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Impact of GST E-Invoicing on Tax Compliance and Revenue Mobilization in India: A Conceptual Assessment of Digital Tax Administration during 2020–May 2023

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Abstract- A significant milestone in India's digital transition of tax administration was achieved with introduction of GST e-invoicing on 1 October 2020, which mandated that specified categories of registered enterprises must digitally report invoice data through a prescribed system, thus generating validated and structured transaction data that can be accessed by GST tax administration; against this context, this conceptual paper asks whether implementation and gradual expansion of GST e-invoicing in India since October 2020 helped strengthen tax compliance and revenue mobilization by providing for greater transaction transparency, harmonized invoices, accurate reporting, input-tax-credit authentication, audit trails, and timely data for tax administration; using a purely conceptual and qualitative research design based on secondary data only from 1 October 2020 to 31 May 2023, comprising government notifications, GST Council reports, CBIC and GSTN data, Economic Surveys, official compliance and revenue data, institutional studies, and related research literature, which it analyzes through a thematic-constructivist method rather than correlational analysis, the paper finds that GST e-invoicing has the potential to enhance GST compliance architecture by generating structured digital invoice records, reducing reporting variability, enabling matching of B2B transactions, supporting input-tax-credit validation, enhancing transparency of B2B sales, and helping detect invoice and input-tax-credit anomalies, thereby raising the possibility that tax loss can be limited and the effective tax base can be transformed into revenue; at the same time, these gains are contingent upon technology upgrade costs, ERP linking cost, digital capabilities, procedural complications, GST system change management, compliance costs for MSMEs, data quality issues, and persistent distortions from fake invoice, fake transactions, and bogus input-tax-credit claim distortions, which can diminish the potential effects of GST e-invoicing; accordingly, the paper concludes that GST e-invoicing is best conceptualized not merely as an e-invoicing requirement but as part of an integrated India-wide information-driven digital tax administration system that depends on solid e-invoicing data, taxpayer education, systematic support to businesses, GST system interoperability, risk management, and balanced regulation.

Keywords: GST E-Invoicing, Tax Compliance, Revenue Mobilization, Digital Tax Administration, Input Tax Credit, Transaction Visibility, Tax Evasion, India.

I. INTRODUCTION AND BACKGROUND RELATED TO THE STUDY

Digitalization of economic activity has shifted the tax administration paradigm from the document-centric and post-facto verification approach towards a data-driven paradigm in which transaction information can be captured, standardised, transmitted, cross-verified and analysed closer to the point at which the taxable events occurred, and this shift is captured by the OECD's Tax Administration 3.0, since in this new paradigm tax fit into taxpayers' business systems so that their compliance can be smoother and administrations better equipped to ensure compliance (Organisation for Economic Co-operation and Development [OECD], 2020); in India, this shift was observable post-GST, owing to the fact that the effectiveness of a VAT type tax relies heavily on a trustworthy invoice data connecting outward supply of a supplier with input-tax-credit claims of the purchaser, as invoices are central to tax reporting, verification of the taxable turnover, cross-matching of transactions, identification of suspicious claims and creating an audit trail, and the GST architecture relied upon digital registration, electronic filing, e-way bills, input-tax-credit statements and invoice level data more and more, which created the foundation for an information-enriched compliance structure on which the tax authorities could cross-check data at multiple stages in the supply chain and have that knowledge used as potential risk indicators; and GST e-invoicing was subsequently implemented as a module for the whole supply chain from 1 October 2020 for specific B2B and export transactions of specified taxpayers, with invoices submitted to the Invoice Registration Portal, which assigned invoice reference numbers to the data, and input into GST returns could filter into the GST return process, thereby reducing the duplicate inputting of data and improving tracking of transactions (Ministry of Finance, 2020); by the end of its first six months, more than 39.81 crore e-invoices had been issued by more than 88,000 suppliers, involving more than 47 lakh recipients (Ministry of Electronics and Information Technology, 2021); and its scope was broadened by reducing the turnover criterion to above 20 crore from 1 April 2022 and above 10 crore from 1 October 2022, and a notification from 10 May 2023 announced a further reduction to 5 crore from 1 August 2023 (Central Board of Indirect Taxes and Customs [CBIC], 2022a, 2022b, 2023); at conceptual level, standardization of invoice data could strengthen input-tax-credit validation, cross-matching of transactions and anti-evasion efforts by making relationships between providers and buyers more visible and, based on evidence from other economies, the OECD finds electronic invoicing as a promising method of increasing compliance protection and bridging information gaps between taxpayers and administrators (OECD, 2022); however, that does not mean increased data provides easily available information on which to make decisions on whether an increase in the quantity of the data increases revenues or improves compliance because the risk reduction effectiveness depends on system robustness, the digital skills of taxpayers, costs of compliance, data accuracy, the procedural complexity, tax treatment and the ability of taxpayers and administrators to adapt to ongoing innovations, which is why the present study investigates whether electronic invoicing enhanced the accuracy, timeliness, clarity and convergence of GST compliance, and whether increased process transparency and administrative capacity enhanced the government ability to protect the productive capacity of the currency and mobilize the GST accruals during October 2020-May 2023.

II. INSTITUTIONAL BACKGROUND OF GST E-INVOICING IN INDIA

It is critical to appreciate the institutional genesis of GST e-invoicing in India as an offshoot of a GST regime that was, even before mandated e-invoicing, already largely digitalized because the Goods and Services Tax Network (GSTN) and the GST common portal had already put in place an electronic platform through which taxpayers could obtain GST registration and GSTINs, furnish outward-supply information through Form GSTR-1, disclose consolidated tax liabilities and impending input-tax credits through Form GSTR-3B, keep electronic cash and credit ledgers, pay tax liabilities electronically and generate e-way bills for the movement of goods between specified locations, while Form GSTR-1 already disclosed invoice-specific details for key B2B categories of supplies, and the e-way-bill system created electronic linkages between the movement of goods and the business-to-business supplies that underlay the movement so as to produce the type of digital reporting environment within which more integrated invoice-level administration could later be introduced (CBIC, 2017; GSTN, 2019); the push for e-invoicing was driven partly by the fact that businesses could be mandated to separately report similar invoice details in their GST returns, their financial or enterprise-resource-planning accounting systems, and their e-way-bill systems, and the GST Council therefore saw electronic invoicing as a solution to report standardized invoice data in a uniform format to be used by multiple compliance programs, thereby reducing duplication and bolstering structured transaction data (GST Council Secretariat, 2019); importantly, e-invoicing has not meant that the government portal now creates the commercial invoice, because the supplier continues to generate the commercial invoice through its accounting, billing or enterprise-resource-planning systems using a common standardized schema and reports the prescribed invoice data electronically to an Invoice Registration Portal (IRP), which verifies the data, applies pre-set rules and, once successfully registered, generates a unique Invoice Reference Number (IRN) and back-end digitally signs the invoice data, and returns a QR code with digitally signed billing particulars, after which the relevant invoice data can be shared with the GST portal as needed for return reporting and other compliance processes, effectively transforming a regular commercial invoice into an electronically verified GST record (GSTN, 2020); this also implements the interchangeability objective of the schema because the same data fields can be used to enable communication between differing accounting systems while electronic transmission can underpin other compliance processes such as return filing and e-way-billing; the rollout also proceeded in multiple stages, starting on 1 October 2020 for very large taxpayers with aggregate turnover above 500 crore and extending down to those above 100 crore on 1 January 2021, those above 50 crore on 1 April 2021, those above 20 crore on 1 April 2022, and those above 10 crore on 1 October 2022, with a further extension to those above 5 crore notified on 10 May 2023 to be effective from 1 August 2023, so that in May 2023 the institutional rollout clearly indicates the projection that e-invoicing would continue to be rolled out across an expanding range of GST-registered entities (GST Council, 2021, 2022, 2023).

III. PROGRESSIVE EXPANSION OF E-INVOICING

The rollout of GST e-invoicing in India between October 2020 and May 2023 illustrates a carefully staged process in which mandated digital invoicing was targeted first at large taxpayers and then further phased down to successively smaller turnover thresholds as technical and administrative capacity was increased; while originally GST e-invoicing was only intended for taxpayers with aggregate annual turnover of over 100 crore, this was deferred because of the COVID-19 pandemic and only implemented on 1 October 2020 for taxpayers with aggregate annual turnover of over 500 crore in any of the relevant previous financial years, thereby beginning the rollout with taxpayers who were relatively large and had access to the better technological systems (Ministry of Finance, 2020); this coverage expansion was then achieved by Notification No. 88/2020-Central Tax, which brought in taxpayers exceeding 100 crore from 1 January 2021, and Notification No. 05/2021-Central Tax, which did the same for taxpayers exceeding 50 crore from 1 April 2021 (Central Board of Indirect Taxes and Customs [CBIC], 2020, 2021); then, even broader coverage was introduced by Notification No. 01/2022-Central Tax, which brought in taxpayers exceeding 20 crore from 1 April 2022, and Notification No. 17/2022-Central Tax, which included taxpayers exceeding 10 crore from 1 October 2022 (CBIC, 2022a, 2022b); final change also brought in taxpayers exceeding 5 crore, but not until 1 August 2023 after the release of Notification No. 10/2023-Central Tax on 10 May 2023 (Government of India, 2023); in sum, this progression from 500 crore to a notified 5 crore threshold is indicative of India's move from selective use of large-taxpayer e-invoicing toward significantly expanded use, while the present analysis purposefully excludes implementation-related events after May 2023.

IV. STATEMENT OF THE RESEARCH PROBLEM

The problem this study addresses is the tension between the anticipated gains in compliance and revenue from GST e-invoicing and the conditions surrounding institutional capacity, technology and taxpayer attitudes, behaviour and processes that influenced its operation during the period October 2020–May 2023 in India. These conditions are significant because the change from manually keyed invoice details to standardized reporting was expected to lower transcription errors and Reporting Errors, improve consistency in invoice data, pave the way to automation of the GST compliant business processes of the tax-payer, enhance the timeliness of transaction information to tax authorities, strengthen the linkages between sales reported by taxpayers and claims of input-tax credit (ITC) by purchasers, aid in return preparation and transaction matching and enable development of better electronic audit trails to detect Under Reporting of sales, Fake Invoicing, etc (Ministry of Finance, 2022). While this digital technology per se exists, it does not mean that adoption of e-invoicing will result in better compliance or higher revenue. For effective digital tax administrations, the under- lying information system needs to be well-designed, usable, reliable, and accepted by the users (Dikshit et al., 2022). A survey conducted on a sample of 937 Indian firms on the nation's GST data infrastructure, found that while majority firms embraced digital reporting, they experienced problems like service quality issues and technology related strain, demonstrating that the push for digitization creates costs in terms of organizational adaptation (Dikshit et al., 2022) while producing administrative gains. These issues become critical as coverage spreads to smaller enterprises, and, given that studies on Indian MSMEs have found that these enterprises face persistent problems with GST compliance inordinate procedures (Pandey & Raj N., 2022) it is likely that those businesses which are less well endowed with finances, professional accounting talent and technologies, may react to digital compliance obligations in different ways to large businesses that may have already invested in integrated accounting and enterprise-resource-planning (ERP) systems. Another limitation is that greater transaction visibility does not automatically stamp out fraud. In May 2023, it was reported by the Central Board of Indirect Taxes and Customs that fraudsters were registering firms that did not exist, were not in business, to issue fake invoices and fraudulently pass ITC. This resulted in the Central Government coordinating a national effort with states to tackle these fake invoices and firms (Central Board of Indirect Taxes and Customs [CBIC], 2023). This reiterates the need for robust registration verification processes, risk analysis, etc., alongside the digital records. Therefore, the central research problem examined in this study is the conceptually ascertain the contribution of GST e-invoicing to tax compliance and revenue mobilizing capacity in India from October 2020 to May 2023 with focus on standardised reporting transparency of transactions, ITC verification and linkages, automation of return preparation, and the anti-evasion capacity of the system, whilst also exploring how requirements for ERP integration, technological uptake, compliance costs, awareness levels, errors in e-invoices, procedural adjustments, digital capacity, system reliance and the proliferation of fake registrations and fraudulent ITC behaviour affected or confined the achievement of those anticipated outcomes. In this, the study aims to avoid a simple claim that an increase in digital invoicing or GST collection amounts to a proven causal improvement in either tax compliance or revenue productivity.

V. RESEARCH QUESTIONS

How does GST e-invoicing theoretically influence taxpayer compliance?

How can e-invoicing improve transaction visibility and revenue mobilization?

What role does e-invoicing play in input-tax-credit verification and detection of fraudulent invoices?

What implementation challenges affected taxpayers and administrators between 2020 and May 2023?

Through what mechanisms can digital invoicing translate into stronger GST revenue performance?

VI. RESEARCH OBJECTIVES

To examine the conceptual role of GST e-invoicing in strengthening tax compliance in India.

To analyse how e-invoicing may contribute to GST revenue mobilization through improved transaction reporting and tax-base visibility.

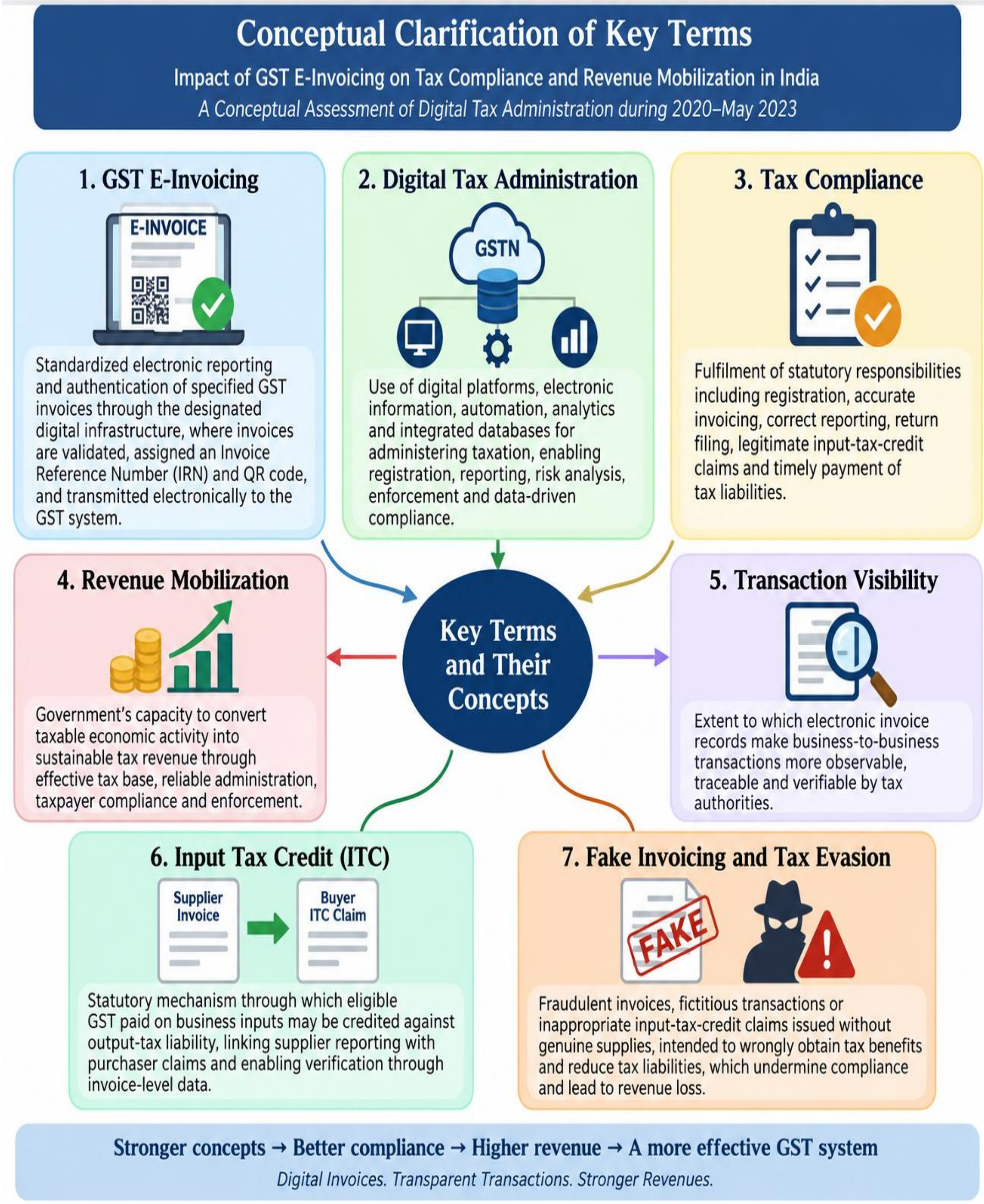
To examine the relationship between e-invoicing, input-tax-credit verification, and prevention of fraudulent invoicing.

To identify technological, administrative, and taxpayer-related challenges associated with implementation during 2020–May 2023.

To develop a conceptual framework explaining the relationship between e-invoicing, digital tax administration, compliance, and revenue mobilization.

VII. CONCEPTUAL CLARIFICATION OF KEY TERMS

In this paper, GST e-invoicing is defined as the standardized electronic reporting and authentication of prescribed business-to-business invoices through the Indian GST digital infrastructure, which consists of reporting an invoice generated by a taxpayer's accounting and enterprise-resource-planning system to an Invoice Registration Portal, matching the data elements contained in the invoice against the prescribed schema, assigning an Invoice Reference Number and generating a digitally-signed QR code, and transforming the invoice data into structured, machine-readable tax information rather than simply substituting a paper invoice for an electronic record, as reflected in the broader conceptualization of electronic invoicing as the structured transmission of invoice data that enables automatic tax-administration processes (OECD, 2022a). Digital tax administration is defined as the use of electronic platforms, digital identities, automated tax filing and payments, integrated information systems, data sharing, and data-driven analytics, automatic risk-management systems and machine learning techniques for tax administration and to embed compliance into the everyday business routines of taxpayers (OECD, 2022b). Tax compliance in this paper refers to the taxpayer's performance of their statutory duties with regard to registration, issuance and reporting of proper invoices, declaration of reportable supply, filing of returns, claiming of input tax credits, and payment of taxes due, reflecting the concept that sustainable compliance rests upon the effective performance of the core administrative functions of registration, reporting, filing and payment (Akitoby et al., 2018). Revenue mobilization is the government's ability to convert the legally-taxable economic activity into adequate and sustainable tax revenue through an effective tax base, strong administration, tax compliance and enforcement, rather than the monitoring of short-term increases in nominal GST collections (Akitoby et al., 2018). Transaction visibility refers to the observability, traceability and verifiability of taxable business-to-business transactions by tax administrations, and how their structured digital records can complement the contextual information obtained from suppliers to give administrations a more complete view of taxpayers' commercial activity and flag inconsistencies (OECD, 2022b). Input tax credit (ITC) is a legal mechanism whereby GST paid on business inputs, subject to prescribed conditions, can be credited against output-tax liability, thus creating the incentives to report transactions within supply chains; connection of these supplier and purchaser incentives can lead to mutual reporting and enforcement efficiencies (Government of India, 2017); the empirical literature on international VAT e-invoicing finds that digital invoice mandates can create compliance effects by establishing interconnected firm-to-firm networks of transaction data (Bellon et al., 2022); lastly, fake invoicing and evasion here are defined as issuing or using invoices without corresponding economic transactions, creating fictitious transactions, manipulating false document or misappropriating or transferring false input tax credits, and exploiting design characteristics of the e-invoice system to generate wrongful credits, which are recognized as practices that create wrongful credit and revenue loss within India's GST framework (CBIC, 2022). The conceptual clarification of key terms provides the foundation for understanding how GST e-invoicing may influence tax compliance and revenue mobilization in India. GST e-invoicing refers to standardized electronic reporting and authentication of invoices through the GST digital system, while digital tax administration involves the use of platforms, automated processes, integrated databases, and analytics for tax management. Tax compliance covers registration, invoicing, reporting, return filing, valid input-tax-credit claims, and payment of liabilities. Revenue mobilization reflects the government’s capacity to convert taxable activity into tax receipts. Transaction visibility improves when invoice data become traceable and verifiable, while input tax credit links seller reporting with purchaser claims. Fake invoicing and tax evasion undermine these mechanisms by creating transactions and fraudulent credit claims.



Above diagram showing Conceptual Clarification of Key Terms related to the study

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VIII. REVIEW OF LITERATURE

Expert literature on GST e-invoicing and digital tax administration suggests that digital systems may not simply substitute for paper compliance mechanisms, but may instead affect the quantum, timeliness, standardization and verifiability of information that is available to tax administrators and taxpayers (Cummings et al., 2020; Li, Wang, and Wu, 2020; Okunogbe and Pouliquen, 2022; Pomeranz, 2015; including Irish and Torgler, 2006 and Singh and Saurav, 2016 regarding the general impact of transparency on compliance; Ghosh, 2022 on the effects of taxation on informal formalization of micro and small businesses; and Roy and Khan, 2021 on the effect of the digital transformation of tax administration on low capability businesses;). Of particular interest for describing the mechanism by which GST e-invoicing in India influences visibility and compliance, and where less basic insights are needed, prior research discusses the impact of digital systems, including e-returns, tax filing, invoice reporting, and information-based enforcement on compliance behavior and government revenue in Italy (Beetsma et al., 2008; Ordorini et al., 2009), China (Li, Wang, and Wu, 2020), Tajikistan (Okunogbe and Pouliquen, 2022), Chile (Pomeranz, 2015), India (Hussain et al., 2009; and Irish and Torgler, 2006 on the provision of incentives to induce better taxpayer compliance; and Qiu and Azmi, 2021 on the impact of invoice reporting on compliance efficiency) and VAT experiments involving more than 400,000 firms in Chile (Pomeranz, 2015), which demonstrated that paper trails created by invoice reporting and third-party information can foster preventive deterrence and self-enforcement effects throughout supply chains by discouraging output suppliers from cheating tax inspectors and discouraging consumers from participating in illicit business transactions. The research finds that digital visibility through invoices, which can provide documentary support for buyer ITC claims, can also enable discrepancies between reported sales and claimed credits to be detected and become more observable. This can enhance the effectiveness of invoice verification and audit trails, although other sources of revenue leakage, such as counterfeit invoices, fictitious firms and fraudulent ITC, cannot be eliminated solely through digital records, leading the CBDT (2023) to initiate a coordinated data-driven verification drive in June 2023 to examine the veracity of GST registrations and notional invoices issued without underlying supplies (with some sources indicating that 4.3 lakh notional invoices worth INR 11,000 crores were detected). Similar to prior application of invoice data in our country in the context of VAT experiments, the literature supports the idea that digital visibility through information linkages between sellers and buyers can improve reporting and compliance, increase formalization and GST system revenue collection while also reducing the likelihood of leakage. But digital systems can only do so much to eliminate fake invoices, notional invoices, fictitious firms and inflated ITC. Given the case of our country, there is little research yet exploring the simultaneous operation of digital visibility and information linkages through e-invoicing, the resulting effects on determination of ITC claim eligibility, the use of invoice variation to inspect tax compliance, and the strengthening of a virtual audit trail. All approaches thus far discussed in our country, to the best of our knowledge, therefore do not make due consideration for this linkage effect. Furthermore, the impact of formalization driven by increased digital visibility between seller and buyer to enhance government revenue may be and indeed has been adverse on micro and small businesses that have been formed amid digital transformation, as identified in the PESTEL analysis of the Indian MSME sector (Ghosh, 2022; Roy and Khan, 2021). What we thus know of prior scholarship, is that from 1 October 2020 to 31 May 2023, digital visibility on the supply side in our country, through obtaining a GST registration, filing GST returns, generating GST invoices and issuing a GST e-way bill, has been held constant, but the resulting effects of visibility with tax compliance-enhancing seller-buyer information linkages, strengthening of an electronic audit trail, increased purchase-side visibility through claiming of input tax credit, leading to greater formalization of businesses with as well as without a GST registration, and its resultant effect on higher revenue mobilization for the Indian GST system, have not been examined, but represent, according to the literature, otherwise an effect of increased visibility on a successful verification process.

IX. CONCEPTUAL FRAMEWORK

The conceptual framework of this study hypothesizes that that GST e-invoicing, taxpayer compliance, and revenue mobilization are related in a sequential but conditional information-and-compliance chain in which GST e-invoicing achieves broader effective tax base and revenue mobilization through a sequential but conditional information-and-compliance chain in which GST e-invoicing provides the primary institutional intervention to enhance taxpayer compliance by defining qualifying business invoices as standardized digital records that enable standardized digital invoice reporting to reduce data-format inconsistencies and facilitate automatic reporting and comparison of transaction information that increases transaction visibility and data availability as electronically reported B2B transactions create an information trail through which tax authorities can track the relationship between suppliers and customers more systematically, consistent with Pomeranz's (2015) findings that VAT invoice trail and third-party information can generate preventive deterrence and self-enforcement across transaction chains; this increased visibility is expected to facilitate invoice verification, input-tax-credit (ITC) reconciliation, and stronger electronic audit trail, because information reported by sellers can be cross-checked with ITC claims and records associated with customers, while evidence from technology-based tax administration suggests that increased third-party reporting and information-processing capacity can enhance enforcement and discourage tax sheltering (Li et al., 2020); this may in turn lead to fewer reporting errors and more detection of suspicious or fraudulent transactions to increase the probability of exposure of underreporting, thus incentivizing more accurate filing, with evidence from VAT e-invoicing indicating it can increase reported sales, purchases, and tax liabilities due to increased monitoring and deterrence (Bellon et al., 2022); among other things, greater accuracy of reported information and increased detection of fraud will make the probability of detection of falsely reported liabilities higher, which in turn should further incentivize more accurate filing, which in turn can raise the effective tax base and improve revenue mobilization; yet higher reported liabilities should not automatically be equated with increases in paid liabilities due to intervening credit balances and other institutional factors (Bellon et al., 2022), but this pathway is conditional upon and mediated by the level of technological capability, costs of compliance, level of taxpayer awareness, capacity of the administration, reliability of the system, complexity of the system, and efficacy of enforcement efforts, because the provision of digital services can reduce the burden of compliance and improve monitoring when implemented well (Okunogbe & Pouliquen, 2022) whereas firms lacking organizational and technological capacity can be disadvantaged by higher costs of formalization and compliance (Roy & Khan, 2021); consequently, the hypothesized overall pathway can be summarized as e-invoicing standardized reporting transaction visibility invoice/ITC verification improved compliance and fraud detection effective tax base and revenue mobilization while technologically capability, compliance costs, awareness, administrative capacity, system reliability, system complexity, and enforcement can moderate each relationship. The conceptual framework further assumes that e-invoicing influences revenue outcomes indirectly rather than mechanically, because its effectiveness depends on whether digital records are accurate, accessible, and effectively used by tax authorities and taxpayers. Improved information quality can enhance verification, reduce opportunities for concealment, and strengthen compliance behavior, while weak system integration, low digital readiness, and complex procedures may dilute these effects. Thus, the framework emphasizes the interaction between technological infrastructure, taxpayer behavior, administrative capacity, and enforcement quality in shaping GST revenue outcomes.

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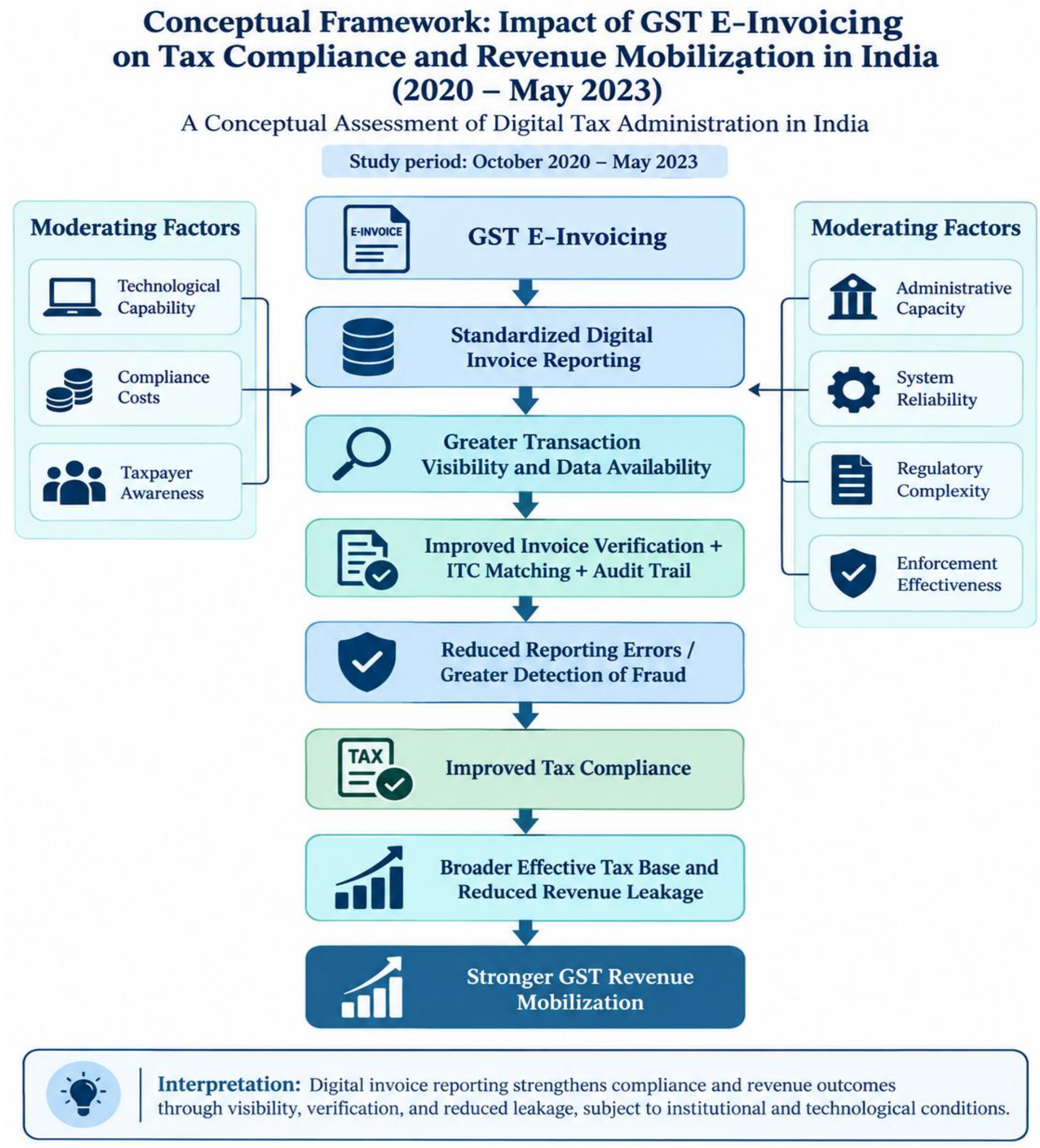

Above diagram showing Conceptual Framework related to the study

X. RESEARCH METHODOLOGY

The present research design is a conceptual and descriptive research design based on secondary evidence examining the potential impact of GST e-invoicing on tax compliance and revenue mobilization in India between 1 October 2020 and 31 May 2023. This is in line with the focus of conceptual research on synthesizing ideas, institutional evolution, policy evidence, and previous empirical work to construct an explanatory narrative rather than direct observation, as Jaakkola (2020) argues conceptual studies should explicitly display how existing thinking and information are integrated to develop new theory.

Accordingly, the study incorporates purposively selected pieces of evidence from the aforementioned sources within the pertinent time frame, such as sources from the Ministry of Finance, Central Board of Indirect Taxes and Customs, GST Council, Goods and Services Tax Network, National Informatics Centre, Economic Survey of India, Reserve Bank of India, Comptroller and Auditor General, parliamentary documents, peer-reviewed journal articles, academic books, NIPFP working papers, reports from the OECD, IMF, and World Bank, with the choice of sources driven by relevance, authority, appropriateness of the period of coverage, and the direct or indirect association with e-invoicing, digital compliance, input-tax-credit verification, anti-evasion, and GST revenue collection; since the evidence is drawn from dissimilar academic and documentary sources, it adopts the logic of integrative review that entails detailed comparison and synthesis of different types of evidence without averaging, averaging, synthesizing, as Thomas (2006) asserts, provides a valid means for developing working knowledge and conceptual structure from qualitative sources, while organization of the material adopts the model of thematic analytical coding and grouping with the themes of GST e-invoicing digitalization of tax administration transaction transparency invoice and input-tax-credit verification taxpayer compliance anti-evasion capacity, revenue mobilization, while contextual variables of technological capacity, complexity of regulations, taxpayer awareness, system sophistication, administrative capacity are conceptualized as factors between cause and effect; as the present research on Chinese FDI is neither based on econometric identification, experimental design, and causal estimation at the firm level, it does not hypothesize that the changes of tax compliance and revenue collection were caused solely by e-invoicing, but it discusses in detail the mechanisms that e-invoicing would enhance compliance and revenue collection in the context of India.

XI. EVOLUTION OF GST E-INVOICING IN INDIA, 2020–MAY 2023

The development of GST e-invoicing in India from October 2020 to May 2023 demonstrates a staged growth of digital compliance, moving from large-taxpayer direct intervention to widespread transaction reporting. Starting from 1 October 2020 e-invoicing was made compulsory for notified taxpayers whose aggregate turnover for the specified B2B and export transactions is greater than 500 crores, as an empirically cautious step that could gauge the loading capacity of the GSTN Infrastructure as well as the readiness of taxpayers and the service environment to accommodate further rollouts with smaller turnover thresholds. This phase was followed by a reduction in the threshold to above 100 crores from 1 January 2021 and above 50 crores from 1 April 2021. According to data from the GST council records, the policy goal was gradual reach-out as the infrastructure and the taxpayer environment were ready for deeper penetration (Goods and Services Tax Council, 2021). It was then reduced to above 20 crores from 1 April 2022, again meeting the GSTN/NIC readiness, followed by a further reduction to above 10 crores from 1 October 2022, while a reduction to above 5 crore was announced by 10 May 2023, to take effect from 1 August 2023. By the study cut-off date of 31 May 2023 this threshold was still in operation. (Goods and Services Tax Council, 2022; Government of India, 2023). In parallel, e-invoicing increasingly became part of GST return finalization in that invoice details sent successfully to the Invoice Registration Portal, along with the Invoice Reference Number, were then forwarded to the GST system and automatically inserted into the relevant sections of the supplier's GSTR-1. This eased the task of retaking, balancing and completing invoice data with information not contained in the e-invoice. This same information architecture also linked e-invoicing with the e-way-bill system. Details of the invoice supplied to the IRP could be used to feed Part A of the e-way bill and could, where mode of transport details were provided, help generate the e-way bill (Invoice Registration Portal, 2023). In conceptual terms, the incremental lowering of thresholds was aimed at increasing the number and business diversity of entities reporting automated invoice data, thus expanding the quantity of supplier-buyer information within the GST environment, increasing the possibility for more transaction checks, cross-verification, input-tax-credit checks, risk evaluation, auditability, and giving increased importance to system robustness, taxpayers' digital literacy and personnel capacity as e-invoicing extended from very large organisations to smaller companies.

XII. GST E-INVOICING AND TAX COMPLIANCE

E-invoicing can conceptually strengthen compliance, since it provides a more standardized, timely, and data-rich flow of information for cross-checking between parts of the GST system: first, the use of a prescribed electronic invoice schema will potentially improve invoice-reporting accuracy by standardizing critical data elements and reducing duplicated manual entries, but broader evidence from digital tax administration points to a negative effect of electronic systems on compliance costs and the scope for administrative distortion if appropriately designed (Kochanova et al., 2020); second, timely electronic reporting can improve transaction timeliness and coverage, by bringing information closer to the underlying business event than waiting until periodic tax returns; third, an increased flow of invoice-level information can facilitate cross-checks between taxpayers, reducing the information advantage that buyers and sellers have over tax collectors, since supplier information enhances tax authorities' ability to validate declared liabilities against raw information from source documents, consistent with evidence from VAT e-invoicing that better monitoring and deterrence raises the reported sales, purchases, and VAT liabilities of suppliers (Bellon et al., 2022); fourth, e-invoicing can also support input tax-credit discipline, since both buyer and seller have incentives to keep invoice information stable, or otherwise both face more frequent detectability of invoice mismatches; fifth, integrating authenticated invoice data with GST return data can enable pre-filled returns and automate certain calculations, reducing taxpayer data entry burdens and transcription errors, while prompting taxpayers to review the automatically generated amount; finally, standardized digital records can support risk management and compliance monitoring by facilitating comparisons between invoice, return, credit, and other transaction records, in line with the finding that electronic tax administration can reduce compliance costs while affecting the probability that under-reporting will be detected (Okunogbe & Pouliquen, 2022); hence, e-invoicing should be viewed as an information-based compliance-enhancement tool that depends on data quality, technological infrastructure, taxpayer capacity, and administrative use of digital records, rather than an inherent source of increased compliance.

XIII. GST E-INVOICING AND REVENUE MOBILIZATION

GST e-invoicing: revenue enhancement potential The main revenue-enhancement pathways through GST e-invoicing relate to improved taxpayer compliance and transaction observability, as the conversion of business-to-business sales into machine-readable and electronically verifiable records can enhance observability of under-reported sales and broaden the effective tax base without necessarily raising rates-this is the most established rationale in the theoretical literature and evidence from tax reforms that incorporate information technology: as Ali et al. (2021) document for Ethiopia, establishment of electronic sales-registration technology increased reported sales and VAT revenues, a phenomenon also observed by Mascagni et al. (2021), who calculated sizable revenue gains from electronic sales-registration but found smaller effects than in reported sales, because the increased information prompted many taxpayers to adjust their reported costs while negative effects from unreported inputs offset some of the revenue increases; documented spillovers from improved data availability include greater taxpayer compliance, because better information about revenue can both detect non-compliance and serve as credible threat, and potential for improved tax-enforcement upon the invention of integrated invoice databases, as these can enable risk-scoring, cross-matching, anomaly detection, pattern recognition, and tailored audits-which directs enforcement capacity to transactions that generate higher compliance risk-although these benefits assume credible enforcement and access to granular and timely third-party data, as Carrillo et al. (2017) have shown that revealed revenue gaps are often mirrored by adjustments in the cost base of non-compliant taxpayers, who appear to compensate in response to the detection of revenue discrepancies; correspondingly, information on sales can also serve to curtail revenue leakage by revealing invisible sales, inconsistencies, and over-claims and comparisons of input credits and taxpayer-supplied purchase invoices may help monitor the validity of input claims, while integrated invoice records could be used to help prevent excess input-tax credits from formally eroding the tax base, via targeted audits, fraud detection, risk-based valuation, and data analysis; the main caveat to these initiatives is that third-party information may reveal only so much, as taxpayers who face fewer revenue losses through detection may compensate by raising less-verifiable costs (Carrillo et al., 2017), which presumes that enforcement action is remotely to hand; thus, the key revenue-productivity implication of GST e-invoicing is that it may enable the government to extract a higher share of (already tributory) sales than ex ante more effectively through better reporting, ITC compliance, and diminished leakage rather than higher rates (Ministry of Finance, 2023).

XIV. E-INVOICING, FAKE INVOICES, AND FRAUDULENT ITC

GST e-invoicing could enhance the rigor of tax administration by linking authenticated invoice identifiers, standard transaction data, digitally verifiable QR information, and structured data that could be fed into return filing, input-tax-credit verification, audit trail, and risk-based monitoring to augment the comparative capacity of tax authorities to detect mismatches between supplier and buyer reports; in principle, this architecture could make fake or duplicate transactions more difficult to hide, because invoice-level data is more likely to be traceable across multiple systems of compliance (Pomeranz, 2015; Li et al., 2020); digitalization, however, does not automatically eradicate fraud, because miscreants have a propensity to adapt to existing reporting schemes, utilizing fake GST registrations, circular trading, bogus invoices, abuse of credentials, shell companies, or coordinated chains of dummy registrants to generate or siphon off ineligible input-tax credits, and experience before May 2023 shows that fake registrations and invoice-only transactions were widespread enough that the Indian Central Board of Indirect Taxes and Customs launched a nationwide special verification campaign aimed at detecting vulnerable GST registrations and illegitimate ITC syphons (Central Board of Indirect Taxes and Customs [CBIC], 2023); this gap highlights how even e-invoicing with its standards-based data structure leaves room for circumventing the tax, since a transaction documented solely through an electronic file might be tied to fictitious suppliers, manipulated supply chains, or other types of illicit schemes, and that omittance can be costly in a GST context because the fraud siphons off revenue in the form of ineligible credit.

XV. MAJOR IMPLEMENTATION CHALLENGES DURING 2020–MAY 2023

During the staggered rollout of GST e-invoicing in India, from October 2020 to May 2023, both operational and institutional challenges emerged because business could have had to adapt existing ERP and accounting software to meet the invoice schema specification, connect through APIs to Invoice Registration Portals, undertake data mapping, and adapt systems to generate and store Invoice Reference Numbers and QR codes, while the official e-invoicing portal itself flagged ERP completion, system connections, error resolution, cancellation, and GSTR-1 reporting as implementation issues (Invoice Registration Portal, 2023), requirements that potentially involved investment in technology and compliance costs through IT specialists for smaller firms without dedicated IT staff, and which related to information systems adoption for small and medium enterprises according to research on cloud-ERP implementation (Haddara et al., 2022); variations in internet access, digital literacy, technological capacity, and organizational readiness meant these concerns would have been especially significant for Indian MSMEs, which form a diverse group with significantly varying technological capacities (Buteau, 2021); carrying out compliance therefore made taxpayer education more critical with regard to changing thresholds, deadlines, and software policies, whilst invoice errors created complications because an IRN could not be altered after issuance and cancellations generally had to be completed within a 24-hour time limit, after which corrections would have to be submitted using GST procedures (Invoice Registration Portal, 2023); interdependent digital portals amplified the importance of reliable ICT systems, data quality, interoperability, information security, access controls, and confidentiality of commercial data during transactions, as shortcomings at any stage could compromise reporting reliability, and changing regulations and thresholds mean that taxpayers need to continuously adapt to compliance obligations; balancing strong digital enforcement with

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practical ease of compliance underpins effective implementation and especially for MSMEs, because technology facilitates easier compliance when integrated into systems but could potentially place undue burdens on those with limited technological, advisory, or financial resources (OECD, 2022).

XVI. DISCUSSION RELATED TO THE STUDY

Taking the literature and conceptual framework together, the impact of GST e-invoicing on revenue mobilization in India (October 2020 – May 2023) should be interpreted as an indirect and conditional one in which the digitalization of invoicing enhances transparency of transaction data, increased transparency strengthens the reporting of economic activity and authentication of input tax credits, improved authentication enhances the standard of compliance, higher standard of compliance reduces the opportunities for tax evasion, and diminished opportunities for evasion has the potential to enhance revenue mobilization, since both the transparency of information reporting and the potential for enforcement of rules are critical factors in the outcome of taxpayer compliance (Slemrod, 2019). However, this channel is not self-executing, for the reason that increased digitalization in reporting also imposes new procedural, technical, and expert administrative costs upon the tax paying entities, and research concerning VAT/GST implementations internationally (such as in Harju et al. 2019) has illustrated how the administrative costs of compliance are themselves a potential driver of firm behavior distinct from statutory taxation, especially for small-to-medium-scale enterprises. Hence, increased complications within generating e-invoices, integration with enterprise systems, invoice reconciliation, procedures for corrections and annual return filing could equally act to potentially impede voluntary tax compliance among enterprises with constrained digital or administrative capacity. Furthermore, digitalization is no panacea against the fabrication of records, creation of chain of fraudulent ITC invoices and other methods of evasion and therefore, it needs to be supplemented with other modes of verification and investigation. Most importantly, one cannot explain the performance of GST collections in the period October 2020 to May 2023 through the prism of e-invoicing alone, since revenue is determined simultaneously by various factors such as nominal growth of the economy, the pace of inflation, trends in consumption, the revision of tax rates/exemptions, anti-evasion drives and the rebound effect post the COVID-19 pandemic. In fact, Economic Survey (2021-22) observed that the buoyancy in the GST collection is an outcome of sustained economic recovery, anti-evasion activities, specifically action against fake billers, many systemic changes introduced from time to time with regard to GST return filling, the settlements in regard to audits and better administration. Similarly, Economic Survey (2022-23) noted the strong post GST revenue performance. Therefore, the most prudent inference is that e-invoicing has improved the data and compliance system in GST but revenue increase can be attributed to the interplay of digital compliance reforms, the taxpayers' response, quality of administration and general macroeconomic performance.

XVII. POLICY IMPLICATIONS

From a pre-June-2023 policy perspective, India's GST e-invoicing experience indicates potential to further improve compliance and revenue mobilization through a balanced mix of technology, taxpayer facilitation, administrative simplification and enforcement: 1. E-invoicing processes must continue to be reduced for complexity, especially for SMEs, because integrating tax obligations into operational business and accounting procedures can reduce compliance friction and error; OECD (2022a) notes that operationalizing seamless taxation minimizes compliance costs for SMEs; 2. Investment in the effectiveness, capacity, scalability and system integration for increased coverage must continue, while higher coherence across the e-invoicing system, GST returns and e-way bills can reduce duplicated data input and increase data coherence; 3. Supporting SMEs by making the technological platform affordable and user-friendly, while providing electronic assistance and guidance, can support SMEs compliance efforts (OECD, 2022b); 4. More systematic exploitation of invoice level data through analytical identification of complex risky transaction networks, suspicious claims of input tax credits (ITC) and high-risk taxpayers can improve compliance risk management; 5. New automated identification of fake companies, ITC fraud should be supported by registration verification, cross-checks across systems, detection of anomalies and targeted investigation; 6. Removal of the duplicated information and responsibilities among the invoice reporting, the returns and the movement of goods records; 7. Speeding up the process of invoice correction, cancelling and appeals; and 8. Maintaining proportionate enforcement because balancing provision of assistance to those seeking to adhere to the law with aggressive enforcement against intentional evasion remains the most effective approach to revenue protection.

XVIII. LIMITATIONS OF THE STUDY

Some limitations apply when considering these findings, with the first relating to reliance on secondary evidence; this focus on secondary sources means the data was not gathered specifically to investigate the phenomena under study but instead draws on government documents, institutional reports, published research and administrative data that was collected for other purposes, meaning variations in definitions, coverage, measurement and reporting may render data sources incomparable (Vartanian, 2011). The study's lack of primary data at the firm-level – coupled with some additional factors – further limits the scope of possible conclusions, as the analysis cannot delve into the specifics of taxpayers' practical experience with invoice accuracy, ERP linkage, compliance costs, ITC scrutiny, digital resilience, and tax behaviour; short-term observations following implementation mean fewer conclusions can be made regarding eventual adjustment behaviour and revenue impacts; multiple overlapping reforms make it difficult to distinguish the independent impact of e-invoicing; and the short time interval over which e-invoicing was implemented means matching between different taxpayer groups was imperfect, because different sets of taxpayers entered the system at different points in time, further complicating before-and-after comparisons. Meanwhile, the simultaneous implementation of multiple additional measures to enhance GST compliance – e-way-bill checks, return matching, anti-evasion efforts, analytics, and ITC restrictions – limits the ability to parse out the independent effects of e-invoicing, while India's economic recovery after COVID-19 lockdowns meant the relatively high growth in tax revenue may have been driven by increases in economic activity and inflation more generally, rather than solely the impact of reforms (World Bank, 2022). These factors imply that e-invoicing's impact on revenue cannot be unequivocally attributed to the reform itself, and the findings necessarily reflect a descriptive and conceptual rather than a causal or quantitative approach, meaning clear cause-and-effect conclusions cannot be confidently drawn from the data; instead, the relationships identified should be understood as observed rather than proven effects, and treated as hypotheses for further research (Shadish et al., 2002).

XIX. SCOPE FOR FUTURE RESEARCH

Further research could try to move away from conceptual conceptualizing to firm-level, transaction-level empirical work that can identify the implications of electronic invoice reporting for tax compliance, input-tax-credit claiming, and revenue effects across different types of taxpayers (some researchers could use the staggered reductions in e-invoicing thresholds as staggered policy interventions and carry out longitudinal or difference-in-differences designs comparing firms that join at different points in time, because modern methods explicitly allow the evaluation of policy interventions introduced across multiple periods and have different timestamps of adoption (Callaway & Sant'Anna, 2021)). Future research should explore, for example, whether e-invoicing alters supplier networks and their relationships including whether registered firms rely more heavily on sales from electronically compliant suppliers, given that Indian administrative research has shown that tax collection can shape client-supplier relationships and how firms choose to participate in VAT (Gadenne et al., 2019)). Other work could explore whether fraudulent input-tax-credit detection is feasible, for instance, if invoice-level network analysis can detect fake firms and circular trade structures as well as invoice mills; because Waseem (2023) finds that fake invoices are an important form of VAT non-compliance, even when transaction network reporting exists, there is scope for survey research into MSMEs' technology costs, ERP modification costs, consulting costs, digital skills, understanding of compliance rules, and accuracy in return-filing, and sector- or State-level research into variation in responsiveness to transaction- and invoice-level controls could identify heterogeneity across firms with different firm structures, levels of digital experience, and quality of administration; other research should examine whether e-invoicing influences VAT buoyancy once it is disentangled from inflation, consumption growth, rate variation, and the fact that recovery has been strong after the COVID-19 pandemic (Das et al., 2022); because Indian evidence that electronic payments drove increased reported firm sales suggests that future work must analyse payments, invoices, and tax filings jointly, rather than analyzing these instruments in isolation (Das et al., 2022);and because advancing risk-based analytics and machine learning has huge potential for turning the expanding e-invoicing data into more effective enforcement, but it is unclear whether this would simply increase enforcement costs for voluntary compliance (for example, by providing tools for detecting rule-breakers more readily) or actually ease compliance.

XX. CONCLUSION

The findings through 31 May 2023 suggest conceptualizing GST e-invoicing as an important part of India's broader movement away from traditional, return-based tax administration toward a digital, data-centric, transaction-focused approach to taxpayer compliance. For that is what standardized electronic invoices can help produce: structured transaction data more proximate to the underlying business event, better consistency in reporting, stronger linkages between suppliers and buyers, improved input-tax-credit verification, and greater electronic audit-trailing through which tax administrations can assess inconsistencies and compliance risks-one element of a global trend toward integrating taxation within the digital systems of taxpayers (Organisation for Economic Co-operation and Development [OECD], 2022); India's own efforts with GST information infrastructure also show that nation-wide digital tax reform can help achieve administrative integration and customer interaction while that system's quality, service levels, and information technology-related demands can create compliance challenges (Dikshit et al., 2022). This pathway-e-invoicing standards producing better transaction transparency, better invoice and ITC verification, stronger compliance, less revenue leakage, and higher revenue mobilization capacity-is one that makes sense as to how e-invoicing might further strengthen GST administration, yet it should not be understood as a causal chain that is empirically driven or statistically validated. Rather, each step is susceptible to technological reliability, taxpayer digital literacy, administrative simplicity, data accuracy, interoperability, enforcement levels, and institutional capacity, while India's experience of GST has shown that system instability and structural complexity can weaken compliance and revenue productivity (Rao, 2022). After all, revenue growth that India experienced between 2020 and 2022 cannot be attributed solely to e-invoicing, because the economic recovery, inflation, consumption expansion, enforcement, policy adjustments, and other technology-enabled tax reforms contributed to the revenue uplift at least as much-indeed, even the Ministry of Finance (2023) earmarked some of the revenue increase "to the technology-enabled reforms, of which the major one has been the e-invoicing system," while noting that "the Income Tax Department also saw a sharp rise in collections"–and e-invoicing is best viewed as a critical enabler of strengthened compliance and revenue safeguarding, whose long-term effectiveness hinges on matching reliable technologies with simple procedures, taxpayer facilitation, high-quality data, proportionate enforcement, and ongoing institutional adaptation.

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