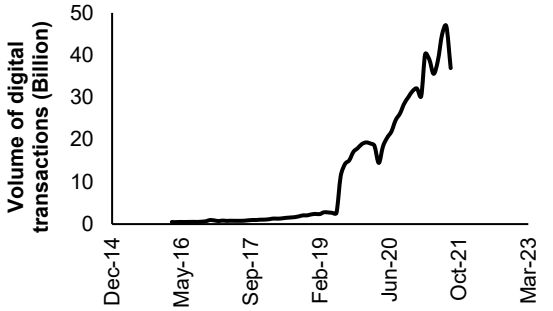

Figure 3 Changes in the number of digital transactions.
Source: NPCI (2021)

On the other side, there has been an increase in digital payments, particularly in urban areas (Kameswaran & Hulikal Muralidhar, 2019). However, macro-level data is not sufficient alone to depict a clear perspective. Accordingly, micro-level data from rural and urban areas of Faridabad, Haryana, is analyzed to identify a comparison between rural and urban areas. Further, the empirical results will test how far the demonetization policy contributes to the spread of digitalization in rural and urban areas.

3.3. The Indian stock market

This section sheds light on the impact of demonetization on the Indian stock market through the secondary data of shares traded. The stock market holds many funds and indicates the economy's health (Anoop *et al*., 2018; Jawed *et al*., 2019). Monetary policy changes significantly impacted the stock market (Pal & Garg, 2019). Indian equity markets have shown a declining trend since demonetization (Giri & Singh, 2017). The two benchmark equity indices, the NIFTY 50, fell 6.3 percent from November 8 until November 22, 2016, and the S&P BSE Sensex fell 5.9 percent during the same period (Giri & Singh, 2017). The market capitalization of BSE and NSE on March 31, 2016, was INR 94 trillion and INR 93 trillion, respectively (Pal & Garg, 2019). The gross purchase and sale of equity on March 31, 2016, were INR 59 billion (USD 0.98 billion) and INR 44 billion (USD 0.73 billion), respectively. However, after demonetization, the impacts on shares trading are analyzed empirically. Figure 4 presents the trends of shares trading.

The number of traded shares increased except in December 2016, when the quantity of share trading declined abruptly, showing a deep gorge in Figure 4. This reflects investors' loss of confidence in the stock market. The cash crunch with the public and restrictions on daily transactions during the demonetization period forced the investors to withdraw their hard-earned money from the market and invest in safer instruments, namely fixed deposits and saving bank accounts. The ARCH model has been used to empirically test the impact of demonetization on the stock market and determine its future trends.

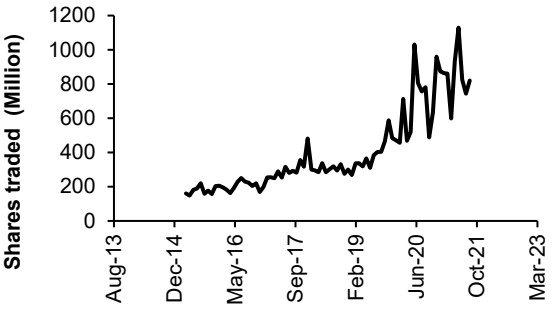

Figure 4 Quantity of shares traded.
Source: NSE (2021)

4. Methodology

The nature of the research is exploratory and descriptive. The studies were conducted in Faridabad, an industrial city in North India, to assess the sectoral impact of demonetization on rural-urban and formal-informal economies. Secondary data were gathered from various sources to ascertain sectorial impact. Primary data were collected from two hundred fifty-two workers from different occupations.

As per the 2011 census, the total area of Faridabad is 741 sq. km, of which 523 sq. km is rural and 218 sq. km is urban. Further, 79.51 percent of the population live in urban areas, and the remaining 20.49 percent are in rural areas. Two rural areas, Tigaon and Tilpat, and two urban areas, Roshan Nagar and Surya Nagar, were selected in the Faridabad district. The sample had 252 respondents, 50 percent from urban and 50 percent from rural areas. The distribution of males and females in rural and urban areas is also 50: 50. The F-test is applied to ascertain any significant income difference between formal and informal sectors before and after demonetization. The Analysis of Variance (ANOVA) model has been used to determine the average awareness rate (dependent variable) in rural and urban areas to showcase the influence of demonetization in promoting digitalization.

For analyzing the impact of demonetization on the Indian stock market, the Chow test was applied to ascertain the structural changes due to

demonetization, followed by the ARCH model to forecast data. The Augmented Dickey-Fuller Test showed non-stationary data. The data relating to the total number of stocks traded from 2015 to 2019 have been taken from National Stock Exchange (NSE). The ARCH model was incorporated to assess the volatility clustering of the series. After ascertaining the presence of the ARCH effect, the estimated ARCH model was created to forecast the mean and variance. Various analyses were performed using Excel, STATA, and EViews software.

5. Findings

This section summarizes the findings on the impact of demonetization on informal-formal workers, rural-urban areas, and the stock market under three subsections as follows:

5.1. Impact of demonetization on informal and formal workers

During the survey, informal and formal workers were asked to provide data and their experiences due to the implementation of demonetization. It was seen that informal workers are impacted more than formal workers, as the loss of income in the case of informal workers is more prominent than formal workers. This is shown in Figure 5 and Figure 6.

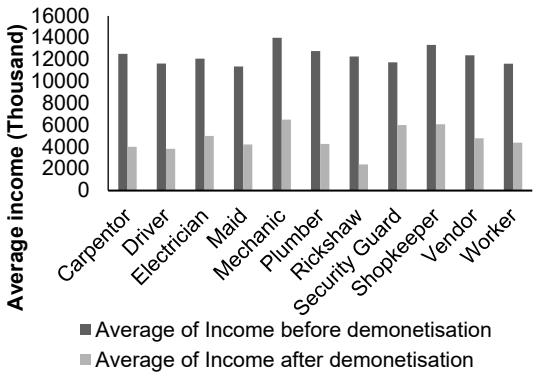

Figure 5 Income before and after demonetization of informal workers
Source: the authors' calculation from survey data

Further, it was found that the savings of informal workers diminished abruptly. Liquidity constraints led them to borrow money from money lenders at a high interest rate. It was also found that most women had no bank accounts to put their hard-earned money safely. Thus, demonetization reduced their cash holding, which was further aggravated due to a decrease in consumption. Figures 5 and 6 show that during demonetization, the formal workers did not suffer much, and their cash was stacked for a few months. No significant financial losses were noticed for formal workers. On the contrary, informal workers were severely impacted due to demonetizations. Their income dropped suddenly due to a cash shortage.

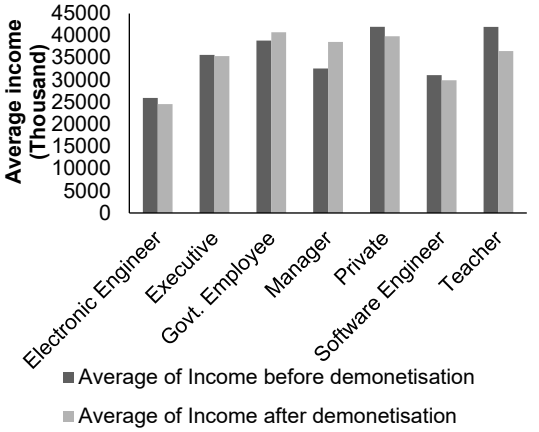

Figure 6 Income before and after demonetization of formal workers
Source: the authors' calculation

For testing the concept, our null and alternate hypotheses are:

$H_{1(null)}$: Demonetization has not affected the informal workers more than formal workers.

$H_{1(alternate)}$: Demonetization has affected informal workers more than formal workers.

Table 5 F-test

Particulars	Income after demonetization (Formal)	Income after demonetization (Informal)
Mean	36219.03	4482.444
Variance	3.41E+08	9607420
df	125	125
F	35.47798	
P (F<=f) one-tail	6.65E-63	
F Critical one-tail	1.343613	

Source: the authors' calculation from survey data

The F-test (Table 5) is used for empirical analysis of the income after demonetization for both informal and formal workers. Post-demonetization, the income of informal workers dropped drastically as compared to formal workers, with no significant impact on their income.

Since the F-value is greater than the critical value at the significance level (95 percent), the null hypothesis is rejected, i.e., the demonetization has significantly affected informal workers more than formal workers.

5.2. Digitalization in rural and urban areas

It is the first time in India that demonetization has ignited digitalization, and the primary and secondary data support it. The good thing is that most people have adopted digital payment in urban areas. Figure 7 shows the adoption of various modes of payment, such as Unified Payment Interface (UPI), Debit card, Paytm, and cash.

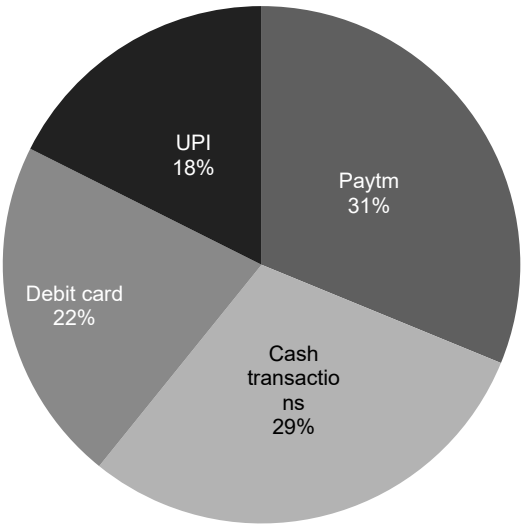

Figure 7 Various modes of payments by urban households.
Source: the authors' calculation

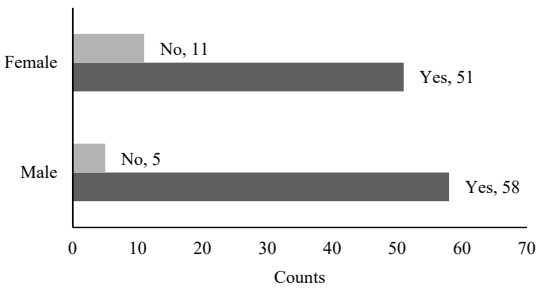

Figure 8 Bank accounts of urban households
Source: the authors' calculation

In urban areas, it is revealed that 29 percent of the population still uses cash transactions in day-to-day business/financial activities and has not adapted to digital payments. The adoption of digital payment, such as Paytm, covers a maximum area of about 31 percent. The urban population is more comfortable with Paytm because it is easy to carry out various small transactions quickly.

Figure 8 shows the adoption of bank accounts between males and females in urban areas. Gender-wise, males have a higher proportion of bank accounts than females. On the other side, women had fewer bank accounts than men. Further, the survey also found that homemakers in urban areas are uncomfortable with digital payment.

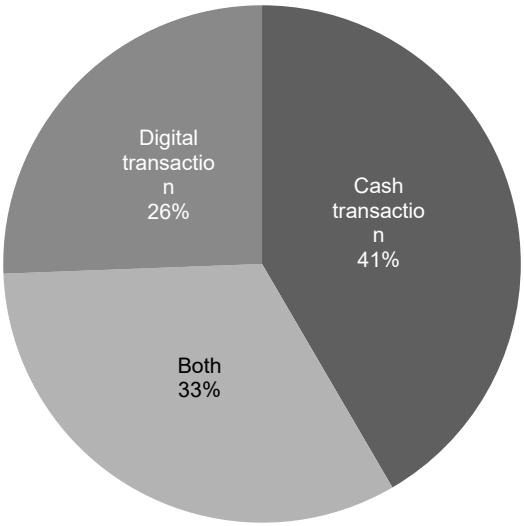

Figure 9 Comfort level in transactions by urban households
Source: the authors' calculation

Figure 9 shows the comfort level among urban households in transactions where it was found that they are still comfortable in cash transactions which is 41 percent, followed by those who use cash and digital payments. They feel comfortable making every small transaction in cash, although they have access to digital payments. Another point of this analysis is that if 41 percent of the urban population are comfortable with cash, and 59 percent are happy to use digital transactions, which is a good sign of digital penetration.

The survey in rural areas revealed that bank branches and automated teller machines (ATMs) are not found nearby. Hence, digitalization in rural areas is less prevalent. Most of the respondents were not aware of mobile banking and far away from the technical know-how of digital payments, and were found to be more comfortable in cash transactions. Figure 10 reveals the mode of payments adopted by rural households, as 83 percent of rural households still use cash in day-to-day transactions despite digital payments, most popularly Paytm, which is easy to use. Rural areas are still lagging in digitalization, as merely 17 percent of the population use digital transactions for their day-to-day activities.

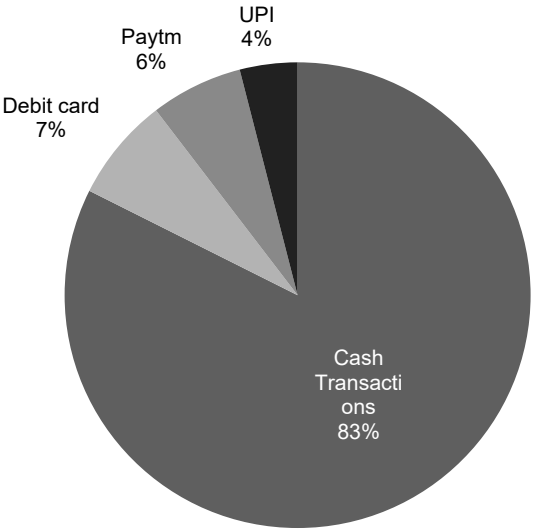

Figure 10 Various modes of payments by rural households
Source: the authors' calculation

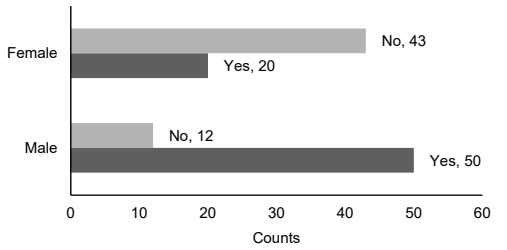

Figure 11 Bank accounts of rural households
Source: the authors' calculation

Figure 11 throws light on males and females having bank accounts. Unfortunately, many females still do not have active accounts in banks. Due to the lack of bank branches nearby, they are reluctant to visit bank branches to open their bank accounts. Further constraints, namely the vicinity of financial institutions or banks, daily wage workers' time overlapsing with banking hours, financial illiteracy, and a lack of awareness, are the significant problems discouraging rural households from adopting electronic payment services.

Figure 12 shows that selected samples are essentially bent towards cash transactions, which is 85 percent larger than urban households, which is 41 percent. They are still restricting themselves from using electronic payments. One of the key findings from the survey in rural areas is that digital transactions are becoming costly because of low income. On the other side, internet service providers charge a high price. In such a situation, they are left with only one option: cash. Moreover, poor rural people's low literacy and digital transaction awareness hinder the growth of a cashless environment.

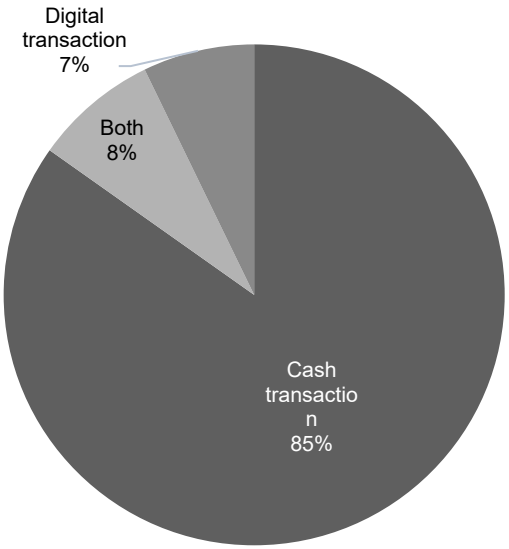

Figure 12 Comfort level in transactions by rural households
Source: the authors' calculation

Further, the hypotheses for this study are:

$H_{2(null)}$: No infrastructural and economic bottleneck exists between urban and rural areas.
$H_{2(alternate)}$: There is an infrastructural and economic bottleneck between urban and rural areas.

ANOVA was conducted on primary data to ascertain the mean value of awareness rate among the sample in urban and rural areas of Faridabad, shown in Table 6. ANOVA is used to know the statistical significance of the relationship between regressand and dummy regressors (Allen, 1997). In this context, three categories have been made based on the awareness level of rural and urban households. The weightage of each variable is 10 percent, 30 percent, and 60 percent (categorized by authors).

Table 6 Classification of Awareness Level

Awareness Levels		
10%	**30%**	**60%**
Knowledge of having a bank account	Knowledge of having a Bank account + Mobile transactions (Internet banking and Mobile banking)	Knowledge of having a Bank account + Mobile transactions (Internet banking and Mobile banking) + Process of digital payments

Source: the authors' calculation

Table 7 Results from Dummy variable Regression Model

Variables	Area of Residence	Dummy variable regression model
Rate of Awareness	44.16 (β_1) -24.4 (β_2)	$Y_i = \beta_1 + \beta_2 D_2 + u$ Where, Y=Awareness rate (percent) β_1= The mean awareness rate of urban β_2= The mean awareness rate of rural D_2= Area of Residence; 0= Urban, 1= Rural
Actual average awareness rate (calculated)	19.76	

Source: the authors' calculation

Table 7 presents a dummy regression model that the actual awareness rate among the rural-urban population is around 20 percent, considering urban as the benchmark category. Hence, the statistical findings of urban and rural households proved the proposed hypothesis of an infrastructural and economic bottleneck between urban and rural areas.

5.3. An impact of demonetization on the Indian stock market

Various authors have given their mixed analyses; some supported the fact that there is a significant impact of demonetization on the stock market, while others do not agree with this statement. A Chow test has been applied to find whether there is a structural change due to the implementation of demonetization, where two sets of time-period have been selected. The first data set starts from January 2015 to October 2016, and the second set begins from November 2016 to December 2019 (Table 8). The chow test is widely used to determine structural instability in time series data (Nielsen & Whitby, 2015).

Table 8 Equations for the Chow test

Period	Equations	Observations
01/2015-10/2016 (pre-demonetization)	$Y_t = \lambda_1 + \lambda_2 X_t + \mu_{1t}$	n_1=22
11/2016-12/2019 (post-demonetization)	$Y_t = \gamma_1 + \gamma_2 X_t + \mu_{2t}$	n_2=38
01/2015-12/2019	$Y_t = \alpha_1 + \alpha_2 X_t + \mu t$	n=60

Source: the authors' calculation

Table 9 Chow test

F-Value		
Calculated	Critical	df
31.74	3.16	2 and 56

Source: the authors' calculation

Furthermore, to know that there is a structural change due to the implementation of the demonetization Chow test was applied (Table 9), resulting in a critical value of F, which is less than the calculated F value. Hence, by rejecting the null hypothesis that assumes no structural change, it has proven that a decrease in money supply certainly impacted the total number of shares traded. The findings are represented in Tables 10 and 11.

Table 10 Regression analysis

Variables	Constant	Coefficient	F-value	Observations	df	Period
Quantity of shares traded (dependent variable) Money supply (independent variable)	1.255541	2.252032	24.96	60	58	2015 – 2019 (Combined data)
Quantity of shares traded (dependent variable) Money supply (independent variable)	-1.35534	1.843836	5.02	22	20	Jan2015 – Oct2016 (pre-demonetization)
Quantity of shares traded (dependent variable) Money supply (independent variable)	9.673168	1.892455	23.97	38	36	Nov2016 – Dec2019 (post-demonetization)

Source: the authors' calculation

Table 11 Descriptive statistics

Quantity of shares traded (billion)	Mean	Minimum	Maximum
Pre-demonetization (2015 to 2016)	19.31	14.79	25.00
Post-demonetization (2016 to 2019)	33.17	24.94	58.75

Source: the authors' calculation

Compared with the two sets of data, the combined data (2015-2019) found a structural change due to demonetization, which means that the parameter is not constant throughout the entire period. There was a shock observed due to monetary changes.

Further, the descriptive statistics are shown in Table 11, revealing the mean value of shares traded pre and post-demonetization. It is observable that

the mean value of the quantity of traded shares increased from 19.31 billion to 33.17 billion after the declaration of monetary policy. If the minimum and maximum value are to be considered in that case, it also shows a pre and post-intervention rise, revealing no significant impact on the number of shares traded due to the declaration of demonetization.

With the above findings, this section moves forward to empirically analyze the impact of demonetization on the number of shares traded from 60 observations. The Augmented Dickey-Fuller (ADF) test was conducted to ascertain its volatility concerning a past period. The calculated t-value is higher than the critical t-value, and the p-value is higher than 0.005. Hence, the data were found statistically insignificant, which means the data is not stationary (Table 12).

Table 12 Augmented Dickey-Fuller test, Lag Length: 1

Null Hypothesis: The number of shares traded has a Unit root	
t-Statistics	-2.20
Critical t value at 5% level	-3.48
p-value	0.4801

Source: the authors' calculation

Further, an ARCH model will assess the volatility clustering in a given series. Using the ARCH model for variance in time series data to analyze and forecast volatility, this section predicts a model to ascertain the validity of the announcement of demonetization. After conducting a heteroskedasticity test, the ARCH model is shown in Table 13, and the hypotheses for this study are:

$H_{3(null)}$: Demonetization had no considerable effect on the Indian Stock market.
$H_{3(alternate)}$: Demonetization considerably affected the Indian Stock market.

Table 13 ARCH Equations

The mean equation of the ARCH model	$qst= \beta_0=1.07$
The variance equation of the ARCH model	$h_{t+1}=\beta_0+\beta_1 u^2_{t-1}=11.68+0.86\ u^2_{t-1}$

Source: the authors' calculation

where *qst* is the number of shares traded, β_0 mean value of shares traded, and β_1 coefficient of residual. Moreover, Figure 13 represents how conditional variance coincides with those of the original plot of the series

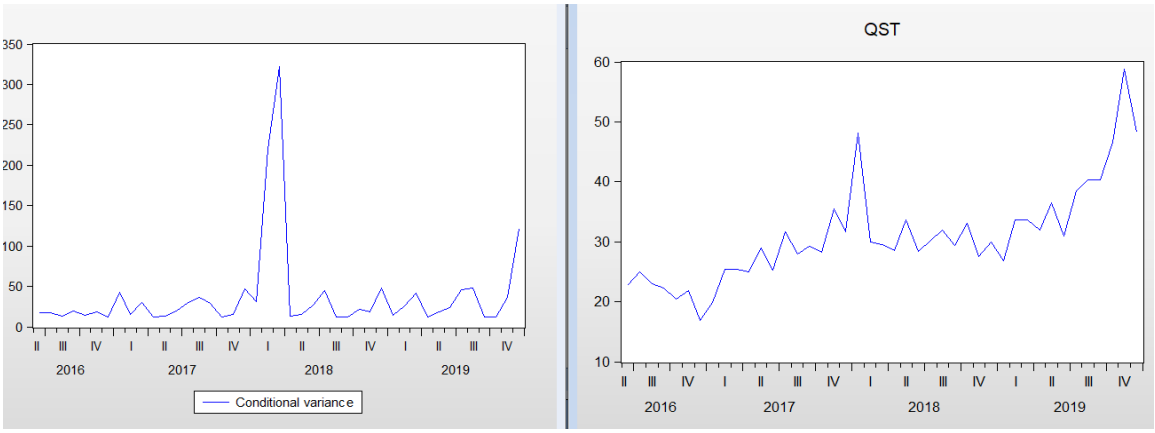

Figure13 Coincidence of actual data with variance
Source: the authors' calculation using E-Views

Figure 14 represents the forecasted value of the number of shares traded. It shows a meager fall in the short run after the announcement of demonetization. Still, there is consistency in shares trading with an increasing trend in the long run, so in the future also, there is no possibility of significant deviation in the trading of shares making volatility stable, as it lies within the standard error band, which implies that there is no significant impact of demonetization on shares trading. Also, Theil Inequality Coefficient, which is represented as (U), lies between 0 and 1 or close to zero (0.149), which means the predictive power of the model is strong (Mackay & Bliemel, 2014). Thus, our null hypothesis that demonetization has no considerable effect on the Indian Stock market is accepted. Further, the descriptive statistics of pre and post-intervention demonetization show that the average quantity of shares traded is 19.31 billion and 33.17 billion, respectively. This indicates no significant fall in shares traded post-demonetization. However, after looking at the series, it decreased significantly up to around 16 billion during demonetization.

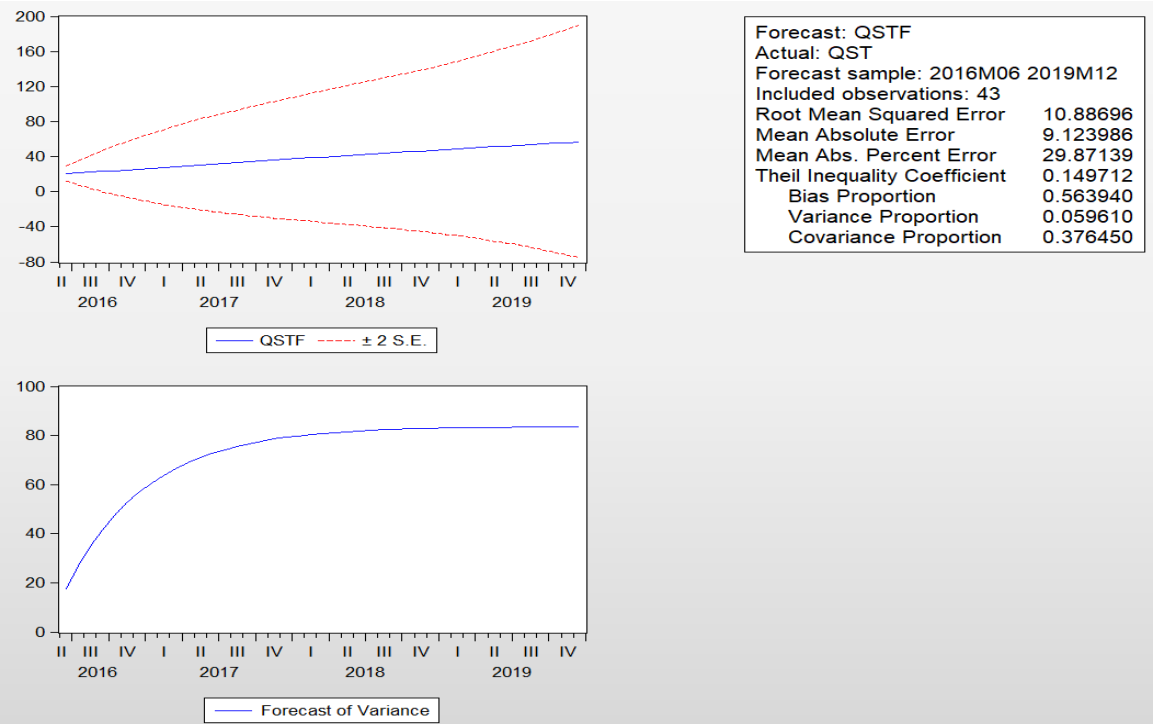

Figure14 Forecast of variance

Source: the authors' calculation using E-Views

6. Conclusion

The announcement of demonetization caused pain to the general population, as 86.9 percent of the total currency in circulation was wiped out from the economy (Rajagopalan, 2020). This macroeconomic policy had a diverse impact on different sectors, but informal workers suffered unintentionally and became more vulnerable. The study illustrates that informal workers lost income, savings, and consumption. On the contrary, formal workers who have economic backup and are financially literate were not impacted or suffered as much. Simultaneously, the model used for the study appears to be robust and efficient. The empirical model's robustness has been tested with actual field data and is efficient due to unbiased, significant estimators. The model was tested statistically, showing a substantial impact of demonetization on informal workers. Thus, implementing macroeconomic policies may ensure the protection of the interests and livelihood of an economically vulnerable population.

This survey proves that urban households are educated and capable of doing digital transactions; they do not face any difficulties in adopting technology or doing digital transactions. However, people in rural areas have low education, so they are uncomfortable with digital transactions and suffer greatly from income and purchasing power loss. Hence, despite substantial technological advancements in digital payments, the motive of moving away from cash is fading because it is easier to pay in cash. Moreover, the study observes a vast disparity in the budding of digitalization between rural and urban areas. There is no doubt that digital transactions are growing, but the slow pace needs to be accelerated rapidly. It is commendable that various government policies have already been rolled out to promote digitalization, like Jan Dhan Yojana (JDY) and Jan Dhan Aadhar Mobile (JAM). Still, there is a lack of awareness and financial literacy that needs to be considered by all stakeholders.

Additionally, the empirical study reveals that the stock market is not affected. The fall of share trading was observed three to four months after demonetization. However, later, it showed an increasing trend, which is a good sign of progress. Even forecasted value also showed a growing trend of shares trading.

Hence, this step has two aspects. First, it is deliberately exercised for the betterment of the economy. Second, it has a negative impact that reduces income leading to a fall in the rate of

consumption, investment, and savings which may further aggravate the economic condition of informal workers. Given the above, the following are recommended from a policy perspective:

- Empowerment of informal workers to get maximum benefits from social security schemes launched by the government.
- Equal wages for male and female workers are also a crucial aspect of economic development for the informal sector.
- Women must be economically empowered. This is because, during the case study, most women had no bank accounts and were highly impacted economically due to demonetization.
- Affordable digital platforms to promote digitalization, especially in rural areas.
- Comprehensive policies for cybercrime and provision of strict punishment.
- Guarantee of quick compensation in case of siphoning off money.
- Expansion of banking services, especially in rural areas, and extension of working hours of banks so that daily wage workers could get time to open or manage accounts.
- Dissemination of information among the illiterate population so they can perform digital transactions in their daily lives.
- Promotion of digital payment techniques.
- Preventing monopolization of digital payment services to rationalize taxes and surcharges.
- FDI on digital transactions and technology is welcome in India, especially in rural areas.
- Frequent conduction of awareness campaigns related to digital transactions in institutions like schools, colleges, and factories.

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