

Impact of Digital Payments on Economic Growth: Evidence from India

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Abstract: In recent years, economic transactions are carried out through electronic or online or cashless means all over the world especially in developed countries and developing countries like India. As a result of increased digital means of payment has brought down usage of cash transactions in the economy. Digital transactions have the features of speed, less cost, and comfort. A well functioning digital payment system has much relevance on overall economic activity, monetary policy, and financial stability of a country. This study tries to verify the impact of digital payments on the economic growth of India. The economic growth is measured through a proxy – real Gross Domestic Product. Digital payments are measured using Real Time Gross Settlement (RTGS), Clearing Corporation of India Ltd (CCIL) operated systems, paper clearing, retail electronic clearing, Card payments, and Prepaid Payment Instruments (PPIs). Data for digital payments and real GDP are collected from the year 2011 to 2019. Ordinary Least Square Regression, Auto-Regressive Distributed Lag (ADRL) co-integration approach and ARDL Bounds test are employed for the analysis. The study results reveal that digital payments impact economic growth significantly in the short run. But, digital payments don't impact economic growth in the long-run.

Keywords: Digital payments, Economic growth, Real GDP, RTGS, CCIL operating system, Card payments, Paper clearing, Retail electronic payments

I. INTRODUCTION

Global business is driven by technology and innovations. In many cases, technological innovations change the face of the businesses and the ways through which businesses are carried out. Technological innovations have also changed the prospect of payment systems. Modern technologies have turned traditional cash-based payments systems into a cashless payments system which is more efficient and effective. The features of digital payments like the ease of use, convenience, safety, and speed made digital transactions lucrative in the field of payments than a traditional system. Digital payments emerge as a favorite mode of payments all over the world including India.

Digital payments have been picking up rapidly in India since 2014 due to “Digital India” initiatives of the government, internet penetration, smart-phone penetration and adoption of the technologies by the people.

India has achieved a Cumulative Average Growth Rate (CAGR) of 58.9% in terms of volume and CAGR of 28.4% in terms of value in digital payments in the year 2019. This growth rate of India is remarkable in the global payments market (NITI Aayog, 2018).

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Digital payments have many advantages. Cashless payments discourage robbery and cash related crimes (Laura Arme, 2014). An efficient payments system increases the efficiency of financial markets and the financial system as a whole, boosts consumer confidence, and facilitates trade both in goods and services (BIS, 2003). On the other hand, unsafe and inefficient payment systems hamper the transfer of funds among individuals and economic actors (Humphrey et al 2006). Digital payments ensure efficient and effective payments among the parties involved at a minimum cost.

Researchers found that cashless payments bring operational efficiency, better revenue and lower operating cost to the business people (Alliance, 2003). Thus, higher operational efficiency synergized with the lower operational cost of the businesses leads to higher revenue and business growth. When the economy has an efficient payment system, macroeconomic variables will show positive effects. Electronic card payments have a meaningful impact on the world economy. The real global Gross Domestic Product (GDP) grew on an average of 1.8% due to electronic card payments (Zandi, 2013). Efficient electronic retail payments have a significant positive impact on economic activities for both euro-zone countries and non-euro-zone countries (Hasan, 2013). The research works indicate there is a relationship between digital payments and economic activities.

II. PROBLEM FORMULATION

The government of India takes digitalization forward rigorously and tirelessly. The government pushed digitalization through “Digital India” and Demonetization. These initiatives faced a lot of appreciations and criticisms in India. However, the digitalization effort has gained the confidence of people and started to pick up. The digitalization has reached the field of payments and settlement as well. The payments and settlements in India are dominated by cash and this dominance has gradually been minimized by digital payments like Real Time Gross Settlement (RTGS), National Electronic Fund Transfer (NEFT), Immediate Payment Services (IMPS), Cheque Truncation System (CTS), Unified Payment Interface (UPI), Bharat Interface for Money (BHIM) and Aadhar Enabled Payment System (AEPS) since 2014. Even after having robust growth in the digital payments market, there are still many questions unanswered in India. These questions include; Can a country like India where there is a large number of low-income people having low financial literacy and computer literacy transit to the cashless economy? Does the cashless economy impact economic growth in India as there is proved the relationship between these variables in other countries? Therefore, this study investigates quantitative evidence of the relationship between digital payments and economic growth in India and also this study look for the impact of

digital payments on the economic growth of India.

III. LITERATURE SURVEY

Digital payments literature is evolving and there is no conclusive definition of digital payments. Digital payments are considered synonyms with electronic payment, online payment, and cashless payments. In fact, digital payment is the function of electronic fund transfer, card payments, paper clearing, and prepaid payment instruments. Paper clearing indicates cheque clearing and prepaid payment instruments are prepaid payment cards and m-wallets.

Cashless payment is the economic transaction wherein goods and services are transacted without cash (Paul and Friday 2012). The e-payment is any payment service that makes use of information and communications technologies including Integrated Circuit (IC) cards, cryptography, and telecommunications (Jussi Snellman, 2001).

“Electronic funds transfer means any transfer of funds which is initiated by a person by way of instruction, authorization or order to a bank to debit or credit an account maintained with that bank through electronic means and includes point of sale transfers; automated teller machine transactions, direct deposits or withdrawal of funds, transfers initiated by telephone, internet and, card payment” (Government of India, 2017).

Many kinds of research have been done considering cause and effect relationships between the use of electronic payment instruments and the profitability of the organizations. Electronic payment technologies increase productivity and profitability (Berger, 2003).

Development in the use of electronic payments is related to remarkable improvement in bank performance (Humphery, 2006).

An efficient payment infrastructure facilitates trade, services, and transfers of funds, fostering economic interactions by eliminating or reducing market frictions and costs. Consumption and trade increase, in turn, support higher production and thereby overall economic development (Zandi, 2013).

Electronic card payments have a significant impact on each economy which has adopted it. Greater usage of electronic card payment products added \$983 billion in real U.S. dollars to the GDP of 56 countries they studied from 2008 to 2012. Card payment has raised consumption by an average of 0.7% across the 56 countries. Asian economies gained an average growth of 0.06% in their GDPs and 0.12% growth on consumption in the Asian economies. Further, India's GDP gained 0.07% due to the use of electronic card payments during the period of 2008 to 2012 (Zandi, 2013).

The present research work sought to identify and analyze the contribution of digital payments to the economic growth of India during the periods between 2011 and 2019.

IV. RESEARCH OBJECTIVE

The primary objective of this research work is to measure and analyze the impact of digital payments on the economic growth of India.

V. THE METHODOLOGY OF THE RESEARCH WORK

The study examines the causal relationship between digital payments and economic growth in India during the periods of 2011 to 2019. In this study, RTGS, Clearing Corporation of India Ltd (CCIL) operated systems, paper clearing, retail electronic clearing, Card payments, and Prepaid Payment Instruments (PPIs) are the proxies to measure digital payments in India. The economic growth of India has been measured using real GDP. The real GDP has been used as a proxy to measure economic growth (Wang et al 2016). The real GDP information has been taken from the Reserve Bank of India database on the Indian Economy for the chosen period of the study. Data on Digital Payments proxies have been collected from the Reserve Bank of India Bulletin. RTGS transactions include customer transactions and interbank transactions. CCIL operated systems reflect Collateralized Borrowing and Lending Obligations (CBLO), Government Securities clearing and Forex clearing. Paper clearing comprises of Cheque Truncations System (CTS), MICR clearing and Non-MICR clearing. Electronic Clearing Service (ECS), National Electronic Fund Transfer (NEFT), Immediate Payment Services (IMPS), and National Automated Clearing House (NACH) transactions represent retail electronic clearing. Card payments include both debit and credit cards. Prepaid payment instruments are represented by m-wallets, PPI cards, and paper vouchers. Quarterly data of the real GDP has been considered for the day. The real GDP data (GDP at market price) has been taken from the RBI database on the Indian Economy on a quarterly basis. Further, data on digital payments have been collected from RBI Bulletin where digital payments data are available monthly basis. The monthly data on digital payments are converted to quarterly data to conduct this study.

A regression model was used to predict the relationship between digital payments and economic growth in India. The formulated multiple regression model has been presented below;

$$Y_t = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \epsilon_t$$

Whereby Y_t is the logarithm of real gross domestic product for India at the time t , X_1 is the total value of RTGS for India at the time t , X_2 is the total value of CCIL Operating system for India at the time t , X_3 is the total value of paper clearing for India at the time t , X_4 is the total value of electronic retail clearing for India at the time t , X_5 is the total value of card payments for India at the time t and X_6 is the total value of PPIs for India at the time t . All values of independent variables are also logged values.

VI. RESULTS AND DISCUSSIONS

The unit root test was performed for all series of the data which are under consideration of this study in order to avoid spurious regression of non-stationary series at the level by employing Philips-Perron test statistic. The following table displays the results of the unit root test.

Table 1: Unit Root Test - Philips-Perron Method

Particulars	At level		1 st Difference	
	Adj. “t” statistics	P value	Adj. “t” statistics	P value
LReal GDP	-7.21646	0.0000	-	-
LRTGS	-1.08481	0.9156	-7.05587	0.0000
LCCIL Operating System	-2.202118	0.4719	-6.56895	0.0000
LPaper clearing	-3.31805	0.0820	-9.29651	0.0000
LRetail Electronic clearing	-3.1545	0.1121	-9.63879	0.0000
LCard Payments	-3.24152	0.0951	-7.94302	0.0000
LPrepaid Payment Instruments	-2.27502	0.4343	-5.18461	0.0012

Table 1 provides information about unit root test results. Real GDP is stationary at level itself (p-value is 0.00). Other variables namely RTGS, CCIL operating system, paper clearing, retail electronic clearing, card payments, and prepaid payment instruments are non-stationary at the level first and they become stationary at the 1st difference which is indicated by their respective p-values given in table 1.

Table 2: Ordinary Least Square Regression

Included observations: 32				
Variable	Coefficient	Std. Error	t-statistic	Probability
LRTGS	0.0475	0.035	1.332	0.1948
LCCIL_OS	-0.124	0.061	-2.00	0.0558
LPAPER_CLEARING	-0.058	0.108	-0.53	0.5971
LCARD_PAYMENT	-0.074	0.073	-1.01	0.3198
LELEC_RETAIL_PAYMENT	0.2536	0.051	4.929	0.0000
LPPI	0.0073	0.016	0.450	0.6559
C	9.8427	1.542469	6.381164	0.0000
R-squared	0.9865	Mean Dependant Variable		10.221
Adjusted R-squared	0.9832	S.D. Dependant Variable		0.1689
S.E. of regression	0.0218	Akaike Info Criterion		-4.620
Sum squared residual	0.0119	Schwarz Criterion		-4.299
Log-likelihood	80.923	Hannan-Quinn Criterion		-4.513
F-statistic	305.08	Durbin-Watson Statistic		1.6580
Probability (F-statistic)	0.0000			

Dependent variable: Log of Real GDP

Table 2 exhibits the results of Ordinary Least Square (OLS) Regression for the equation formulated for this study. In the OLS regression, the real GDP of India has been considered as a dependent variable and RTGS, CCIL operating system, Paper clearing, Card payments, Retail electronic payments, and prepaid payment instruments are the regressors. The results indicate that among the independent variables, retail electronic payments (p-value 0.00) is the only variable which impacts the real GDP significantly and the other variables – RTGS (p-value 0.194), CCIL operating system (p-value 0.055), Card payments (p-value 0.319), Paper clearing (p-value 0.597) and prepaid payment instruments (p-value 0.655) - do not impact the real GDP significantly at 5% level of significance. The R squared value of the model is 0.986526

which means that the independent variables of the study explain the variance in the dependent variable to the extent of 98.65 percent. The regression model has the Standard Error of 0.021832 and Sum square residual of 0.011916 which are the indicators of the minimum difference between estimated Y (real GDP) and actual Y (real GDP) of India. As the p-value of F statistic is 0.00, the prediction model under the consideration is significant at the overall level. All three criterion scores- Akaike Info Criterion (-4.620234), Schwarz Criterion (-4.299605), and Hannan-Quinn Criterion (-4.513955)– are smaller and closer to each other. Durbin-Watson statistic ensures (1.658005) that there is no serial correlation problem in the model. From the above results, it can be concluded that the prediction model considered for the study does not have any serial correlation problem and the model is significant at the overall level. Further, retail electronic payments impact the real GDP significantly. Moreover, there is a minimum difference between the estimated dependent variable and the actual dependent variable.

Table 3: Auto-Regressive Distributed Lag Co-integration Approach

Variable	Coefficient	Std. Error	t-statistic	Probability
LREAL_GDP(-1)	-0.046	0.0791	-0.58	0.5626
LREAL_GDP(-2)	-0.003	0.0793	-0.04	0.9635
LREAL_GDP(-3)	-0.047	0.0715	-0.66	0.5138
LREAL_GDP(-4)	0.674	0.0933	7.226	0.0000
LELEC_RETAIL_PAYMENT	0.091	0.0330	2.760	0.0114
C	3.4657	1.3410	2.584	0.0169
R-squared	0.9967	Mean Dependant Variable		12.570
Adjusted R-squared	0.9959	S.D. Dependant Variable		10.254
S.E. of regression	0.0096	Akaike Info Criterion		0.1523
Sum squared residual	0.0020	Schwarz Criterion		-6.2567
Log-likelihood	93.594	Hannan-Quinn Criterion		-5.9712
F-statistic	1341.4	Durbin-Watson Statistic		-6.1694
Probability (F-statistic)	0.0000			
Included observations: 28 after adjustments				
Model selection method: Akaike info criterion (AIC)				
Selected Model: ARDL(4, 0)				

Dependent variable: Log of Real GDP

ARDL co-integration approach is employed to find out the long-run relationship between real GDP, and retail electronic payments. Other independent variables namely RTGS, CCIL operating system, card payments, paper clearing, and prepaid payment instruments are not considered for checking long-run relationships as these variables do not significantly explain variance in real GDP of India. Table 3 indicates that the Akaike info criterion is used for model selection and the numbers of included observations are 28 after adjustment. Model (4,0) is a selected model out of 20 models evaluated.



Table 4: ARDL Bounds Test for Co-integration analysis

Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	K
F-statistic	2.632267	1
Critical Value Bounds		
Significance	Lower Bound	Upper Bound
10%	4.04	4.78
5%	4.94	5.73
1%	6.84	7.84

The present study investigated the long-run relationship among real GDP, and retail electronic payments employing the ARDL Bounds test. Table 4 presents the results of the Bounds test. According to the results of the Bounds test, the computed F – statistic is 17.65581 and lower and upper critical bounds at 10%, 5%, and 1% are (4.04, 4.78), (4.94, 5.73), and (6.84, 7.84) respectively. Since the computed F statistic is less than the upper bound critical values at all significance levels, the null hypothesis is accepted and it is concluded that there is no long-run relationship between real GDP and retail electronic payments.

Table 5: Estimated Long-run coefficients

Variable	Coefficient	Std. Error	t-Statistic	P value
LELEC_RETAIL_PAYMENT	0.2157	0.0082	26.08	0.00
C	8.1883	0.0622	131.4	0.00

Dependent variable: Log of Real GDP

The present study interprets the long-run relationship through the long-run elasticity derived from the estimated long-run coefficients of the ARDL model. The long-run coefficient for the independent variable of the study is presented in table 5. The P-value of retail electronic payments is 0.000 with an elasticity of 0.2157.

Based on the results of the Bounds Test and estimated long-run coefficient, it can be concluded that retail electronic payments do not impact the real GDP in the long-run.

Tables 1 to 5 present natures of the data considered for the study and the relationships among them in a short-run and long-run basis. The following observations can be made based on the results of the study;

- a) All the variables considered are converted into a logarithm.
- b) Dependent variable (Log real GDP) is stationary at the level
- c) Independent variables are stationary at the first difference
- d) The variable namely retail electronic payment has a significant impact on the real GDP of India in the short run.
- e) But, there is no long-run relationship between real GDP and retail electronic payments.
- f) So, digital payments don't impact the economic growth of India in the long-run.

Digital payments in India are measured by two segments namely Systematically Important Financial Market Infrastructures (SIFMIs) and Retail Payments. SIFMIs consist of Real-Time Gross Settlement (RTGS), and CCIL operating systems. Retail payments include paper clearing, retail electronic clearing, card payments, and prepaid payment instruments. The results of the present study show that SIFMIs don't have an impact on the real GDP of India. But, retail payments-especially retail electronic payments such as Electronic Clearing Services (ECS), National Electronic Fund Transfer (NEFT), Immediate Payment Services (IMPS), and National Automated Clearing House (NACH) have a significant short-run impact on real GDP. These electronic payment avenues have got prominence after the demonetization and "Digital India" initiatives of the Government of India and have grown healthy after the year 2014. In the long run, retail electronic payments don't impact the GDP of India. Therefore, it can be understood that Digital payments at large and retail electronic payments don't contribute to the economic growth in India directly in the long-run and these payments may indirectly contribute to economic growth through speedy, lesser cost and convenient economic transactions.

VII. CONCLUSIONS

Innovative technologies have brought new paradigms in the global business. One of the most disturbed areas of the business by innovative technologies such as Artificial Intelligence, Blockchain, Machine learning, and Cloud computing is payment and settlements. In fact, the financial services sector has confronted with dramatic technological advancement and as a result, this sector has grown remarkably. Researchers in the European Union, China, and other advanced countries have found that a well-functioning payment system brings a better financial system and boosts consumer confidence. On the other hand, inefficient payment system hinders the efficient transfer of funds and settlement among individuals and economic actors. But, there is a limited study in India on the efficiency of the payment system driven by technology on the financial system and economy. This study intends to bridge the gap. The present focuses on measuring and analyzing the impact of digital payments on economic growth. The study employed real GDP as a proxy of economic growth and used RTGS, CCIL operating system, paper clearing, card payments, retail electronic payments, and prepaid payment instruments to measure digital payments. The study applied ordinary least square regression, ARDL co-integration approach and ARDL Bounds Test to assess and analyze the impact of digital payments on economic growth in India. The study reveals that among the independent variables, retail electronic payment is the only variable that impacts the real GDP significantly and the other variables do not impact the real GDP significantly in the short-run. In the long run, retail electronic payments don't impact the GDP of India. Therefore, it is concluded that Digital payments at large and retail electronic payments don't contribute to the economic growth in India directly in the long-run.

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