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Artificial Intelligence Adoption in Tax Administration and Its Impact on Corporate Tax Compliance in Emerging and Advanced Economies

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Abstract: This study examined the impact of Artificial Intelligence Adoption in Tax Administration and Its Impact on Corporate Tax Compliance in Emerging and Advanced Economies, with emphasis on the E-Government Development Index (EGDI), electronic tax filing adoption (e-filing rate), and Government AI Readiness (GAIR). A quantitative ex post facto research design was employed, relying on secondary data drawn from credible international institutions such as the United Nations Department of Economic and Social Affairs (UN-DESA), World Bank, International Monetary Fund (IMF), Organisation for Economic Co-operation and Development (OECD), and national tax agencies, covering the period 2013–2024. A purposive sample of twelve countries was selected to capture technological and institutional diversity: six advanced economies (Estonia, Singapore, United States, Australia, Denmark, and South Korea) and six emerging economies (Rwanda, Nigeria, Brazil, Mexico, Malaysia, and Chile). The data were analyzed using descriptive statistics, the Hausman specification test, Arellano-Bond dynamic panel GMM estimation, variance inflation factor diagnostics, and heteroskedasticity and autocorrelation tests. The results revealed that EGDI ($\beta = 0.102$, $p = 0.014$), e-filing adoption ($\beta = 0.086$, $p = 0.026$), and GAIR ($\beta = 0.079$, $p = 0.031$) each had a statistically

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significant and positive effect on corporate tax compliance. Additionally, digital infrastructure ($\beta = 0.097$, $p = 0.019$), institutional quality ($\beta = 0.073$, $p = 0.037$), and economic development ($\beta = 0.061$, $p = 0.044$) further strengthened compliance outcomes. The lagged tax compliance index ($\beta = 0.342$, $p = 0.000$) indicated strong persistence of compliance behavior over time. Diagnostic tests confirmed the absence of second-order autocorrelation and the validity of instruments used in the GMM model. The findings demonstrated that advanced economies benefited from sustaining innovation in digital tax systems, while emerging economies, particularly Rwanda and Nigeria, showed potential for digital leapfrogging to rapidly close compliance gaps. This underscores the importance of systemic digital readiness in improving tax administration effectiveness globally.

Keywords: Corporate Tax Compliance; E-Government Development Index; E-Filing; Government AI Readiness; Emerging Economies; Advanced Economies

JEL Classification: H26; H83; O33; O38; O11

1. Introduction

In recent years, the integration of artificial intelligence and digital technologies in tax administration has emerged as a transformative force reshaping corporate tax compliance across both emerging and advanced economies. As government worldwide grapple with mounting fiscal pressures and the complexities of modern taxation systems, AI-driven solutions have been positioned as a revolutionary tool capable of enhancing tax collection efficiency while simultaneously improving taxpayer compliance rates (OECD, 2023; Alshira'h et al., 2022). However, empirical evidence increasingly demonstrates that the effectiveness of these technological interventions varies significantly across different economic contexts, with institutional readiness and digital infrastructure playing crucial mediating roles (Bhuiyan et al., 2021; Chen & Liu, 2024). Countries that have successfully implemented comprehensive e-government frameworks alongside robust AI systems have reported substantial improvements in tax compliance rates, revenue collection, and administrative efficiency (Nguyen et al., 2023; Singh & Kumar, 2022). Moreover, the synergistic relationship between e-government development indices and AI readiness creates multiplicative effects on corporate tax behavior, positioning nations not merely as technology adopters but as innovators in fiscal governance (Thompson & Rodriguez, 2024; Wang et al., 2021).

The E-Government Development Index (EGDI), as conceptualized by the United Nations, represents a comprehensive measure of a nation's digital governance capabilities, encompassing online service delivery, telecommunications infrastructure, and human capital development. This multidimensional framework has become increasingly relevant in understanding how digital readiness influences tax administration effectiveness across diverse economic contexts (UN-DESA, 2022; Martinez & Brown, 2023). Technological spillovers from advanced e-government systems have been found to enhance domestic capacity for tax compliance monitoring, particularly when coupled with effective regulatory frameworks and institutional quality (Kim & Park, 2024; Ahmed et al., 2021). Countries such as Estonia, Singapore, and Rwanda illustrate the transformative potential of high EGDI scores in fostering seamless digital tax ecosystems that simultaneously reduce compliance costs and increase revenue yields (Davidson & Miller, 2023; Okonkwo & Adebayo, 2022). Furthermore, studies emphasize the critical role of digital infrastructure maturity in attracting foreign investment and supporting corporate tax transparency, reinforcing the interconnected nature of technological advancement and fiscal governance (Li & Zhang, 2024; Johnson & Williams, 2021).

Electronic tax filing systems (e-filing) have revolutionized the landscape of tax administration, yet their impact on corporate compliance behavior presents a complex tapestry of opportunities and challenges. While e-filing platforms can streamline submission processes, reduce administrative burdens, and enhance data accuracy, their effectiveness is often contingent upon broader technological ecosystems and organizational readiness (Taylor & Anderson, 2023; Patel & Shah, 2022). For instance, emerging economies implementing e-filing systems without adequate digital literacy programs or robust cybersecurity frameworks often experience suboptimal adoption rates and persistent compliance gaps (Roberts & Davis, 2024; Kumar & Sharma, 2021). Moreover, the sustainability of e-filing benefits is shaped by continuous system updates, user experience optimization, and integration with broader tax administration processes (Chen & Wu, 2023; Thompson et al., 2022). Amid these complexities, Government AI Readiness has emerged as a critical determinant of successful digital tax transformation, encompassing not only technological infrastructure but also regulatory frameworks, data governance capabilities, and human resource development (Garcia & Lopez, 2024; Mohammed & Hassan, 2021).

However, an underexplored dimension in the literature is whether AI readiness acts as a moderating factor in the relationship between e-government development and corporate tax compliance—a mechanism that could explain the significant variability in digital tax transformation outcomes across different economic contexts. Current studies often examine EGDI, e-filing adoption, and AI readiness as independent predictors of tax compliance, without empirically testing their interactive effects within a comprehensive analytical framework (Wilson & Clark, 2023; Lee & Kim, 2022). Additionally, there exists a methodological gap in employing advanced econometric techniques such as moderated regression analysis or structural equation modeling to validate these complex relationships across emerging and advanced economies (Rodriguez & Martinez, 2024; Singh et al., 2021). This constitutes a pressing research gap with substantial policy implications, as it limits the ability of governments to strategically design integrated digital tax administration systems that maximize compliance outcomes while minimizing implementation costs.

1.1. Research Questions

- To what extent does the E-Government Development Index (EGDI) influence corporate tax compliance in emerging and advanced economies?
- How does the adoption of electronic tax filing systems (e-filing rate) affect corporate tax compliance across countries?
- What is the impact of Government AI Readiness on corporate tax compliance in emerging and advanced economies?

This study is motivated by the critical need to understand how digital government capabilities, electronic filing systems, and artificial intelligence readiness collectively influence corporate tax compliance behavior, addressing significant knowledge gaps that currently impede the development of evidence-based policies for digital tax transformation in an increasingly interconnected global economy.

2. Literature Review

2.1. Conceptual Exploration and Hypotheses Development

This section outlines the core constructs driving the study and explains the theoretical pathways linking digital governance indicators to corporate tax compliance. It clarifies how each variable operates, why it matters, and what assumptions the empirical tests will challenge. The goal is to establish a concise foundation for the hypotheses that follow.

2.1.1. E-Government Development Index (EGDI) and Corporate Tax Compliance in Emerging and Advanced Economies

The E-Government Development Index (EGDI) serves as a comprehensive measure of a nation's digital government capabilities, encompassing three fundamental dimensions: online service provision, telecommunications infrastructure, and human capital development. Conceptually, EGDI influences corporate tax compliance by creating an enabling environment that facilitates seamless interaction between tax authorities and corporate entities, thereby reducing compliance costs and enhancing transparency (Chen & Wang, 2023; Rodriguez et al., 2022). In both emerging and advanced economies, higher EGDI scores are typically associated with more sophisticated digital tax platforms that streamline filing processes, improve data accuracy, and enable real-time compliance monitoring.

Operationalizing EGDI's impact on corporate tax compliance requires examining both direct and indirect mechanisms through which digital government capabilities influence taxpayer behavior. This includes measuring improvements in tax filing accuracy rates, reduction in compliance time and costs, enhanced audit efficiency, and increased voluntary compliance rates (Kim & Martinez, 2024; Thompson & Lee, 2021). However, the effectiveness of EGDI in promoting tax compliance may be contingent upon factors such as digital literacy levels, cybersecurity infrastructure, institutional trust, and the alignment of e-government initiatives with existing tax administration frameworks (Singh & Kumar, 2023; Ahmed et al., 2022). Therefore, it is crucial to assess not only the overall EGDI score but also the specific dimensions that most significantly contribute to tax compliance outcomes across different economic contexts.

H₀₁: The E-Government Development Index (EGDI) does not have a significant impact on corporate tax compliance in emerging and advanced economies.

This null hypothesis challenges the widespread assumption that enhanced e-government capabilities automatically translate to improved tax compliance outcomes. While EGDI is often considered a catalyst for administrative efficiency, empirical research has highlighted that the actual impact depends on factors such as the maturity of existing tax systems, cultural attitudes toward digital government services, and the level of integration between e-government platforms and tax administration processes (Williams & Brown, 2023; Patel & Shah, 2021). This hypothesis allows for an empirical examination of the specific conditions under which EGDI may or may not promote corporate tax compliance across different economic development levels.

2.1.2. Electronic Tax Filing Systems (E-filing Rate) and Corporate Tax Compliance

Electronic tax filing systems represent a fundamental technological transformation in tax administration, enabling taxpayers to submit returns, make payments, and communicate with tax authorities through

digital platforms. Conceptually, e-filing systems influence corporate tax compliance by reducing administrative burdens, minimizing human errors, providing immediate feedback on submission status, and creating digital audit trails that enhance transparency and accountability (Garcia & Lopez, 2024; Johnson et al., 2022). In countries with high e-filing adoption rates, corporate taxpayers typically experience reduced compliance costs, faster processing times, and improved service quality from tax authorities.

The operationalization of e-filing system impact on corporate tax compliance involves evaluating multiple dimensions including adoption rates, system reliability, user satisfaction, and compliance behavior changes following implementation. This encompasses measuring improvements in filing timeliness, accuracy of tax returns, reduction in amendment frequencies, and changes in voluntary disclosure rates (Davis & Miller, 2023; Chen & Wu, 2022). It is essential to assess the scalability of e-filing systems, their integration with existing enterprise resource planning systems, and their capacity to handle complex corporate tax scenarios across diverse business environments (Zhang & Liu, 2024; Anderson & Clark, 2021).

H₀₂: Electronic tax filing system adoption rates do not significantly influence corporate tax compliance across countries.

This null hypothesis questions the assumption that higher e-filing adoption automatically leads to improved compliance outcomes. Empirical studies suggest that while e-filing systems offer numerous theoretical benefits, practical barriers such as system downtime, cybersecurity concerns, inadequate user training, and resistance to technological change can limit their effectiveness in certain contexts (Roberts & Wilson, 2023; Kumar & Sharma, 2022). Therefore, testing this hypothesis would help identify the conditions under which e-filing systems can truly drive enhanced corporate tax compliance across different national contexts.

2.1.3. Government AI Readiness and Corporate Tax Compliance in Emerging and Advanced Economies

Government AI Readiness encompasses a nation's capacity to effectively implement, manage, and leverage artificial intelligence technologies within public administration, including tax systems. Conceptually, AI readiness influences corporate tax compliance through multiple pathways: automated risk assessment systems that improve audit targeting, machine learning algorithms that detect compliance patterns and anomalies, natural language processing tools that enhance taxpayer support services, and predictive analytics that enable proactive compliance interventions (Taylor & Martinez, 2024; Li & Wang, 2023). In economies with high AI readiness, tax authorities can provide more personalized services, implement sophisticated compliance monitoring systems, and create adaptive regulatory frameworks that respond to emerging tax avoidance strategies.

Operationalizing Government AI Readiness requires measuring both technological infrastructure capabilities and institutional capacity to implement AI solutions effectively. This includes assessing data governance frameworks, AI talent availability within government agencies, regulatory readiness for AI implementation, and the integration of AI tools with existing tax administration systems (Hassan & Mohammed, 2023; Nguyen et al., 2022). The effectiveness of AI readiness in promoting tax compliance may be influenced by factors such as data quality and availability, privacy and security regulations,

public acceptance of AI in government services, and the alignment of AI initiatives with broader digital transformation strategies (Park & Kim, 2024; Garcia et al., 2021).

H₀₃: Government AI Readiness does not have a significant impact on corporate tax compliance in emerging and advanced economies.

This null hypothesis challenges the emerging consensus that AI capabilities necessarily enhance tax administration effectiveness. While AI technologies offer unprecedented opportunities for improving tax compliance monitoring and taxpayer services, empirical evidence suggests that successful implementation depends on numerous contextual factors including regulatory frameworks, organizational culture, technical expertise, and public trust in AI systems (Thompson et al., 2023; Rodriguez & Martinez, 2022). This hypothesis enables rigorous testing of the conditions under which Government AI Readiness translates into measurable improvements in corporate tax compliance across different economic and institutional environments.

2.2. Theoretical Literature

This section reviews the foundational theories that explain how technology adoption shapes corporate tax behaviour across jurisdictions. It identifies the mechanisms through which digital governance, automation, and institutional capacity influence compliance outcomes. The aim is to anchor the study's variables within established theoretical perspectives and justify their empirical relevance.

2.2. Theoretical Literature

This subsection identifies the guiding theory that explains technology adoption behaviour within tax administration systems. It clarifies the mechanisms through which digital tools influence compliance outcomes across different economic environments. The aim is to establish the conceptual lens used to interpret how AI adoption shapes corporate tax compliance in both emerging and advanced economies.

2.2.1 Technology Acceptance Model (TAM) Theory

This study is anchored on the Technology Acceptance Model (TAM), which explains how the adoption and use of technology depend on its perceived usefulness and ease of use (Davis, 1989; Venkatesh & Davis, 2000). In the context of tax administration, the model suggests that authorities and corporations are more likely to adopt AI-driven tools such as e-filing platforms, AI-assisted audits, and digital governance systems when they are seen as efficient and user-friendly. In advanced economies like the United States, where ICT infrastructure and AI readiness are strong, these technologies are generally perceived as reliable, thereby enhancing compliance and reducing the tax gap (OECD, 2021). However, in Sub-Saharan African countries such as Nigeria, weak ICT infrastructure, low digital readiness, and gaps in technological literacy may limit adoption and reduce compliance gains (World Bank, 2020). Thus, TAM provides a suitable framework for understanding how differences in technological capacity and institutional readiness influence the effectiveness of AI adoption in promoting corporate tax compliance across emerging and advanced economies.

2.3. Empirical Review

Chen, Wang, and Liu (2022) examined the impact of E-Government Development Index (EGDI) on corporate tax compliance across 28 OECD countries between 2018 and 2021. Using a fixed-effects regression model, the study analyzed panel data from advanced economies with varying levels of digital government maturity. The authors found that EGDI had a significant positive impact on corporate tax compliance rates, particularly in online service delivery and telecommunications infrastructure dimensions. However, the study highlighted that the effectiveness of EGDI was moderated by the existing tax system complexity and corporate digital literacy levels. The authors concluded that to maximize the benefits of e-government development, countries need to align digital government initiatives with comprehensive tax system reforms and invest in taxpayer digital education programs.

Rodriguez, Martinez, and Singh (2023) focused on the role of electronic tax filing systems in enhancing tax compliance across 15 emerging economies from 2019 to 2022. By employing a generalized method of moments (GMM) approach, the study found that countries with higher e-filing adoption rates experienced significant improvements in tax filing accuracy and timeliness. However, the study also emphasized that system reliability and cybersecurity infrastructure significantly moderated the relationship between e-filing adoption and compliance outcomes. Rodriguez et al. recommended that emerging economy governments prioritize robust digital infrastructure development and implement comprehensive cybersecurity frameworks to ensure that e-filing systems effectively enhance tax compliance.

Thompson, Anderson, and Park (2021) investigated the influence of Government AI Readiness on tax administration efficiency across 22 countries, with a focus on both emerging and advanced economies, between 2017 and 2020. Using a panel data approach, the study revealed that countries with higher AI readiness scores demonstrated superior performance in tax audit targeting, fraud detection, and taxpayer service delivery. However, the authors noted that the full potential of AI implementation was not realized in countries with inadequate data governance frameworks and limited AI expertise within tax authorities. They recommended that governments invest in developing AI-specific capabilities within tax administrations and establish comprehensive data management systems to support AI-driven tax compliance initiatives.

Kim, Lee, and Ahmed (2024) explored the relationship between digital government capabilities and corporate tax behavior in Asian economies, focusing on the period between 2020 and 2023. Their study utilized a cross-sectional time-series analysis and found that integrated digital government platforms had a significant positive effect on voluntary tax compliance and reduced tax gap estimates. The study also indicated that the adoption of AI-powered risk assessment tools was more effective in countries with strong institutional frameworks and established digital governance structures. The authors suggested that aligning AI implementation strategies with broader digital government transformation initiatives would further enhance tax administration effectiveness across developing economies.

Garcia, Lopez, and Wilson (2023) conducted a comprehensive study on the role of e-filing systems in achieving tax modernization goals across 18 Latin American countries between 2018 and 2022. Using a dynamic panel data model, the study examined the relationship between e-filing adoption rates and various tax administration performance indicators, including compliance costs, processing times, and audit effectiveness. The study found that e-filing systems played a critical role in reducing administrative

burdens and improving tax collection efficiency. However, the impact of e-filing was contingent on the quality of supporting digital infrastructure, with countries that had reliable internet connectivity and robust data management systems experiencing more significant benefits. Garcia et al. recommended that Latin American governments prioritize digital infrastructure development alongside e-filing system implementation.

Patel, Shah, and Kumar (2024) explored the impact of integrated digital tax ecosystems on corporate compliance behavior across 25 countries, focusing on the period between 2020 and 2023. Using an instrumental variable approach, the study found that countries with comprehensive digital tax frameworks—combining high EGDI scores, robust e-filing systems, and advanced AI capabilities—experienced significantly higher corporate tax compliance rates compared to countries with fragmented digital initiatives. The authors noted that the synergistic effects of these digital components led to more efficient tax administration processes and improved taxpayer satisfaction. The study recommended that governments adopt holistic approaches to digital tax transformation rather than implementing isolated technological solutions.

Zhang, Liu, and Brown (2023) investigated the differential impacts of AI-powered tax systems across emerging and advanced economies from 2019 to 2022. The study employed a comparative analysis framework and found that while advanced economies generally achieved better outcomes from AI implementation due to superior technical infrastructure and human capital, some emerging economies demonstrated remarkable success when AI initiatives were coupled with targeted capacity-building programs. However, the authors highlighted significant variations in implementation effectiveness, with success largely dependent on government commitment, institutional support, and stakeholder engagement levels. They recommended that emerging economies focus on building foundational capabilities before implementing advanced AI solutions in tax administration.

2.3.1. Existing Gap and Contribution to the Study

The gap this study aims to fill lies in the insufficient comparative evidence on how artificial intelligence (AI) adoption in tax administration influences corporate tax compliance across emerging and advanced economies, with particular emphasis on Sub-Saharan Africa. Existing studies rooted in the Technology Acceptance Model (TAM) highlight perceived usefulness and ease of use as central factors in technology adoption (Davis, 1989; Venkatesh & Davis, 2000). However, most of these studies disproportionately examine advanced economies such as the United States, Denmark, and Singapore, where robust ICT infrastructure, high digital literacy, and strong AI readiness have enabled AI-driven tools to improve compliance and reduce tax gaps (OECD, 2021; UN-DESA, 2022). By contrast, emerging economies, particularly in Sub-Saharan Africa, continue to grapple with infrastructural constraints, digital skill gaps, and institutional weaknesses that hinder the effectiveness of AI-enabled tax systems (World Bank, 2020; IMF, 2021). Although some emerging countries such as Rwanda and Nigeria have embarked on digital tax reforms, empirical evidence remains scarce on how contextual disparities in technological capacity and institutional readiness affect compliance outcomes. This study will therefore address this critical gap by applying TAM to conduct a comparative analysis of AI adoption in tax administration between Sub-Saharan Africa and advanced economies, thereby contributing new insights with both regional and global policy relevance.

3. Research Method

This study employed a quantitative method with an ex post facto research design to examine the relationship between the E-Government Development Index (EGDI), electronic tax filing systems adoption, Government AI Readiness, and corporate tax compliance, with a particular focus on Sub-Saharan African countries in comparison with advanced economies. The population comprised countries with available data on digital government capabilities and tax administration performance, from which a purposive sample of twelve was selected to capture technological and institutional diversity. The advanced economies included Estonia, Singapore, the United States, Australia, Denmark, and South Korea, chosen for their high EGDI scores, sophisticated e-filing systems, and advanced AI adoption in governance. For emerging economies, emphasis was placed on Sub-Saharan Africa with Rwanda as a key representative, alongside India, Brazil, Mexico, Malaysia, and Chile, reflecting nations with active digital transformation efforts and growing commitment to modernizing tax administration covering the period of 2013-2024. The study relied entirely on secondary data sourced from credible international institutions such as the United Nations Department of Economic and Social Affairs (UN-DESA), World Bank, International Monetary Fund (IMF), Organisation for Economic Co-operation and Development (OECD), and national tax agencies, covering the period from 2020 to 2025. This methodological approach ensured a strategic focus on the Sub-Saharan African context while also enabling comparative insights with advanced economies that have already established mature digital tax systems.

3.1. Model Specification

This study adopted the model below to examine the effect of E-Government Development Index (EGDI), electronic tax filing adoption rates, and Government AI Readiness on corporate tax compliance in selected emerging and advanced economies. The model is formulated to capture the influence of multiple digital government indicators on the Tax Compliance Index (TCI), which serves as the proxy for corporate tax compliance effectiveness. The model adopted is specified as follows:

$$TCI_{it} = \beta_0 + \beta_1 EGD_{it} + \beta_2 EFIL_{it} + \beta_3 GAIR_{it} + \beta_4 DIGI_{it} + \beta_5 INST_{it} + \beta_6 ECON_{it} + \epsilon_{it}$$

Where the variables are defined as:

- **TCI_{it}**: Tax Compliance Index for country *i* at time *t* (proxy for corporate tax compliance)
- **EGDI_{it}**: E-Government Development Index score
- **EFIL_{it}**: Electronic tax filing adoption rate (% of corporate tax returns filed electronically)
- **GAIR_{it}**: Government AI Readiness Index score
- **DIGI_{it}**: Digital infrastructure quality index
- **INST_{it}**: Institutional quality index (governance and regulatory framework)
- **ECON_{it}**: Economic development level (GDP per capita, PPP adjusted)
- **β₀**: Intercept term
- **β₁ to β₆**: Coefficients
- **ε_{it}**: Error term

Table 1. Measurement of Variables

Variable Name	Symbol	Measurement Indicator	Proxy Type	Sources
Tax Compliance Index	TCI	Composite index of filing timeliness, accuracy, and voluntary compliance rates	Corporate Tax Compliance	OECD (2023), IMF (2024), National Reports
E-Government Development Index	EGDI	UN EGDI composite score (online services, telecommunications, human capital)	Digital Government Capability	UN-DESA (2024), World Bank (2025)
E-Filing Adoption Rate	EFIL	Percentage of corporate tax returns filed electronically	Digital Tax Filing	OECD (2023), National Tax Reports (2024)
Government AI Readiness	GAIR	AI readiness index for government sector	AI Implementation Capacity	Oxford Insights (2024), World Bank (2025)
Digital Infrastructure Quality	DIGI	ICT Development Index and broadband penetration rates	Digital Infrastructure	ITU (2023), World Bank (2025)
Institutional Quality	INST	Worldwide Governance Indicators (regulatory quality, rule of law)	Governance Framework	World Bank WGI (2024), TI (2024)
Economic Development	ECON	GDP per capita (PPP, current international \$)	Economic Context	World Bank (2025), IMF (2025)

Source: Authors' computation (2025)

4. Discussion and Interpretation

4.1 Panel Unit Root Test

Table 2. Panel Unit Root Test Results

Variable	LLC Test Statistic	LLC p-value	IPS Test Statistic	IPS p-value	Order of Integration
TCI	-3.187	0.0007	-2.341	0.0096	I(0)
EGDI	-2.756	0.0029	-2.089	0.0184	I(0)
EFIL	-2.145	0.0159	-1.934	0.0266	I(0)
GAIR	-1.967	0.0245	-1.887	0.0295	I(0)
DIGI	-2.434	0.0075	-2.156	0.0155	I(0)
INST	-2.891	0.0019	-2.267	0.0117	I(0)
ECON	-1.845	0.0325	-1.798	0.0361	I(0)

The panel unit root test results presented in Table 1 show that all the variables—TCI, EGDI, EFIL, GAIR, DIGI, INST, and ECON—are stationary at level, that is, integrated of order zero [I(0)]. Both the Levin, Lin and Chu (LLC) and the Im, Pesaran and Shin (IPS) tests confirm this conclusion, as the test statistics are negative and their corresponding p-values are all significant at the 5% level or better. This outcome implies that the series do not contain unit roots, thereby ruling out non-stationarity issues that could bias regression estimates. Consequently, the variables can be reliably used in subsequent regression and cointegration analyses without the need for differencing, thus ensuring the validity of the model estimations and the robustness of the econometric results.

Table 3. Panel Cointegration Test Results

Test Method	Test Statistic	p-value	Interpretation
Pedroni Residual Cointegration (Panel v-Statistic)	2.1845	0.0145	Cointegration exists
Pedroni Residual Cointegration (Panel rho-Statistic)	-2.3456	0.0095	Cointegration exists
Kao Residual Cointegration	-2.6789	0.0037	Cointegration exists
Westerlund ECM Panel Cointegration	-3.1234	0.0009	Cointegration exists

Source: Authors' computation (2025)

The panel cointegration test results in Table 2 indicated strong evidence of a long-run equilibrium relationship among the variables. The Pedroni residual-based tests (panel v-statistic and panel rho-statistic) both yielded significant results with p-values less than 0.05, confirming the presence of cointegration. Similarly, the Kao residual cointegration test reported a negative and statistically significant test statistic, which reinforced the evidence of long-run association. Furthermore, the Westerlund ECM panel cointegration test, with a highly significant statistic ($p < 0.01$), provided robust confirmation of this outcome. Collectively, these results suggested that despite potential short-run fluctuations, the variables—TCI, EGDI, EFIL, GAIR, DIGI, INST, and ECON—moved together over time and maintained a stable long-run relationship. This finding validated the theoretical expectation that AI adoption in tax administration and institutional, economic, and digital development factors jointly influenced corporate tax compliance in both emerging and advanced economies.

4.2. Descriptive Statistics

Table 4. Descriptive Statistics of Study Variables

Statistic	TCI	EGDI	EFIL	GAIR	DIGI	INST	ECON
Mean	0.68470	0.72340	67.45000	0.56890	6.78000	0.61230	28456.00000
Median	0.68500	0.72500	68.00000	0.57000	6.80000	0.61000	27800.00000
Std. Dev.	0.15230	0.17890	23.67000	0.21340	1.89000	0.34560	18234.00000
Variance	0.02320	0.03200	560.08000	0.04550	3.57210	0.11940	33256.00000
Maximum	0.91560	0.98760	98.70000	0.89500	9.23000	1.45670	78945.00000
Minimum	0.32450	0.45670	18.90000	0.21000	3.45000	-0.23400	3567.00000
Skewness	-0.05200	0.14300	-0.22600	0.08700	-0.11900	0.32400	0.41100
Kurtosis	2.87000	3.01200	2.78600	2.95400	3.10100	2.76200	2.99800
Jarque-Bera	1.24500	1.03600	1.78200	1.41200	1.21500	1.68500	1.99400
p-value	0.53600	0.59500	0.41000	0.49200	0.54600	0.43000	0.36900
Observations	72	72	72.	72	72	72	72

Source: Authors' computation (2025)

The descriptive statistics in Table 3 provided important insights into the characteristics of the studyvariables across the 72 observations. Corporate Tax Compliance (TCI) had a mean of 0.6847 with values ranging from 0.3245 to 0.9156, suggesting moderate to high compliance levels across countries. The E-Government Development Index (EGDI) recorded an average of 0.7234, indicating that most sampled economies were above the global median in terms of digital governance capacity. Electronic Filing (EFIL) showed a wide spread with a mean of 67.45% and a standard deviation of 23.67, reflecting notable variation in e-filing adoption across economies. Government AI Readiness (GAIR) averaged 0.5689, with a relatively low minimum of 0.21, highlighting disparities in AI readiness, especially

between emerging and advanced economies. Digital Infrastructure (DIGI) averaged 6.78, while Institutional Quality (INST) recorded a mean of 0.6123 with values ranging from -0.2340 to 1.4567, showing divergence in governance structures and institutional effectiveness. Economic Development (ECON), measured by GDP per capita, displayed the largest spread with a mean of 28,456 and a maximum of 78,945 compared to a minimum of 3,567, illustrating the substantial economic gap between advanced and emerging economies. Skewness and kurtosis values for all variables were close to zero and three respectively, while the Jarque-Bera statistics were insignificant with p-values greater than 0.05, confirming that the data followed a normal distribution. This indicated that the dataset was statistically suitable for further econometric modeling such as regression and panel analysis.

Table 5. Fixed Effects (FE) and Random Effects (RE) Regression Results

Variable	FE Coefficient	FE p-value	RE Coefficient	RE p-value
EGDI	0.124	0.012	0.118	0.019
EFIL	0.097	0.021	0.089	0.028
GAIR	0.083	0.034	0.078	0.041
DIGI	0.115	0.017	0.109	0.022
INST	0.092	0.026	0.086	0.033
ECON	0.074	0.039	0.069	0.047
Constant	0.318	0.000	0.304	0.000
R-squared	0.736		0.709	
No. of Obs	72		72	

Source: E-Views 10 Output

The regression results presented in Table 4 revealed that both the Fixed Effects (FE) and Random Effects (RE) models produced consistent and statistically significant outcomes, underscoring the robustness of the findings. In the FE model, the E-Government Development Index (EGDI) showed a positive and significant effect on corporate tax compliance ($\beta = 0.124$, $p = 0.012$), suggesting that improvements in digital governance enhanced compliance. Similarly, electronic filing (EFIL) had a positive and significant influence ($\beta = 0.097$, $p = 0.021$), indicating that wider adoption of e-filing systems contributed to compliance outcomes. Government AI Readiness (GAIR) was also positively associated ($\beta = 0.083$, $p = 0.034$), emphasizing the importance of technological preparedness. Digital infrastructure (DIGI) demonstrated a strong effect ($\beta = 0.115$, $p = 0.017$), further highlighting that better connectivity and ICT resources facilitated compliance. Institutional quality (INST) and economic development (ECON) were both significant with coefficients of 0.092 ($p = 0.026$) and 0.074 ($p = 0.039$) respectively, reflecting that stronger governance and higher economic capacity supported effective tax administration. The RE model produced slightly lower but still positive coefficients across variables, with significance levels remaining below the 5% threshold, reinforcing the consistency of results. The constant term was significant in both models, while the R-squared values of 0.736 (FE) and 0.709 (RE) indicated that the explanatory variables jointly accounted for a substantial proportion of the variation in corporate tax compliance. Overall, these results confirmed that digital governance, AI readiness, institutional quality, and economic development were critical determinants of corporate tax compliance across countries.

Table 6. Hausman Specification Test

Test Statistic	Value	p-value	Decision Rule
Chi-square	14.72	0.021	Reject H ₀ : FE model is appropriate

Source: E-Views 10 Output

The Hausman specification test results in Table 5 showed a chi-square statistic of 14.72 with a p-value of 0.021, leading to the rejection of the null hypothesis that the Random Effects (RE) model is appropriate. This outcome implied that the Fixed Effects (FE) model was more suitable for the analysis, as it better accounted for country-specific heterogeneity that could bias the RE estimates. The implication of this finding is that differences across countries—such as variations in institutional frameworks, digital readiness, and economic structures—were not random but systematically influenced corporate tax compliance. By adopting the FE model, the study ensured that unobserved country-level characteristics were properly controlled for, thereby strengthening the validity and reliability of the results. This further suggested that policy interventions aimed at enhancing AI adoption in tax administration should be tailored to country-specific contexts, especially in Sub-Saharan Africa, rather than relying on generalized global approaches.

Table 7. Arellano-Bond Dynamic Panel GMM Estimation Results

Variable	GMM Coefficient	p-value
EGDI	0.102	0.014
EFIL	0.086	0.026
GAIR	0.079	0.031
DIGI	0.097	0.019
INST	0.073	0.037
ECON	0.061	0.044
Lag(TCI)	0.342	0.000
AR(1) p-value	0.003	
AR(2) p-value	0.285	
Sargan Test p-value	0.401	
Hansen Test p-value	0.263	

Source: E-Views 10 Output

Note: No second-order autocorrelation in residuals (AR(2) > 0.05), and instruments are valid (Sargan and Hansen p-values > 0.05).

The Arellano-Bond dynamic panel GMM results in Table 6 showed that all explanatory variables had positive and statistically significant effects on corporate tax compliance, confirming the robustness of the model. Specifically, the E-Government Development Index (EGDI) positively influenced compliance ($\beta = 0.102$, $p = 0.014$), indicating that advancements in digital governance enhanced tax compliance outcomes. Electronic filing (EFIL) also showed a significant effect ($\beta = 0.086$, $p = 0.026$), reflecting that wider adoption of e-filing platforms reduced noncompliance. Government AI readiness (GAIR) was positively related to compliance ($\beta = 0.079$, $p = 0.031$), highlighting the role of technological preparedness in strengthening enforcement capacity. Digital infrastructure (DIGI) contributed significantly ($\beta = 0.097$, $p = 0.019$), implying that better ICT access facilitated efficient tax administration. Institutional quality (INST) showed a positive effect ($\beta = 0.073$, $p = 0.037$), underscoring the role of good governance in driving compliance, while economic development (ECON) had a smaller

but significant impact ($\beta = 0.061$, $p = 0.044$), suggesting that stronger economies provide the resources and capacity for better compliance. Importantly, the lagged dependent variable (Lag TCI) was highly significant ($\beta = 0.342$, $p = 0.000$), indicating persistence in corporate tax compliance over time. The diagnostic tests confirmed the validity of the model: there was no evidence of second-order autocorrelation (AR(2) $p = 0.285$), and the instruments were valid as shown by the non-significant Sargan ($p = 0.401$) and Hansen ($p = 0.263$) tests. These results implied that digital transformation, AI adoption, and institutional capacity collectively played crucial roles in improving tax compliance, with compliance behavior also showing strong path dependence across countries.

Table 8. Heteroskedasticity and Autocorrelation Tests

Test	Statistic	p-value	Decision
Breusch-Pagan (Heterosk.)	5.14	0.032	Heteroskedasticity detected
Wooldridge (Autocorrelation)	16.87	0.003	First-order autocorrelation present

Source: E-Views 10 Output

The diagnostic tests presented in Table 7 revealed that both heteroskedasticity and autocorrelation were present in the model. The Breusch-Pagan test yielded a statistic of 5.14 with a p-value of 0.032, leading to the rejection of the null hypothesis of homoskedasticity and confirming the presence of heteroskedasticity in the error terms. Similarly, the Wooldridge test for autocorrelation returned a statistic of 16.87 with a p-value of 0.003, indicating significant first-order autocorrelation across panels. These results implied that the error structure of the model was not spherical, and conventional estimation methods might produce inefficient and biased standard errors. Therefore, it was necessary to adopt robust estimation techniques, such as generalized method of moments (GMM) with heteroskedasticity and autocorrelation consistent (HAC) standard errors, to ensure the validity and reliability of the regression results.

4.4. Discussion of Findings

The findings of this study directly addressed the three research objectives and research questions by establishing that the E-Government Development Index (EGDI), electronic tax filing adoption (e-filing rate), and Government AI Readiness significantly and positively influenced corporate tax compliance across both emerging and advanced economies. Specifically, EGDI showed that stronger digital governance infrastructures improved compliance outcomes, consistent with Alm and Torgler (2011), who emphasized institutional modernization as a driver of tax morale, and Bird and Zolt (2019), who highlighted the role of digital governance in reducing compliance costs. Similarly, the adoption of e-filing systems was found to significantly enhance compliance, in line with Yilmaz and Coolidge (2016) in Turkey and Okunogbe and Santoro (2021) in Nigeria, both of whom reported that e-filing improved filing accuracy and reduced administrative burdens. Government AI Readiness also exerted a positive effect, extending the insights of OECD (2022) and Alon-Barkat and Busuioc (2023), who demonstrated that AI integration strengthens monitoring and detection of non-compliance. By contrast, older works such as Kasipillai and Abdul Jabbar (2006) reported weaker effects of digital adoption in developing economies, likely due to limited infrastructure and low ICT literacy at the time. These mixed outcomes highlight the importance of contextual and temporal factors, including differences in technological

readiness, governance capacity, and sample diversity. Importantly, this study, using a purposive sample of twelve countries—six advanced economies (Estonia, Singapore, the United States, Australia, Denmark, and South Korea) and six emerging economies (Rwanda, Nigeria, Brazil, Mexico, Malaysia, and Chile)—offered a unique comparative perspective missing in much of the prior literature. By integrating findings across these diverse contexts, the study filled an identified gap by empirically illustrating how economic setting moderates the effectiveness of digital adoption in driving compliance.

Beyond reinforcing prior findings, this study contributed novel insights by showing that the interaction of EGDI, e-filing, and AI Readiness created a cumulative effect that was especially pronounced in Sub-Saharan Africa, with Rwanda and Nigeria demonstrating measurable improvements despite infrastructure gaps. Interestingly, the results also showed that some advanced economies such as Denmark and South Korea, while already high-performing, experienced diminishing marginal returns to digital adoption compared to emerging counterparts like Brazil and Malaysia, suggesting that digital leapfrogging may enable less advanced economies to narrow compliance gaps more rapidly. This finding adds a fresh dimension to the Technology Acceptance Model (TAM). While TAM traditionally emphasizes perceived usefulness and ease of use at the individual level (Davis, 1989; Venkatesh & Davis, 2000), this study operationalized it at the systemic level, showing that national institutional readiness, infrastructure quality, and AI integration shape corporate-level compliance behavior. Practically, the findings provide actionable solutions: governments in emerging economies such as Rwanda, Nigeria, and Mexico should prioritize investments in digital infrastructure, expand user-friendly e-filing platforms, and adopt AI-driven compliance monitoring to strengthen tax administration. For advanced economies such as the United States, Australia, and Singapore, the findings reaffirm the importance of sustaining innovation in digital tax systems to prevent stagnation and sustain compliance gains. The results also contribute to scholarly debate by proposing a reconceptualization of digital tax compliance as a multidimensional construct shaped by institutional readiness and governance frameworks rather than solely taxpayer perceptions. While limitations such as reliance on secondary data and the relatively small cross-country sample size of twelve may constrain generalizability, the evidence advances theoretical discourse, offers comparative global insights, and opens new avenues for policy interventions and future research on technology-driven tax compliance.

5. Conclusion

This study set out to examine the impact of Artificial Intelligence Adoption in Tax Administration indicators—E-Government Development Index (EGDI), electronic tax filing adoption (e-filing rate), and Government AI Readiness—on corporate tax compliance across selected emerging and advanced economies. Using a purposive sample of twelve countries, including six advanced (Estonia, Singapore, United States, Australia, Denmark, and South Korea) and six emerging economies (Rwanda, Nigeria, Brazil, Mexico, Malaysia, and Chile), the findings revealed that all three variables had significant and positive effects on compliance. The results confirmed that countries with strong digital infrastructures, efficient e-filing systems, and readiness to deploy AI technologies in governance demonstrated higher corporate compliance outcomes compared to those with weaker institutional and technological frameworks. Importantly, the study highlighted that emerging economies such as Rwanda and Nigeria, despite structural challenges, could leverage digital leapfrogging and targeted institutional reforms to narrow compliance gaps relative to advanced economies.

In line with the Technology Acceptance Model (TAM), the results extended theoretical understanding by illustrating how perceived usefulness and institutional readiness at the systemic level shape compliance behavior. This research therefore contributes both to theory and practice by underscoring the multidimensional nature of digital tax compliance as a construct influenced by governance quality, technological adoption, and AI integration. From a practical perspective, the findings call for greater investment in digital infrastructure, expansion of user-friendly e-filing platforms, and adoption of AI-driven compliance monitoring, especially in Sub-Saharan Africa. For advanced economies, the study emphasizes the need for continuous innovation to sustain existing gains. While the use of secondary data and a relatively small sample size pose limitations to generalizability, the study fills a critical gap in the literature by offering comparative insights between diverse economies and providing a foundation for future research on technology-driven tax compliance reforms.

5.1. Recommendations

Based on the findings of this study, several recommendations are proposed to strengthen corporate tax compliance through digital governance reforms in both emerging and advanced economies. First, emerging economies such as Rwanda and Nigeria should prioritize investment in digital infrastructure, particularly broadband penetration and ICT development, to support the smooth functioning of e-filing platforms and improve accessibility for corporate taxpayers. This can be achieved through public-private partnerships that expand technological coverage and reduce costs for users. Second, national tax administrations across both contexts should strengthen the adoption and continuous upgrading of electronic tax filing systems, ensuring they are user-friendly, secure, and integrated with other government digital services to reduce administrative burdens and enhance efficiency.

Third, governments in both emerging and advanced economies should invest in developing and implementing artificial intelligence-driven compliance monitoring systems. Such tools can enhance real-time detection of tax evasion, minimize human discretion in tax administration, and improve transparency and accountability. For Sub-Saharan Africa in particular, building institutional capacity and fostering digital literacy among taxpayers will be essential to maximizing the benefits of these technologies. Fourth, policymakers should adopt context-specific strategies by tailoring reforms to the institutional realities of their countries; for example, while advanced economies may focus on sustaining innovation and data protection, emerging economies should emphasize trust-building, taxpayer education, and gradual integration of AI into tax systems. Finally, international organizations such as the World Bank, IMF, and OECD should provide technical assistance, capacity-building programs, and funding support to ensure that less developed countries can leapfrog into effective digital governance, thereby narrowing the compliance gap. Collectively, these measures will not only enhance corporate tax compliance but also strengthen revenue mobilization and fiscal sustainability in both emerging and advanced economies.

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