ASHREJ
ASIAN SOCIAL SCIENCE AND HUMANITIES RESEARCH JOURNAL

e-ISSN: 2636 – 9109
Volume 7 Number 2 September 2025, 01 ~ 16
DOI: https://doi.org/10.37698/xrfrhc41

Analyzing the Influence of Illicit Financial Flows on Economic Growth: A Static Panel Approach

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ARTICLE INFO

Article history:

Received Sep 28, 2025
Revised Oct 30, 2025
Accepted Nov 22, 2025

Keywords:

Illicit Financial Flows;
Economic Growth;
Developing Economies;
Fixed Effects;
Capital Flight;
Trade Misinvoicing

Conflict of Interest:

None

Funding:

None

ABSTRACT

Illicit financial flows (IFFs) are widely regarded as a major constraint on development, yet empirical evidence on their direct impact on economic performance remains inconclusive. This study examines the relationship between IFFs and economic growth using an unbalanced panel of 91 developing countries from 2009 to 2018. A static panel framework is employed, with pooled ordinary least squares, random effects, and fixed effects estimators used to benchmark the results. The diagnostic tests favour the fixed effects estimator, allowing the analysis to control for unobserved country specific characteristics that remain constant over time. The findings reveal no statistically significant direct effect of IFFs on economic growth across all specifications. Although theory predicts a negative association, the estimates are imprecise and vary in sign, suggesting that within country changes in IFFs do not exert a measurable impact on growth during the sample period. In contrast, several control variables display robust and theoretically consistent effects. Capital formation and trade openness are positively associated with growth, while population growth exhibits a strong negative association. Human capital yields negative coefficients across estimators, indicating structural constraints that weaken the productivity benefits of educational expansion. These results contribute to the literature by providing updated evidence from a large multi region sample and by demonstrating that IFFs may influence development through indirect or lagged channels rather than through contemporaneous effects on growth. The study underscores the importance of sustained investment, demographic transition, and improvements in educational quality, while reaffirming the relevance of anti IFF measures based on their broader governance and fiscal consequences. Future research may explore non linear specifications and dynamic transmission mechanisms to capture pathways not identified in static models.

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1. Introduction

1.1 The Problem of Illicit Financial Flows

The global financial system processes more than USD 7.5 trillion in daily foreign exchange transactions and functions as the foundation for economic activity across countries (McGuire et al., 2022). Within this system,

illicit financial flows (IFFs) have gained prominence as a critical obstacle to sustainable development, particularly in developing economies. IFFs refer to cross border movements of money that are illegally earned, transferred, or used, and they include proceeds from corruption, tax evasion, trade misinvoicing, and a wide range of criminal activities (Global Financial Integrity, 2023). For the purposes of this study, IFFs are understood as movements of funds across borders that originate from illegal sources, employ illegal or unethical transfer methods, or serve illegal uses. This definition recognises the diverse drivers and channels associated with IFFs and is responsive to the evolving nature of financial opacity, including the growing role of digital platforms highlighted by Tropina (2016) and Nikkel (2020).

The scale of IFFs in developing countries is substantial and has increased significantly over time. Global Financial Integrity (2021) reports that trade related IFFs among 134 developing countries rose from USD 551.2 billion in 2009 to USD 835.0 billion in 2018, an increase of 51 percent over the decade. Developing Asia accounts for the largest share at 38.8 percent of cumulative outflows, with China, India, and Malaysia ranking among the top sources. While the absolute values are highest in Asia, Sub Saharan Africa records the highest regional average relative to GDP at 6.1 percent, suggesting that smaller economies face disproportionate developmental pressures from illicit outflows. These regional patterns illustrate both the scale and heterogeneity of the problem, underscoring why a deeper understanding of IFFs remains crucial for policy and research.

IFFs threaten economic development through several mechanisms. They drain public resources that could otherwise support infrastructure, education, and healthcare. The African Union (2019) notes that illicit outflows weaken domestic savings and reduce foreign exchange reserves needed to finance essential imports, both of which constrain long term growth prospects. UNCTAD (2022) estimates that developing countries lose approximately USD 88.6 billion annually through trade related IFFs alone. Such losses represent foregone development opportunities and weaken countries' ability to meet social and economic priorities.

Recognising the significance of this challenge, the United Nations has incorporated the reduction of IFFs into the 2030 Agenda for Sustainable Development under target 16.4, signalling a coordinated global response. Major international institutions, including the Financial Action Task Force, the World Bank, the International Monetary Fund, the Global Financial Integrity, the United Nations Office on Drugs and Crime, and the Organisation for Economic Co operation and Development, have intensified efforts to strengthen regulatory frameworks, improve cross border cooperation, and enhance the transparency of the global financial architecture.

Despite growing attention, the empirical relationship between IFFs and economic performance remains insufficiently understood. Existing studies often rely on limited samples, short time periods, or inconsistent measurement approaches, and results vary considerably across regions and methods. These gaps highlight the need for updated empirical analysis using broader cross-country data and more comprehensive controls to assess whether IFFs exert measurable effects on economic growth. This study addresses this need by examining the relationship between IFFs and economic growth across 91 developing countries over the period 2009 to 2018 using a static panel framework that compares pooled ordinary least squares, random effects, and fixed effects estimators.

1.2 Economic Growth Implications

Economic growth, commonly measured as the sustained increase in real GDP per capita, remains a central concept in development economics because it reflects the capacity of an economy to expand productive output over time (Solow, 1956). The theoretical connection between illicit financial flows and economic growth draws from neoclassical growth theory and capital flight literature. The Solow model, including its augmentation by Mankiw, Romer, and Weil (1992), posits that long term growth is shaped by capital accumulation, labor force expansion, and technological progress. IFFs can influence each of these components by eroding the financial and institutional foundations required for productive economic activity.

IFFs undermine capital accumulation by facilitating the diversion of domestic resources to foreign jurisdictions where they cannot contribute to domestic investment (Ndikumana and Boyce, 2021). They also reduce government revenue by weakening the tax base, which limits public expenditure on infrastructure and human capital development (Afolabi, 2023). Evidence further indicates that high levels of IFFs reflect weak institutional environments, thereby discouraging both domestic and foreign investment through heightened perceptions of risk (Mohd Padil et al., 2022). These channels imply a potential negative effect of IFFs on economic growth, although the empirical literature shows results that vary widely across contexts and

methodological approaches. Studies such as Herkenrath (2014), Ndikumana (2015), and Osman and Salifu (2022) report negative associations between capital flight and economic performance, yet the magnitude and significance of these effects remain inconsistent because IFFs are difficult to measure and frequently interact with broader governance challenges.

1.3 Research Gap and Contribution

Despite substantial progress in the literature, several gaps remain in the empirical understanding of IFFs and economic growth. First, most existing studies focus on specific regions, particularly Sub-Saharan Africa, which limits the generalizability of findings to the wider developing world (Thiao, 2021; Wanjau and Tobias, 2020). While substantial evidence documents the effects of capital flight in African economies (Ndikumana and Boyce, 2021), it remains unclear whether similar patterns hold in Asia, Latin America, the Middle East, or other developing regions. A broader cross regional analysis is therefore needed to develop more comprehensive conclusions.

Second, methodological approaches differ widely, ranging from single equation correlations to advanced dynamic panel estimators. This diversity complicates comparison across studies and creates challenges for synthesising aggregate findings. Third, the potential endogeneity between IFFs and economic performance remains insufficiently addressed in many analyses. Weaker growth prospects may themselves induce capital flight, creating a simultaneous relationship that complicates causal inference. Few studies employ instrumental variable strategies or exploit natural experiments that could credibly address this simultaneity.

Fourth, variation in the measurement of IFFs introduces further uncertainty. Researchers draw on balance of payments residuals, trade misinvoicing estimates, hot money indicators, or composite indices, each with its own limitations. These differences complicate the task of determining whether findings are robust to alternative measurement strategies.

This study contributes to the literature by providing updated cross-country evidence using a large panel of 91 developing economies from 2009 to 2018. The analysis employs pooled ordinary least squares, fixed effects, and random effects estimators to offer transparent and comparable results across multiple static panel approaches. The exclusive use of trade related IFFs measured through misinvoicing allows the study to focus on the component most consistently quantified by Global Financial Integrity. A key contribution of this research lies in its explicit acknowledgement of the limitations of static panel estimators in capturing potentially dynamic or indirect relationships between IFFs and growth. By reporting both significant and non significant findings, the study advances methodological transparency and provides guidance for future research seeking to address the limitations of existing approaches rather than selectively emphasising favourable statistical outcomes.

1.4 Research Objective and Hypothesis

The primary objective of this study is to examine the effect of illicit financial flows on economic growth in developing economies using static panel data methods. Drawing from capital flight theory (Cuddington, 1986), resource curse theory (Auty, 1993), and existing empirical evidence, the analysis tests the following hypothesis:

H_1: Illicit financial flows exert a negative and statistically significant effect on GDP per capita growth in developing countries after controlling for other determinants of economic performance.

The remainder of this paper is structured as follows. Section 2 reviews the theoretical and empirical literature. Section 3 describes the data, variables, and econometric methodology. Section 4 presents descriptive statistics, correlation analysis, model selection tests, and regression results. Section 5 discusses the findings and their implications. Section 6 concludes with limitations and directions for future research.

2. Literature Review

2.1 Theoritical Framework

2.1.1 Solow Growth Model and Extensions

The analysis in this study is anchored in the Solow growth model (Solow, 1956) and its augmented variant proposed by Mankiw, Romer, and Weil (1992). In its standard form, the Solow model posits that long-run economic performance depends on capital accumulation, labor force expansion, and technological progress. Output is represented by the Cobb–Douglas production function:

$$Y(t) = A(t)K(t)^{\alpha}L(t)^{1-\alpha}$$

where $Y(t)$ represents the total output, $A(t)$ is the level of technology, $K(t)$ denotes the stock of capital, $L(t)$ is the labor force, and α is the output elasticity of capital (Solow, 1956).

The MRW extension incorporates human capital into the production process, acknowledging that improvements in education and skills directly enhance worker productivity and accelerate income growth. This extension is particularly relevant for developing economies, where disparities in education quality and access translate into substantial productivity differences across countries.

Within this framework, investment is a central driver of economic performance. Higher savings and investment rates accelerate capital accumulation, enabling countries to converge to higher steady-state income levels. Any factor that suppresses investment, including illicit financial outflows, is therefore expected to hinder long-run growth. The Solow–MRW framework thus provides a clear theoretical basis for anticipating an adverse relationship between IFFs and economic growth.

2.1.2 Capital Flight Theory

Capital flight theory, developed by scholars such as Cuddington (1986) and Dooley (1986), offers more specific insights into how illicit financial outflows affect economic performance. Capital flight refers to the movement of financial assets out of a country in response to instability, poor governance, or opportunities for tax evasion. While definitions vary across studies (Cuddington, 1986; Dooley, 1986; Epstein, 2005; Williamson & Lessard, 1987; Yalta, 2009), the conceptual distinction becomes less important for countries facing external debt pressures, since all forms of capital outflow exacerbate financing constraints (Hermes et al., 2002).

A central feature of capital flight theory is the role of financial secrecy. Secrecy jurisdictions provide anonymity, legal insulation, and low tax burdens, enabling the movement of illicit wealth across borders (Cobham & Janskỳ, 2017; Sharafutdinova & Lokshin, 2021). These conditions attract corrupt officials, tax evaders, and firms engaged in misinvoicing practices, thereby facilitating economic leakages.

The theory identifies several channels through which capital flight affects growth. First, capital flight reduces the stock of funds available for domestic investment, limiting the productive capacity of the economy. Second, because it is predominantly the wealthiest households and most profitable firms that shift assets abroad, the economy loses high-return capital that could have generated substantial domestic output. Third, capital flight signals governance deficiencies, discouraging legitimate foreign and domestic investment.

The channels of outflow are multifaceted. Bhagwati (1978) emphasises misinvoicing as a key mechanism, where exporters and importers deliberately falsify trade values to move capital abroad. Schneider (2003) widens this view, arguing that outflows also arise from cash smuggling, corruption in procurement and arms deals, and legal yet distortionary tax-avoidance practices. In the context of this study, trade misinvoicing is of central interest because it constitutes the largest quantifiable component of IFFs and directly contributes to capital movements that evade taxation and regulatory oversight.

IFFs linked to capital flight also have macroeconomic consequences. Persistent outflows affect fiscal capacity, exchange rate stability, and monetary policy effectiveness (Ndiaye, 2011; Schineller, 1997). These constraints are especially damaging for developing countries where IFFs represent forgone investment in infrastructure, education, and health, thereby limiting prospects for sustained economic development.

2.1.3 Resource Curse Theory

Resource curse theory (Auty, 1993) provides complementary insights into why IFFs may be particularly harmful in certain developing economies. The theory posits that resource-rich countries often experience weaker growth, higher corruption, and poorer governance outcomes compared to resource-scarce economies. Rent-seeking behaviour, contestation over natural resource revenues, and weak institutional oversight enable illicit diversion of funds, including through IFFs (Kolstad & Søreide, 2009; Herkenrath, 2014).

In resource-dependent economies, valuable commodities create incentives for mispricing. Export underinvoicing and import overinvoicing facilitate illicit outflows and deprive governments of tax revenues that could otherwise support development. Although this study does not explicitly test interactions between

resource dependence and IFFs due to data limitations, the theory provides important conceptual grounding for understanding why IFFs may have especially adverse effects in countries with large extractive sectors.

2.2 Empirical Evidence on IFFs and Economic Growth

Empirical findings on the relationship between IFFs and economic growth are mixed, reflecting differences in measurement strategies, country samples, and econometric approaches.

A significant body of literature identifies negative associations between capital flight and growth. Ndikumana and Boyce (2021) report substantial long-term losses from capital flight across 30 African economies, paired with reductions in investment and growth. The accumulated offshore wealth of African countries is estimated to exceed their external debt, illustrating the severity of resource leakage. Herkenrath (2014) similarly finds adverse correlations between IFFs and development indicators in cross-country analysis.

More recent studies adopt more rigorous econometric techniques to address endogeneity. Mohd Padil et al. (2022) find that IFFs reduce growth and that the magnitude of the effect varies with institutional quality. Sodji (2022), using long-run dynamic models for WAEMU countries, estimates that capital flight significantly limits investment and growth, with cumulative losses equivalent to a sizeable share of regional investment.

Regional analyses highlight heterogeneity in effects. Afolabi (2022) reports that IFFs consistently crowd out investment across multiple regional blocs in Sub-Saharan Africa. Mantilla (2022) argues that in Latin America, the growth benefits of FDI are overstated when illicit outflows from extractive sectors are taken into account.

However, several studies find statistically insignificant effects once country fixed effects are included or once institutional variables are controlled. Thiao (2021) observes that negative bivariate relationships often weaken in multivariate settings, suggesting that IFFs may affect growth through indirect institutional or fiscal channels rather than through direct output effects.

Methodological choices help explain these divergent findings. Cross-sectional or pooled OLS studies tend to report stronger associations, whereas fixed-effects models often detect weaker relationships due to limited within-country variation in IFFs. The length of the time series also matters, with long-span datasets better suited for capturing long-run impacts (Ndikumana & Boyce, 2021).

Measurement issues further contribute to inconsistency. Because IFFs involve concealed transactions, existing estimation approaches capture only subsets of total outflows. Cobham et al. (2021) highlight that trade misinvoicing estimates contain reporting errors, product misclassification, abnormal pricing, and tariff effects. Such noise leads to attenuation bias, reducing the likelihood of detecting statistically significant relationships.

2.3 Control Variables and Growth Determinants

A broad empirical literature identifies several established determinants of economic growth that are used as controls in this study. Capital formation is consistently one of the strongest predictors of growth, reflecting the direct contribution of physical investment to productive capacity (Levine and Renelt, 1992). Human capital, proxied by measures of education, also plays a central role in growth (Mankiw et al., 1992). Recent evidence emphasises education quality rather than years of schooling, with cognitive skills more strongly associated with growth outcomes (Hanushek and Woessmann, 2012). Technology likewise contributes to long-run income improvements, although its effects depend on complementary infrastructure and institutional capacity that enable effective adoption and diffusion (Niebel, 2018).

Population growth has uncertain theoretical implications. Larger populations may expand labour supply and market size, yet rapid population increases can dilute the capital stock and strain public resources. Empirical studies generally find negative associations between population growth and steady-state income in developing countries (Dao, 2012).

Foreign direct investment represents an additional channel through which capital accumulation can influence growth, particularly through technology transfer, management practices, and integration into global production networks. However, the growth effects of FDI in developing economies depend on absorptive capacity, financial depth, and governance quality, with weaker institutional settings often limiting the potential benefits. Domestic credit to the private sector is similarly relevant, as deeper financial systems facilitate investment and support entrepreneurial activity. Trade openness is another important determinant,

as economies integrated into global markets typically experience productivity gains through competition, access to larger markets, and exposure to new technologies. Together, these variables capture structural features of developing economies that shape long-run growth trajectories and provide essential controls for isolating the independent association between IFFs and economic performance.

3. Method

3.1 Data and Sample Selection

This study employs an unbalanced panel of 91 developing countries spanning 2009 to 2018. The sample is determined primarily by the availability of consistent estimates of trade related illicit financial flows from Global Financial Integrity and complete macroeconomic data for the control variables. Although the original GFI dataset covers 134 developing countries, several had to be excluded due to substantial missing observations, resulting in 768 usable country year pairs for the main regressions.

The period 2009 to 2018 represents the most recent decade for which GFI's trade misinvoicing estimates are available and covers the post global financial crisis environment during which many developing economies experienced marked institutional and structural adjustments relevant to both IFFs and growth. The final sample includes countries from all major developing regions, namely Sub-Saharan Africa, Developing Asia, Latin America and the Caribbean, the Middle East and North Africa, and Developing Europe. This regional breadth enhances the external validity of the analysis while necessitating econometric strategies that account for heterogeneity across countries.

3.2 Variable Definitions and Measurement

3.2.1 Dependent Variable

Economic growth is measured as the natural logarithm of real GDP per capita in constant 2015 USD, sourced from the World Development Indicators. This measure is widely used in the growth literature as it reflects living standards and the productive performance of an economy over time. The logarithmic transformation stabilises variance and allows coefficient estimates to be interpreted as elasticities.

3.2.2 Independent Variable of Interest

The main explanatory variable is IFFs, measured using GFI's trade misinvoicing estimates for each country year. These estimates are constructed from discrepancies between reported exports and partner reported imports after accounting for legitimate shipping and valuation differences. Persistent gaps are interpreted as deliberate mispricing intended to shift capital across borders. Although trade misinvoicing captures only part of total IFFs, it represents the largest measurable component and provides the most systematically compiled cross country dataset. The variable enters the model in natural logarithmic form.

3.2.3 Control Variables

The empirical specification incorporates control variables widely used in growth studies. Capital formation is measured as the natural logarithm of gross fixed capital formation as a share of GDP and reflects the contribution of physical investment to the productive base of the economy. Human capital is proxied by mean years of schooling for adults aged 25 and above, which captures average educational attainment within the labour force. Technological capability is represented by the share of individuals using the internet, an indicator of digital access and technology adoption that is relevant for modern production processes.

Population growth enters the model as $\ln(n + 0.07)$ following the augmented Solow framework, where the constant reflects assumed rates of technological progress and depreciation (Mankiw et al., 1992). Foreign direct investment inflows as a share of GDP capture the potential external benefits associated with multinational activity, including technology transfer and managerial diffusion (Borensztein et al., 1998). Credit to the private sector as a percentage of GDP proxies financial development and the ability of the financial system to channel savings toward productive investment (Levine, 1997). Trade openness is measured as total trade relative to GDP and reflects the degree of international integration and exposure to global markets.

All variables are expressed in natural logarithms to stabilise variance, mitigate skewness, and enhance interpretability. The inclusion of these macroeconomic controls ensures that the estimated association between IFFs and economic growth is not confounded by structural, financial, or external factors known to influence long run performance in developing economies.

Table 1: Key Variables for Assessing the Impact of IFFs on Economic Growth in Developing Economies

Variable Name	Brief Description	Measurement / Transformation	Sources of Data
Gross Domestic Product Per Capita (GDPpc)	Income per capita in U.S. dollars (constant 2015). Serves as an indicator of economic performance.	Natural log of GDP per capita.	WDI, International Financial Statistics
Illicit Financial Flows (IFFs)	Illicit outflows estimated from trade misinvoicing across developing economies. Measures unrecorded capital flight.	Natural log of IFFs based on value-gap methodology.	Global Financial Integrity reports; UN Comtrade; IMF Statistics
Capital Accumulation (K)	Fraction of output invested in physical capital formation.	Gross capital formation as percentage of GDP (logged).	WDI, International Financial Statistics
Human Capital (HC)	Availability of skilled labour proxied by average years of schooling. Influences productivity and long-term growth.	Natural log of mean years of schooling.	Human Development Report; Barro-Lee Dataset
Technology (A)	Level of technological access measured by individuals using the internet. Reflects digital connectivity and adoption.	Percentage of internet users (logged).	WDI, International Telecommunication Union
Population Growth Rate (n)	Annual percentage change in total population, affecting labour supply and demographic pressure.	Population growth rate (logged).	WDI, International Financial Statistics
Foreign Direct Investment (FDI)	Net inflows of investment aimed at establishing long-term interest in domestic enterprises.	FDI inflows as % of GDP (logged).	UNCTAD; WDI
Credit to Private Sector	Domestic credit provided by banks to private sector as % of GDP. Proxy for financial development.	Natural log of domestic credit to private sector (% of GDP).	WDI
Trade Openness	Degree of integration into the global economy.	Sum of exports and imports as % of GDP (logged).	WDI

3.3 Empirical Model Specification

The static panel regression model used in this study is specified as follows:

$$lnGDPpcGrowth_{it} = \alpha_0 + \alpha_1 lnIFFs_{it} + \alpha_2 lnK_{it} + \alpha_3 \ln HC_{it} + \alpha_4 lnA_{it} + \alpha_5 \ln(n_{it} + g + \delta) + \alpha_6 lnFDI_{it} + \alpha_7 \ln Credit_{it} + \alpha_8 \ln Trade_{it} + \mu_i + \varepsilon_{it}$$

where:
i indexes countries (i = 1, ..., 91)
t indexes years (t = 2009, ..., 2018)
μ_i represents country-specific fixed effects
λ_t represents year fixed effects
ε_{it} is the idiosyncratic error term

This specification controls for unobserved, time-invariant country characteristics through μ_i and estimates the relationship between IFFs and economic growth using a static panel framework. The model is estimated using pooled OLS, fixed effects, and random effects for comparison and validation.

3.4 Estimation Strategy

Three static panel estimators are employed in this study, each offering distinct advantages for evaluating the IFFs growth relationship.

Pooled OLS provides a baseline estimate by treating the full sample as a single cross section and ignoring country specific heterogeneity. While the estimator is likely biased due to omitted country effects, it serves as a useful point of comparison.

Fixed Effects (FEM) allows the country specific effects to correlate with the regressors and exploits within country variation over time. FEM effectively answers whether changes in IFFs within a given country are associated with changes in its economic growth rate, after holding constant all time invariant national characteristics.

Random Effects (REM) assumes that country specific effects are uncorrelated with the regressors. When this assumption holds, REM is more efficient than FEM because it incorporates both within and between country variation. However, if the assumption fails, REM yields inconsistent estimates.

All models are estimated with robust standard errors clustered at the country level to address potential heteroskedasticity and serial correlation within countries.

3.5 Model Selection and Specification Tests

A series of diagnostic tests is conducted to identify the most appropriate estimator for the data.

The poolability F test evaluates whether the country specific effects are jointly equal to zero. Rejection of the null indicates that pooled OLS is inappropriate and that fixed effects should be preferred.

The Breusch Pagan Lagrange Multiplier test examines whether unobserved country effects are present. Rejection of the null suggests that random effects provide a better fit than pooled OLS.

The Hausman test assesses whether the country specific effects are correlated with the regressors. A significant result favours fixed effects over random effects. To ensure robustness, the analysis also reports the Hausman Mundlak version, which relaxes strict distributional assumptions.

These complementary tests allow systematic evaluation of estimator suitability and ensure that the main findings are not driven by inappropriate model selection.

3.6 Justification for Static Panel Approach

Static panel methods are employed for several reasons. The time dimension of the dataset (T = 10) and its moderate cross-sectional size (N = 91) do not generate the severe dynamic panel bias typically associated with short panels. Static estimators also offer clearer interpretability, particularly for establishing baseline associations between IFFs and growth before introducing more complex dynamic structures.

Moreover, the primary objective of this study is to provide transparent, comparable evidence across multiple static estimators widely used in empirical growth research. This approach allows careful assessment of the stability of estimated coefficients under alternative specifications. Nevertheless, static methods cannot fully capture persistence, feedback effects, or dynamic adjustment processes in growth. These limitations are acknowledged explicitly, and dynamic estimators such as System GMM are identified as promising directions for future work.

4. Results and Discussion

4.1 Descriptive Statistics

Table 2 reports the descriptive statistics for all variables in the analysis. GDP per capita growth varies substantially across countries, ranging from -4.30 to 3.67, with a mean value of 1.09. This spread reflects the diverse growth experiences of developing economies over the sample period.

Table 2: Descriptive Statistics

Variables	Observations	Mean	Sta. Dev.	Minimum	Maximum
lnGRW	910	1.081	1.485	-4.299	3.665
lnIFFs	880	2.971	0.224	1.589	4.184
lnK	896	3.131	0.323	1.626	4.357
lnHC	909	1.958	0.480	0.066	2.571
lnA	897	3.179	1.058	-1.347	4.591

lnPOP	910	1.005	0.809	-1.770	3.353
lnFDI	880	0.942	1.045	-6.167	4.030
lnCRE	867	3.502	0.696	1.115	5.006
lnTRD	900	4.258	0.449	2.846	5.403

Illicit financial flows also display considerable dispersion, with a standard deviation of 0.224 and a log range from 1.59 to 4.18. These values indicate that countries with the highest levels of IFFs experience illicit outflows more than ten times greater than those with the lowest, underscoring the wide variation in exposure to IFFs across developing economies.

Human capital and technological readiness exhibit substantial heterogeneity as well. The standard deviation for human capital is 0.480, while internet penetration shows even greater dispersion with a standard deviation of 1.058. This reflects the uneven development landscape within the sample, spanning countries with limited educational attainment and minimal digital access to those approaching near-universal internet adoption.

4.2 Correlation Analysis

Table 3 presents the correlation matrix for the key variables. GDP per capita growth has a weak negative correlation with IFFs (-0.050), consistent with theoretical expectations although the magnitude is low. Capital formation shows a positive correlation with growth (0.109), indicating that higher investment is generally associated with stronger economic performance.

Table 3: Correlation Matrix

	lnGRW	lnIFFs	lnK	lnHC	lnA	lnPOP	lnFDI	lnCRE	lnTRD
lnGRW	1.000								
lnIFFs	-0.050	1.000							
lnK	0.109*	0.021	1.000						
lnHC	-0.023	-0.331*	0.102*	1.000					
lnA	0.023	-0.306*	0.149*	0.732*	1.000				
lnPOP	-0.181*	0.320*	0.056	-0.503*	-0.428*	1.000			
lnFDI	0.111*	-0.030	0.198*	0.179*	0.119*	-0.030	1.000		
lnCRE	0.032	-0.319*	0.211*	0.489*	0.619*	-0.358*	0.016	1.000	
lnTRD	0.041	-0.134*	0.336*	0.371*	0.305*	-0.206*	0.378*	0.364*	1.000

Population growth displays a negative correlation with GDP per capita growth (-0.181), supporting the neoclassical argument that rapid demographic expansion can dilute capital per worker and reduce income levels. Human capital and technology exhibit near-zero correlations with growth (–0.023 and 0.023 respectively), which deviates from standard theoretical predictions and likely reflects cross-country heterogeneity, income effects, or short-run fluctuations.

The correlation between human capital and technology is high at 0.732, reflecting the strong complementarity between education and digital adoption in developing economies. However, variance inflation factors remain below conventional thresholds, suggesting that multicollinearity is not a concern in the regression models.

IFFs exhibit negative correlations with both human capital (-0.331) and technology (-0.306), indicating that countries with higher illicit outflows tend to have weaker educational outcomes and lower digital penetration. These patterns align with governance-based explanations of IFFs, where institutional weaknesses and revenue losses constrain social and technological development.

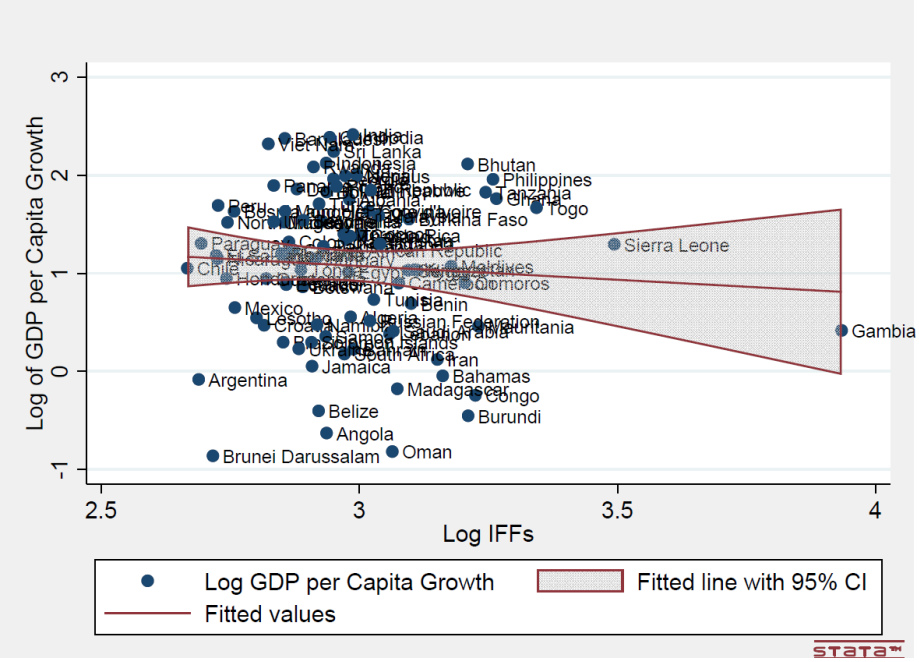

Figure 1. Visual Association Between Illicit Financial Flows and GDP per Capita Growth Across Developing Countries

The fitted regression line is nearly flat, indicating the absence of a clear linear relationship between the two variables. This visual pattern is consistent with the low correlation coefficient reported earlier (-0.050), suggesting that any potential relationship between IFFs and growth is unlikely to be captured through bivariate association alone. The wide dispersion of points around the fitted line also reflects substantial heterogeneity across developing countries, reinforcing the need for multivariate panel estimation.

4.3 Model Selection and Spesification Test

Before presenting regression results, it is essential to determine which panel estimator is most appropriate for the data. Table 4 summarizes the key specification tests.

Table 4: Summary of key specification tests

Test	Statistics	P-Value	Implication
Poolability F-test	4.35	<0.001***	Reject pooling; use panel methods
Breusch-Pagan LM Test	145.49	<0.001***	REM preferred over pooled OLS
Hausman Test	54.78	<0.001***	FEM preferred over REM
Robust Hausman-Mundlak	48.29	<0.001***	Confirms FEM specification

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

The poolability F-test rejects the null hypothesis that country effects are jointly zero ($F = 4.35$, $p < 0.001$). This indicates that pooled OLS would be inappropriate, as it ignores cross-country heterogeneity that is clearly present in the data. A panel estimator is therefore required.

The Breusch–Pagan LM test also rejects the null of no random effects ($\chi^2 = 145.49$, $p < 0.001$). This confirms that unobserved country-specific heterogeneity is significant and must be incorporated into the estimation strategy. The Hausman test rejects the null that the regressors are uncorrelated with the country-specific effects ($\chi^2 = 54.78$, $p < 0.001$), indicating that the Fixed Effects estimator is preferred to Random Effects. The robust Hausman–Mundlak test ($\chi^2 = 48.29$, $p < 0.001$) supports this conclusion, offering a more reliable comparison under weaker assumptions.

Collectively, these diagnostic tests point to the Fixed Effects Model as the preferred specification for consistent inference. Nonetheless, results from Pooled OLS, Random Effects, and Fixed Effects are presented to ensure transparency and to facilitate robustness evaluation.

4.4 Main Regression Results

Table 5 presents the main regression results using all three panel estimators with robust standard errors. Given the specification tests, primary focus is placed on the Fixed Effects estimates (Column 2).

Table 5: Impact of IFFs on Economic Growth - Panel Estimation with Robust Standard Errors

	Standard Error			Robust Standard Errors		
	Pooled OLS	**FEM**	**REM**	**Pooled OLS**	**FEM**	**REM**
lnIFFs	-0.087	0.055	-0.046	-0.087	0.055	-0.046
	(0.228)	(0.320)	(0.273)	(0.314)	(0.336)	(0.265)
lnK	0.502***	1.525***	0.845***	0.502	1.525**	0.845**
	(0.165)	(0.358)	(0.236)	(0.341)	(0.568)	(0.390)
lnHC	-0.550***	-0.602	-0.706***	-0.550**	-0.602	-0.706***
	(0.164)	(0.973)	(0.253)	(0.241)	(0.907)	(0.239)
lnA	-0.071	0.286*	0.022	-0.071	0.286	0.022
	(0.085)	(0.167)	(0.117)	(0.150)	(0.201)	(0.150)
lnPOP	-0.533***	-0.728***	-0.642***	-0.533***	-0.728***	-0.642***
	(0.071)	(0.129)	(0.096)	(0.105)	(0.135)	(0.100)
lnFDI	0.191***	0.203***	0.183***	0.191***	0.203**	0.183***
	(0.051)	(0.062)	(0.057)	(0.062)	(0.089)	(0.069)
lnCRE	0.060	-1.378***	-0.237*	0.060	-1.378***	-0.237
	(0.093)	(0.286)	(0.144)	(0.147)	(0.483)	(0.160)
lnTRD	-0.119	1.820***	0.227	-0.119	1.820***	0.227
	(0.130)	(0.373)	(0.199)	(0.200)	(0.479)	(0.219)
Constant	0.387	-7.049***	-1.059	0.387	-7.049***	-1.059
	(0.946)	(2.661)	(1.267)	(1.512)	(2.366)	(1.363)
Observations	793	793	793	793	793	793
R-Squared	0.191	0.266	0.174	0.191	0.266	0.174
F-Test (Year Dummies)	10.35***	9.57***	108.22***	9.27***	7.40***	80.35***
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Poolability F-Test		4.35***				
BP LM Test			145.49***			
Hausman Test		54.78***				
Robust Hausman - Mundlak			48.29***			

Note: Robust standard errors clustered by country in parentheses. ***, **, * denote significance at 1%, 5%, and 10% levels. All models include year fixed effects.

4.4.1 Main Finding: IFFs and Economic Growth

The coefficient on IFFs in the preferred Fixed Effects specification is 0.055 with a robust standard error of 0.336, yielding a t-statistic of 0.16. This estimate is statistically insignificant at all conventional levels and provides no evidence of a systematic within-country relationship between IFFs and economic growth. Although the coefficient is positive, the large standard error and p-value far above 0.10 indicate that the data provide no evidence of a systematic relationship between IFFs and growth in either direction within countries over time.

This null finding is consistent across alternative estimators. In the pooled OLS specification, the coefficient on IFFs is -0.087, while in the Random Effects model it is -0.046. Both estimates are statistically insignificant, and the magnitudes of the coefficients remain small relative to their standard errors. The instability of the point estimates across specifications, combined with the consistent absence of statistical significance, suggests that the relationship between IFFs and economic growth is weak or non-existent in this sample rather than obscured by inadequate statistical power.

4.4.2 Control Variables: Consistent Findings

The control variables present clear and stable patterns across estimators. Capital formation shows a strong positive association with growth, with the FEM coefficient of 1.525 (robust SE: 0.568) significant at the 1 percent level. The consistency of this result across all estimators confirms the central role of investment in driving output expansion in developing economies.

Human capital displays a negative coefficient (-0.602 in FEM), though statistically insignificant. The pooled OLS and REM estimates remain negative and significant. This pattern suggests that schooling quantity, as captured by mean years of education, may not translate into productivity gains in contexts where instructional quality, labour market absorption, and skill relevance remain limited. Prior studies report similar findings, particularly where education systems expand without corresponding improvements in quality or structural conditions.

Internet penetration shows a positive but insignificant coefficient in the FEM model (0.286, robust SE: 0.201). This indicates that technology diffusion alone does not yield substantial productivity gains without supporting infrastructure, digital skills, and institutional capability. The result is consistent with evidence that developing economies benefit from digitalisation only when complementary conditions are present.

Population growth has a strong negative effect on economic performance. The FEM coefficient of -0.728 (robust SE: 0.133) supports the neoclassical prediction that rapid population expansion reduces per capita growth through capital dilution and higher dependency burdens. This is in line with empirical evidence from countries undergoing demographic transition.

Foreign direct investment exhibits a positive and significant coefficient (0.203 in FEM), consistent with the view that external capital inflows support growth by facilitating technology transfer and improving production efficiency. The stability of this finding across estimators strengthens its reliability.

Private sector credit shows a negative and significant association with growth (FEM coefficient: -1.378, robust SE: 0.483). This indicates that financial deepening does not necessarily support productive activity in environments where lending is often channelled toward consumption or speculative uses. Weak regulatory oversight may further amplify risks associated with rapid credit expansion.

Trade openness shows a strong positive relationship with economic growth. The FEM coefficient of 1.820 (robust SE: 0.479) is significant at the 1 percent level and aligns with theoretical predictions that openness promotes technology diffusion, improves competitiveness, and expands market access. The magnitude suggests that external integration remains an important driver of growth in developing economies.

4.5 Robustness and Alternative Interpretations

4.5.1 Coefficient Stability Across Specifications

Table 5 reveals both encouraging and concerning patterns regarding coefficient stability. The control variables, including capital, human capital, and population growth, show consistent coefficient signs across pooled OLS, FEM, and REM, although the magnitudes differ. This consistency strengthens confidence that these associations are not driven by model specification.

In contrast, the coefficient on IFFs displays considerable instability across estimators. The pooled OLS coefficient is -0.087, the FEM coefficient is 0.055, and the REM coefficient is -0.046, with all three estimates statistically insignificant. The reversal of sign between pooled OLS and FEM is particularly notable. Since FEM identifies effects from within-country variation over time while pooled OLS draws on both within-country and between-country variation, the positive FEM coefficient alongside the negative pooled OLS coefficient suggests that cross-country differences in IFFs may be negatively associated with growth, while within-country changes in IFFs over time show no detectable effect.

This pattern is plausible given that IFFs tend to be highly persistent, slow-moving variables. If most variation occurs between countries rather than within countries across the 10-year period, the FEM estimator may have insufficient within-country variation to capture the true relationship. Moreover, if both IFFs and economic growth are influenced by long-term institutional characteristics, controlling for country fixed effects may remove much of the variation relevant for identifying the effect of IFFs on growth.

4.5.2 Why Might the Direct Effect Be Insignificant?

The absence of a statistically significant direct effect of IFFs on economic growth, despite strong theoretical priors, warrants closer examination. Several plausible explanations can be advanced to account for this pattern.

First, measurement error is a likely contributor. Trade misinvoicing estimates, although widely used, contain unavoidable uncertainty. The GFI method relies on discrepancies in bilateral trade statistics that may reflect legitimate discrepancies such as timing issues or classification inconsistencies rather than deliberate misreporting. Classical measurement error in the explanatory variable biases coefficients toward zero, potentially obscuring true relationships in the data.

Second, the variation in IFFs may be predominantly cross-sectional rather than temporal. IFFs are influenced by institutional quality, regulatory enforcement, and governance norms, all of which tend to evolve slowly. If within-country variation over the ten-year period is limited, the FEM estimator may lack sufficient identifying variation to detect meaningful effects. A longer time span or the use of multi-year differences might reveal dynamics that annual data cannot capture.

Third, the relationship between IFFs and growth may operate primarily through indirect channels. IFFs can weaken investment, erode institutional capacity, and undermine human capital formation, all of which may influence growth with a delay. If the effect unfolds gradually, or via mediating mechanisms such as corruption, a contemporaneous specification may not capture the full pathway, thereby yielding a null result in the direct model.

Fourth, the association may be non-linear. The effect of IFFs on growth could depend on threshold levels of institutional quality, governance capacity, or financial openness. A linear specification assumes constant marginal effects across all conditions and may therefore mask patterns that only emerge at higher or lower intensities of IFFs. Future work incorporating threshold models or interaction terms may yield additional insight.

Finally, endogeneity remains a concern. Weak growth performance may itself induce higher IFFs as firms or individuals seek to relocate capital in anticipation of declining economic prospects. Such reverse causality may counterbalance any adverse causal effect of IFFs on growth, resulting in an insignificant net coefficient. Addressing this issue rigorously would require valid external instruments or policy shocks that shift IFFs independently of growth.

Taken together, these explanations provide a coherent account of why the direct relationship between IFFs and economic growth may not be detectable in the baseline model, despite theoretical expectations suggesting otherwise.

4.6 Policy and Practical Implications

Although the direct effect of IFFs on economic growth is statistically insignificant, several substantive policy implications emerge from the empirical analysis. The strong positive association between capital formation and economic performance underscores the central role of investment-driven development strategies. Policies that support private-sector investment, facilitate infrastructure expansion, and enhance the broader investment climate remain essential for sustaining growth trajectories in developing economies.

The significant negative association between population growth and GDP per capita growth highlights the importance of demographic policy. Investments in reproductive health, female education, and labour market opportunities for women can reduce dependency burdens and support long-term economic gains associated with demographic transition.

The negative coefficients associated with human capital, although unexpected, signal the need for policy emphasis on education quality rather than merely expanding years of schooling. Strengthening curriculum relevance, improving teacher training, and enhancing school-to-work transitions may help unlock the growth potential associated with human capital accumulation.

With respect to IFFs, the absence of a statistically significant direct effect should not be interpreted as evidence that illicit flows are inconsequential. Extensive research documents their broader developmental costs, including reduced fiscal capacity, weakened institutions, and heightened inequality. Moreover, measurement limitations and restricted within-country variation may obscure true effects in static panel frameworks, while indirect channels involving investment, governance, or human capital are not fully

captured in the reduced-form specification employed here.

Therefore, policy efforts aimed at reducing IFFs remain warranted. Strengthening financial transparency, improving tax enforcement, enhancing cross-border cooperation through initiatives such as the FATF and the OECD BEPS framework, and reinforcing anti-corruption institutions continue to serve critical economic and governance objectives even if direct growth effects are not observable in this dataset.

5. Conclusion

This study examined the impact of IFFs on economic growth using static panel data methods across 91 developing countries from 2009 to 2018. Diagnostic tests consistently favored the Fixed Effects specification. The main finding reveals that IFFs do not exhibit a statistically significant direct effect on GDP per capita growth in the preferred model. However, control variables demonstrate expected relationships: capital formation, foreign direct investment, and trade openness positively influence growth, while population growth exerts a negative effect. Interestingly, credit to private sector shows a significant negative association, suggesting potential credit misallocation in developing economies.

This study contributes to the IFFs-growth literature by providing comprehensive cross-country evidence from a geographically diverse sample, transparently reporting specification tests across multiple estimators, and honestly presenting null findings rather than selectively emphasizing favorable results.

Several limitations warrant acknowledgment. Static panel methods cannot adequately capture dynamic feedback effects or address endogeneity concerns. The insignificant IFFs coefficient may reflect these methodological constraints, measurement error in trade misinvoicing estimates, or insufficient within-country variation over the 10-year period. Future research should employ dynamic panel methods, particularly System GMM, to account for growth persistence and potential reverse causality. Extending the time dimension and explicitly modeling indirect pathways through which IFFs affect growth would strengthen causal inference.

Policymakers should not interpret the null finding as evidence that combating IFFs is unimportant. IFFs generate harmful consequences beyond aggregate growth effects, including fiscal revenue losses, governance deterioration, and inequality exacerbation. Continued international cooperation to enhance financial transparency, strengthen tax enforcement, and close regulatory loopholes remains justified. While the precise quantitative impact on growth requires further investigation using more sophisticated analytical approaches, the broader case for tackling IFFs as part of sustainable development strategies remains compelling.

Acknowledgements

This study forms part of the first author's doctoral research at Putra Business School (PBS). The authors wish to convey their deep appreciation to Professor Dr Muzaffar Shah Habibullah for his supervision and intellectual guidance throughout the preparation of this work. Sincere thanks are also extended to Dr Nurulashikin binti Romli for her constructive scholarly input, and to Wan Zarifah binti Hasan for her valuable assistance during the research process. The authors further acknowledge the institutional support provided by Putra Business School (PBS), Universiti Teknologi MARA (UiTM), and UCYP University. Any remaining errors are solely the responsibility of the authors.

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