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Effect of Digitalization on Income Tax Mobilization: Evidence from Côte d'Ivoire

Abstract: The study examines how tax digitalization affects income tax mobilization in Côte d'Ivoire, focusing on the 2017 e-tax platform. Using an ARDL model with data from 1992-2022, the results show that digitalization significantly increases income tax collection in both the short and long run. ICT expansion – especially internet access – also enhances compliance. Conversely, human capital, measured by primary school completion, negatively affects revenue, suggesting a skills mismatch. Overall, e-tax has strengthened tax administration. Policymakers could extend digital tools, improve ICT infrastructure, and reinforce fiscal training to improve domestic resource mobilization.

Keywords: Digital economy, Tax system, E-taxation, ICT, Income mobilization, Côte d'Ivoire.

Effet de la digitalisation sur la mobilisation de l'impôt sur le revenu : Evidence empirique en Côte d'ivoire

Résumé : *Cette étude analyse l'impact de la digitalisation fiscale sur la mobilisation de l'impôt sur le revenu en Côte d'Ivoire, en mettant l'accent sur la plateforme e-impôt introduite en 2017. À l'aide d'un modèle ARDL et des données couvrant la période 1992-2022, les résultats montrent que la digitalisation accroît significativement la collecte de l'impôt sur le revenu, aussi bien à court qu'à long terme. L'expansion des TIC – en particulier l'accès à l'internet – améliore également la conformité fiscale. À l'inverse, le capital humain, mesuré par le taux d'achèvement du primaire, affecte négativement les recettes, suggérant un décalage de compétences. Globalement, e-impôt a renforcé l'administration fiscale. Les décideurs publics pourraient étendre les outils numériques, améliorer les infrastructures TIC et renforcer les formations fiscales pour améliorer la mobilisation des ressources.*

Mots clés *: Economie numérique - Système fiscal, e-impôt, TIC, Mobilisation des recettes, Côte d'Ivoire.*

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1. Introduction

In recent decades, Information and Communication Technologies (ICT) have become a powerful driver of transformation across all sectors of global economy. The COVID-19 pandemic has further accelerated this process, pushing governments, businesses, and transactions (Karsenti & al., 2020). Within this global wave of digital transformation, public administrations – particularly tax administrations – have undergone profound changes, as digitalization promises to enhance transparency, efficiency, and fairness in the management of public resources.

In developing economies, income taxes are the primary and most stable source of government financing, representing on average 16% of GDP in sub-Saharan Africa, compared to 34% in The Organisation for Economic Co-operation and Development (OECD)[1] countries (IMF, 2023). Côte d'Ivoire, one of West Africa's largest economies, has made considerable progress in income mobilization, with income tax rising from 2,660 billion FCFA in 2010 to 6,190 billion FCFA in 2022 (DGI[2], 2022). However, the country's tax-to-GDP ratio remains around 13-15% still below the 20% threshold recommended by the African Union for achieving fiscal sustainability. This persistent gap highlights the need for innovative strategies to strengthen domestic resource mobilization.

To address these challenges, Côte d'Ivoire initiated several reforms aimed at modernizing its tax administration. A major milestone was the introduction of the e-tax platform (e-impôt) in 2017, designed to simplify tax declaration and payment processes, reduce administrative delays, and curb corruption. By August 2018, the platform had registered 3,155 taxpayers and mobilized about 1,093 billion CFA, accounting for 33% of total income tax (DGI, 2022). Despite the promising figures, overall tax collection – particularly corporate income tax (CIT) – has shown only moderate growth since 2017 (World Development Indicators). This paradox raises an essential question:

To what extent has the digitalization of taxes services effectively enhanced income tax mobilization in Côte d'Ivoire?

While numerous studies (e.g., Uyar et al., 2021; Nkoa & Song, 2022; Yamen et al., 2023) have analyzed the relationship between ICT adoption and fiscal performance, most have focused on cross-country or regional analyses, often overlooking country-specific institutional contexts. These is limited empirical evidence on how digital tax reforms influence income performance in individual African countries, especially in Côte d'Ivoire, where digital transformation is still emerging. This study fills this gap by providing country-specific econometric evidence using annual data from 1992 to 2022 and employing an AutoRegressive Distributed Lag (ARDL) model to capture both short- and long- run effects of digitalization on income tax.

The findings of this study are expected to benefit multiple stakeholders.

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[1] Aslo known as *Organisation de coopération et de développement économiques* (OCDE)

[2] *Direction Générale des Impôts (DGI).*

- For policymakers, it provides evidence-based insights to guide the design and expansion of digital tax initiatives.
- For the tax administration (DGI), it identifies key determinants influencing the effectiveness of e-tax reforms.
- For researchers and academics, it contributes to the literature on fiscal digitalization in Africa by offering empirical validation of theoretical expectations.

The main objective is to evaluate the effect of digitalization in public services – particularly in tax administration – on the mobilization of income taxes in Côte d'Ivoire.

Specifically, the study aims to:

- Quantify the impact of the e-tax platform on total income taxes;
- Assess the contribution of ICT indicators (mobile subscriptions, internet use) to fiscal performance;
- Identify policy levers to strengthen digital transformation for improved income collection.

The remainder of this paper is structured as follows: Section 2 presents the Literature Review; Section 3 the econometric methodology; Section 4 reports the empirical results; Section 5 discusses and interprets the findings; and Section 6 concludes with policy recommendations

2. Literature Review

2.1. Theoretical Review

The theoretical foundation of fiscal digitalization is rooted in the theory of optimal taxation developed by Ramsey (1927) and later expanded by Mirrlees (1971) and Gautier (2001). This framework emphasizes minimizing both administrative costs and distortions induced by taxation, while maximizing income efficiency. Within this context, digitalization is conceived as a means to reduce transaction costs, improve taxpayer compliance, and enhance information symmetry between taxpayers and administrations (Sen Gupta, 2007; IMF, 2018).

According to the transaction-cost economics theory proposed by Williamson (1979), digital technologies reduce coordination and monitoring costs, which are typically high in traditional tax systems reliant on manual processing. By introducing automated reporting, digital receipts, and online declaration systems, governments can strengthen transparency and accountability in fiscal governance. These categories align with the *OECD framework of Tax Administration 3.0* (OCDE, 2022), which envisions tax systems fully integrated with digital ecosystems through automation, big data, and real-time analytics as also highlighted by Reddick and Coggburn (2006).

The diffusion of digital technologies also draws from Rogers' (2003) diffusion of innovations theory, which explains adoption dynamics through perceived usefulness, ease of use, and institutional readiness. In the fiscal context, this means that the success

of e-tax platforms depends not only on technological design but also on taxpayers' trust, ICT literacy, and the institutional capacity of tax authorities Hattab and El Houari (2024).

Finally, governance and institutional theory (North, 1990) posits that the efficiency of digital transformation depends on the broader institutional environment – particularly regulatory quality, political stability, and anti-corruption measures. In countries with weak institutions, digitalization may not immediately translate into improved tax outcomes because compliance behavior remains influenced by enforcement credibility and public trust, also raised by Dossa and Bakena (2024) for WAEMU countries.

2.2. Empirical review

Empirical literature reveals a growing body of evidence linking digitalization to income tax performance across both advanced and developing economies.

In developed countries, Uyar and al. (2021) analyzed a panel of 96 countries from 2003 to 2018 using a two-step system GMM model to examine whether e-government initiatives mitigate tax evasion. Their findings indicate that ICT adoption and online tax platforms significantly reduce evasion, especially where institutional quality is high. Similarly, Kitsios & al. (2023) employed a dynamic panel regression for OECD members (2006-2021) and confirmed that electronic invoicing and cross-border data exchange decrease Value-added tax (VAT) fraud by up to 10%.

In the European context, Heinemann and Stiller (2024) used a difference-in-differences design exploiting the Italian e-invoicing reform of 2017. They found a 7-8% increase in VAT compliance within two years, underscoring the efficiency gains of digital monitoring. within

Turning to developing regions, Myovella & al. (2020) applied a panel-VAR model to sub-Saharan and OECD countries (200-2018). Their results show a bidirectional causality between digitalization and economic growth, implying that ICT expansion indirectly enhances fiscal capacity through income growth. In Nigeria, Etim & al. (2020) used survey data from 120 tax officers analyzed via multiple linear regression, concluding that digital tax systems improve compliance and reporting accuracy but remain constrained by network instability and limited staff training. For Kenya, Ndung'u (2019) analyzed the Kenya Income Authority's e-Tax system using time-series regressions (2005-2018). The study demonstrated that e-filing adoption raised VAT and PAYE revenues by 15%, driven by real-time taxpayer monitoring.

Within West Africa, Nkoa & Song (2022) conducted a system GMM analysis of 45 African countries (2000-2018) and concluded that internet penetration and mobile connectivity positively influence income tax, but the effect is contingent upon political stability and bureaucratic quality. These findings are consistent with Gnangnon and Brun (2019), who showed that internet diffusion reshapes the structure of public revenue toward non-resource taxation. In Ghana, Appiah and al. (2021) applied an ARDL bounds-testing approach using data from 1990-2019 to examine the long-run impact of ICT investment on income tax. The study revealed a positive and statistically significant long-term relationship, confirming that digitalization improves income elasticity when accompanied by institutional reforms. Ayoki and al. (2005) investigated Uganda's e-tax

system through a mixed-methods design combining time-series econometric analysis and stakeholder interviews. Results indicated improved taxpayer compliance and cost efficiency but noted challenges related to infrastructure gaps and cybersecurity.

At the regional level, Trinnou (2021) and Adanle & Chabossou (2022) showed that tax effort and optimal fiscal pressure in WAEMU countries depend not only on macroeconomic fundamentals but also on administrative capacity and modernization of tax systems. Similarly, Dossa and Bakena (2024) highlighted that fiscal digitalization in WAEMU reduces compliance costs and improves traceability, while facing challenges related to infrastructure and harmonization.

The literature also identifies potential risks. Hamilton and Stekelberg (2017), analyzing U.S corporate data via panel regression, found that digital tools can facilitate aggressive tax-planning strategies, highlighting the need for governance safeguards. Moreover, Strango (2021) showed that while digitalization in public services reduces tax evasion, its effectiveness diminishes in contexts characterized by weak institutional control.

Collectively, empirical findings converge on the notion that digitalization positively affects tax mobilization, though its magnitude depends on institutional capacity, digital infrastructure, and governance quality (IMF, 2018; OECD, 2022). However, most available studies rely on cross-country panels, which mask country-specific contexts and policy heterogeneity. Few adopt time-series econometric approach such as ARDL to evaluate both short- and long-term dynamics within a single country. This methodological gap justifies the present study's contribution: by applying the ARDL framework to Côte d'Ivoire, it offers context-specific empirical evidence on how tax digitalization – particularly the 2017 e-tax reform – affects income mobilization in a developing-country setting.

3. Econometric analysis

3.1. Model specification and Estimation Strategy

The econometric analysis in this study aims to assess the effect of digitalization on income tax mobilization in Côte d'Ivoire. The model builds upon previous empirical works by Keho (2012), Asongu and al. (2021), and Nkoa & Song (2022), which explored fiscal performance determinants in developing economies. The dependent variable is total income tax, representing all taxes collected by the central government.

$$income\_tax_t = \alpha + \beta_i X_t + \varepsilon_t \quad (1)$$

X_t represents the explanatory variables: e-tax, mobile phone subscriptions, Internet users, trade openness, money supply, and human capital (proxied by the primary school completion rate).

The model is therefore expressed as:

$$income\_tax_t = \alpha + \beta_1 e - tax_t + \beta_2 mobile_t + \beta_3\, int\, e\, rnet_t + \beta_4 trade_t + \beta_5 money_t + \beta_6 human\_capital_t + \varepsilon_t (2)$$

Digitalization is represented by a dummy variable (e-tax) that takes the value 1 for the years following the introduction of the e-tax platform (2017-2022) and 0 otherwise. This variable captures the structural break corresponding to the digitalization of tax administration and its expected positive influence on income mobilization.

The number of mobile phone subscriptions and internet users (as a share of the population) proxy the diffusion of ICT, which facilitates electronic declarations and payment compliance.

Trade openness (measured as the sum of exports and imports of goods and services measured as a share of gross domestic product) is included to control for the level of economic activity and integration into the global economy.

Money supply (Broad money, % of GDP) reflects the degree of financial development and liquidity in the economy.

Human capital, measured by the primary school completion rate, accounts for education-related capacities that can influence both administrative efficiency and taxpayer literacy. The use of this proxy is justified by the lack of available data for other proxies over the study period.

The functional form of the model is specified as follows:

$$Lincome\_t\,ax_t = \alpha + \beta_1 e - tax_t + \beta_2 Lmobile_t + \beta_3\, int\, e\, rnet_t + \beta_4 trade_t + \beta_5 money_t + \beta_6 human\_capital_t + \varepsilon_t (3)$$

where:

$\text{Lincome\_}tax_t$ denotes the logarithm of total income tax in year t,

$e - tax_t$ is the digitalization dummy, and the other explanatory variables are defined as above.

The coefficients β represent the elasticities of income tax with respect to each explanatory variable, while ε_t is the random disturbance term.

Given the time-series nature of the data, the variable mobile is expressed in logarithms to reduce heteroscedasticity and interpret coefficients as elasticities. The analysis proceeds through three main stages: testing for stationarity, determining lag length, and estimating the VAR.

3.2. Preliminary Tests

Prior to estimation, several diagnostic tests were conducted to ensure data suitability and model robustness. The first step involved verifying the stationarity of the variables using both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit-root tests. These tests were performed at level and at first difference to determine the order of integration for each variable. The results revealed a mixture of I(0) and I(1) processes, justifying the use of the ARDL approach, which is valid when variables are integrated of order 0 and 1 but not 2.

The second step involved lag-length selection, which is critical for capturing the dynamic structure of the data. Optimal lag orders were determined using standard information criteria such as the Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC), and Hannan-Quinn (HQ). the lag order corresponding to the minimum AIC value was retained for model estimation.

3.3. The ARDL Model and Cointegration Testing

The AutoRegressive Distributed Lag (ARDL) model, initially proposed by Pesaran, Shin, and Smith (2001), is particularly suitable for small samples and mixed integration orders. It allows the simultaneous estimation of both short- and long-term dynamics between the dependent and independent variables. The general ARDL $(p, \mathrm{q}_1, \mathrm{q}_2, ..., q_6)$ model applied in this study is expressed as:

$$income\_tax_t = \alpha_0 + \sum_{i=1}^{p} \beta_i income\_tax_{t-i} + \sum_{j=0}^{q} \gamma_i X_{t-j} + \varepsilon_t \quad (4)$$

where X_t represents the explanatory variables (e-tax, ICT, trade openness, …)

Specific steps:

- Selection of lags (p,q): use information criteria (AIC, BIC) for each variable.
- Estimation of the ARDL model: includes both the lags of the dependent variable (income taxes) and those of the explanatory variables.
- Testing long-term relationships:
    - Perform a cointegration test (such as the Bounds test by Pesaran and al, 2001) to verify the existence of a long-term relationship.
    - If cointegration is confirmed, decompose the model into short-and long-term components.

3.4. Data Sources and Measurement

All quantitative data were drawn from reliable international sources. Annual series for income tax, mobile phone subscriptions, internet users, trade openness, money supply, and primary school completion rate were obtained from the World Development Indicators from World Bank. The e-tax dummy variable was constructed by the authors to reflect the post-2017 period of tax digitalization implemented by the Ivorian Tax Administration

Descriptive statistics and correlation matrices were analyzed to identify potential multicollinearity before running the ARDL model.

3.5. Diagnostic and Stability Tests

Finally, several diagnostic tests were conducted to ensure the validity and robustness of the estimated model. These include the Breusch-Godfrey LM test for serial correlation, the Breusch-Pagan-Godfrey test for heteroscedasticity, the Jarque-Bera or residual normality test, and the Ramsey Reset test for functional-form specification. Model stability was assessed through the Cusum and Cusum of squares tests, ensuring that all parameters remained within the 5% confidence bounds.

Collectively, these methodological steps ensure that estimated ARDL model provides consistent and unbiased estimations of the short- and long-run effects of digitalization and related macroeconomic factors on income tax mobilization in Côte d'Ivoire.

4. Empirical Results

4.1. Stationarity of the variables

Before proceeding with model estimation, the time-series properties of all variables were examined using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. These tests identify whether the variables are stationary at level, I(0), or become stationary after first differencing, I(1). Table 1 presents the outcomes of both tests.

Table 1: Stationarity Test Results (ADF and PP)

Variables	ADF		PP		Décision
	Level	First Difference	Level	First Difference	
Lincome _ tax	0.906	-6.609***	1,563	-6,6***	I(1)
Lmobile	-2.951***		-6.867***		I(0)
int*ernet*	-6.105***		-3.339**		I(0)
trade	-2.101	-5.555***	-2.288	-6.005***	I(1)
money	-0.571	-5.401***	-0.315	-4.882***	I(1)
human _ capital	-0.267	-6.154***	-0.107	-4.67***	I(1)

The results indicate a mixture of I(0) and I(1) series, confirming the appropriateness of the ARDL framework (Pesaran, Shin and Smith, 2001), which can handle such mixed integration orders.

4.2. Lag-Length Selection and Cointegration (Bounds Test)

Before estimating the ARDL model, the optimal lag length was determined using the Akaike (AIC), and Hannan-Quinn (HQ) information criteria. As shown in Table 2, the minimum AIC value occurs at lag 2, which was thus retained for model estimation.

Table 2: VAR Lag-Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	45.58459	NA	1.08e-10	-3.086767	-2.745482	-2.992109
1	209.5027	222.9286	1.29e-14	-12.28021	-9.549933	-11.52295
2	292.9695	66.77344*	2.56e-15*	-15.03756*	-9.918280*	-13.61769*

Note. AIC= Akaike information criterion; SC= Schwarz criterion; HQ= Hannan-Quinn criterion. The asterisk (*) indicates the selected lag order

The Bounds test for cointegration confirmed the existence of both short- and long-run relationships among the variables, supporting the inclusion of both components in the ARDL model. This result is consistent with Nkoa & Song(2022), who also found long-term cointegration between ICT indicators and income tax for African economies.

4.3. Short- Term and Long-Term Dynamics

The estimated ARDL (1, 1, 0, 2, 1, 1, 0) model reveals the short-run and long-run effects of digitalization and control variables on income tax.

Table 3: ARDL Cointegrating and Long-Run Results

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D($e-tax$)	0.196971	0.087065	2.262350	0.0415
D(L$mobile$)	0.093264	0.085582	1.089764	0.2956
D(int$ernet$)	0.503168	0.076431	6.583307	0.0000
D(int$ernet$ (-1))	0.118187	0.037729	3.132499	0.0079
D($trade$)	0.391686	0.243782	1.606709	0.1321
D($money$)	0.057025	0.143990	0.396036	0.6985
D($human\_capital$)	-0.926502	0.335344	-2.762844	0.0161
CointEq(-1)	-0.899155	0.148351	-6.061014	0.0000

Cointeq = $Lincome\_tax$ - (0.5733* $e-tax$ + 0.0839 * $Lmobile$ + 0.1785* int$ernet$ -0.5923* $trade$ + 0.3655* $money$ -1.0520* $human\_capital$ + 31.9276)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$e-tax$	0.573325	0.216745	2.645158	0.0202
$Lmobile$	0.083867	0.132125	0.634758	0.5366
int$ernet$	0.178484	0.106615	1.674092	0.1180
$trade$	-0.592291	0.560538	-1.056646	0.3099
$money$	0.365487	0.280221	1.304280	0.2148
$human\_capital$	-1.051962	0.560491	-1.876859	0.0832
C	31.927564	2.644051	12.075245	0.0000

Note. *,**, *** denote significance at the 10%, 5%, and 1% levels, respectively.

In the short run, e-tax digitalization and internet use exhibit positive and significant effects on income tax. This implies that digital tools immediately enhance income collection efficiency, consistent with findings from Uyar et al. (2021) and Heinemann and Stiller (2024), who observed that e-filing and e-invoicing reforms significantly improved compliance in both developing and developed contexts. In contrast, human

capital shows a negative short-run coefficient, possibly reflecting a mismatch between basic education levels and the technical skills required for digital tax management.

In the long run, the coefficient of e-tax (0.573, $p<0.05$) confirms that sustained digitalization leads to higher income taxes. This result aligns with Nkoa & Song (2022) and Appiah and al. (2021), who demonstrated that digital transformation enhances tax mobilization when supported by institutional reforms. Other variables such as mobile subscriptions, trade openness, and money supply are positive but statistically insignificant, suggesting their indirect influence through the digital enhances tax mobilization when supported by institutional reforms. Other variables such as mobile subscriptions, trade openness, and money supply are positive but statistically insignificant, suggesting their indirect influence through the digital infrastructure channel.

4.4. Diagnostic and Stability Tests

To ensure model robustness, several diagnostic checks were performed.

Table 4: Diagnostic Test Results

Test	Statistic	Probability	Conclusion
Breusch-Pagan-Godfrey (Heteroskedasticity)	1.539	0.226	No heteroscedasticity
Breusch-Godfrey LM (Autocorrelation)	1.006	0.336	No serial correlation
Jarque-Bera (Normality)	-	0.089	Residuals normally distributed
Ramsey RESET (Functional form)	0.464	0.509	Correct model specification
CUSUM/CUSUMQ	-	-	Parameters stable

All diagnostic tests indicate that the ARDL model is statistically sound: residuals are homoscedastic and normally distributed, with no serial correlation or model misspecification. The CUSUM and CUSUM of Squares plots remained within the 5% confidence bands, confirming parameter stability throughout the sample period.

4.5. Discussion of Findings

The results substantiate that digitalization, particularly through the e-tax platform, significantly improves income tax mobilization in Côte d'Ivoire. This outcome supports theoretical expectations from Ramsey (1927) and Mirrlees (1971), who emphasized efficiency and minimized distortions in optimal taxation systems. The positive role of ICT diffusion (internet usage) confirms that modern communication technologies facilitate compliance and data tracking, thus strengthening fiscal capacity.

However, the negative and significant effect of human capital highlights a potential policy concern. Similar findings were reported by Ayoki and al. (2005) for Uganda, where limited digital literacy constrained the efficiency of tax reforms. This suggests that digital transformation in taxation must be accompanied by capacity-building programs to enhance the technical skills of both taxpayers and tax administrators.

The insignificance of trade openness and money supply implies that digitalization operates through institutional rather than purely macroeconomic channels – emphasizing the administrative and governance dimensions of reforms.

In summary, the econometric evidence confirms that the digitalization of tax services has both immediate and lasting positive effects on income mobilization, reinforcing the importance of continuing to modernize fiscal systems.

5. Analysis and Discussion of Results

The empirical analysis explored both the short- and long-term effects of digitalization and related macroeconomic variables on income tax mobilization in Côte d'Ivoire. The results obtained from the ARDL estimations confirm the existence of a stable long-run relationship between the variables, as evidenced by the significance of the error correction term (ECM) and the results of the Bounds test.

5.1. The Impact of Digitalization on Income Tax

The study reveals that the digitalization of tax services (e-tax) exerts a positive and statistically influence on income tax both in short and long term. In the long run, the estimated coefficient (0.573, $p<0.05$) suggests that the introduction of the e-tax platform in 2017 contributed significantly to the improvement of tax collection performance in Côte d'Ivoire. This confirms the efficiency gains associated with digital reforms, such as the reduction of administrative delays, enhancement of transparency, and minimization of corruption opportunities.

These findings are consistent with prior studies. Nkoa & Song (2022) established a similar positive association between digitalization and income tax for a panel of 45 African countries, emphasizing that ICT-driven reforms strengthen fiscal capacity. Likewise, Kitsios & al. (2023), using data from OECD economies, and Heinemann and Stiller (2024), focusing on Italy's e-invoicing reform, found that electronic tax systems significantly improve compliance and reduce evasion. The result therefore reinforces the view that digital tools facilitate better information management and monitoring, ultimately enhancing the efficiency and equity of the tax system.

5.2. The Role of ICT Development

The study also demonstrates that internet usage, as a proxy for ICT diffusion, has a positive and significant effect on income tax in the short term, including with a one-period lag. This underscores the importance of connectivity and digital access in improving taxpayer compliance and the overall functioning of the e-tax systems. Internet access facilitates online declaration and payment, reduces the cost of compliance, and fosters voluntary participation in the formal economy. These results echo those of Uyar et al. (2021), who confirmed that higher ICT penetration mitigates tax evasion, and of Appiah et al. (2021) in Ghana, who reported that investments in digital infrastructure yield long-run improvements in fiscal performance.

Conversely, the number of mobile phone subscribers – although positively signed – does not exert a statistically significant influence. This may be attributed to the fact mobile penetration in Côte d'Ivoire is already high, but the integration of mobile services into tax collection (such as mobile payment systems for taxes) remains limited. Thus, while mobile technology offers potential, it has not yet been fully harnessed by the tax administration.

5.3. The Influence of Human Capital

An intriguing result of this study is the negative and significant effect of human capital, proxied by the primary school completion rate, on income tax. This outcome, though counterintuitive, can be interpreted in light of the limitations of the indicator. The primary completion rate captures basic education rather than the technical and digital skills necessary for effectively managing modern fiscal systems. In other words, while education levels may rise, they do not necessarily translate into the specialized competencies required for tax compliance or for the administration of digitals tools.

The finding is consistent with Ayoki and al. (2005), who showed that in Uganda, digital literacy and institutional capacity were decisive factors in realizing the benefits of e-tax reforms. It also resonates with the argument by Nkoa & Song (2022) that the quality rather than the quantity of human capital determines the success of digital fiscal initiatives in Africa. Hence, policy interventions should focus on capacity-building in digital and fiscal management, both within the tax administration and among taxpayers.

5.4. Trade Openness and Financial Development

The coefficients for trade openness and money supply are statistically insignificant in both the short and long run. This lack of significance suggests that external trade and financial liquidity do not directly translate into higher income taxes, possibly due to weaknesses in tax collection mechanisms and persistent informality in cross-border transactions. In Côte d'Ivoire, a significant portion of income taxes is derived from corporate income and wage taxes rather than trade-based or financial flows, which may explain the weak elasticity of these variables.

This finding aligns with earlier works such as Keho (2012), who observed limited responsiveness of income taxes to openness in West African economies, and Pradhan et al. (2014), who found that while financial development supports growth, its fiscal effects depend on institutional enforcement. Thus, the Ivorian context highlights the importance

of strengthening administrative and customs mechanisms to capture potential income gains from trade and financial activity.

Overall, the analysis provides compelling evidence that tax digitalization and ICT expansion are powerful drivers of fiscal modernization in Côte d'Ivoire. The e-tax platform has enabled a more transparent, efficient, and traceable tax collection process, consistent with the principles of optimal taxation theory (Ramsey, 1927; Mirrlees, 1971). However, the observed limitations – particularly the negative impact of basic human capital and the insignificance of macroeconomics controls – highlight the need for complementary reforms. Specifically, strengthening ICT infrastructure, enhancing digital literacy, and promoting integration of mobile-based payment systems could magnify the impact of fiscal digitalization. Moreover, sustained investments in education targeted toward technological and administrative skills would ensure that the benefits of e-taxation extend to a broader base of taxpayers. These findings echo the broader conclusion of Heinemann and Stiller (2024) that successful fiscal digitalization requires not only technological innovation but also institutional adaptation and human capacity development. Thus, the Ivorian experience underscores that digitalization, while essential, must be embedded within a broader framework of governance reform and administrative strengthening to fully realize its potential for sustainable income mobilization.

6. Conclusion and Policy Implications

This study examined the effect of the digitalization of tax services on income mobilization in Côte d'Ivoire over the period 1992-2022. By employing the AutoRegressive Distributed Lag (ARDL) approach, it analyzed both short- and long-term dynamics among digitalization, ICT development, and macroeconomic factors influencing fiscal performance.

The empirical evidence demonstrates that digitalization – captured through the e-tax platform – has a positive and statistically significant impact on income tax in both the short and long run. Since its introduction in 2017, the e-tax system has transformed tax collection through faster transactions, enhanced transparency, and greater taxpayer compliance. These results confirm the predictions of optimal taxation theory (Ramsey, 1927; Mirrlees, 1971) and align with recent empirical evidence from Nkoa & Song (2022), Heinemann and Stiller (2024) and Appiah and Al. (2021).

The analysis also highlights that internet usage, as a measure of ICT diffusion, significantly enhances tax mobilization, emphasizing the complementary role of connectivity in strengthening fiscal performance. However, human capital, measured by the primary school completion rate, exhibits a negative coefficient, indicating that basic education alone does not equip citizens or administrators with the digital and fiscal competencies necessary to benefit from tax digitalization. Similarly, trade openness and money supply statistically insignificant, suggesting that macroeconomic variables exert weaker direct effects on tax collection than institutional and technological reforms.

Based on the findings, several policy suggestions emerge:

- Deepen and broaden fiscal digitalization by extending the e-tax platform to cover small and microenterprises, subnational tax offices, and property-related taxes. A more inclusive platform would strengthen the income base and formalize informal economic activities.
- Invest in ICT infrastructure and connectivity, particularly in rural areas, to ensure equitable access to digital tax services and enhance voluntary compliance.
- Promote digital literacy and fiscal capacity-building among taxpayers and civil servants. Training programs should focus on practical e-tax usage, cybersecurity, and data management to maximize the efficiency of digital reforms.
- Integrate mobile-based payment systems to simplify tax transactions and leverage Côte d'Ivoire's high mobile penetration rate. Successful cases such as Rwanda and Kenya show that mobile tax payments significantly improve compliance.
- Improve data governance and interoperability by linking tax databases with other public systems (customs, social security, land registry) to minimize fraud and broaden the taxpayer base.

These measures would not only enhance fiscal performance but also contribute to Sustainable Development Goals (SDGs) 8, 9, and 16, by fostering economic growth, innovation, and institutional integrity.

While the study provides robust econometric evidence, it faces certain limitations. First, the analysis is restricted to aggregate time-series data, which may mask sectoral or regional disparities in the impact of digitalization. Second, the human capital variable (primary school completion rate) does not fully capture digital skills or professional training, potentially underestimating the true effect of education quality. Third, the dummy variable for e-tax captures only the post-2017 period and may not reflect gradual adoption effects or differences in taxpayer categories. Finally, potential structural breaks due to macroeconomic shocks or policy reforms beyond taxation were not explicitly modeled.

Future research could address these limitations in several ways. First, micro-level or firm-level datasets could be employed to assess how different taxpayer groups respond to digitalization. Second, incorporating digital governance indicators (e.g., cybersecurity readiness, open data policies) could refine the measurement of digital efficiency. Third, comparative studies across UEMOA countries could shed light on regional convergence in fiscal digitalization. Finally, mixed-method approaches combining econometric analysis and qualitative interviews could provide richer insights into behavioral and institutional factors influencing e-tax adoption.

In conclusion, the digital transformation of tax administration in Côte d'Ivoire represents a strategic lever for strengthening domestic resource mobilization and improving fiscal governance. The e-tax platform has already generated measurable gains in efficiency and compliance, but sustaining these benefits will require continuous technological

upgrading, capacity-building, and policy coherence. Digitalization, when integrated with strong institutions and human capital development, can serve as a cornerstone of a resilient and transparent fiscal system, supporting the country's long-term economic transformation.

7. References

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