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Digital Payments and GST Revenue: An Empirical Analysis

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Abstract

The robust functioning of a tax system depends largely on the technological advancements and digital ecosystem of the economy. This paper analyses the relationship between digital payments and the GST revenue in India in the context of digitalisation of the economy in India. The period of study is from August 2017 to March 2022. In the ARDL (Autoregressive Distributed Lag) framework, our empirical results suggest that there exists a positive and significant long-run relationship between digital payments and GST revenue in India. Apart from the digital payments, the performances of the economy, tax compliance and imports have a positive and inflation and exports have a negative relationship with GST revenue in India. Among the various measures by the tax authorities in improving compliance and increasing tax revenue, digital payments stand odd as it involves no extra efforts either by the taxpayers or by the tax officials. The findings of the study highlight the importance of digital transactions not only in transforming the nation into a digital economy and reaping its benefits but also in enhancing the tax revenue of the country.

Keywords

Goods and Services Tax – Digitalisation - Digital payments – Tax Compliance – ARDL model

1. Introduction

The Covid-19 pandemic has made a momentous impact on non-cash payments all over the world and the anecdote is not different for India. The sudden huge shift from cash to digital payments associated with the spread of the pandemic can be attributed to a number of contributing factors such as the closedown of shops, the non-availability of physical cash, and the hesitation to make physical contact (Bank for International Settlements, 2021). The usage of digital modes of payments such as cards and other non-physical modes of transfer witnessed tremendous growth during and after the pandemic period (Pietrowiak et al., 2021). Thus, the "virus" became a catalyst for the exponential growth of digital transactions. Digitalization initiated as a matter of convenience then became a matter of necessity during the pandemic and a major behavioural pattern of payment thereafter.

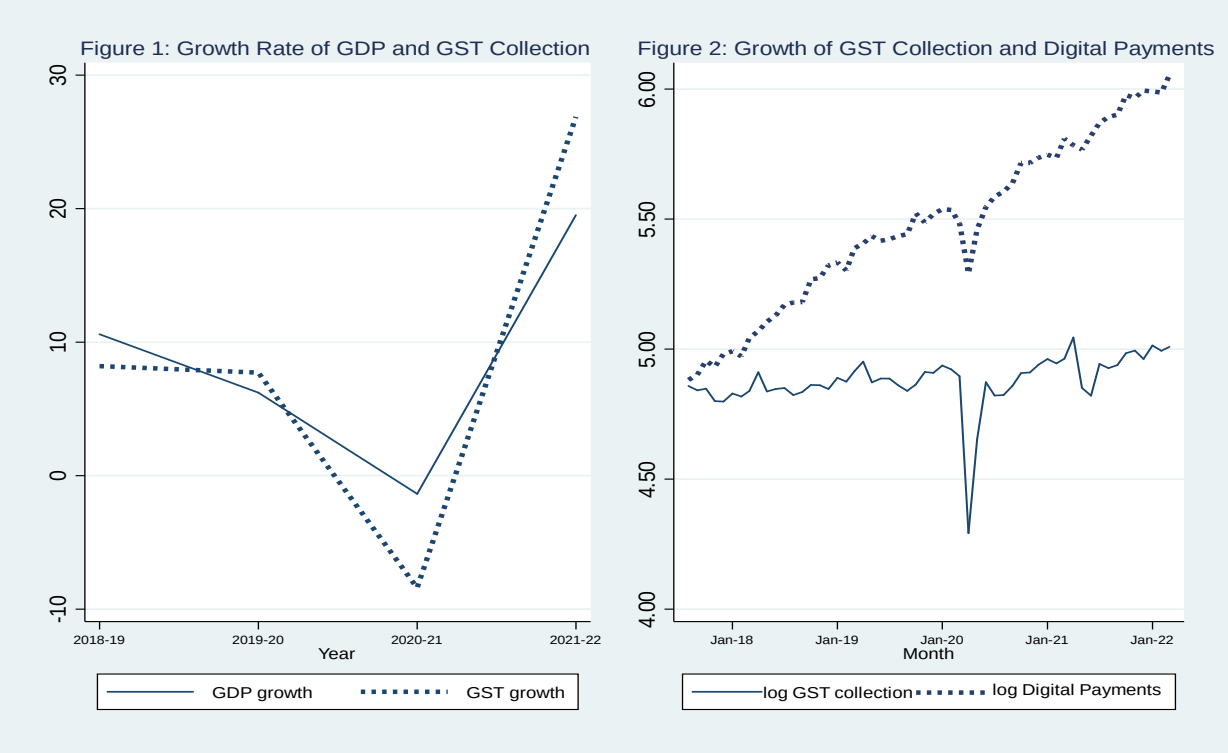
The surveys conducted during the last few years by the central banks of various countries revealed a decline in the cash usage and preferences for digital payments by the consumers (See Caddy et al., 2020; Foster et al., 2020; Reserve Bank of New Zealand, 2019; Henry et al., 2018). The payment system in India also has undergone a radical transformation during this period. As of March 2021, the share of retail digital payments accounted for around 80 percent of total retail payments (RBI, April 2021).

The pandemic has bottlenecked the normal activities of the economy. It curtailed the production and income generation activities and slashed the consumption expenditures, thus, hitting hard on revenue collected from Goods and Service Tax (GST). But when the virus started to recede, we saw the gradual recovery of the economy and the tax revenue.

The growth of GST revenue outpaced the growth in the Gross Domestic Product (GDP) of India after the pandemic (See fig 1) in its phase of recovery. The growth in the GST revenue can be accredited to the combined effect of increased consumption and improved compliance. Other than consumption what contributes more to the improved GST revenue is the primary question of inquiry. Various literature suggest a positive relationship between the digitalization of payments and improved tax revenue (See Bird & Zolt, 2008; Danchev, Gatopulus & Vettas, 2020; Dogan, 2011; Hondroyiannis and Papaoikonomou, 2017; Immordino & Russo, 2018; Madzharova, 2014; Maherali 2017; Slemrod et al., 2017).

In this context, it is evident that India’s transaction or payment architecture is being subjected to a drastic change in favour of non-cash payments and from literature, it is evident that

digitization of payments is a strong predictor of increased tax revenue. This article thus focuses on the evolving relationship between digital payment and GST Revenue in India (See fig 2.). The discussion is organized as follows. Section 2 deals with the various existing studies that explain the relationship between tax revenue and digital payments while Section 3 explains the mechanism through which digital payments lead to better tax revenue. Section 4 explains the digital payment ecosystem in India and Section 5 deals with the data and methodology followed the results and interpretation and finally the conclusion.



Source: Own calculation based on data from MOSPI, GST portal, RBI and NPCI

2. Review of Literature

Danchev, Gatopulus,G, & Vettas, (2020) used the method of least squares to conclude that the growth of electronic payments has positively impacted the tax compliance in Greece. They portrayed that out of the new nine digital transactions recorded in Greece between 2015 and 2017, at least one corresponded to a previously unrecorded economic transaction. There are also other studies that manifested the growth in VAT revenue as compliance is increased as a result of an increase in the value of payment cards transaction in the Greek context (Hondroyiannis and Papaoikonomou, 2017).

European pieces of evidence as well show that VAT evasion and the use of card payments are negatively related (Immordino & Russo, 2018). The prime reason identified by them for this relationship is the non-traceability of the cash transactions. Madzharova (2014), enquired whether there is any association between the mode of payment and VAT revenue using the data from 26 European Union (EU) countries for the decade, 2000-2010. He could show a consistently negative impact of cash on VAT payments. It is also important to note that POS (Point of Sale) terminals are shown to affect the VAT-to-consumption ratio positively in almost all regressions.

Even income taxes are affected by the mode of payment of transactions. Slemrod et al. (2017) find that sales with electronic payments significantly increase the reported income of US sole proprietorships.

In the Indian context, barely any literature explores the relationship between these two interesting players in the economy, especially in the context of GST. This could be attributed to many reasons such as the primitive phase of development of the digital payment environment of India, limited availability of data, and the shorter period after the implementation of GST. In fact, there exists a wide gap in the literature on this area and we try to address a fraction of this gap through our analysis.

3. Conceptual Framework

Researchers explain the affinity of tax revenue and digital payments in multiple ways. Among them, the traceability of transactions is the paramount one. The non-traceability of transactions, as Immordino and Russo (2018) have argued, will induce the buyer and the seller to enter into a bargain of price discount and the success of this bargain leads to tax evasion. When the transaction becomes traceable, this probability evades. Therefore, by creating digital records and leaving digital traces, digital payments pour light into the otherwise unseen financial lives of individuals and businesses. The digital payment trails make it easier for governments to measure statistics, including the tax and income, for their county.

The increased use by businesses of financial institutions to channel receipts and expenditures provides information not only on those businesses but also on their suppliers and businesses further down the economic activity chain. Similarly, the increased use of credit cards or more sophisticated electronic payment mechanisms provides not only information as to the financial

capacity of the purchaser, but also information that may be used to confirm the value-added tax (VAT) and income tax filings of the sellers (Bird & Zolt, 2008). In the United States, third-party organizations, including banks, are required to share the information collected by them with the revenue authority and this data is used by the authority to match merchants' sales with reported sales (Treasury Inspector General for Tax Administration, 2011). Even the knowledge of the firms that transactions are recorded by third parties can serve as a major deterrent to evasion and as a tool to diminish the tax gap (Madzhariva, 2014). The availability of checking credit card sales while preparing tax returns has helped to reduce noncompliance to a large extent in Turkey (Dogan, 2011).

When more people are brought into the purview of formal financial institutions, the tax revenue will eventually rise. Financial inclusion nourishes the interconnection between digital payments and tax revenue. The literature suggests that the broader adoption of digital payments significantly helps the financial inclusion of the disadvantaged sections (Leora & Dorothe, 2014). "If financial inclusion is the road to bring people to the formal economy, then digital payments are the vehicle that makes the journey possible" (Alim, 2017). Consumers can demand and perform digital modes of payments only if they are financially included in its broader sense. Financial inclusion leads to better tapping of the benefits of digitalization and digitalization in turn leads to the further deepening of financial inclusion. They are reciprocating the derived benefits. Both these factors together contribute to better tax revenue.

The reduction of the shadow economy is the next factor that relates digital payments with tax revenue. In a study of Europe's shadow economy, Schneider (2013) found that increasing digital payments by an average of ten percent annually for four years can shrink the shadow economy by five percent and shift the behaviour of merchants who underreport sales. This is because the use of electronic payments produces a document of the transactions making it more difficult to participate in the shadow economy. Alim (2017) also provides shreds of evidence of digital payments help reduce the shadow economy and improve adherence to tax laws worldwide.

The mechanism of VAT augmenting revenue via digital payments

Improvement of tax compliance mainly depends on the public who should always insist on genuine tax invoices for every procurement of goods and services. This compliance of ultimate consumers at large will voluntarily ensure the compliance of the immediately preceding

registered person (retailer) under the supply chain. This impact continues towards the upward direction of the chain and creates a multiplier outcome in tax compliance.

A digital payment by the public will insist his suppliers to record their supply outwards of goods and services. This systemic change reduces the chances of the retailer to suppress the turnover. When the retailers' outward supply is largely accounted, to match with the recorded outward supply, the inward supply will also be recorded. This, in turn, forces all the registered persons under the supply chain to record the transactions. Thus, the benchmark of improving tax compliance started from the public at large and percolated in the upward chain. This ensures the recording and presenting of transactions by different players in the supply chain who earlier could easily evade tax in the absence of digitalization.

As the standard theory of evasion suggests (Allingham & Sandmo, 1972), evasion has a positive relationship with the probability of being caught. The probability of being caught increases since digitalization leaves digital traces. Further digitalization ecosystem will increase the perception of the taxpayers of being caught. Therefore, there exists a negative relationship between digitalization and underreporting of supply.

The probable evasion that may creep in is the use of non-business accounts for escaping from formalizing digital payments. The intention of using non-business accounts (including bank accounts of relatives and friends) is non-recording or under-recording the transactions and thereby creating a barrier to efficient tax collection. Through the cash withdrawals from such non-business accounts, the registered person may opt for unaccounted purchases from the predecessor. However, this practice will not work in a large scale since income tax law restricts cash withdrawal from bank accounts as unexplained debits.

4. Digital Payment Ecosystem in India

India has a wide range of payment facilities arranged for customers and RBI is considered the official authority to regulate and supervise the payment systems in India. The enactment of the Payment and Settlement Systems Act, of 2007 (Roy, 2021) and the launch of the National Payment Corporation of India Ltd (NPCI) in 2008 for operating retail payments and settlement systems in India were the landmarks in Indian digital payment scenario. Due to these efforts, the share of digital payments in India has been gradually increasing and currently, around 89 percent of the total payments in India are digital (RBI, 2021).

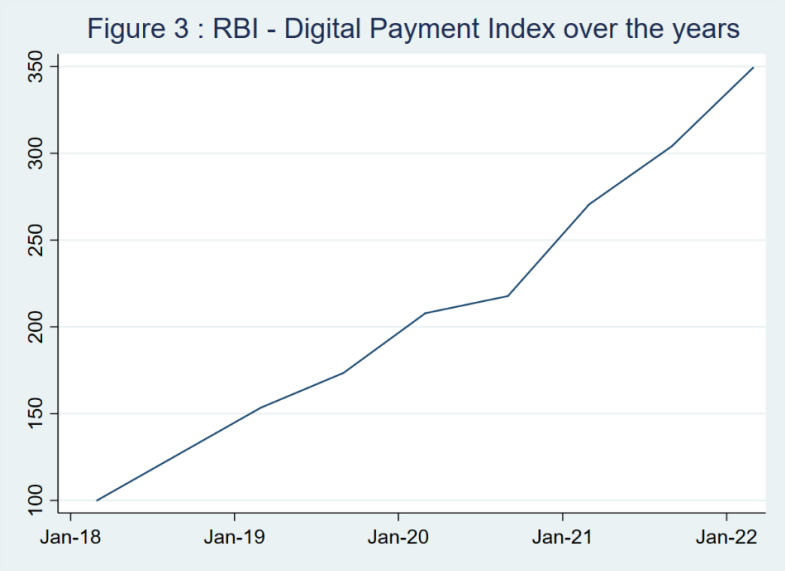
The digital payment modes in India can be classified into two categories; Fund Transfer Payment Systems (FTPS) and Merchant Payment Systems (MPS). FTPS includes RTGS (Real Time Gross Settlement), NEFT (National Electronic Funds Transfer), and IMPS (Immediate Payment Service). These are mainly involving money transfers, Government disbursements, etc. Meanwhile, MPS facilitates payments for availing goods or services (RBI, 2022). It includes card networks (Debit cards, Credit Cards) and Prepaid Payment Instruments (PPI). UPI is acting both as an FTPS and an MPS.

Our analysis takes into consideration only the Merchant Payment Systems and UPI as these are the most commonly used digital payment systems, related to the purchase and sale of goods/services. Even though some of the remaining digital payment modes, (Fund Transfer Payment Systems) facilitate merchant payments, these are not popular channels for the daily purchase of goods and services (RBI, 2022).

Further, there are sufficient valid reasons for the inclusion of these three payment modes in the analysis. The growth in tax revenue due to increased usage of digital payments is mainly attributed to informal sectors, small and unnoticed traders. The development of UPI has significantly contributed to the journey toward a cashless economy by giving confidence to people to go out without taking any cash in hand. This necessitated such traders to accept digital to ensure sales. This not only has resulted in the growth of UPI transactions but also facilitates the growth of other digital payment modes.

Again, the growth of online transactions during the past few years was tremendous, especially after COVID. Most people prefer card payments or UPI for making payments for their online purchases. Therefore, a huge increase in these payment modes is attributed to online shopping or e-commerce, where tax could not be avoided. The reduced prices and offers they receive through online shopping outweigh the advantage they gain through the bargaining made with the traders for underreporting the sales.

As a result of the above mechanisms, digital payments in India are proliferating. The Digital Payment Index (DPI) developed by RBI to capture the extent of payment digitalisation in the country taking March 2018 as the base year, shows a significant growth in the payment digitalisation in India (See Fig 3).



Source: RBI

5. Data and Methodology

5.1 Data

The period of study is from August 2017 to March 2022. Monthly data of GST collection, segregated as CGST Collection, IGST collection, SGST Collection and Cess Collection of all the states are taken from the GST portal[1]to arrive at the total collection of the nation. The data regarding UPI was taken from NPCI and those pertaining to Debit cards and Credit cards were taken from RBI. From the Bank wise ATM/POS/Card statistics available from the Reserve Bank of India, the individual banks' data was added up to arrive at the data for card transactions[2]. Due to the unavailability of data concerning Prepaid Payment Instruments (PPI), the variable has been ignored in the study.

CPI and IIP data are taken from MOSPI (Ministry of Statistics and Programme Implementation). The data pertaining to imports and exports has been taken from the data published by the Department of Commerce, Ministry of Commerce and Industry[3].

[1] https://www.gst.gov.in/download/gststatistics.

[2] Monthly data available at Payment system indicators were not comparable from November 2019 onwards.

[3] https://tradestat.commerce.gov.in/meidb/default.asp

Table 1: Descriptive statistics					
Variables	**Obs**	**Mean**	**Std. Dev**	**Min**	**Max**
GST collection	56	4.87	.10	4.29	5.04
IIP	56	2.10	.06	1.73	2.17
GST compliance	56	91.82	2.66	87.65	96.63
CPI	56	2.17	.03	2.13	2.22
Digital Payments	56	5.47	.33	4.88	6.05
Export	56	5.29	.09	4.89	5.53
Import	56	5.45	.10	5.11	5.68

5.2 Methodology

Autoregressive Distributed Lag (ARDL) model is applied to establish the long run relationship between the variables. The dependent variable is GST collection and the independent variables are digital payments, the Index of industrial Production (IIP), the Consumer Price Index (CPI), GST compliance, imports and exports. Variables except compliance are converted into a log form. Compliance is expressed in percentage form.

ARDL Model

An Autoregressive Distributed Lag model is an ordinary Least Square (OLS) based model which could be used when the variables are stationary or of mixed order of integration. This Model takes sufficient number of lags to capture the data generating process in a general to specific modelling framework (Pesaran & Pesaran, 1997).

The model equation is as follows

$$gst_t = \beta_0 + \beta_1 gst_{t-1} + \beta_2 gst_{t-2} + \gamma_0 comp_t + \gamma_1 comp_{t-1} + \gamma_2 comp_{t-2} + \gamma_3 comp_{t-3} + \theta_0 cpi_t + \theta_1 cpi_{t-1} + \theta_2 cpi_{t-2} + \theta_3 cpi_{t-3} + \alpha_0 digpay_t + \alpha_1 digpay_{t-1} + \pi_0 export_0 + \pi_1 export_{t-1} + \pi_2 export_{t-2} + \pi_3 export_{t-3} + \vartheta_0 iip_t + \vartheta_1 iip_{t-1} + \vartheta_2 iip_{t-2} + \vartheta_3 iip_{t-3} + \omega_0 import_t + \varepsilon_t \quad (1)$$

Table 2: Variable Description

Variable Code	Variable Name	Description
gst	GST Collection	Monthly GST collections in India
digpay	Digital Payments	Monthly Value of transactions made through UPI, Debit card POS and credit card POS
cpi	CPI	Consumer Price Index
export	Exports	Total exports made by India
import	Imports	Total imports made into India
comp	Compliance	The number of eligible taxpayers who have filed GSTR 3B before or after the due date
iip	IIP	Index of Industrial Production

Control Variables

Digital payments is not the single factor that affects GST revenue. The literature identifies various other factors that can potentially affect the same. Based on the literature we have identified the following control variables.

1. **GST Compliance**

Compliance with a tax system is one of the prime elements that can significantly impact the revenue from it. It is simply the taxpayer's decision to comply with the laws and regulations that govern the tax system which results in the timely and accurate filing of returns and payment of the tax. It is tenable to argue that the more compliable the tax, the more will be the revenue and vice versa. Improving the efficiency of tax collection and tackling tax evasion can increase government revenue and ensure that the redistributive properties of the tax system function (European Union, 2012).

2. **Economic performance**

When the economy is moving up, the aggregate demand goes up and the tax revenue will go up. Similarly, when the economy is in a recession, the aggregate demand goes down. Bikas & Andrskaite (2013) identified economic situation of the country affects the tax revenue. The

Gross Domestic Product of the country is the true, convenient and conventional measure of its economic performance. But due to the limitation concerning the availability of high-frequency data on GDP, we use the Index of Industrial Production as an indicator of economic performance that is available on a monthly as a proxy of the economic performance of the country.

3. Inflation

GST is an ad-valorem tax charged on the price of goods and services. When the price of the goods or services, changes, the tax amount also gets affected. Therefore, inflation is a factor that can potentially affect GST collections. Researchers like Imam and Jacobs (2014), have supported this positive influence of inflation on tax revenue. His study was conducted in 12 Middle Eastern countries from 1900 to 2003.

At the same time, some researchers argue that there is a negative relationship between tax revenue and inflation. Taxpayers respond to "tax increases" due to inflation through informal economic activities, underground economies, and tax evasion (Amin et al., 2014). Ayenew (2016) also confirms this negative relationship. Tanzi (1977) has identified the lags in tax collection as a reason for this negative relationship. So, to capture the impact of digital payments on GST tax collection, we control for inflation in the model using Consumer Price Index.

4. Exports and Imports

Literature also suggests exports and imports as important factors affecting tax revenue. Amin *et. al.* (2014) has also made a significant finding that imports raise revenue while exports reduce tax revenue. Tanzi (1992) argued that the share of imports in the GDP has a positive relationship with the tax revenue. Ahmed & Mohammed (2010) also learned that imports have a positive impact on tax revenue. Anware (2014) also established a positive relationship between tax revenue with exports and imports. The study by Stotsky and WoldeMariam (1997) concluded that the share of exports has a positive impact on tax revenue.

There are a large number of other variables that are identified to be affecting tax revenue. To list a few, GDP per capita, agricultural sector, industrial sector, capital inflow, openness, political stability, corruption, inflation, accountability, and mortality are some of the important economic determinants of tax revenue (Tanzi and Davoodi, 1997; Ghura, 1998; Piancastelli,

2001; Gupta, 2007; Bird et al., 2008; Chaudhry and Munir, 2010; Dioda, 2012; Karagoz, 2013; Castro and Camarillo, 2014; Gobachew, et.al 2017). However, the majority of the above-said variables are used to capture the country-specific characteristics and become nearly time invariant when considering a comparatively small span of a period of fewer than five years, we only control for four variables explained above.

6. Results and Interpretation

6.1 Unit Root Test

Augmented Dickey-Fuller Test is done to check the stationarity of the independent and dependent variables (with constant) the results of which are given in Table 1. Lag lengths are based on Schwarz Info Criterion. P value less than 5 percent indicates that the variables are stationary at a 5 % significance level or else non-stationary. The results of ADF Test are in Table 3.

Table 3: Unit Root Test Results (ADF)

Variables	**P- Value**	
	At Level	At First Difference
gst	0.000	0.000
comp	0.232	0.037
cpi	0.987	0.000
digpay	0.854	0.000
iip	0.001	0.000
import	0.424	0.000
export	0.071	0.000

The results explain that the variables are stationary at I(0) or I(1) and not at I(2). This prevents us from doing a simple OLS regression or cointegration. Therefore, we adopt Autoregressive Distributed Lag (ARDL) approach, as it can be used to establish the long run relationship between the variables irrespective of whether the variables are I(0), I(1) or a combination of both.

6.2 Bounds Test

The bounds test is to check the long-run relationship of the variables and this is done by computing the Bound F statistic. The null hypothesis is that there is no levels relationship and the alternate hypothesis is that there is a levels relationship. When the F-statistic is above the upper band, we reject the null hypothesis that there is no levels relationship and when it is below the lower band, we fail to reject the null hypothesis that there is no levels relationship. If the F statistic is within the band, then we have to know whether the underlying variables are I(0) or I(1).

Table 4: F - Bounds Test Results

Dependent variable: GST collection

Test Statistic	**Value**	**Significance level**	**I(0)**	**I(1)**
F-Statistic	13.951	10%	2.139	3.204
Actual Sample Size	53	5%	2.49	3.658
		1%	3.33	4.708

Since the F statistic is above the upper bound critical value, it implies that there exists a co-integration or a long run relationship between the dependent variable and independent variables in the model.

Since there exists a long run relationship between the variables, the ARDL approach to co-integration is applied. The optimum lag length (k) is determined by Akaike Information Criterion (AIC).

6.3 Levels equation

The levels equation illustrates the long run relationship of the variables at the level. The results of the level equation are given in Table 5.

Table 5: Levels equation				
Dependent variable: GST collection				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob**
comp	0.003	0.002	1.85	0.07
cpi	-1.5	0.565	-2.65	0.01
digpay	0.31	0.046	6.63	0.00
export	-0.56	0.226	-2.46	0.02
iip	1.52	0.160	9.50	0.00
imp	0.27	0.125	2.15	0.03
c	4.38	0.929	4.71	0.00

The result of the levels equation suggests that digital payment has a positive and significant effect on GST revenue collection. All other control variables have also appeared significant in the model while compliance, IIP, and imports have a positive coefficient, CPI and exports have negative coefficients.

IIP can be considered a proxy for the economic performance of the country. Manufacturing or industrial output is expected to be high during the time of economic boom and recession phase bottlenecks the same. So, the Index of Industrial production positively and significantly impact the tax revenue since increased production is accompanied by increased income and therefore increased consumption. A hike in consumption expenditure directly leads to increased tax revenue.

The results also suggest a negative relationship between CPI and GST revenue. In fact, there are a large number of literature suggesting a negative relationship between them. The reason is that the increased price of goods and services will lead to a decrease in the demand for the same which will affect their sale and thereby a decrease in the indirect tax revenue of the Government.

Further the results also suggest a positive relationship between imports and GST collection. Import of goods and services are significant sources of GST revenue as these imported products are consumed in the country at various stages which will lead to increased tax revenue. The treatment of exports in the GST regime is unique as they are treated as zero-rated goods under which a supplier is eligible to receive back the input tax paid by him to acquire the exported

goods or services. In such a way, there is no wonder in seeing a negative relationship between exports and GST revenue.

6.4 Conditional Error Correction Regressions

The Error Correction Model explains the short run dynamics of the underlying variables. The estimated Error Correction Model is as follows (Table 6.)

Table 6: ECM Regression

Dependent Variable: GST collection

Variable	Coefficient	Std. Error	t-Statistic	Prob.
c	6.16	2.27	2.72	0.01
gst(-1)*	-1.40	0.14	-9.90	0.00
comp(-1)	0.01	0.00	1.49	0.15
cpi(-1)	-2.11	1.25	-1.69	0.10
digpay(-1)	0.43	0.12	3.44	0.00
export(-1)	-0.79	0.25	-3.14	0.00
iip(-1)	2.14	0.28	7.66	0.00
imp**	0.38	0.15	2.49	0.02
D(comp)	-0.01	0.00	-1.37	0.18
D(comp(-1))	-0.01	0.00	-1.62	0.11
D(comp(-2))	0.01	0.00	2.79	0.01
D(cpi)	-0.48	2.22	-0.22	0.83
D(cpi(-1))	2.08	2.08	1.00	0.33
D(cpi(-2))	-2.62	2.08	-1.26	0.22
D(digpay)	0.06	0.19	0.32	0.75
D(export)	-0.08	0.19	-0.43	0.67
D(export(-1))	0.58	0.22	2.67	0.01
D(export(-2))	0.50	0.15	3.31	0.00
D(iip)	1.30	0.25	5.23	0.00
D(iip(-1))	-0.23	0.22	-1.05	0.30
D(iip(-2))	-0.65	0.17	-3.79	0.00

Conclusion

This paper analysed the nature of the relationship between digital payments and tax revenue growth in India. Our empirical analysis finds that digital payments is a strong predictor of GST revenue in India and they are positively associated in the long run. The promotion of digital payments, apart from tax revenue, has a strong positive correlation with economic growth, trade, and consumption. (Hassan, et. al. 2012). Besides this, other factors that positively

influence GST revenue are GST compliance and imports. At the same time, CPI and Exports have a negative impact on GST revenue.

Tax revenue of the government can be enhanced through multiple channels including audits, check posts, account scrutiny, etc. But optimum tax revenue with least complications and effort is the desirable state of affairs. The aforesaid measures have their limitations in that regard. These methods of course will increase the revenue but create pressure on the taxpayers and demands huge work by the tax officials. But digital payments, bypassing this problem, volunteers augmented and sustainable revenue. People choose digital payments because they are conditioned to them very organically. Further, it involves zero cost, either from the Government or the taxpayer side. Various theories have suggested that strengthening and encouraging voluntary compliance augments and sustain the tax revenue. Thus, digitalization proves to be the best tool for voluntary compliance by taxpayers.

At the same time, the mode of retail digital payment is also not an ever-winning solution to mitigate tax evasion; We cannot close all doors of tax evasion. However, digital mode of payment can reduce evasion to a large extent and increases tax revenue. Here again, lies the role of ultimate consumers in ensuring compliance by demanding tax invoices for each and every transaction. It is concluded that the tax authorities should come out with nationwide public awareness to encourage digital payments.

Much attention should be given to digital payments and ways to foster them should be developed. Information sharing by third parties and tax authorities should be practiced. Not merely because it brings revenue to the government, but for the fact that digital economy is, at current times, not a luxury but a necessity for a developing nation like India.

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ANNEXURES

A.1: GDP and GST from 2017-2022

Year	GDP (Crores)	GST (Crores)	GDP Growth	GST Growth
2017-18	17090042	810275		
2018-19	18899668	876746	10.58	8.20
2019-20	20074855	944407	6.21	7.71
2020-21	19800913	865059	-1.36	-8.40
2021-22	23664636	1097545	19.51	26.87

Source: EPWRF, GST Portal

A.2: RBI - Digital Payment Index

Period	**RBI- DPI Index**
March 2018(Base)	100
March 2019	153.47
September 2019	173.49
March 2020	207.84
September 2020	217.74
March 2021	270.59
September 2021	304.06
March 2022	349.3

Source: RBI

A.3. Retail Payments in India

As per RBI, Retail payments in India include

A. Retail credit transfers

1. Aadhar Enabled Payment System (AePS)

Using Aadhar as one's identity, Aadhar Enabled Payment System (AEPS) helps a customer to perform basic banking transactions such as balance enquiry, cash withdrawals etc at Points of Sale through the business correspondent.

2. Aadhar Payment Bridge System (APBS)

APBS also uses Aadhar number as vital component. APBS is usually used to channelize all the subsidies and benefits by the Government to the Aadhar enabled bank account.

3. Immediate Payment Service (IMPS)

Initiated by NPCI, IMPS is an instant money transfer service where users can transfer funds from their savings account in real time. The major advantage of IMPS is that this service is 24*7, 365 days. This service is also available through various channels such as mobile, internet, ATM and SMS.

4. National Automated Clearing House Credit (NACH Cr)

NACH is a clearing house for banks, financial institutions, corporates and Government. NACH (Cr) is an electronic payment service used by an institution to afford credits to a large number of beneficiaries in their bank accounts for the payment of dividend, interest, salary, pension etc

5. National Electronic Fund Transfer (NEFT)

Under NEFT, users can transfer limited funds from any bank to any individual with another bank account anywhere in India, conditional that the latter's bank should be a bank participating in NEFT. The sender does not require a bank account in this case. This do not support real time settlements but operate in hourly basis with different batch

6. Unified Payment Interface (UPI)

UPI is becoming the most popular retail payment system in the country. UPI is also managed by NPCI. This is also an immediate real time payment system helping transfer funds between different accounts. The main reason behind the success of this mechanism is that with the simplicity of sending a text message, account transfer can be done.

B. Debit Transfers and Direct Debits

1. BHIM Aadhar pay

Bhim Aadhar pay enables merchants to receive payments from the consumers digitally. This facility is for users who have linked their Aadhar with the bank account. This method is highly secure as the biometrics of the user is used for authentication.

2. National Automated Clearing House Debit (NACH Dr)

NACH Dr is similar to NACH Cr. Instead of crediting funds to customers' accounts, various institutions debit funds from the customer's account in a non-interfering manner. For instance, electricity bills, EMI s etc.

3. National Electronic Toll Collection (NETC)

NETC is yet another initiative by NPCI. Program to meet the electronic tolling requirements of the Indian market. It offers an interoperable nationwide toll payment solution including clearing house services for settlement and dispute management.

C. Card Payments

Cards refer to both credit cards and debit cards. Cards can be used in two alternative ways. Either to withdraw cash from the ATMs or for making payment directly through POS (Point Of Sale). The PoS for accepting card payments also include online payment gateways. This facility is used for enabling online payments for goods and services.

D. Prepaid Payment Instruments

Pre payments are now a common payment instrument which enable purchase of goods and services against the value stored on these instruments. This value stored in those instruments are transferred through cash, debit to a bank account, or by credit card. The pre-paid payment instruments includes smart cards, magnetic stripe cards, internet accounts, internet wallets and so on

E. Paper based instruments

1. Cheque Truncation System (CTS)

CTS is a step undertaken by the Reserve Bank of India (RBI) for quicker cheque clearance. This is a process of clearing cheques electronically rather than processing the physical cheque by the presenting bank en-route to the paying bank branch

2. Others

Model Adequacy Tests

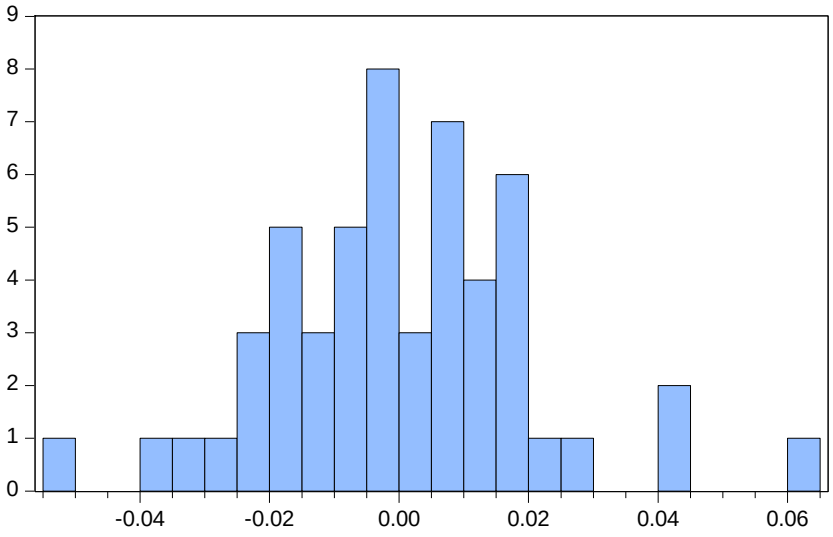
A.4. Test for Heteroskedasticity

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.983914	Prob. F(20,32)	0.5034
Obs*R-squared	20.18157	Prob. Chi-Square(20)	0.4466
Scaled explained SS	11.03521	Prob. Chi-Square(20)	0.9453

A.5. Test for auto correlation

Breusch – Godfrey Serial Correlation LM Test			
F-statistic	0.393196	Prob. F(2,30)	0.6783
Obs*R-squared	1.353804	Prob. Chi-Square(2)	0.5082

A.6. Test for Normality



Series: Residuals
Sample 2017M11 2022M03
Observations 53

Mean	1.79e-15
Median	-0.000826
Maximum	0.061581
Minimum	-0.053743
Std. Dev.	0.020452
Skewness	0.261722
Kurtosis	3.999905
Jarque-Bera	2.812984
Probability	0.245001

A.7. Test for Multicollinearity – Variance Inflation Factors

	Coefficient	Uncentered	Centered
Variable	Variance	VIF	VIF
gst(-1)	0.0	90103.7	41.7
comp	0.0	98490.8	43.9
comp(-1)	0.0	50080.9	18.0
comp(-2)	0.0	40477.0	23.7
comp(-3)	0.0	31380.5	14.7
CPI	4.7	8150172.0	894.8
CPI(-1)	16.3	28190351.0	2408.5
CPI(-2)	12.1	20910866.0	1687.3
CPI(-3)	2.7	4669133.0	427.4
DIGPAY	0.0	228660.9	506.5
DIGPAY(-1)	0.0	245473.3	484.6
EXP01	0.0	414942.8	110.2
EXP01(-1)	0.0	442569.3	118.9
EXP01(-2)	0.0	269676.2	93.0
EXP01(-3)	0.0	242914.3	210.7
IIP	0.1	181189.5	188.6
IIP(-1)	0.2	314701.0	343.8
IIP(-2)	0.0	61795.8	127.5
IIP(-3)	0.0	42278.0	179.3
IMP	0.0	324032.4	148.1
C	1.9	691662.6	NA