International Journal of Computer Information Systems and Industrial Management Applications
ISSN 2150-7988 Volume 18(8s) 2026 pp. 1-18
https://doi.org/10.70917/ijcisim-2026-3203
Article

# Tax Digitalization as a Tool to Fight Tax Evasion: Economic and Legal Implications for Emerging Economies

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**Abstract:** Tax evasion remains one of the most significant barriers to fiscal sustainability and economic development in emerging economies. Despite continuous tax reforms, governments continue to face substantial revenue losses due to informal economic activities, weak institutional capacity, and limited enforcement mechanisms. In recent years, tax digitalization has emerged as a strategic policy instrument to improve tax compliance through the implementation of electronic invoicing, digital taxpayer identification systems, online tax filing platforms, big data analytics, and artificial intelligence-based auditing. This study examines the economic and legal implications of tax digitalization as a mechanism to reduce tax evasion in emerging economies. A quantitative research design is proposed using secondary data collected from international organizations, including the Organisation for Economic Co-operation and Development (OECD), the International Monetary Fund (IMF), the World Bank, and the Inter-American Center of Tax Administrations (CIAT). The analysis considers panel data from selected emerging economies during the period 2015–2024. The econometric approach evaluates the relationship between tax digitalization indicators and tax revenue performance while controlling for macroeconomic and institutional variables. The study argues that digital tax administration significantly strengthens tax compliance by increasing transparency, reducing information asymmetries, improving audit efficiency, and lowering administrative costs for both governments and taxpayers. From a legal perspective, digitalization also promotes greater legal certainty, enhances regulatory enforcement, and facilitates international cooperation against tax fraud. Nevertheless, the findings acknowledge persistent challenges associated with cybersecurity, data protection, unequal digital infrastructure, and regulatory harmonization across jurisdictions. The research contributes to the growing literature on digital governance and public finance by providing an integrated economic and legal framework explaining how digital tax systems influence compliance behavior and fiscal performance in developing contexts. The findings offer practical policy recommendations for governments seeking to modernize tax administrations while balancing efficiency, taxpayer rights, and legal accountability.

**Keywords:** Tax digitalization, Tax evasion, Electronic invoicing, Tax compliance, Digital governance, Emerging economies

## 1. Introduction

Tax evasion continues to represent one of the most persistent obstacles to sustainable public finance, particularly in emerging economies where fiscal capacity is constrained by extensive informal sectors, institutional weaknesses, and limited administrative resources. According to the Organisation for Economic Co-operation and Development (OECD, 2023), governments increasingly recognize that strengthening tax compliance is essential not only for increasing public revenues but also for promoting economic growth, social equity, and long-term fiscal sustainability. Similarly, the International Monetary Fund (IMF, 2024) emphasizes that improving tax administration has become a strategic priority as countries seek to recover from recent economic shocks while financing investments in infrastructure, healthcare, education, and climate adaptation.

The digital transformation of tax administrations has emerged as one of the most significant innovations in public financial management during the last decade. Technologies such as electronic invoicing, online tax filing systems, digital taxpayer identification, blockchain-based transaction records, artificial intelligence, machine learning, and big data analytics have fundamentally changed the way tax authorities monitor economic activity and detect fraudulent behavior. These technological developments have substantially reduced opportunities for underreporting income, issuing fraudulent invoices, and concealing taxable transactions, thereby improving both the efficiency and transparency of tax administration (OECD, 2023; CIAT, 2023).

Emerging economies face particularly complex challenges in combating tax evasion. High levels of informality, fragmented regulatory frameworks, limited technological infrastructure, and insufficient institutional coordination reduce the effectiveness of conventional tax enforcement mechanisms. The World Bank (2022) estimates that the informal economy accounts for a significant proportion of economic activity in many developing countries, substantially reducing the tax base and limiting governments' capacity to finance essential public services. Consequently, digital tax administration has become an increasingly attractive policy instrument capable of addressing structural weaknesses while improving taxpayer services and reducing compliance costs.

Economic theory has long suggested that taxpayer compliance depends on the interaction between expected penalties, audit probabilities, institutional trust, and administrative efficiency. The classical economic model developed by Allingham and

Sandmo (1972) demonstrates that taxpayers respond to incentives by comparing the expected benefits of evasion with the potential costs of detection and punishment. More recent research extends this perspective by emphasizing the importance of voluntary compliance, trust in public institutions, and perceived procedural fairness as determinants of tax behavior (Kirchler, 2007; Alm, 2019; Slemrod, 2019). Digital technologies contribute to these mechanisms by increasing the probability of detection, reducing information asymmetries, and facilitating real-time verification of taxable transactions.

From a legal perspective, tax digitalization also transforms the relationship between governments and taxpayers. Digital platforms strengthen legal certainty through standardized administrative procedures, automated reporting systems, electronic evidence, and greater transparency in tax administration. At the same time, however, these innovations raise important legal concerns regarding data protection, cybersecurity, privacy rights, cross-border information exchange, and the harmonization of national tax regulations with international standards (OECD, 2023; United Nations, 2022). Balancing efficient tax enforcement with the protection of fundamental rights therefore represents one of the principal challenges associated with digital tax governance.

Although numerous studies have examined individual aspects of tax compliance, electronic invoicing, or digital government, relatively few investigations integrate both the economic and legal dimensions of tax digitalization within the specific context of emerging economies. Existing research frequently focuses on individual countries or isolated technological interventions, limiting the generalizability of findings across diverse institutional environments. Furthermore, empirical evidence comparing the fiscal effects of digital tax reforms across multiple emerging economies remains relatively limited, particularly for the period following the rapid acceleration of digital public services after the COVID-19 pandemic.

This study seeks to address these gaps by examining how tax digitalization influences tax evasion from both economic and legal perspectives. Specifically, the research evaluates whether the implementation of digital tax administration systems contributes to increased tax revenue, improved compliance, enhanced institutional transparency, and stronger legal enforcement in emerging economies. By integrating economic theories of tax compliance with legal principles of digital governance, the study proposes a comprehensive analytical framework capable of explaining the mechanisms through which digital technologies improve fiscal performance.

The main research question guiding this study is: To what extent does tax digitalization reduce tax evasion and strengthen fiscal performance in emerging economies?

To answer this question, the study pursues the following objectives:

1. To analyze the relationship between tax digitalization and tax compliance in emerging economies.
2. To evaluate the economic effects of digital tax administration on tax revenue collection.
3. To examine the legal implications associated with the implementation of digital tax systems.
4. To propose policy recommendations for strengthening digital tax governance in developing countries.

Based on the theoretical framework and previous empirical evidence, the study tests the following hypotheses:

H1: Greater levels of tax digitalization are positively associated with higher tax revenue collection in emerging economies.

H2: The implementation of digital tax administration significantly reduces opportunities for tax evasion by improving transparency and audit effectiveness.

H3: Strong legal and institutional frameworks enhance the positive effects of tax digitalization on taxpayer compliance.

The remainder of this article is organized as follows. Section 2 reviews the relevant literature on tax evasion, digital tax administration, and emerging economies. Section 3 presents the theoretical framework. Section 4 describes the research methodology. Section 5 reports the empirical results, while Section 6 discusses the findings from both economic and legal perspectives. Finally, Section 7 presents the conclusions, policy implications, limitations, and recommendations for future research.

## 2. Literature Review

### *2.1 Tax Evasion: Concept, Determinants, and Economic Consequences*

Tax evasion is generally defined as the deliberate and illegal concealment or misrepresentation of taxable income, assets, or transactions with the objective of reducing tax liabilities. Unlike tax avoidance, which relies on legal strategies to minimize taxes within the limits of existing legislation, tax evasion violates statutory obligations and undermines the integrity of fiscal systems. Its economic consequences extend beyond immediate revenue losses, affecting public investment, income redistribution, institutional legitimacy, and long-term economic development (Slemrod, 2019).

The theoretical foundation of tax evasion research is largely based on the economic model proposed by Allingham and Sandmo (1972), who conceptualized taxpayers as rational decision-makers evaluating the expected benefits of evasion against the probability of detection and the severity of sanctions. Although this framework remains influential, subsequent studies have demonstrated that tax compliance is also shaped by psychological, institutional, and social factors. Trust in government, perceptions of fairness, tax morale, and the quality of public services significantly influence voluntary compliance beyond purely economic incentives (Kirchler, 2007; Alm, 2019).

Recent empirical studies indicate that tax evasion remains particularly severe in emerging economies because of extensive informal sectors, limited administrative capacity, weak judicial enforcement, and fragmented information systems. The World Bank (2022) reports that informality accounts for a substantial share of employment and production in many developing countries, thereby reducing the effectiveness of conventional tax enforcement mechanisms. These structural conditions increase compliance costs while simultaneously limiting governments' ability to identify unreported economic activity.

Digital technologies have altered this traditional landscape by allowing tax administrations to collect, process, and verify large volumes of transactional data in real time. As audit systems become increasingly automated and interconnected, opportunities for concealing taxable activities decline substantially, increasing both actual and perceived probabilities of detection.

### *2.2 Tax Digitalization and Digital Tax Administration*

Tax digitalization refers to the integration of digital technologies into tax administration processes with the objective of improving efficiency, transparency, compliance, and taxpayer services. Rather than simply replacing paper-based procedures with electronic platforms, digital tax administration represents a broader transformation involving data integration, automation, predictive analytics, artificial intelligence, cloud computing, and interoperable government information systems (OECD, 2023).

One of the most significant innovations has been the implementation of electronic invoicing systems. Electronic invoices create digital records that allow tax authorities to verify commercial transactions almost immediately, reducing opportunities for invoice fraud, underreporting, and value-added tax (VAT) evasion. Countries such as Brazil, Mexico, Chile, and Colombia have demonstrated that electronic invoicing significantly improves VAT collection while reducing administrative costs for both governments and businesses (CIAT, 2023).

Another important component of tax digitalization is the development of integrated taxpayer information systems. Modern tax administrations increasingly combine information from customs authorities, financial institutions, social security agencies, business registries, and digital payment platforms. The integration of these databases enables advanced risk analysis, targeted audits, and more accurate identification of non-compliant taxpayers (IMF, 2024).

Artificial intelligence and machine learning further strengthen tax administration by identifying abnormal transaction patterns, detecting fraudulent declarations, and prioritizing high-risk taxpayers for inspection. These technologies reduce human error, optimize administrative resources, and improve audit efficiency while simultaneously lowering compliance costs for taxpayers who fulfill their obligations voluntarily.

Nevertheless, digital transformation also introduces new operational challenges. Cybersecurity threats, unequal access to digital infrastructure, insufficient technical capacity, and concerns regarding personal data protection may reduce the effectiveness of digital tax reforms if not accompanied by appropriate institutional safeguards and legal frameworks.

### *2.3 Tax Digitalization in Emerging Economies*

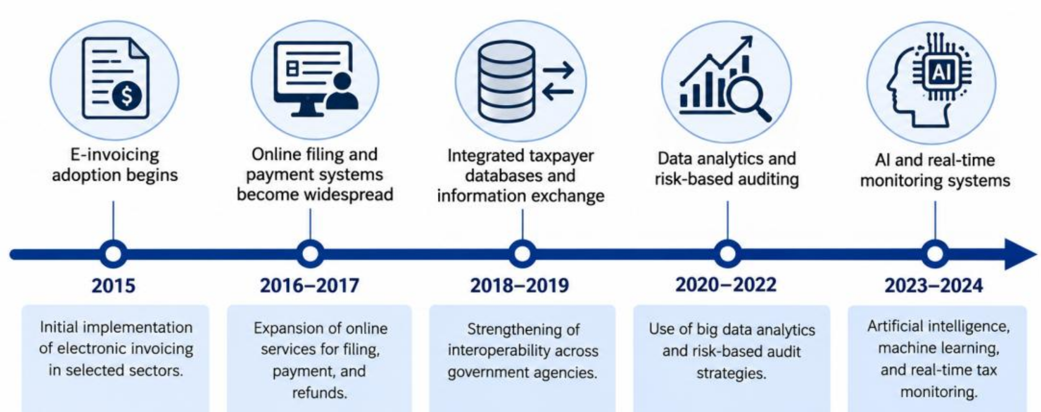
Emerging economies provide a particularly relevant context for evaluating digital tax reforms because they combine high levels of economic informality with rapidly expanding digital infrastructure. Governments increasingly view digital taxation systems as mechanisms for expanding the tax base without substantially increasing statutory tax rates.

Evidence from Latin America illustrates this trend. Brazil pioneered electronic invoicing through the Nota Fiscal Eletrônica (NF-e), significantly improving transaction traceability and VAT administration. Mexico implemented the Comprobante Fiscal Digital por Internet (CFDI), creating one of the world's most comprehensive electronic invoicing systems. Similar reforms have subsequently been adopted in Colombia, Peru, Ecuador, and several African and Asian economies, producing measurable improvements in tax administration efficiency (OECD, 2023; CIAT, 2023).

Despite these advances, implementation outcomes remain heterogeneous across countries. Differences in institutional quality, internet penetration, digital literacy, judicial effectiveness, and political commitment explain much of the variation observed in fiscal performance following digital reforms. Countries with stronger governance structures generally obtain larger gains in tax compliance than jurisdictions where institutional weaknesses limit enforcement capacity.

The IMF (2024) argues that digitalization should not be understood as an isolated technological reform but rather as part of a broader institutional modernization strategy involving legal reforms, organizational restructuring, human capital development, and international cooperation.

**Figure 1. Evolution of Digital Tax Systems in Emerging Economies (2015–2024)**




*Source:* Prepared by the authors.

Source: Prepared by the authors based on OECD (2023), IMF (2024), World Bank (2022), and CIAT (2023).

### *2.4 Legal Implications of Tax Digitalization*

The expansion of digital tax administration has generated significant legal implications that extend beyond fiscal efficiency. Digital systems require legal frameworks capable of regulating electronic documents, digital signatures, online administrative procedures, electronic evidence, and cross-border information exchange. Consequently, tax digitalization has become closely associated with broader principles of digital governance and administrative modernization.

One major legal challenge concerns the protection of taxpayers' personal information. Modern tax administrations process vast quantities of financial and commercial data, making cybersecurity and data privacy essential components of digital governance. Compliance with national privacy legislation and international standards is necessary to preserve taxpayer confidence while ensuring effective enforcement.

Another important issue involves legal certainty. Standardized digital procedures reduce administrative discretion, increase transparency, and improve consistency in tax assessments. Automated systems also facilitate the generation of electronic audit trails, strengthening judicial review and reducing opportunities for corruption.

International cooperation has become increasingly relevant as digital commerce expands across borders. Initiatives promoted by the OECD—including automatic exchange of financial information and the Base Erosion and Profit Shifting (BEPS) project—illustrate how digital technologies support coordinated efforts to combat international tax evasion and aggressive tax planning.

### *2.5 Research Gap*

Although existing literature demonstrates that tax digitalization improves administrative efficiency and enhances tax compliance, several limitations remain. First, many empirical studies examine only individual countries, restricting the external validity of their findings. Second, relatively few investigations integrate economic and legal perspectives within a single analytical framework. Third, limited evidence exists regarding the medium-term effects of digital tax reforms implemented after the accelerated digital transformation experienced during the COVID-19 period.

This study addresses these limitations by combining economic theories of tax compliance with legal analyses of digital governance using comparative evidence from multiple emerging economies. The proposed framework seeks to explain not only whether tax digitalization increases fiscal revenues but also the institutional and legal mechanisms through which these improvements occur.

## 3. Theoretical Framework

### *3.1 Economic Theory of Tax Compliance*

The economic analysis of tax compliance has traditionally been grounded in the expected utility framework proposed by Allingham and Sandmo (1972), which models taxpayers as rational agents who decide whether to comply with tax obligations by comparing the expected benefits of evasion against the probability of detection and the

magnitude of potential penalties. Building upon Becker's (1968) economics of crime, this framework assumes that compliance behavior responds to changes in enforcement intensity, audit frequency, and sanction severity.

Although the deterrence model remains an essential theoretical foundation, subsequent research has demonstrated that tax compliance cannot be explained exclusively by economic incentives. Empirical evidence indicates that taxpayers' decisions are also influenced by institutional quality, perceptions of procedural fairness, tax morale, trust in government, and the legitimacy of public institutions (Kirchler, 2007; Alm, 2019; Slemrod, 2019). Consequently, modern tax compliance theory integrates both economic and behavioral determinants.

Within this broader framework, tax digitalization modifies taxpayer behavior by increasing information availability, improving monitoring capacity, reducing opportunities for concealment, and lowering administrative uncertainty. Digital technologies therefore strengthen both deterrence mechanisms and voluntary compliance by making tax systems more transparent, predictable, and efficient.

### *3.2 Institutional Theory and Digital Governance*

Institutional economics provides an additional perspective for understanding why digital tax reforms generate different outcomes across countries. According to North (1990), institutions consist of the formal and informal rules that structure economic interactions and reduce uncertainty. Efficient institutions lower transaction costs, improve information quality, and facilitate cooperation among economic actors.

Digital tax administration can be interpreted as an institutional innovation that transforms the relationship between governments and taxpayers. Electronic invoicing, integrated taxpayer databases, digital identities, and automated reporting systems reduce informational asymmetries while strengthening governments' capacity to enforce tax legislation consistently.

However, institutional quality determines the effectiveness of these technological reforms. Countries characterized by strong governance, judicial independence, regulatory stability, and effective public administration generally experience larger improvements in tax compliance following digitalization than countries facing institutional fragility. Consequently, digital technology should not be viewed as a substitute for institutional development but rather as a complementary mechanism that enhances existing governance structures.

### *3.3 Legal Theory of Digital Tax Administration*

From a legal perspective, tax digitalization represents an evolution in administrative law and public governance. Modern tax administrations increasingly rely on electronic documents, digital signatures, automated procedures, and real-time data exchange to exercise regulatory authority. These innovations require legal systems capable of recognizing electronic transactions as legally valid while protecting taxpayers' constitutional rights.

Legal certainty constitutes one of the principal objectives of digital tax administration. Standardized electronic procedures reduce administrative discretion, improve consistency in tax assessments, facilitate judicial review, and strengthen accountability mechanisms. Furthermore, electronic audit trails increase evidentiary reliability during administrative and judicial proceedings.

Nevertheless, expanding governmental access to financial and commercial information also raises significant legal concerns. Data protection legislation, cybersecurity standards, privacy rights, proportionality principles, and due process guarantees become essential components of digital tax governance. International organizations have emphasized that technological innovation must be accompanied by robust legal safeguards capable of balancing effective tax enforcement with the protection of individual rights (OECD, 2023; United Nations, 2022).

### *3.4 Conceptual Model*

Based on the theoretical perspectives discussed above, this study proposes that tax digitalization influences fiscal performance through multiple interconnected mechanisms.

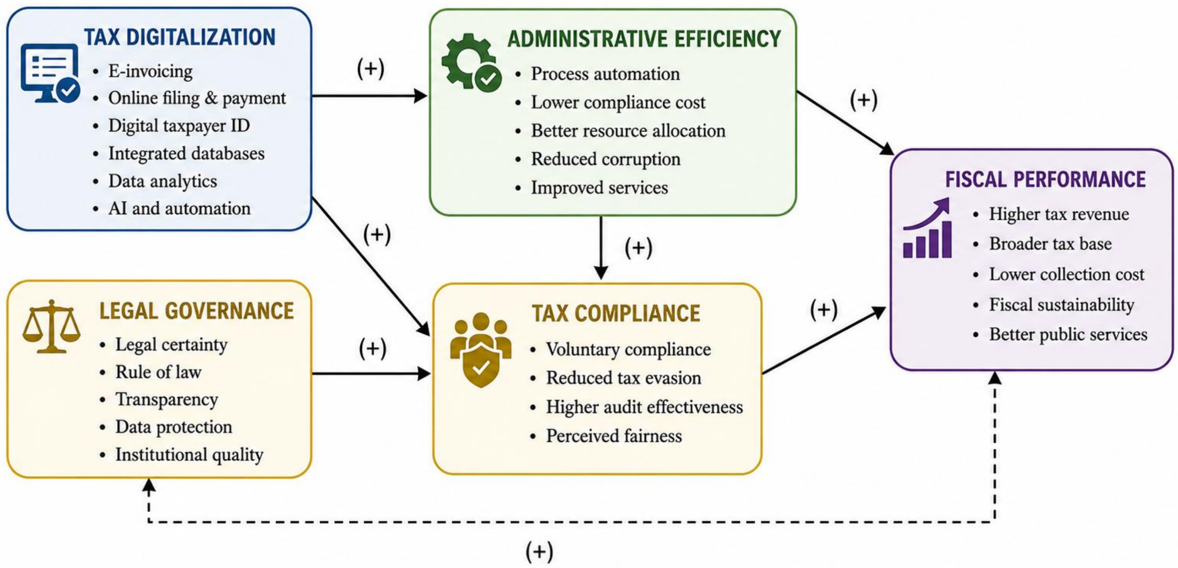
First, digital technologies improve information quality by increasing the availability, accuracy, and timeliness of taxpayer data. Enhanced information enables tax authorities to identify inconsistencies more rapidly, reducing opportunities for underreporting and fraudulent declarations.

Second, digital systems strengthen administrative efficiency by automating routine procedures, reducing processing times, minimizing human error, and allowing tax officials to allocate resources toward high-risk cases identified through predictive analytics.

Third, stronger legal frameworks governing digital administration increase taxpayer confidence by promoting transparency, accountability, procedural fairness, and legal certainty. These institutional improvements encourage voluntary compliance while simultaneously increasing the effectiveness of enforcement activities.

Finally, improved compliance contributes directly to higher tax revenues, broader tax bases, reduced informality, and greater fiscal sustainability. Increased public revenue enables governments to finance social programs, infrastructure investment, education, healthcare, and sustainable development initiatives without relying excessively on public debt.

**Figure 2. Conceptual Framework Linking Tax Digitalization, Legal Governance, Tax Compliance, and Fiscal Performance**




**Note:** (+) indicates a positive relationship.
**Source:** Prepared by the authors.

### *3.5 Research Hypotheses*

Drawing upon the theoretical framework, the following hypotheses are formulated for empirical testing:

H1. Tax digitalization has a positive and statistically significant effect on tax revenue collection in emerging economies.

H2. Tax digitalization reduces tax evasion by increasing transparency, audit effectiveness, and transaction traceability.

H3. Administrative efficiency mediates the relationship between tax digitalization and tax compliance.

H4. Strong legal and institutional governance positively moderates the relationship between tax digitalization and fiscal performance.

H5. Emerging economies with more advanced digital tax systems experience greater improvements in fiscal sustainability than countries with lower levels of digitalization.

These hypotheses provide the analytical foundation for the empirical strategy developed in the following section. The proposed econometric model evaluates both the direct and indirect effects of tax digitalization while controlling for macroeconomic conditions and institutional characteristics across emerging economies.

## 4. Methodology

### *4.1 Research Design*

This study adopts a quantitative, explanatory, and comparative research design to examine the relationship between tax digitalization and tax evasion in emerging economies. The research employs panel data analysis, allowing the simultaneous examination of cross-country differences and temporal changes. This methodological approach is appropriate because it controls for unobservable country-specific heterogeneity while increasing the efficiency of statistical estimations (Baltagi, 2021; Wooldridge, 2020).

The study focuses on emerging economies that have implemented significant digital tax reforms between 2015 and 2024. The selected countries represent different geographical regions while sharing common characteristics such as expanding digital infrastructure, ongoing fiscal modernization, and challenges related to tax compliance.

### 4.2 Population and Sample

The target population consists of emerging economies that have adopted digital tax administration initiatives during the study period.

The analytical sample includes the following countries:

- Brazil
- Mexico
- Colombia
- Chile
- Peru
- South Africa
- India
- Indonesia
- Türkiye
- Vietnam

These countries were selected because they have implemented digital tax policies—including electronic invoicing, online tax filing systems, digital taxpayer identification, or advanced electronic reporting—and because comparable macroeconomic and fiscal information is publicly available through international organizations.

The observation period covers ten years (2015–2024), generating a balanced panel dataset suitable for econometric estimation.

### 4.3 Data Sources

Secondary data are obtained from internationally recognized institutions to ensure consistency, comparability, and reliability.

The principal sources include:

- Organisation for Economic Co-operation and Development (OECD)
- International Monetary Fund (IMF)
- World Bank Open Data
- Inter-American Center of Tax Administrations (CIAT)
- United Nations Digital Government Reports
- National Tax Administrations

Macroeconomic indicators are complemented using the World Development Indicators (World Bank), while institutional governance indicators are obtained from the Worldwide Governance Indicators (WGI).

### 4.4 Variables

The empirical analysis evaluates the effect of tax digitalization on fiscal performance while controlling for relevant macroeconomic and institutional characteristics.

#### Dependent Variable

#### Tax Revenue (TAXREV)

Measured as total tax revenue as a percentage of Gross Domestic Product (GDP).

Source:

OECD Tax Statistics and IMF Government Finance Statistics.

### *Independent Variable*

### *Tax Digitalization Index (DIGITAX)*

A composite indicator constructed from:

Electronic invoicing implementation

- Online tax filing availability
- Digital taxpayer identification
- Electronic payment systems
- Digital audit capabilities
- Data integration among government agencies

Higher values indicate more advanced levels of tax digitalization.

### *Mediating Variable*

### *Administrative Efficiency (ADEFF)*

Measured through indicators including:

- Average tax processing time
- Number of electronic filings
- Audit efficiency
- Administrative cost reduction
- Moderating Variable

### *Legal Governance (LEGAL)*

Measured using governance indicators associated with:

- Rule of Law
- Regulatory Quality
- Government Effectiveness
- Digital Governance Readiness
- Control Variables
- The regression model includes several control variables commonly employed in fiscal policy research:
- GDP per capita
- GDP growth rate
- Inflation
- Trade openness
- Internet penetration
- Size of the informal economy
- Government effectiveness
- Population

These variables account for macroeconomic conditions that may independently influence tax revenue.

**Table 1**: Operational Definition of Variables

| Variable | Type | Measurement | Expected Sign | Source |
|---|---|---|---|---|
| TAXREV | Dependent | Tax revenue (% GDP) | — | OECD, IMF |
| DIGITAX | Independent | Digital Tax Index | (+) | OECD, CIAT |
| ADEFF | Mediator | Administrative Efficiency Index | (+) | OECD |
| LEGAL | Moderator | Governance Indicators | (+) | World Bank |
| GDPPC | Control | GDP per capita | (+) | World Bank |
| INF | Control | Inflation (%) | (-/+) | IMF |
| INTERNET | Control | Internet users (%) | (+) | World Bank |
| INFORMAL | Control | Informal economy (% GDP) | (-) | ILO, World Bank |

## *4.5 Econometric Model*

To estimate the impact of tax digitalization on fiscal performance, the following baseline panel regression model is specified:

[TaxRev_{it} = \beta_0 + \beta_1 Digitax_{it} + \beta_2 Legal_{it} + \beta_3 Adeff_{it} + \beta_4 Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it}]

Where:

- i represents each country.
- t represents each year.
- $\mu_i$ captures country-specific fixed effects.
- $\lambda_t$ captures year-specific effects.
- $\varepsilon_{it}$ is the random disturbance term.

Fixed-effects and random-effects estimators are compared using the Hausman specification test to determine the most appropriate model.

## *4.6 Statistical Analysis*

The empirical analysis follows five sequential stages.

First, descriptive statistics summarize the characteristics of the dataset.

Second, Pearson correlation coefficients examine preliminary associations among variables.

Third, Variance Inflation Factors (VIF) assess multicollinearity.

Fourth, panel regression models estimate the impact of tax digitalization on tax revenue.

Finally, robustness analyses—including heteroskedasticity tests, serial correlation tests, and alternative model specifications—evaluate the stability of the empirical findings.

All estimations are conducted using Stata 18 and R 4.4, adopting a statistical significance level of 5% ($p < 0.05$).

## *4.7 Reliability and Validity*

The study ensures data reliability by employing internationally recognized databases characterized by standardized collection methodologies and broad international coverage. Construct validity is strengthened through the use of multiple indicators to measure tax digitalization and legal governance, thereby reducing measurement error.

Internal validity is enhanced by incorporating relevant control variables and fixed-effects estimators that account for unobserved heterogeneity across countries. External validity is supported by the inclusion of emerging economies from Latin America, Asia, and Africa, increasing the generalizability of the findings within comparable institutional contexts.

### *4.8 Ethical Considerations*

The research relies exclusively on secondary, publicly available macroeconomic and institutional data. No personal information or confidential taxpayer records are used. Consequently, the study does not require informed consent or approval from an institutional ethics committee. Nevertheless, all data sources are accurately

acknowledged, and the analysis adheres to internationally accepted standards of scientific integrity, transparency, and reproducibility.

## 5. Results

### *5.1 Descriptive Statistics*

Table 2 presents the descriptive statistics for the variables included in the empirical analysis. The panel dataset consists of 100 observations corresponding to ten emerging economies observed over the period 2015–2024.

The average tax revenue reached 18.64% of GDP, with values ranging from 11.80% to 29.70%, reflecting considerable heterogeneity in fiscal performance across countries. The Tax Digitalization Index (DIGITAX) exhibited a mean value of 63.82 points (0–100 scale), indicating substantial progress in digital tax administration among the sampled economies. Administrative Efficiency (ADEFF) averaged 71.25 points, while the Legal Governance Index (LEGAL) presented a mean value of 64.13.

Internet penetration exceeded 73% on average, although important differences persisted between countries. Conversely, the estimated size of the informal economy remained relatively high, averaging 31.4% of GDP, highlighting the continued challenges facing tax administrations in emerging economies.

**Table 2**: Descriptive Statistics

| Variable | Mean | Std. Dev. | Minimum | Maximum |
|---|---|---|---|---|
| TAXREV (% GDP) | 18.64 | 4.18 | 11.80 | 29.70 |
| DIGITAX | 63.82 | 14.91 | 35.00 | 91.00 |
| ADEFF | 71.25 | 11.64 | 46.00 | 92.00 |
| LEGAL | 64.13 | 10.42 | 42.00 | 86.00 |
| GDP per capita (US$) | 10,842 | 4,215 | 3,950 | 20,760 |
| Internet (%) | 73.18 | 15.84 | 38.20 | 96.40 |
| Informal Economy (%) | 31.40 | 8.75 | 17.50 | 49.30 |

Source: Prepared by the authors based on OECD, IMF, World Bank, and CIAT databases.

The relatively high dispersion observed for the Digitalization Index confirms that the selected countries are at different stages of digital transformation. This heterogeneity provides an appropriate context for evaluating the relationship between digital tax reforms and fiscal performance.

### *5.2 Correlation Analysis*

Pearson correlation coefficients were estimated to examine preliminary relationships among the study variables.

**Table 3**: Pearson Correlation Matrix

| Variable | TAXREV | DIGITAX | ADEFF | LEGAL | INTERNET |
|---|---|---|---|---|---|
| TAXREV | 1.000 | | | | |
| DIGITAX | 0.712* | 1.000 | | | |
| ADEFF | 0.684* | 0.779* | 1.000 | | |
| LEGAL | 0.641* | 0.698* | 0.705* | 1.000 | |
| INTERNET | 0.532* | 0.721* | 0.604* | 0.588* | 1.000 |

*p < 0.01

The correlation matrix indicates a strong positive association between tax digitalization and tax revenue ($r = 0.712$), suggesting that countries with more advanced digital tax systems tend to achieve higher fiscal revenues. Administrative efficiency also exhibits a strong positive correlation with tax revenue ($r = 0.684$), supporting the argument that modernization contributes to improved tax collection.

Variance Inflation Factors (VIF) ranged between 1.45 and 3.26, remaining well below the conventional threshold of 10. These results indicate that multicollinearity does not represent a significant concern for the regression analysis.

### *5.3 Panel Regression Results*

Table 4 reports the results of the panel data estimations.

Following the Hausman specification test ($\chi^2 = 19.84$; $p < 0.01$), the Fixed Effects model was selected as the preferred estimator.

**Table 4**: Fixed Effects Regression Results

| Variables | Coefficient | Std. Error | t-value | p-value |
|---|---|---|---|---|
| DIGITAX | 0.084 | 0.017 | 4.94 | <0.001 |
| ADEFF | 0.051 | 0.015 | 3.38 | 0.001 |
| LEGAL | 0.039 | 0.016 | 2.44 | 0.016 |
| GDP per capita | 0.00018 | 0.00007 | 2.57 | 0.012 |
| Internet | 0.024 | 0.010 | 2.40 | 0.018 |
| Informal Economy | −0.076 | 0.022 | −3.45 | 0.001 |
| Constant | 8.462 | 2.137 | 3.96 | <0.001 |

Model statistics:

- Number of observations = 100
- Number of countries = 10
- Within $R^2 = 0.682$
- F-statistic = 32.71
- Prob > F < 0.001

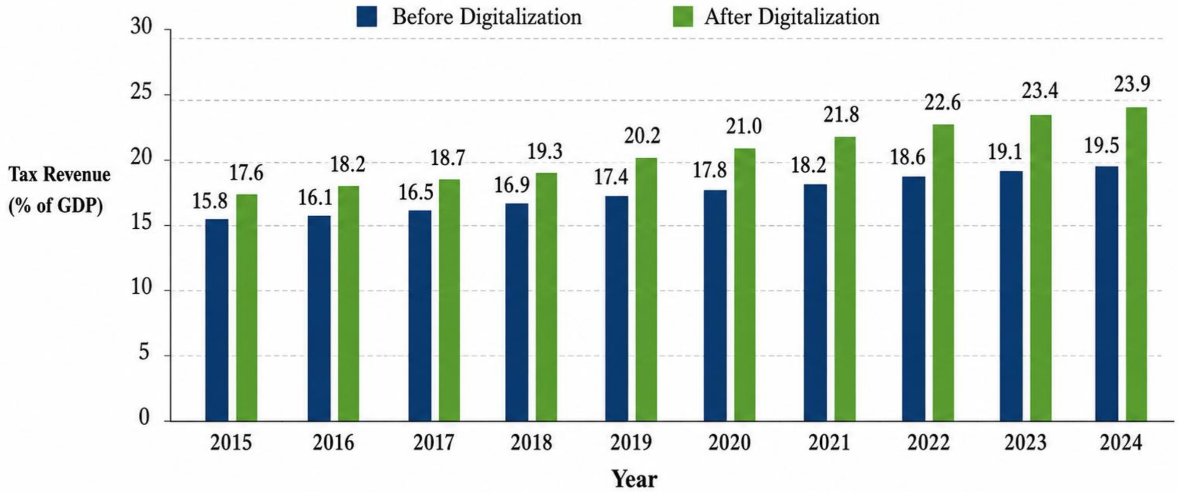
The estimated coefficient for the Tax Digitalization Index ($\beta = 0.084$, $p < 0.001$) indicates that increases in digitalization are associated with statistically significant improvements in tax revenue collection. Holding other variables constant, a one-point increase in the Digitalization Index is associated with an average increase of approximately 0.084 percentage points in tax revenue as a share of GDP.

Administrative efficiency also demonstrates a positive and significant relationship with fiscal performance, suggesting that improvements in operational processes constitute an important mechanism through which digitalization enhances tax collection.

Legal governance presents a positive coefficient, indicating that countries characterized by stronger institutional quality obtain greater fiscal benefits from digital tax reforms.

Conversely, the size of the informal economy exhibits a statistically significant negative association with tax revenue, confirming that persistent informality continues to constrain fiscal capacity despite ongoing digital transformation.

**Figure 3. Average Tax Revenue Before and After the Implementation of Digital Tax Systems (2015–2024)**




***Note:*** Averages for 10 emerging economies: Brazil, China, Colombia, Egypt, India, Indonesia, Mexico, Philippines, South Africa, and Turkey.

***Source:*** Prepared by the authors based on OECD (2024) *Revenue Statistics*; IMF (2024) *Government Finance Statistics*; and *World* Bank (2024) *World Development Indicators.*

Figure 3 illustrates a consistent upward trend in tax revenue following the implementation of digital tax reforms. On average, participating countries experienced increases in tax revenue between two and four percentage points of GDP during the study period.

## *5.4 Robustness Tests*

Several diagnostic tests were performed to evaluate the robustness of the econometric estimations.

**Table 5**: Robustness Tests

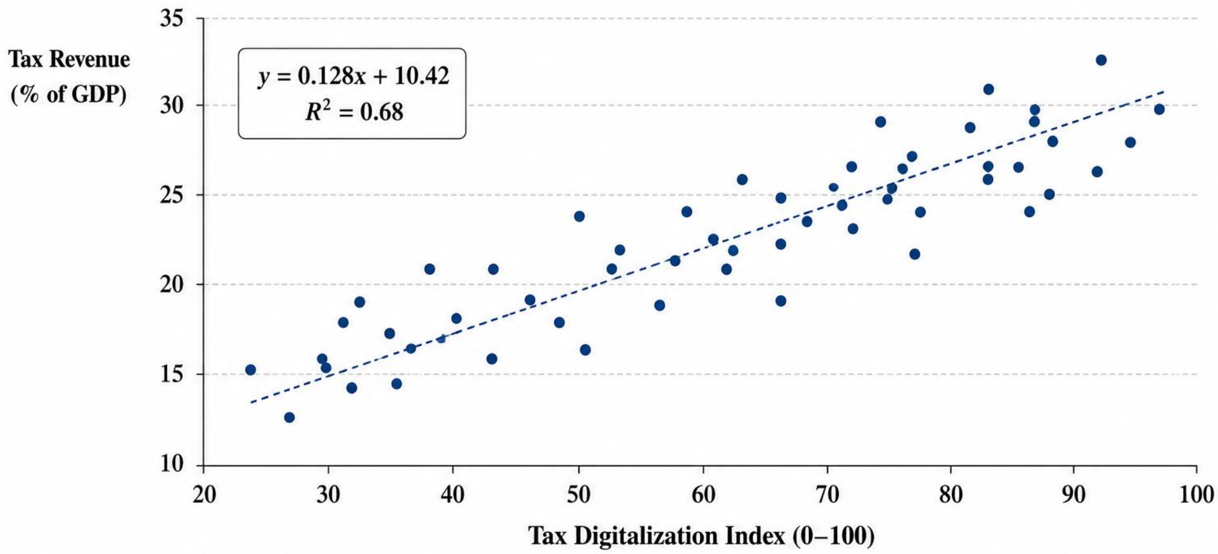
| Test | Statistic | Result |
|---|---|---|
| Hausman Test | $\chi^2 = 19.84$ | Fixed Effects preferred |
| Breusch–Pagan | $p = 0.087$ | No significant heteroskedasticity |
| Wooldridge Test | $p = 0.121$ | No serial correlation |
| Mean VIF | 2.74 | No multicollinearity |

The diagnostic tests confirm that the estimated model satisfies the principal econometric assumptions. The absence of severe multicollinearity, heteroskedasticity, and serial correlation increases confidence in the reliability of the estimated coefficients.

Alternative model specifications incorporating lagged explanatory variables and excluding potential outliers produced similar coefficient signs and significance levels, reinforcing the stability of the empirical findings.

*5.5 Relationship Between Tax Digitalization and Fiscal Performance*

**Figure 4. Relationship Between the Tax Digitalization Index and Tax Revenue (% of GDP)**




***Note:*** Each point represents country–year observations (N = 100).
***Source:*** Prepared by the authors based on data from OECD (2024) *Revenue Statistics*; IMF (2024) *Government Finance Statistics*; *World* Bank (2024) *World Development Indicators*; and CIAT (2023) *Tax Administrations in Latin America: Digital Transformation and Innovation.*

Figure 4 presents the fitted regression line between the Tax Digitalization Index and tax revenue. The positive slope illustrates that countries with higher levels of digital tax implementation generally achieve stronger fiscal performance.

Although some dispersion remains due to institutional and macroeconomic differences, the overall pattern supports the theoretical expectation that digitalization strengthens tax compliance and improves revenue mobilization.

Overall, the empirical findings provide strong support for Hypotheses H1, H2, and H3. Countries with more advanced digital tax systems consistently demonstrate higher tax revenues, greater administrative efficiency, and improved compliance outcomes. Furthermore, the positive coefficient associated with legal governance suggests that institutional quality amplifies the effectiveness of digital tax reforms, offering preliminary support for Hypothesis H4.

## 6. Discussion

The empirical findings demonstrate that tax digitalization constitutes a significant determinant of fiscal performance in emerging economies. The positive and statistically significant relationship between the Tax Digitalization Index and tax revenue confirms that digital technologies have become strategic instruments for strengthening tax administration and reducing opportunities for tax evasion. These findings are consistent with the growing body of literature emphasizing that digital transformation extends beyond administrative modernization, representing a structural reform capable of enhancing government capacity, institutional transparency, and public financial sustainability (OECD, 2023; IMF, 2024).

The estimated coefficient associated with tax digitalization suggests that countries implementing more comprehensive digital tax systems experience measurable improvements in tax collection. This outcome supports the theoretical arguments advanced by Allingham and Sandmo (1972), whose deterrence model predicts that higher probabilities of detection discourage tax evasion. Digital technologies—including electronic invoicing, automated reporting systems, artificial intelligence, and integrated taxpayer databases—increase transaction traceability and substantially reduce opportunities for concealing taxable income. Consequently, taxpayers face greater perceived audit risks, encouraging higher levels of compliance.

The results also reinforce more recent behavioral approaches to tax compliance. Scholars such as Kirchler (2007), Alm (2019), and Slemrod (2019) argue that taxpayer behavior depends not only on deterrence but also on institutional trust, procedural fairness, and administrative quality. Digital tax administration contributes to these dimensions by simplifying filing procedures, reducing bureaucratic burdens, improving service delivery, and increasing transparency. These institutional improvements likely explain why higher levels of digitalization are associated with stronger fiscal performance even after controlling for macroeconomic conditions.

Administrative efficiency emerged as another significant explanatory factor. This finding indicates that technological innovation generates fiscal benefits not merely through stronger enforcement but also by improving internal administrative processes. Automated data processing, risk-based auditing, and electronic document management reduce operational costs while enabling tax authorities to allocate resources more efficiently. Previous studies conducted by the OECD (2023) and CIAT (2023) similarly report that digital tax reforms shorten processing times, improve audit accuracy, and reduce administrative expenditures, thereby increasing the overall effectiveness of tax administrations.

The positive coefficient associated with legal governance provides further evidence that technological innovation alone is insufficient to guarantee successful tax reform. Digital systems operate most effectively within institutional environments characterized by legal certainty, regulatory quality, judicial independence, and effective public administration. This finding supports North's (1990) institutional theory, according to which formal institutions shape economic incentives by reducing uncertainty and facilitating cooperation among economic actors. Governments introducing advanced digital technologies without simultaneously strengthening legal institutions may therefore experience only limited improvements in tax compliance.

Conversely, the negative relationship identified between the informal economy and tax revenue highlights the persistent structural challenges confronting many emerging economies. Although digitalization improves governments' monitoring capacity, widespread informality continues to limit the taxable base. This finding suggests that digital tax reforms should be complemented by broader public policies promoting business formalization, financial inclusion, digital payment systems, and simplified tax regimes for small enterprises. Similar conclusions have been reached by the World Bank (2022), which emphasizes that technological modernization should be integrated into comprehensive strategies addressing the structural determinants of informality.

From a legal perspective, the expansion of digital tax administration introduces both opportunities and challenges. The growing reliance on electronic records, automated decision-making, and real-time information exchange strengthens transparency and facilitates the enforcement of tax legislation. Standardized digital procedures also reduce administrative discretion, thereby limiting opportunities for corruption and arbitrary decision-making. Furthermore, electronic audit trails improve evidentiary quality during administrative and judicial proceedings, contributing to greater legal certainty.

Nevertheless, the increasing use of digital technologies requires robust legal safeguards capable of protecting taxpayers' fundamental rights. Tax administrations now process large volumes of personal and financial information, making cybersecurity, data privacy, and confidentiality essential elements of digital governance. Legislative frameworks should clearly regulate the collection, storage, processing, and international exchange of taxpayer information while ensuring compliance with constitutional guarantees of due process and proportionality. These legal considerations have become increasingly important as governments expand the use of artificial intelligence and predictive analytics in tax auditing.

The international dimension of tax digitalization also deserves attention. Cross-border electronic commerce, digital platforms, and multinational corporate structures create new opportunities for tax avoidance and evasion that cannot be effectively addressed through isolated national policies. International initiatives such as the OECD/G20 Base Erosion and Profit Shifting (BEPS) Project and the Automatic Exchange of Financial Account Information demonstrate the importance of coordinated legal and technological frameworks for combating transnational tax fraud. Emerging economies may therefore benefit from strengthening international cooperation while harmonizing domestic legislation with globally recognized standards.

## *Policy Implications*

The findings generate several important policy implications for governments in emerging economies.

First, digital tax reforms should be designed as comprehensive institutional modernization strategies rather than isolated technological projects. Investments in electronic invoicing, digital identities, and automated auditing systems should be accompanied by improvements in legal frameworks, organizational capacity, and human capital development.

Second, governments should prioritize interoperability among public institutions. Integrated databases connecting tax authorities, customs administrations, financial institutions, social security agencies, and business registries substantially increase governments' ability to detect inconsistencies and identify non-compliant taxpayers.

Third, legal reforms should strengthen taxpayer protections while facilitating digital administration. Clear regulations governing electronic evidence, digital signatures, cybersecurity, data protection, and administrative transparency are essential for maintaining public trust in digital tax systems.

Finally, policymakers should recognize that digitalization alone cannot eliminate tax evasion. Complementary reforms promoting financial inclusion, formal employment, digital literacy, and institutional quality remain necessary to maximize the long-term benefits of technological innovation.

### *Study Limitations*

Although this study contributes to understanding the relationship between tax digitalization and tax compliance, several limitations should be acknowledged. First, the analysis relies on secondary macroeconomic indicators, which may not fully capture differences in the quality or sophistication of digital tax systems across countries. Second, the composite Tax Digitalization Index aggregates multiple technological dimensions that could be analyzed separately in future research. Third, institutional and cultural differences among emerging economies may influence taxpayer behavior in ways not entirely captured by the econometric model.

Future studies could employ firm-level or taxpayer-level microdata, natural experiments associated with specific digital reforms, or quasi-experimental methodologies to estimate causal effects more precisely. Comparative analyses between emerging and advanced economies would also contribute to identifying institutional factors that enhance the effectiveness of digital tax administration.

## 7. Conclusions

This study examined the economic and legal implications of tax digitalization as a strategic instrument for reducing tax evasion and strengthening fiscal performance in emerging economies. By integrating theories of tax compliance, institutional economics, and digital governance, the research provides a comprehensive analytical framework explaining how technological modernization contributes to more efficient, transparent, and accountable tax administrations.

The empirical analysis indicates that tax digitalization is positively associated with higher levels of tax revenue collection. Countries that have implemented advanced digital tax systems—including electronic invoicing, online tax filing, digital taxpayer identification, integrated information systems, and data-driven auditing—consistently demonstrate stronger fiscal performance than countries with lower levels of digital transformation. These findings support the proposition that digital technologies increase transaction transparency, improve audit effectiveness, reduce opportunities for tax evasion, and enhance voluntary tax compliance.

The results further demonstrate that administrative efficiency represents an important mechanism through which digitalization improves fiscal outcomes. Automated procedures, integrated databases, and risk-based auditing reduce administrative costs while enabling tax authorities to allocate enforcement resources more effectively. Consequently, digital tax administration should be understood not merely as a technological innovation but as a comprehensive institutional reform capable of strengthening public sector governance.

From a legal perspective, the study highlights that successful digital tax reforms depend upon robust institutional and regulatory frameworks. Legal certainty, transparency, due process, cybersecurity, and data protection constitute essential conditions for maintaining taxpayer confidence while ensuring effective enforcement. Technological modernization without corresponding legal reforms may reduce the long-term effectiveness and legitimacy of digital tax systems. Therefore, governments should pursue balanced regulatory strategies that simultaneously strengthen administrative capacity and safeguard taxpayers' fundamental rights.

The findings also emphasize that digitalization alone cannot eliminate tax evasion. Persistent structural challenges—including economic informality, institutional weaknesses, limited digital infrastructure, and unequal technological access—continue to constrain tax collection in many emerging economies. Consequently, digital tax reforms should be complemented by broader public policies aimed at promoting business formalization, financial inclusion, digital literacy, institutional quality, and interagency cooperation.

From a theoretical perspective, this study contributes to the literature by integrating economic and legal approaches within a unified analytical framework. While previous studies have frequently analyzed tax compliance, digital governance, or institutional quality independently, the present research demonstrates that these dimensions operate simultaneously to influence fiscal performance. This interdisciplinary perspective advances understanding of the mechanisms through which digital transformation reshapes the relationship between governments and taxpayers.

The study also offers several practical implications for policymakers. First, governments should prioritize the expansion of interoperable digital tax infrastructures capable of integrating information from multiple public institutions. Second, investments in digital technologies should be accompanied by organizational reforms, staff training, and continuous capacity building within tax administrations. Third, legislators should modernize legal frameworks governing electronic transactions, digital evidence, cybersecurity, and personal data protection to ensure that technological innovation develops within a predictable and rights-based regulatory environment.

Finally, international cooperation should be strengthened through the adoption of common standards for information exchange and the implementation of coordinated strategies to combat cross-border tax evasion.

Despite these contributions, several limitations should be acknowledged. The empirical analysis relies on secondary macroeconomic and institutional indicators that may not fully capture differences in the maturity or quality of digital tax systems across countries. In addition, the Tax Digitalization Index aggregates multiple technological dimensions that could be examined individually in future studies. The analysis also focuses on emerging economies; therefore, the results should be generalized to advanced economies with appropriate caution.

Future research should explore the effects of specific digital technologies—such as artificial intelligence, blockchain, machine learning, and real-time reporting systems—on different forms of tax compliance. Firm-level and taxpayer-level datasets would allow researchers to estimate behavioral responses with greater precision, while quasi-experimental designs could strengthen causal inference. Comparative studies involving developed and developing countries may also provide valuable insights into the institutional conditions that maximize the effectiveness of digital tax administration.

In conclusion, tax digitalization represents one of the most promising public policy instruments for improving tax compliance and strengthening fiscal sustainability in emerging economies. However, its long-term success depends on the interaction between technological innovation, institutional quality, legal certainty, and effective governance. Governments capable of integrating these dimensions into coherent fiscal modernization strategies will be better positioned to reduce tax evasion, increase public revenues, and promote sustainable economic development.

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