

**GIFT DISCUSSION PAPER SERIES**

**2023**

**2023/01**

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revenue? Evidence from India**

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This article can be cited as Joseph, Jerome & N Ramalingam (2023). Do digital payments enhance tax revenue? Evidence from India GIFT Discussion Paper 2023/01. *Gulati Institute of Finance and Taxation, Thiruvananthapuram, India.*

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**Do digital payments enhance tax revenue?  
Evidence from India**

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## Abstract<sup>1</sup>

This paper analyses the causal relationship between digital payments and the Goods and Services Tax (GST) revenue in India. The period of study is from August 2017 to March 2022. Using Autoregressive Distributed Lag (ARDL) methodology, our empirical results suggest that there exists a positive and highly significant relationship between digital payments and GST revenue in India. Apart from the digital payments, the performance of the economy, tax compliance, and imports have a positive whereas inflation and exports have a negative relationship with GST revenue in the country. Among the various measures by the tax authorities for improving compliance and increasing tax revenue, digital payments stand out 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 to reap its benefits but also in enhancing the tax revenue of the country.

**Key Words:** GST revenue, Digital payments, Compliance, Tax evasion, ARDL model

**JEL Classification numbers:** H24, O30, H20, H26, C22

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<sup>1</sup> We acknowledge Prof. K.J. Joseph, Director, Gulati Institute of Finance and Taxation (GIFT) for the wholehearted support he has given in the process of this research. We would like to express our gratitude to Prof. D. Narayana for his invaluable guidance and constructive criticisms. We are also grateful to Prof. Vijayamohan Pillai, Dr. Kiran Kumar Kakarlapudi, Dr. Anoop S Kumar, and all other faculties and friends in GIFT who generously provided as with their feedback. The earlier versions of this paper were presented at NIPFP Conference on the impact of GST on the Indian Economy held in New Delhi and the 57<sup>th</sup> Annual Conference of The Indian Econometric Society (TIES), held in Hyderabad.

## **1. Introduction**

Payment systems all over the world have been undergoing a radical transformation in recent years. The surveys conducted during the last few years by the central banks of various countries revealed a decline in cash usage and preferences for digital payments by consumers (See Caddy et al., 2020; Foster et al., 2020; Reserve Bank of New Zealand, 2019; Henry et al., 2018). The leading factors for this could be attributed to policy interventions supported by technological advancements and rapid innovations. Moreover, apart from the aforesaid factors, the Covid-19 pandemic too has made a momentous impact on non-cash payments all over the world. 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 and then became a matter of necessity during the pandemic and a major behavioral pattern of payment thereafter.

The story of India concerning digitalization is also not a different one. The affirmative action policies of the Government of India including the demonetisation of 2016 have envisaged a digitally enabled cashless economy. RBI has designated the period 2010-20 as the digital payments' decade. As a result of all these factors, digital payments in India have shown exponential growth in recent years (See Annexure 1). Besides this, the positive valence of digital transactions has added fuel to this thriving. (Xavier and Zakkariya, 2021).

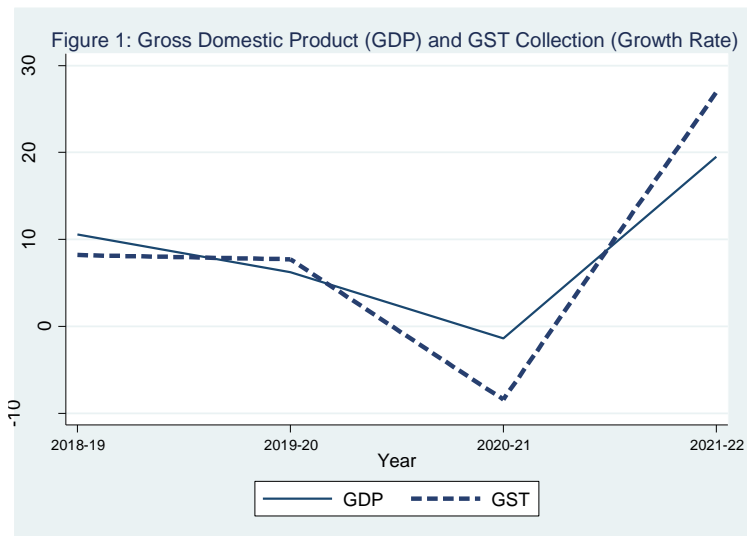
The pandemic, bottlenecking the normal activities of the economy, curtailed the production and income generation activities and slashed the consumption expenditures, thus, hitting hard on revenue collected from Goods and Service Tax (GST). It was interesting to witness the growth of GST revenue outpacing the growth in the Gross Domestic Product (GDP) of India after the pandemic when the pandemic started to recede (See fig 1). This exceptional growth in the GST revenue can be accredited to the combined effect of increased consumption and improved compliance. Other than consumption what contributed more to the improved GST revenue is the primary question of our inquiry. Various literature suggests a positive relationship between the digitalization of payments and improved tax revenue.

Danchev et.al., (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 observing an increase in the tax compliance as a result of an increase in the value of payment card transactions that ultimately resulted in the growth of VAT revenue in the Greek context (Hondroyiannis and Papaoikonomou, 2017). Evidences from Europe also show that VAT evasion and the use of card payments are negatively related (Immordino and 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 observed 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. 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. Apart from tax revenue, the promotion of digital payment, has a strong positive correlation with economic growth, trade, and consumption. (Hassan, et al. 2012).

In the Indian context, Das et al. (2022) find out that increased electronic payments will lead to reporting higher sales to the tax

authorities by the firms in West Bengal. However, to the best of our knowledge, barely any literature explores the relationship between digital payments and tax payments, at the national level, 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 this context of the drastic change in India's transaction or payment architecture favouring the use of non-cash payments, it is evident that digitization of payments is a strong predictor of increased tax revenue. 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. This article thus focuses on the evolving relationship between digital payments and GST Revenue in India.



*Source: Own calculation based on data from MOSPI and GST portal*

The discussion is organized as follows. Section II will set the theoretical background for the study. Section III will provide a conceptual framework to demonstrate how digital payments, as well as other factors, can increase GST revenue in India while section IV will provide an overview of the digital payment ecosystem in India. In Section V, data and methodology will be presented, followed by the results and their interpretation in section VI. The concluding remarks are presented in section VII.

## **II. Theoretical 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 country.

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 and 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).

Das et al., (2022) estimate that firms report total sales to the tax authorities that are substantially higher than the total electronic sales in their areas. This is consistent with the evidence in Gadenne et al. (2021) that firms report sales that are much higher than their total third-party reported sales and suggests firms pay taxes on more than just their electronic sales. We, therefore, do not expect firms to simply increase their reported sales by the amount of extra electronic transactions they make during demonetization. The increase in electronic transactions may instead increase reported sales if firms suspect that information on third-party verified sales gives tax authorities a better proxy of their true sales, or provides them with more readily available information on the basis of which to start an audit investigation. If, in addition, firms cannot adjust other aspects of their tax returns (the amount of input tax they claim back for example), this increase in reported sales will translate into higher tax payments.

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 and 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, p.14). 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.

### **III. Conceptual framework**

Goods and Services Tax (GST) in India was implemented in India from 1<sup>st</sup> July 2017. One of the main arguments envisaged in the implementation of GST was the self-policing feature of GST returns. It was envisaged that the taxpayers were required only to fill GSTR-1, which recorded the outward supply. GSTR 2, which recorded the inward supplies, and GSTR 3 which involves the calculation of tax payable would be calculated on the basis of filled GSTR-1. This could prevent turnover suppression and evasion to a large extent, But, this mechanism did not become a reality as expected. The technical advancements were not so adequate to make this a reality. Therefore, evasions crept into the GST system too from the old tax regimes.

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 suppressing the turnover. When the retailers' outward supply is largely accounted for, 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 and Sandmo, 1972), evasion has a negative relationship with the probability of being caught. The probability of being caught increases since digitalization leaves digital traces. Even when there is less probability of being caught, the digitalization ecosystem will increase the perception of the evaders that they will be caught. This results in strengthening the 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 cash withdrawals from such non-business accounts, the registered person may opt for unaccounted purchases from the predecessor. However, this practice will not

work on a large scale since income tax law restricts cash withdrawal from bank accounts as unexplained debits.

However, there are still ways in which evasion could take place even in the digitalization era. Use of multiple QR codes, non-business accounts, etc to receive payments are a few of them. Still, this evasion is possible only among small traders or transactions. When it comes to large scale, information sharing of banks and other financial intermediaries with various tax authorities can act as a barrier for this type of evasion. The suspicious Financial Transaction (SFT) reports of banks will also act as a barrier to such evasion. Bank transactions are strong pieces of evidence of evasion for tax authorities whereas cash payments leave no such traces. Section 150 of the CGST/SGST requires reporting of the statement of accounts, periodic returns, etc by various authorities and agencies.

The basic question is whether the taxpayer is ready to pay the tax or not. If yes, then the mode of payment does not matter. Whatever the payment mode, there will be no evasion or turnover suppression. However, this does not happen in real life. So there arises the importance of the mode of payments. The consumer who makes payment tax has two options. Either to make payments through cash or through digital modes. When he chooses digital mode, there is traceability of transactions which increases the chances of being caught (at least increases the perception that he

will be caught) which will lead to lesser evasion and increase the tax revenue. Besides this, as we have discussed, digital payments, by deepening financial inclusion and reducing the shadow economy, also increase tax revenue.

However, the mode of payment 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 compliant 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 and Andrskaite (2013) identified economic situation of the country affects the tax revenue.

### **3. Inflation**

Since GST is an ad-valorem tax charged on the price of goods and services, the tax amount will also move in the same direction along the movement of price. Therefore, inflation is a factor that can potentially affect GST collection positively. 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.

### **4. Exports and Imports**

Literature also suggests exports and imports as important factors affecting tax revenue. Amin et al. (2014) 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 and Mohammed (2010) also observed 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.

#### **IV. Digital payment ecosystem in India**

India offers a wide range of payment facilities 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 some of the landmarks in the Indian digital payment scenario. Due

to all these efforts, the share of digital payments in India has been gradually increasing.

The retail digital payment modes in India can be classified into two categories; Fund Transfer Payment Systems (FTPS) and Merchant Payment Systems (MPS). FTPS includes National Electronic Funds Transfer (NEFT), and Immediate Payment Service (IMPS). These mainly involve 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.

## **V. Data and Methods**

### **A. Data**

The period of study is from August 2017 to March 2022.

We measure compliance by the percentage of registered taxpayers who have filed GSTR 3B<sup>2</sup> on or after the due date. State-wise monthly data of all the aspects of GST collection (Central GST, State/Union Territory GST, Integrated GST, and Cess collected),

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<sup>2</sup> GST Return 3B is a self-declared summary GST return filed every month. (Quarterly for QRMP scheme). It is a simplified return to declare summary GST liabilities for a tax period. Even in the absence of any business activities, GSTR 3B has to be filed (nil returns). It is on the basis of GSTR 3B, tax liability is calculated.

which add up to the total GST collection of the country, as well as compliance for all the states are taken from the GST portal<sup>3</sup>.

Regarding digital transactions, our analysis takes into consideration only the transactions relating to Merchant Payment Systems and UPI, being 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 facilitate merchant payments, these are not popular channels for the daily purchase of goods and services (RBI, 2022).

The data regarding UPI transactions were 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<sup>4</sup>. Due to the unavailability of data concerning Prepaid Payment Instruments (PPI), the variable has been ignored in the study.

There are sufficient reasons for including these three payment modes in the analysis. (a). The growth in tax revenue due to increased usage of digital payments is mainly attributed to traders who are small, unnoticed, and transacting in the shadow economy coming to the purview of the formal economy with the increased

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<sup>3</sup> <https://www.gst.gov.in/download/gststatistics>.

<sup>4</sup> Monthly data available at Payment system indicators were not comparable from November 2019 onwards.

use of digital modes of payments. (b). The development of UPI significantly contributes 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 payments to ensure sales. This not only has resulted in the growth of UPI transactions but also facilitates the growth of other digital payment modes. (c). The tremendous growth of online transactions during the past few years which substantially used card payments or UPI for making payments, 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.

Monthly data with respect to Consumer Price Index (CPI), capturing the inflation level of the country is taken from the MOSPI (Ministry of Statistics and Programme Implementation).

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 (IIP) as an indicator of economic performance that is available on a monthly basis from MOSPI.

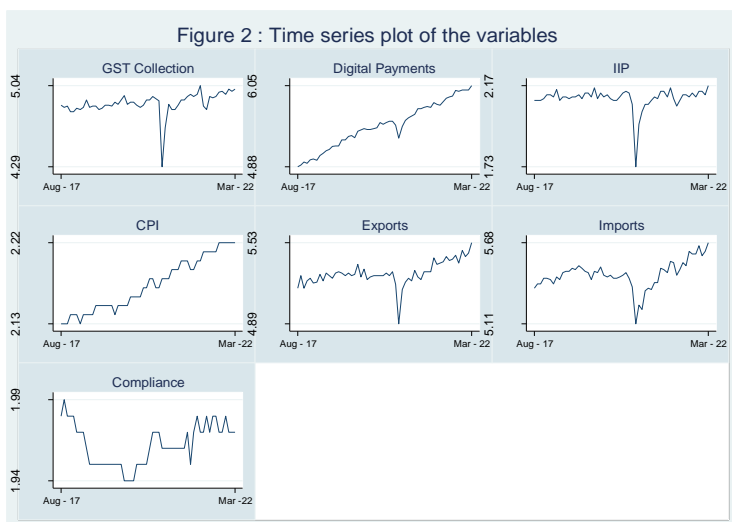
The data pertaining to imports and exports of the country has been taken from the data published by the Department of Commerce, Ministry of Commerce and Industry. All the variables except GST

compliance (which is expressed in percentages) were transformed into logarithmic form.

While we expect positive signs for the coefficients of digital payments, imports, compliance, and IIP. We anticipate a negative relationship between GST collection with CPI and Exports.

Table 1: Variable description		
<b>Variable Code</b>	<b>Variable Name</b>	<b>Description</b>
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
iip cpi	IIP CPI	Index of Industrial Production 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

Table 2: 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



## B. Methods

### Unit root test

The Augmented Dickey-Fuller (ADF) Test done to check the stationarity of variables explain that the variables are stationary at  $I(0)$  or  $I(1)$  and not at  $I(2)$  (See Table 3). A p-value less than percent indicates that the variables are stationary at a 5 % significance level or else non-stationary. This prevents us from doing a simple

Ordinary Least Squares (OLS) regression or cointegration. Therefore, we adopt the Autoregressive Distributed Lag (ARDL) approach, which 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.

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

### **ARDL Model**

Due to the time series properties of the variables and since variables are stationary at different levels (See Table 3), 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.

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 modeling framework (Pesaran and Pesaran, 1997).

The model equation is as follows

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

### **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).

## Levels equation and error correction regression

The levels equation illustrates the long-run relationship of the variables at the level while the Error correction regression explains the short-run dynamics of the underlying variables.

## V. Results and interpretation

### A. F-Bounds test

The results of the F-Bounds test are given in Table 4. 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).

<b>Table 4: F - Bounds Test Results</b>				
<b>Dependent variable: GST collection</b>				
<b>Test Statistic</b>	<b>Value</b>	<b>Significance level</b>	<b>I(0)</b>	<b>I(1)</b>
F-Statistic	13.95 1	10%	2.13 9	3.20 4
Actual Sample Size	53	5%	2.49	3.65 8
		1%	3.33	4.70 8

### B. Levels equation

The results of the level equation are given in Table 5.

The result of the levels equation confirms our expectations about

<b>Table 5: Levels equation</b>				
<b>Dependent variable: GST collection</b>				
<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>	<b>Prob</b>
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

every variable. The results suggest 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, economic performance, and imports have a positive effect, inflation and exports have a negative effect on GST revenue.

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.

Further, 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 (Ayenew, 2016; Tanzi, 1977). A possible explanation for the same is that the reduction in demand due to the increased price may outweigh the revenue gain from the same.

Further the results also suggest a positive relationship between imports and GST collection. Import of goods and services are significant sources of GST revenue they 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.

### C. Error correction regression

The estimated Error Correction Model is as follows (Table 6.)

<b>Table 6: ECM Regression</b>				
<b>Dependent Variable: GST collection</b>				
<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>	<b>Prob.</b>
D(digpay)	0.17	0.19	0.89	0.38
D(digpay(-1))	0.36	0.17	2.12	0.04
D(digpay(-2))	-0.12	0.16	-0.75	0.46
D(digpay(-3))	0.88	0.15	6.01	0.00
D(cpi)	-1.29	1.87	-0.69	0.50
D(cpi(-1))	6.22	2.02	3.08	0.00
D(cpi(-2))	-0.16	2.08	-0.08	0.94
D(cpi(-3))	10.72	1.83	5.84	0.00
D(export)	0.26	0.15	1.78	0.08

D(export(-1))	0.83	0.12	6.99	0.00
D(export(-2))	0.21	0.11	1.91	0.07
D(export(-3))	-0.34	0.10	-3.53	0.00
D(iip)	0.80	0.19	4.17	0.00
D(import)	0.25	0.12	2.15	0.04
CointEq(-1)*	-1.46	0.13	-11.31	0.00

The error correction term, -1.46, is statistically significant at 1 percent significance with a negative coefficient between -1 and -2. This implies dampened fluctuations about the equilibrium path, which implies that instead of monotonically converging to the equilibrium path directly, the error correction process fluctuates around the long run value in a dampening manner. However, once this process is complete, convergence to the equilibrium path is rapid. (See Narayan & Smyth. (2006) for a similar interpretation)

## VI. 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. 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. Further, it involves zero cost, either from the Government or the taxpayer side. 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, this mechanism works efficiently only if information is shared by the third parties to the tax authorities and authorities use this information to sustain the tax revenue. Digital payments not only bring tax revenue to the Government, but digital payments at current times is, not a luxury but a necessity for a developing nation like India.

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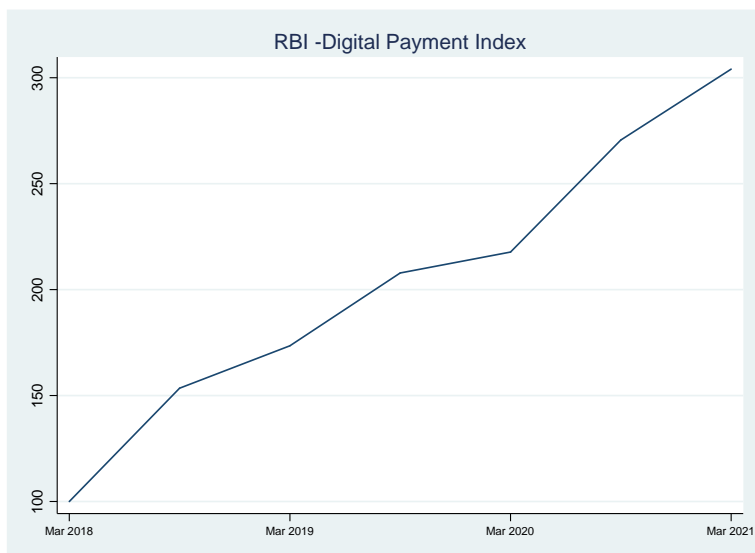
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## Annexures

### A1. RBI - Digital payment index



*Source:* RBI (2022)

### A2. GDP and GST from 2017-2022

Year	GDP (Billion)	GST (Billion)	GDP Growth	GST Growth
2017-18	170900	8103		
2018-19	188997	8767	10.58	8.2
2019-20	200749	9444	6.21	7.71
2020-21	198009	8651	-1.36	-8.4
2021-22	236646	10975	19.51	26.87

*Source:* EPWRF, GST Portal

## Model Adequacy Tests

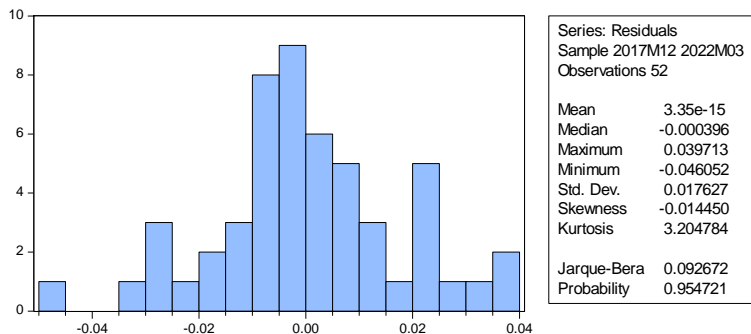
### A3. Test for Heteroskedasticity

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.605	Prob. F(20,32)	0.115
Obs*R-squared	27.514	Prob. Chi-Square(20)	0.154
Scaled explained SS	10.095	Prob. Chi-Square(20)	0.977

### A4. Test for auto correlation

Breusch – Godfrey Serial Correlation LM Test			
F-statistic	0.655	Prob. F(2,30)	0.526
Obs*R-squared	2.326	Prob. Chi-Square(2)	0.312

### A5. Test for Normality



## A6. Test for Multicollinearity – Variance Inflation Factors

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
GST(-1)	0.02	57830.99	25.69
DIGPAY	0.10	298182.70	861.43
DIGPAY(-1)	0.12	360863.90	1065.13
DIGPAY(-2)	0.09	261486.70	786.22
DIGPAY(-3)	0.09	254432.00	778.45
DIGPAY(-4)	0.05	152922.10	475.71
COMP	0.00	8687.23	5.76
CPI	5.50	2561435.00	431.77
CPI(-1)	14.38	6690311.00	1098.21
CPI(-2)	14.03	6518207.00	1051.27
CPI(-3)	16.56	7679925.00	1217.06
CPI(-4)	10.36	4797126.00	743.86
EXP01	0.05	126804.20	34.91
EXP01(-1)	0.04	107345.80	27.02
EXP01(-2)	0.03	76490.41	18.51
EXP01(-3)	0.03	72104.94	16.57
EXP01(-4)	0.02	43961.09	9.59
IIP	0.09	40055.28	23.94
IIP(-1)	0.10	42841.85	25.43
IMP	0.03	74426.24	23.25
IMP(-1)	0.03	84076.80	24.39
C	4.06	399701.70	NA



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