

Short-term and long-term effects of foreign direct investment on tax revenue: empirical evidence from an emerging economy

Effects of FDI
on tax revenue

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Abstract

Purpose – This paper examines the short- and long-run effects of foreign direct investment (FDI) on tax revenue in Ghana.

Design/methodology/approach – The paper adopts the autoregressive distributed lag approach to estimate FDI's long-run and short-run effects on tax revenue. The study uses time-series data from 1983 to 2019 for Ghana, mainly obtained from The Bank of Ghana, the World Bank and the IMF.

Findings – The results show that, in the short-run, FDI has no significant effect on direct tax revenue and total tax revenue but significantly hurts indirect tax revenue. In the long run, however, the results show that FDI has significant positive effects on indirect tax revenue and total tax revenue but no significant effect on direct tax revenue.

Originality/value – Empirical studies often fail to analyse the short-run and long-run effects of FDI on tax revenue. This study contributes to the mixed literature by analysing the short-run and long-run effects of FDI on tax revenue in an emerging market context. Additionally, this study employs three tax revenue measures in analysing the nexus.

Keywords Tax revenue, Foreign direct investment, Ghana, Multinational corporations, ARDL

Paper type Research paper

1. Introduction

Government revenue is essential to the achievement of the developmental aspirations and goals of any nation (Romer and Romer, 2010; Dackehag and Hansson, 2012; Worlu and Nkoro, 2012; Amoh and Adom, 2017). Revenue is essential for investments in the Government's development projects such as education, health, roads, and many others (Amoh and Adom, 2017).

Many nations, particularly in Sub-Saharan Africa, including Ghana, struggle to raise revenue to meet their developmental needs (Amoh and Adom, 2017). This is so because revenue from taxation, which is a significant avenue for mobilising revenue by governments of



developing countries ([Amoh and Adom, 2017](#)), is low. Globally, countries try to maximise tax revenue collection to obtain the necessary funds for economic development. Governments directly tax the incomes of individuals and corporations and impose indirect taxes on goods and services to raise the needed revenue for investment into developmental projects that enhance the well-being of citizens. Countries that cannot mobilise sufficient tax revenue struggle to maintain a reasonable budget. Ghana's tax-to-GDP ratio is one of the lowest amongst her peers. In Ghana, for instance, the Government's projected expenditure consistently exceeds the projected revenue year in and year out. Ghana's tax-to-GDP ratio declined from 12.2% in 2018 to 12% in 2019 and further down to 11.3% in 2020. The low revenue generation reflects the growing budget deficits over recent years. The budget deficit averaged -7.09% from 2004 to 2019, with 2008 recording the worst (lowest). In 2020 and 2021, the deficits were -13.8% and -12.10% , respectively. In order to improve the Government's fiscal position, revenue mobilisation needs to be improved by adopting strategies to enhance the tax-to-GDP ratio.

Globally, governments are competing amongst themselves to attract foreign direct investments (FDIs) into their countries due to the apparent benefits of FDIs. FDIs contribute to economic growth and employment generation through investments in the productive sectors of the economy ([Wang et al., 2013](#); [Stowhase, 2002](#)). FDI inflows promote technology transfer to host countries, especially for less developed and emerging countries. Therefore, governments use tax and non-tax incentives to entice international investors to invest in their nations ([Obeng, 2014](#)). Evidence worldwide (including African countries such as Ghana) indicates that most countries rely on FDI to increase tax revenue collection ([Amoh and Adom, 2017](#)). One competitive strategy governments adopt in the struggle to attract more FDI is tax incentives (including tax rebates and tax holidays). Evidence suggests that 50% or more of the taxes that may be collected go uncollected and unaccounted for, owing to a mixture of tax reliefs, tax inversions, tax evasion and avoidance, tax exemptions, and general corruption ([Fuest and Riedel, 2009](#); [Ade et al., 2018](#)).

Ghana's case is not different from the global trends. For instance, [Kwakye \(2020\)](#) of the Institute of Economic Affairs estimates that Ghana loses over GH¢5 billion (equivalent to US\$ 500m) annually through tax exemptions. The 2022 mid-year budget review provided more accurate figures by stating that Ghana lost about GH¢27 billion (an equivalence of US\$ 2bn) to tax exemptions granted to some businesses between 2008 and 2020. This translates into an average of GH¢12.2 billion (an equivalent of US\$1.2bn) every year. It is believed that these tax exemptions shrink the tax base of host countries and ultimately lead to a loss in tax revenue. In July 2022, the parliament of Ghana passed the tax exemptions bill, which has been under consideration for some time. This is to streamline issues relating to tax exemptions to reduce revenue losses due to tax exemptions.

The preceding discussion shows that evidence on the nexus between tax revenue and FDI inflows provides valuable information for policymakers on tax strategies to fully exploit the benefits of FDI and avoid the risk of losing revenue due to tax exemptions in Ghana. This study could be useful for an emerging economy such as Ghana, struggling to raise sufficient domestic revenue. Attempts have been made by researchers ([Camara, 2022](#); [Ade et al., 2018](#); [Alabede, 2018](#); [Abdioğlu et al., 2016](#); [Obeng, 2014](#)) to analyse the nexus between tax revenue and FDI and the findings are mixed. However, we do not find any studies examining the long-run and short-run effects of FDI on tax revenue, especially in an emerging market context. This study contributes to the empirical literature by analysing the short-run and long-run effects of FDI on three measures of tax revenue: direct tax revenue, indirect tax revenue, and total tax revenue.

This paper is structured into five sections. [Section 1](#) presents the introduction, [section 2](#) presents the theoretical and empirical literature review, [section 3](#) presents the methodology, [section 4](#) presents the results and discussions, and [section 5](#) presents the conclusions and recommendations.

2. Literature

2.1 Theoretical literature

There is a mixed bag of theoretical literature on the relationship between tax revenue and FDI. Whereas a group of researchers postulate the positive impact of FDI on tax income, other researchers theorise the negative impact of FDI on tax income.

According to neoclassical trade theory, FDI can potentially improve the economic well-being of host countries, primarily by boosting tax revenue. [Bond and Samuelson \(1986\)](#) developed a theoretical model to analyse the relationship between FDI and tax revenue across two periods. Their findings suggest that offering tax breaks to encourage FDI in the early stages may initially reduce the tax revenue collected by host nations. However, host nations could benefit from increased tax collection in the long run, as foreign investment is less likely to leave after the tax holiday period. FDI may also have a favourable impact on tax revenue due to the welfare effect.

FDI can have a positive influence on tax collection through some of the channels described by [UNCTAD \(2012\)](#). VAT becomes indispensable when FDI provides financial resources for establishing formal-sector firms, assistance for promotion and industrial dynamism, or increased agricultural production. FDI can boost income and labour taxes by creating jobs ([Fuest and Riedel, 2009](#); [UNCTAD, 2012](#)). By increasing exports and providing access to markets or supply, FDI will increase international tax resources for trade. Knowledge transfer and technology dissemination are two ways that FDI might support natural resource exploitation and generate revenue. Capital gains and profits from FDI are taxed in the host country. By enhancing exports and enabling access to markets or supply, FDI may also increase customs taxes ([Anwar and Nguyen, 2011](#)).

[Ehrhart \(2011\)](#) demonstrates that democratic institutions are critical in resource-rich nations due to increased levels of openness, resulting in favourable impacts of the rent from natural resources on tax revenue receipts from the domestic economy. Furthermore, because the vast majority of FDI is directed towards natural resource exploitation activities in less wealthy countries, increased openness may be extended to enhance the money that FDI may provide. Consequently, a strong institutional structure will entice more foreign investors while assuring their fair share of tax revenue.

As a result, FDI inflows can assist in boosting income by broadening the tax base and generating extra tax revenue through investment and job creation. FDI directed into key natural resource industries will probably result in large enough royalties for nations with vital natural resources. [Amoh and Adom \(2017\)](#) identify two channels through which FDI positively influences tax revenue through enhanced tax collections. For starters, FDI stimulates economic growth by causing economic activities to expand. Second, through improving the formalisation of economic operations and economic competitiveness.

Conversely, numerous publications explain how FDI inflows might reduce the tax base through various channels and variables. For instance, the ability to generate revenue may be compromised by the “adverse effects” of tax incentives and the actions of multinational corporations engaging in tax evasion, fraud, and avoidance. Moreover, hypercompetitive conditions might lead to the displacement of local and domestic companies, while tax authorities and international corporations engage in rent-seeking activities to secure income.

According to [Gropp and Kostial \(2001\)](#), multinational corporations can move taxable revenues to countries with less stringent tax regimes using “transfer pricing” tactics and other mechanisms such as debt financing. An example is an MNC operating in a high-tax jurisdiction that makes a product utilising inputs from a low-tax country. In business-to-business (B2B) trading, this firm is incentivised to overestimate input costs, increasing profits in the low-tax jurisdiction while decreasing earnings in the high-tax jurisdiction, thereby minimising its worldwide tax duties.

[Fuest and Riedel \(2009\)](#) expand on the notion of multinational profit displacement, which distorts trade pricing. They argue that prices of commodities supplied to developing countries are unfairly inflated, while prices of goods imported from these countries are intentionally deflated, resulting in wealth earned in developing countries benefiting industrialised ones.

[Zee et al. \(2002\)](#) emphasise the problems connected with the extensive use of tax incentives to encourage FDI. They argue that it negatively affects tax income. [Fuest and Riedel \(2009\)](#) agree, claiming that FDI might result in revenue losses from tax breaks such as Free Economic Zones, where items are usually duty-free and corporation taxes are minor or non-existent. According to [Zee et al. \(2002\)](#), these incentives undermine the revenue base. Furthermore, they distort resource allocation towards activities that benefit from tax breaks at the expense of others. Finally, tax breaks open the door to corruption and rent-seeking behaviour. As a result, a lack of openness in managing exemptions may influence revenue results. According to the [IMF \(2011\)](#), the revenue consequences of FDI can be greatly lowered when considerable tax cuts follow such investments.

A study by [UNCTAD \(2012\)](#) illustrates that FDI can result in financial resource outflows when repatriating income or expenses. [UNCTAD \(2012\)](#) further asserts that in specific scenarios, FDI might displace domestic businesses, particularly small and medium-sized enterprises, leading to a diminished pool of taxpayers and a subsequent contraction in tax revenue.

2.2 Empirical literature

Globally, the empirical literature on the effect of FDI on tax revenue is mixed. Whilst some studies ([Camara, 2022](#); [Ade et al., 2018](#); [Odabas, 2016](#)) find a positive effect of FDI on tax revenue, other studies find a negative effect of FDI on tax revenue ([Abdioglu et al., 2016](#); [Zee et al., 2002](#); [Fuest and Riedel, 2009](#)). Under certain circumstances, other studies ([Camara, 2022](#)) find no significant effect of FDI on tax revenue.

[Camara \(2022\)](#) investigates the impact of FDI on tax revenue by analysing data from 90 developing countries spanning the period 1990 to 2017 through the Generalised Method of Moments (GMM) framework. The outcomes of Camara's study suggest a noteworthy enhancement in tax revenue resulting from FDI inflows. However, this positive effect does not manifest in countries reliant on resource exports, where FDI inflows seem to have minimal statistical influence on tax revenues.

[Ngangnon \(2017\)](#) employs panel data from 1980 to 2013 to explore the relationship between FDI and government revenues. He reveals that the impact of FDI on government income hinges on the volume of FDI inflows.

[Bayar and Ozturk \(2018\)](#) employ a panel co-integration and causality analysis to probe the connection between FDI inflows and tax receipts across OECD countries from 1995 to 2014. They uncover a unilateral causal link running from FDI inflows to total revenues.

Conducting a panel study focussed on the Southern African Development Community nations from 1990 to 2010, [Ade et al. \(2018\)](#) scrutinise the determinants of tax revenue performance. Their findings affirm the crucial role of FDI inflow in enhancing collected tax revenue. They also identify a feedback loop between taxation and FDI.

[Alabede \(2018\)](#) investigates the interplay between economic freedom and tax revenue performance across 42 Sub-Saharan African countries from 2005 to 2012, utilising feasible generalised least squares (FGLS) and panel-corrected standard errors (PCSE) methods. His analysis establishes a connection between investment freedom and elevated tax revenue.

Using fixed-effect panel estimation and the generalised method of moments (GMM), [Abdioglu et al. \(2016\)](#) assess the influence of the corporate income tax rate on FDI levels in OECD countries. Their results indicate that reduced corporate tax rates correlate with increased FDI and that FDI experiences significant growth following tax rate reductions.

[Odabas \(2016\)](#) argues that investment contributes to increased domestic income, thereby bolstering government revenue by taxing employee wages and corporate profits. Consequently, Odabas contends that FDI inflow positively impacts tax revenue.

Similarly, [Jeza *et al.* \(2016\)](#) assert that FDI offers substantial economic advantages by facilitating growth opportunities, ultimately leading to enhanced government tax revenue and augmenting factors like labour income. Empirical evidence across multiple studies supports the idea that foreign investment positively impacts government tax revenue.

There is a paucity of research concentrating on the relationship between FDI and tax income in Ghana. Existing research examines either tax revenue as a driver of FDI or the broader impact of FDI on government income. [Bamembaya \(2017\)](#), for example, investigates the impact of FDI on government income in Ghana, concluding that there are long-term and short-term correlations between tax revenue and FDI. Similarly, [Obeng \(2014\)](#) investigates the impact of corporation taxes on sector-specific FDI in Ghana and finds that corporate taxes impact FDI inflows across many industries. [Amoh and Adom \(2017\)](#) discover solid evidence that FDI considerably increases tax collection in Ghana using the ARDL approach.

3. Methodology

3.1 Variables and data

The study employs total tax revenue, direct tax revenue, and indirect tax revenue, all expressed as percentages of GDP, as the dependent variables to gauge the impact of FDI on tax revenue. The primary independent variable in this investigation is FDI as a percentage of GDP (FDI). The study also incorporates control variables, namely financial development (FD), economic growth measured by GDP per capita growth, and inflation.

The Bank of Ghana Economic Statistics and the World Bank are the primary sources of data for tax revenue (total tax revenue as a percentage of GDP, indirect tax revenue as a percentage of GDP, and direct tax revenue as a percentage) and FDI. The World Bank provides information on inflation and GDP per capita growth. The study adopts the IMF's comprehensive measure of financial development, initially formulated by [Sahay *et al.* \(2015\)](#) and later computed by [Sviryzdenka \(2016\)](#). The data encompass the years 1983–2019 for Ghana.

3.2 Unit root test

The choice of time-series estimation technique depends on the data's characteristics (stationarity) and the study objectives. This study checks for stationarity of the variables in the models using the Augmented Dickey–Fuller (ADF) ([Dickey and Fuller, 1979](#)), Phillip–Perron (PP) ([Phillips and Perron, 1988](#)), and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) ([Kwiatkowski *et al.*, 1992](#)) unit root tests. The ADF and PP tests proceed with the null hypothesis of the presence of unit root, suggesting non-stationarity. This means that rejecting the null hypothesis for the ADF and PP tests suggests that the series is stationary. In the case of the KPSS, however, the null hypothesis is that the series is stationary (absence of unit root). This suggests that rejecting the null hypothesis means the series is non-stationary. We adopt the three techniques to test for consistency of the results of the stationarity tests. The results are presented in [Table 1](#) and [Table 2](#).

[Table 1](#) presents the unit root results at levels, and [Table 2](#) presents the unit root test results at the first difference. The unit root results show a mixed order of integrations as some variables are stationary at the first difference, and others are stationary at levels. Hence, all variables are integrated at either order zero or one (i.e. $I(0)$ or $I(1)$). The results in [Tables 1 and 2](#) also show that none of the variables is integrated at order two, $I(2)$. This suits the ARDL estimation technique.

Variable	ADF	PP	KPSS
<i>With intercept</i>			
lnTAXREV	-1.886	-3.494**	0.741***
lnDIR	0.259	-1.809	0.738**
lnIND	-5.477***	-5.321***	0.767***
lnFDI	-1.8517	-2.31	0.627**
LnFD	-2.675*	-2.644*	0.770***
lnGROWTH	-5.221***	-5.237***	0.3385
lnINF	-0.6489	-4.583***	0.890***
<i>With intercept and trend</i>			
lnTAXREV	-0.946	-6.072***	0.167**
lnDIR	-3.948**	-3.991**	0.061
lnIND	-6.138***	-6.258***	0.179**
lnFDI	-2.264	-1.87	0.153**
LnFD	-4.498*	-4.507***	0.120*
lnGROWTH	-3.819***	-5.235***	0.058
LnINF	-2.066	-7.190***	0.345***

Table 1.

Unit root test at levels

Source(s): Authors' computations

Variable	ADF	PP	KPSS
<i>With intercept</i>			
d(lnTAXREV)	-1.35	-6.356***	0.334
d(lnDIR)	-5.122***	-6.738***	0.090
d(lnIND)	-7.139***	-7.333***	0.473**
d(lnFDI)	-5.958***	-6.243***	0.358*
d(lnFD)	-6.686***	-14.469***	0.455*
d(lnGROWTH)	-4.535***	-22.915***	0.380*
d(lnINF)	-6.251***	-16.691***	0.206
<i>With intercept and trend</i>			
d(lnTAXREV)	-5.447***	-6.401***	0.101
d(lnDIR)	-5.048***	-6.567***	0.065
d(lnIND)	-7.470***	-7.609***	0.143*
d(lnFDI)	-4.723***	-12.553***	0.500***
d(lnFD)	-6.544***	-14.092***	0.450***
d(lnGROWTH)	-4.418***	-25.435***	0.286***
d(lnINF)	-6.094***	-16.186***	0.162**

Table 2.

Unit root test at first difference

Source(s): Authors' computations

3.3 Model specification and estimation technique

We model tax revenue as a function of FDI and include financial development, economic growth, and inflation as control variables.

$$\text{Tax Revenue} = f(\text{FDI}, \text{FD}, \text{Growth}, \text{INF}) \quad (1)$$

The autoregressive distributed lag (ARDL) model was initially developed by Pesaran and Shin (1999) and later expanded by Pesaran *et al.* (2001). The ARDL model handles the mixed order of integration shown by the unit root test results of this study's data. Additionally, the ARDL corrects for endogeneity and captures both the long-run and short-run effects of FDI on tax revenue. This study presents the generalised form of the ARDL model in equation (2):

$$\begin{aligned} \Delta \ln \text{Tax}_j = & \vartheta + \sum_{i=1}^p \partial_{ii} \Delta \ln \text{Tax}_{jt-1} + \sum_{i=1}^{q_1} \partial_{2i} \Delta \ln \text{FDI}_{t-i} + \sum_{i=1}^{q_2} \partial_{3i} \Delta \ln \text{FD}_{t-i} \\ & + \sum_{i=1}^{q_3} \partial_{4i} \Delta \ln \text{GROWTH}_{t-i} + \sum_{i=1}^{q_4} \partial_{5i} \Delta \ln \text{INF}_{t-i} + \pi_1 \ln \text{Tax}_{jt-1} + \pi_2 \ln \text{FD}_{t-1} \\ & + \pi_3 \ln \text{FD}_{t-1} + \pi_4 \ln \text{GROWTH}_{t-1} + \pi_5 \ln \text{INF}_{t-1} + e_t \end{aligned} \quad (2)$$

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$\ln \text{Tax}$ is the measure of tax revenue (dependent variable), $\ln \text{FDI}$ is the natural log of FDI, $\ln \text{FD}$ is the natural log of financial development, $\ln \text{GROWTH}$ is the natural log of economic growth, $\ln \text{INF}$ is the natural log of inflation, j represents the measure of tax revenue (direct, indirect, or total tax revenue), ϑ_i represents the intercept, ∂_i represent short-run coefficients, π_i represent long-run coefficients, p represents the lag length of the dependent variable, q_i represents the lag length of the explanatory variables, and t represents time or year.

Having established that none of the variables are integrated at order two, $I(2)$, we use the ARDL Bounds Test framework to check for long-run associations between the study variables. Table 3 displays the results.

The ARDL bound test centres around the Wald test (F-statistic), indicating that the conventional distribution of the Wald test is not appropriate when the null hypothesis suggests the absence of co-integration amongst the variables. In prior research, Pesaran *et al.* (2001) identified two significant thresholds for the co-integration assessment, the lower bound, $I(0)$ and the upper bound, $I(1)$, leaving us with three possible outcomes. First, no co-integration is concluded if the computed F-statistic falls below the lower bound. Second, co-integration is concluded if the computed F-statistic falls above the upper bound. Third, the results are inconclusive if the computed F-statistic falls between the lower and upper bound.

From the empirical results in Table 3, the null hypothesis of no long-run relationship is rejected

when indirect tax revenue and total tax revenue are used as dependent variables since the F-statistic of 9.505 and 6.137 are both greater than the upper bounds at both 5 and 1% significant levels. This shows that long-run relationships exist amongst the study variables. On the other hand, when direct tax revenue is taken as the dependent variable, the F-statistic of 2.031 is lower than the lower bound at both 5 and 1% significant levels. This shows that no long-run relationships exist amongst the study variables.

We, therefore, specify an ARDL (short-run) model for the model with direct taxes as a dependent variable (equation 3) since there is no co-integration amongst the study variables. We then specify error correction models for the models with indirect taxes (equation 4) and total tax revenue (equation 5) as dependent variables since co-integration (or long-run relationships) exist amongst the variables with indirect taxes and tax revenue as dependent variables.

Variables (when taken as dependent variable)	ARDL model	F-statistic	At 5%		At 1%	
			I (0)	I (1)	I (0)	I (1)
DIR	(1, 0, 0, 1, 1)	2.031	2.17	4.73	3.19	6.56
IND	(1, 0, 0, 1, 1)	9.505***	2.17	4.73	3.19	6.56
TAX REV	(1, 0, 0, 0, 0)	6.137***	2.17	4.73	3.19	6.56

Note(s): ***, ** and * indicate significance at 1, 5 and 10% respectively; critical values are obtained from Narayan (2004)

Source(s): Authors' computations

Table 3.
ARDL bounds test

$$\begin{aligned}\Delta \ln \text{DIR} = & \delta_1 + \sum_{i=1}^{p_1} \beta_{1i} \Delta \ln \text{DIR}_{t-i} + \sum_{i=1}^{q_1} \beta_{2i} \Delta \ln \text{FDI}_{t-i} + \sum_{i=1}^{q_2} \beta_{3i} \Delta \ln \text{FD}_{t-i} \\ & + \sum_{i=1}^{q_3} \beta_{4i} \Delta \ln \text{GROWTH}_{t-i} + \sum_{i=1}^{q_4} \beta_{5i} \Delta \ln \text{INF}_{t-i} + e_t\end{aligned}\quad (3)$$

$$\begin{aligned}\Delta \ln \text{IND} = & \delta_2 + \sum_{i=1}^{p_2} \theta_{1i} \Delta \ln \text{IND}_{t-i} + \sum_{i=1}^{q_1} \theta_{2i} \Delta \ln \text{FDI}_{t-i} + \sum_{i=1}^{q_2} \theta_{3i} \Delta \ln \text{FD}_{t-i} \\ & + \sum_{i=1}^{q_3} \theta_{4i} \Delta \ln \text{GROWTH}_{t-i} + \sum_{i=1}^{q_4} \theta_{5i} \Delta \ln \text{INF}_{t-i} + \gamma_1 \text{ect}_{t-1} + e_t\end{aligned}\quad (4)$$

$$\begin{aligned}\Delta \ln \text{TAXREV} = & \delta_3 + \sum_{i=1}^{p_3} \varphi_{1i} \Delta \ln \text{TAXREV}_{t-i} + \sum_{i=1}^{q_1} \varphi_{2i} \Delta \ln \text{FDI}_{t-i} + \sum_{i=1}^{q_2} \varphi_{3i} \Delta \ln \text{FD}_{t-i} \\ & + \sum_{i=1}^{q_3} \varphi_{4i} \Delta \ln \text{GROWTH}_{t-i} + \sum_{i=1}^{q_4} \varphi_{5i} \Delta \ln \text{INF}_{t-i} + \gamma_2 \text{ect}_{t-1} + e_t\end{aligned}\quad (5)$$

where $\ln \text{IND}$ is the natural log of indirect tax revenue, $\ln \text{TAXREV}$ is the natural log of total tax revenue, $\ln \text{DIR}$ is the natural log of direct tax revenue, $\ln \text{FDI}$ is the natural log of FDI, $\ln \text{FD}$ is the natural log of financial development, $\ln \text{GROWTH}$ is the natural log of economic growth, $\ln \text{INF}$ is the natural log of inflation, t is time, p_i is the lag length of the dependent variables, q_i is the lag length of the independent variables, δ_i are the intercepts, β_i represent the coefficients for the direct tax model, θ_i coefficients for the indirect tax model and φ_i represents the coefficient for the total tax model.

4. Results and discussions

This section presents and discusses the results and significant findings of this paper. The descriptive statistics are presented in [Table 4](#).

[Table 4](#) presents the summary statistics for the study variables. The average total tax revenue for the study period is 7.898% of GDP with a standard deviation of 2.958%, peaking at 13.165% and recording its lowest of 1.96%. This underscores the low tax revenue Ghana has recorded consistently over the years. Direct tax revenue averages 2.544% of GDP with a standard deviation of 1.559%. The minimum and maximum over the study period are 0.414 and 6.491%, respectively. The mean value for indirect tax is 3.492% of GDP, with a standard

Variable	Obs	Mean	Std. Dev	Min	Max	Source
Direct tax revenue	37	2.544	1.559	0.414	6.491	BOG
Indirect tax revenue	37	3.492	1.488	0.393	6.577	BOG
Total tax revenue	37	7.898	2.958	1.967	13.165	BOG
Foreign direct investment	37	3.261	2.983	0.045	9.467	BOG
Growth	37	2.555	2.789	-7.393	11.315	WDI
Financial development	37	0.107	0.022	0.057	0.153	IMF
Inflation	37	24.179	21.121	4.865	122.874	WDI

Table 4.

Descriptive statistics

Source(s): Authors' computations

deviation of 1.488% of GDP. Indirect tax attains a maximum of 6.577% of GDP and a minimum of 0.393% of GDP over the study period.

The statistics show that Ghana's tax collection is low. According to the World Bank, the ideal tax-to-GDP ratio is at least 15%. FDI averages a meagre 3.261% over the study period with a standard deviation of 2.983%, peaking at 9.467% and recording its lowest value at 0.045%. The statistics show that Ghana needs to work hard to improve both the tax revenue and the inflow of foreign investment in order to propel the economy into sustainable growth and development.

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4.1 Foreign direct investment and tax revenue

Table 5 presents the ARDL (short-run) estimation output analysing the effect of FDI on direct tax revenue. Table 6 presents the short-run and long-run estimation outputs for analysing the

Variable	Coefficient	Std. Error	t-statistic	Prob
dlnDIR _{t-1}	0.332	0.289	-1.150	0.262
dlnDIR _{t-2}	0.060	0.133	-0.449	0.658
dlnFDI _{t-1}	-0.043	0.060	-0.718	0.480
dlnFDI _{t-2}	0.094	0.075	1.249	0.224
dlnGROWTH _{t-1}	0.069***	0.024	2.834	0.009
dlnGROWTH _{t-2}	0.108**	0.050	2.162	0.041
dlnINF _{t-1}	0.058	0.060	0.968	0.343
dlnINF _{t-2}	-0.038	0.028	-1.329	0.197
C	0.068	0.044	1.561	0.132
Serial correlation (Breusch–Godfrey)			3.748	0.371
Normality (Jarque–Bera)			1.116	0.572
Heteroscedasticity (Breusch–Pagan–Godfrey)			0.982	0.456

Source(s): Authors' computations

Table 5.
Effect of FDI on direct tax revenue (ARDL 1, 0, 1, 1)

Variable	Coefficient	Std. Error	t-statistic	Prob
<i>Long run results</i>				
LnFDI	0.049**	0.023	2.134	0.043
lnFD	0.303**	0.147	2.067	0.048
lnGROWTH	0.009	0.036	0.256	0.799
LnINF	0.012	0.041	0.283	0.779
C	1.162***	0.376	3.089	0.004
<i>Error correction model</i>				
dlnIND _{t-1}	0.498***	0.075	6.672	0.000
dlnFDI _{t-1}	0.013	0.015	0.839	0.409
dlnFD _{t-1}	-0.236	0.238	-0.990	0.331
dlnGROWTH _{t-1}	-0.056***	0.016	-3.583	0.001
dlnINF _{t-1}	-0.050***	0.011	-4.665	0.000
ECT _{t-1}	-0.649***	0.162	-4.011	0.000
C	0.019	0.018	1.053	0.302
Serial correlation (Breusch–Godfrey)			1.237	0.307
Normality (Jarque–Bera)			0.433	0.805
Heteroscedasticity (Breusch–Pagan–Godfrey)			1.027	0.427

Source(s): Authors' computations

Table 6.
Effect of FDI on indirect tax revenue (long run and error correction models)

effect of FDI on indirect tax revenue, and Table 7 presents the short-run and long-run estimation outputs for analysing the effect of FDI on total tax revenue.

The ARDL is a least squares model and is subject to the assumptions of the OLS (homoscedasticity, no serial correlation, and normality). We, therefore, perform the Breusch–Godfrey serial correlation test, the Jarque–Bera normality test, and the Breusch–Pagan–Godfrey heteroscedasticity test. All three models pass the residual diagnostic test. For all the models, the Breusch–Godfrey test statistic is insignificant at the conventional 5% significance level, showing that the models do not suffer from serial correlation. Again, the Breusch–Pagan–Godfrey test statistic is insignificant for all three models at the conventional 5% significance level, showing that the models do not suffer from heteroscedasticity. Jarque–Bera test statistic is insignificant for all models, showing that all three models have normally distributed residuals.

The error correction term is negative and highly significant at a 1% significance level in the indirect and total tax revenue models. This shows that the short-run coefficients return to equilibrium in the long-run. The error correction term is the speed of adjustment of the short-run coefficients to their long-run equilibrium after short-run shocks.

Table 5 presents the estimation output of model 3, which is a log-log model. All coefficients are, therefore, elasticity coefficients. The results in Table 5 show that in the short-run, FDI has no significant effect on direct tax revenue in Ghana. Although the negative elasticity coefficient suggests that FDI hurts direct tax revenue in the short run, it is insignificant. The first and second lags of inflation are also insignificant in explaining the changes in direct tax revenue in the short run since the elasticity coefficients are insignificant. The first and second lags of economic growth are both significant at the conventional 5% significance level. A significant elasticity coefficient of 0.069 for the first lag shows that a 1% increase (decrease) in economic growth leads to a 0.069% increase (decrease) in direct tax revenue, holding all other variables constant. The significant second lag of 0.108% also means that a 1% increase (decrease) in economic growth leads to a 0.108% increase (decrease) in direct tax revenue, holding all other variables constant. This suggests that percentage changes in the first and second lags of economic growth will result in positive percentage changes in direct tax revenue.

Variable	Coefficient	Std. Error	t-statistic	Prob
<i>Long run results</i>				
LnFDI	0.044**	0.021	2.077	0.047
lnFD	0.386***	0.113	3.417	0.002
lnGROWTH	0.038	0.029	1.315	0.198
LnINF	0.015	0.034	0.449	0.657
C	1.668***	0.385	4.330	0.000
<i>Error correction model</i>				
dlnTAXREV _{t-1}	0.444***	0.097	4.565	0.000
dlnFDI _{t-1}	-0.014	0.009	-1.660	0.108
dlnFD _{t-1}	-0.109	0.111	-0.989	0.331
dlnGROWTH _{t-1}	-0.014*	0.008	-1.792	0.084
dlnINF _{t-1}	-0.019*	0.011	-1.743	0.092
ECT _{t-1}	-0.521***	0.220	-2.372	0.025
C	0.018*	0.010	1.804	0.082
Serial correlation (Breusch–Godfrey)			7.293	0.118
Normality (Jarque–Bera)			1.116	0.572
Heteroscedasticity (Breusch–Pagan–Godfrey)			0.982	0.456

Table 7.
Effect of FDI on total
tax revenue (long-run
and error
correction model)

Source(s): Authors' computations

Table 6 presents the ARDL results for the effect of FDI on indirect tax revenue (model 4). The lag of indirect tax records a positive and significant elasticity coefficient, indicating that past values of indirect tax revenue affect current levels of indirect tax revenue. The coefficient of 0.498 for the lag value of indirect tax revenue suggests that a 1% increase (decrease) in the first lag of the dependent value leads to a 0.498% increase (decrease) in the current value of indirect tax revenue, holding all other variables constant. The results further show that, at the 5% significance level, FDI has a positive and significant long-run effect on indirect tax revenue with an elasticity coefficient of 0.049. This shows that a 1% increase (decrease) in FDI leads to a 0.049% increase (decrease) in indirect tax revenue, holding all other variables constant. This finding is consistent with Amoh and Adom's (2017) and Camara's (2022) findings. In the short run, however, FDI records an insignificant elasticity coefficient of 0.013, indicating that FDI is insignificant in explaining indirect tax revenue in the short run. Financial development records a positive significant elasticity coefficient of 0.303 in the long run, indicating that, holding all other variables constant, a 1% increase (decrease) in financial development increases (decreases) Ghana's indirect tax revenue by 0.303%. In the short run, however, the elasticity coefficient for financial development is negative and insignificant. Economic growth and inflation record negative and significant elasticity coefficients of -0.056 and -0.050 , indicating that holding all other variables constant, a 1% increase (decrease) in economic growth leads to a decrease (increase) in indirect tax revenue by 0.056% whilst a 1% increase in inflation leads to a 0.050% decrease (increase) in indirect tax revenue in the short run. In the long run, however, both economic growth and inflation record insignificant positive elasticity coefficients. Table 6 further shows that the error correction term, which represents the speed of adjustment, is negative and highly significant at a 1% significance level. This confirms the bounds test results of long-run relationships amongst the variables.

Table 7 presents the estimation output of the effect of FDI on total tax revenue. The results show that the lag of total tax revenue records a positive and significant elasticity coefficient of 0.444, indicating that past values of total tax revenue affect current levels of total tax revenue. It means that holding all other variables constant, a 1% increase (decrease) in the first lag of total tax revenue increases (decreases) the current level by 0.444%. The results further show that, in the long-run, FDI positively and significantly affect total tax revenue with a significant elasticity coefficient of 0.044. This means that a 1% increase (decrease) in FDI leads to a 0.044% increase (decrease) in total tax revenue, holding all other variables constant. This finding is also consistent with existing literature, such as the work of Amoh and Adom (2017) and Camara (2022). In the short run, however, the results show that FDI does not affect tax revenue significantly, with an insignificant elasticity coefficient of -0.014 . Financial development records a positive and significant elasticity coefficient of 0.386 in the long run, indicating that a 1% increase (decrease) in financial development increases (decreases) total tax revenue by 0.386%, holding all other variables constant. In the short-run, however, the coefficient is insignificant. Economic growth and inflation both record insignificant elasticity coefficients in the long and short-run at the conventional 5% level of significance. Table 7 further shows that the error correction term is negative and highly significant at a 1% significance level. This shows that the short-run coefficients return to equilibrium in the long run, confirming the bound's test results.

4.1.1 Model stability test. We employ the cumulative sum (CUSUM) and cumulative sum of squares (CUSUM of Squares) tests to check for the stability of the models. Figure 1 shows that all models are stable and do not suffer from structural breaks. The estimated results are, therefore, reliable.

5. Conclusions and recommendations

This study investigates the impact of FDI on tax revenue within the context of Ghana. The research delves into both short-term and long-term implications of FDI on direct tax revenue,

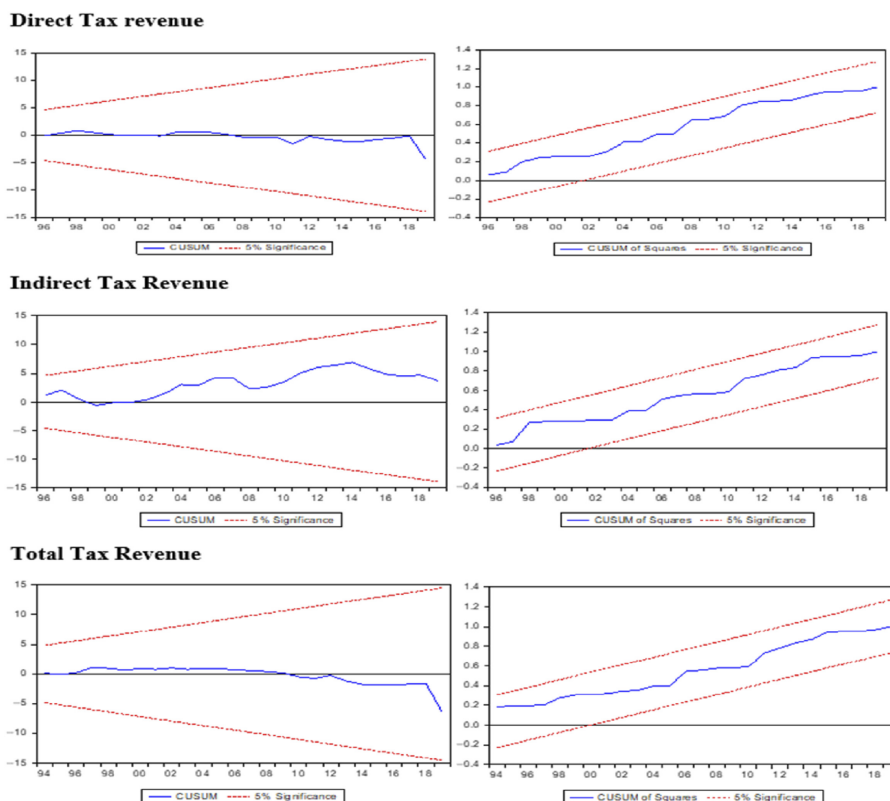


Figure 1.
CUSUM and CUSUM of
squares stability test

Source(s): Figure by authors

indirect tax revenue, and total tax revenue. Employing autoregressive distributed lag (ARDL) models, the study explores the interconnections amongst the variables under scrutiny from 1983 to 2019.

The results indicate that FDI does not significantly influence direct tax revenue in the short or long run. The findings imply that the Government of Ghana is not getting enough direct tax revenue from FDI in Ghana. This could be because most multinational corporations come to the country and employ from their domestic countries rather than the local economy. This reduces the amount of direct tax revenue to the Government. Nevertheless, FDI positively affects indirect and total tax revenue in the long term while exhibiting no noteworthy impact in the short term. These findings suggest that FDI does not detrimentally impact tax revenue in the short or long term. The findings imply that FDI's contribution to tax revenue comes in the long run in the form of indirect tax revenues to the Government. The Government must, therefore, make efforts to improve FDI inflows into the country. The Government must also intensify efforts to improve local participation in multinational corporations to enhance indirect tax revenue. Therefore, the Government's efforts to improve tax revenue must include strategies to attract FDI into the economy.

This study is limited to only one emerging economy, Ghana. The findings may not apply to all countries across the world. Future studies could explore the long-run and short-run effects of FDI on the three forms of tax revenue: direct tax revenue, indirect tax revenue, and

total tax revenue across all countries. Future studies could also check for regional differences in relationships amongst the variables.

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