The Power of Currency Regime: How Does Exchange Rate Volatility Drive Investment in Sub-Saharan Africa?

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Abstract

This paper investigates how fluctuations in currency value affect investment in Sub-Saharan Africa (SSA). While the existing literature focuses on foreign direct investment, this study extends the analysis to domestic, private, and public investment. I use panel data of 27 currencies used in 36 SSA countries, with the baseline analysis covering a period from 1999 to 2017. I address endogeneity issues by using two-stage least squares instrumental variable (2SLS-IV) identification strategy, in which a country's exchange rate regime is an instrument. I find that exchange rate volatility positively affects foreign direct investment inflows and adversely affects both domestic and public investment. The findings also highlight the critical role of institutional quality and openness to trade in attracting investment in Sub-Saharan Africa.

Keywords: Exchange Rate Volatility, Exchange Rate Regime: Floating, Fixed, Managed, Foreign Direct Investment, Domestic Investment, Public Investment, Private Investment, Instrumental Variable, SSA.

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I. Introduction

Investment is a crucial driver of economic growth, a notion supported by a wide range of economic theories and empirical studies. From classical and neoclassical growth models to contemporary empirical analyses, the centrality of investment in enhancing economic performance, through the promotion of innovations and new technology, the creation of new jobs, and the diversification of economic structures, has been consistently emphasized (Adams, 2009; Agosin and Machado, 2005; Nath, 2009). Nevertheless, some regions attract fewer investments than others. For example, developed and emerging economies attract and grow investments at a faster rate than least developed countries (LDCs), leaving them at a disadvantage in their quest for economic convergence (Sauvant, 2015). A complete understanding of these imbalances is crucial to address economic sluggishness in low-income nations.

This paper examines the impact of currency value fluctuations on investment in Sub-Saharan Africa. The analysis leverages annualized monthly variations of a currency's exchange rate against the U.S. dollar as a proxy for changes in the strength of that currency. I am particularly interested in exploring the effect of the currency's exchange rate volatility on investment in Sub-Saharan Africa, as the existing literature presents mixed findings. Some studies identify a negative impact (Bleaney and Greenaway, 2001; Hanusch et al., 2018; Latief and Lefen, 2018), others report a positive effect (Gorg and Wakelin, 2002; Osinubi and Amaghionyeodiwe, 2009), and some find no significant relationship at all (Abbott et al., 2012). According to Russ (2007), this inconsistency in the results might be due to the influence of multiple factors, including endogeneity problems. The main contribution of this paper to the existing literature is evaluating the causal effect of exchange rate volatility on investment, using an instrumental variable method in which the exchange rate regime is an instrument. To my knowledge, I am the first one to approach this analysis using the two-stage least squares (2SLS) method. If this instrument is both relevant and strong, it will address endogeneity issues such as reverse causality, omitted variables, and measurement errors (Cunningham, 2021).

The primary endogenous variable, exchange rate volatility, is instrumented using exchange rate regime categories, which many central banks in SSA use as tools to regulate currency value and stability. A country can choose to fix or peg its currency's exchange rate to another currency (e.g., the US. dollar or Euro) where the exchange rate between those two currencies is always constant (e.g., CFA Franc, which is pegged to the Euro). A country can also choose to adopt a floating regime in which the exchange rate is purely determined by forces of the

market. And finally, a country can adopt an intermediate regime, which involves the central bank's intervention in regulation of the currency's exchange rate stability. Using variations in these regime categories over time as an instrument, this study seeks to establish a credible causal relationship between exchange rate volatility and investment, moving beyond mere correlations. Due to limited data availability my analysis covers a period from 1999-2017, with data collected in 36 SSA countries using 27 currencies.

The strength of the causal effect hinges on the relevance and validity of the instrument. As Cunningham (2021) shows, for the exchange rate regime to be a strong instrument, it has to be strongly correlated with the exchange rate volatility (relevant) and only affect the investment through its effect on the exchange rate volatility (exogenous). The relevance is tested through a linear regression of exchange rate volatility on the currency regime categories. The results show a robust association between exchange rate volatility and currency regime. Floating and intermediate regimes are more likely to have higher fluctuations in their currency's exchange rate against the dollar than fixed regimes. The coefficients are statistically significant, demonstrating a strong positive correlation between exchange rate policy and the volatility in exchange rate. In addition to that, I empirically test whether the instrument is predictive of investment through a reduced form model. The reduced form regression of investment on currency regime classifications reveals that floating regimes are associated with higher FDI inflows, lower domestic and public investment than managed regimes. This suggests that currency regime has predictive power for investment and is important for investment decisions.

The exchange rate regime has to be exogenous in the model to be valid. Given the variations in currency regimes over time, understanding the underlying reasons behind these policy changes can help us understand the potential exogeneity of the currency regime. Countries adjust their exchange rate regimes in response to various financial, political, and economic factors, which can vary across nations (Eduardo Levy-Yeyati and Reggio, 2010). I use both theoretical and case study analysis to assess the common causes of changes in currency policy in many Sub-Saharan African countries. I find that a common short-term underlying motivation behind currency policy changes is to regulate the value of currency. Then, currency stability can lead to achieving other ultimate goals, such as attracting investments, lowering inflation, or regulating private and sovereign foreign debt burdens. It is very plausible that the currency regime affects only investment through its influence on exchange rate volatility.

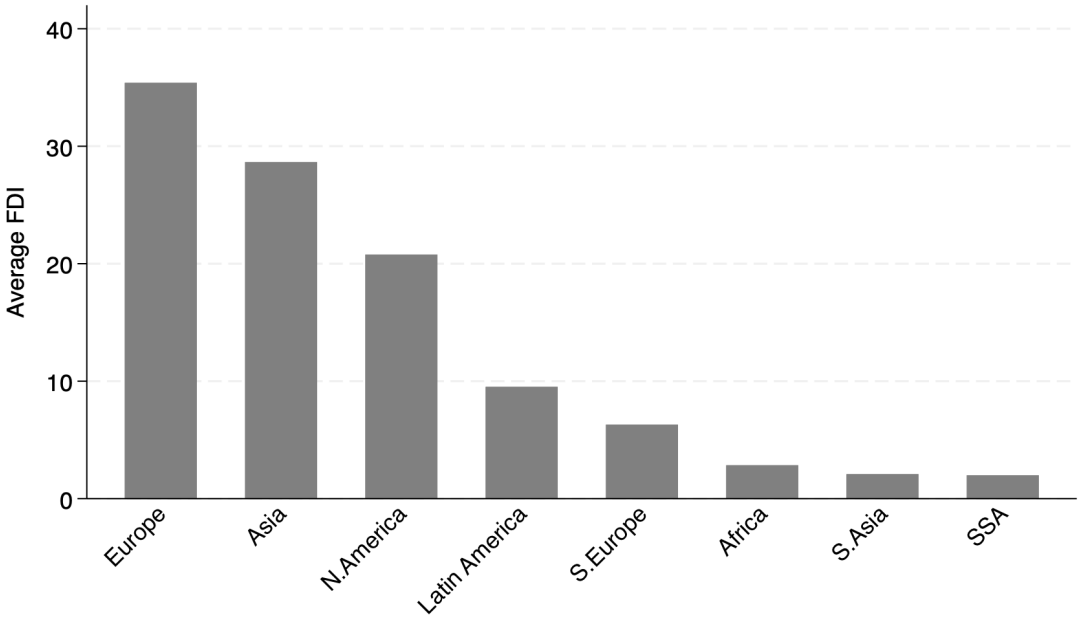
My empirical analysis uses both ordinary least squares (OLS) and two-stage least squares instrumental variable (2SLS-IV) models. This approach allows for comparison and helps

detect potential bias in the 2SLS estimator towards the OLS estimates. The results show a positive effect of exchange rate volatility on foreign direct investment, net inflow. This means that a higher volatility of a currency's exchange rate against the dollar in a given year can stimulate more FDI net inflow. I also find a negative effect of exchange rate volatility on both domestic and public investment. Higher volatility in a currency value discourages investment in public projects regardless of where the money is coming from. It also negatively affects the ability to invest domestically. Other important factors that remain robust across different models are country's ability and effectiveness in cracking down on corruption and a country's level of trade openness. The results show that the greater ability and effort to improve institutional quality by discouraging any form of venality has a very positive impact in attracting investment in SSA. The same is true for a country's openness to global trade. These findings have important policy implications regarding the selection of an appropriate exchange rate regime for a given economy. They underscore the need to improve institutional quality as a critical component in attracting investment and fostering economic growth.

This study is driven by two key motivations. First, the topic remains under-explored in the context of sub-Saharan Africa. To my knowledge, no existing studies approach this subject at the currency level. While the existing literature focuses primarily on foreign direct investment as the key outcome in their analysis, this study expands the scope by incorporating public, private, and gross domestic investment into the analysis. Second, this is a very policy-relevant topic. As many SSA countries are working to grow their economies and eradicate poverty, attracting investment and creating a safe institutional space where new ideas and innovations flourish uninterruptedly are paramount in fostering economic potential and capitalizing on abundant natural and human resources. As Sauvant (2015) underscores, like other types of investment, FDI plays a disproportionately vital role in the economic development of low developed economies (LDCs) compared to other economies. However, many SSA countries are not attracting these key engines for economic growth as other emerging economies.

According to data from the UNCTAD's World Investment Report, investment in Africa, particularly in sub-Saharan Africa (SSA), has remained the lowest among all regions since the 1990s. Figure 1 illustrates that Africa, as a whole, and SSA specifically, continue to trail other regions in attracting foreign direct investment (FDI). The region's share of global investment remains minimal, contributing to persistently slow economic growth. However, this trend is not an inherent characteristic of Africa. With appropriate strategies and policies, the region has the potential to attract significantly higher levels of investment, as has been theoretically proven.

Figure 1: Share of FDI-Inflow Across Regions, Average(1990-2023)



Notes: Author's calculations using data from the UNCTAD. This is an average share of FDI inflow in each region as a percentage of the world's investment. See appendix graph for time series trends across these regions.

Theoretical models, including the Solow-Swan growth model and the Heckscher-Ohlin framework, predict that investments should flow from capital-rich to capital-poor regions, driven by diminishing returns on capital in wealthier economies (Heckscher and Ohlin, 1933; Solow, 1956; Swan, 1956). In principle, capital-scarce countries with abundant labor resources should offer higher returns on investment, encouraging capital inflows. However, in practice, this anticipated flow of capital is often not realized, a phenomenon encapsulated in Lucas's paradox(Robert E. Lucas, 1990). This divergence between theory and reality is particularly pronounced in sub-Saharan Africa. Despite significant efforts to improve political and economic conditions over time, investment remains relatively sluggish and insufficient to bridge regional developmental gaps (for Africa et al., 2006; Ndikumana and Verick, 2008). It is still difficult for many SSA countries to economically catch up to the rest of the world if the key factors that cripple investment development efforts are not adequately addressed.

The remainder of the paper is structured as follows. Section 2 reviews the relevant literature on investment, exchange rates, and exchange rate regimes. Section 3 outlines the empirical strategy, including the use of instrumental variables. Section 4 describes the data sources and presents descriptive statistics. Section 5 details the main results, while Section 6 offers additional analyses and robustness checks. Section 7 interprets the findings and

discusses policy implications, and Section 8 concludes the study.

II. Literature Review

There is no established consensus on the effect of exchange rate volatility on investment, particularly foreign direct investment, in the existing literature. The sign of the effect is still ambiguous. A set of literature establishes a negative effect while others find a positive or no effect at all. Those who find a negative effect include Hanusch et al. (2018) who conducted an extensive study using 80 developing and developed countries to understand the impact of exchange rate volatility on foreign direct investment inflows. They find a negative relationship between exchange rate volatility and FDI inflows, where a 10% decrease in exchange rate volatility in one year can increase FDI inflows by 0.48 percentage points. Even if they use lagged exchange rate volatility, they finding still differ from my findings when lagged exchange rate is used. Bleaney and Greenaway (2001) studied the impact of terms of trade and real exchange rate volatility on investment and growth in sub-Saharan Africa using a panel of data from 14 countries. Their empirical results also show a negative association between high exchange rate volatility and investment inflows. They find that a 1% increase in real exchange rate volatility decreases investment in SSA by 28.5%. Other similar studies carried out in developing countries, such as Azhar et al. (2015) and Latief and Lefen (2018), focusing on countries such as Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka find that high exchange rate volatility is adversely related to lower foreign investment flows in those countries.

The study by Latief and Lefen (2018) which particularly focuses on understanding the impact of exchange rate volatility on FDI and international trade in countries such as Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka has mixed findings. Their results are not consistent in all countries in their sample. Using GARCH model, they find a negative relationship between exchange rate volatility and FDI in Bhutan and Nepal while the relationship is positive for India and Pakistan(Latief and Lefen, 2018). A positive effect of exchange rate volatility on FDI was also found by Osinubi and Amaghionyeodiwe (2009) in their study investigating the empirical evidence on the effect of exchange rate volatility on foreign direct investment (FDI) in Nigeria. Using both OLS and Error Correction Models, they find a significant positive relationship between exchange rate volatility and foreign direct investment inflows in Nigeria. My study, which uses 27 currencies across sub-Saharan Africa, aligns closely with Osinubi's results and builds on these results to further extend the analysis to other types of investments using instrumental variable strategy.

Old studies have also mixed findings. Studies who have found positive effects of exchange rate volatility on FDI are studies conducted by Cushman (1985); Goldberg and Kolstad (1995), and Gorg and Wakelin (2002). Unlike these studies, Campa (1993); Udomkerd-mongkol et al. (2009); Vita and Abbott (2007), find a negative effect. Some other studies such as Menil (1999) does not find any effect of exchange rate volatility on FDI. Abbott et al. (2012) in their study about exchange rate regime and foreign direct investment in developing countries find no significant effect of exchange rate volatility on FDI. This lack of agreement in the existing literature may be due to multiple factors including aggregation problem due to lack of enough data(Abbott et al., 2012). Another important factor that might be the driving forces behind these mixed findings is specification problems, especially, endogeneity issues as Russ (2007) points out. Studying the effect of exchange rate volatility on investment is susceptible to multiple barriers that can undermine the causal relationship. One of the biggest threat is the failure to fully account for all other factors (geographical, geopolitical, security, historical, cultural, etc) that might affect investment. Those factors tend to vary across countries. Another big factor is lack of data, as Abbott et al. (2012) points out, that are not vulnerable from measurement errors.

The role of exchange rate regime

Due to the inconclusive relationship between exchange rate volatility and investments, some studies go further to understand the potential causality between the two. Exchange rate volatility hinges on the health of the country's economy as well as the exchange rate regime implemented in that country. Muhammad et al. (2018) show that a country's choice of exchange rate policy can result in lowering exchange rate volatility or having two aspects of volatility: flexible volatility and uncertain volatility. Same as the finding in this study, Muhammad et al. (2018) show that the flexible volatility is likely to attract capital flows across borders, while the uncertain one can deter investors' confidence due to high risk inherent. This is where the power of institutional credibility comes in. When institutions are not credible, floating regimes and even managed regimes does not yield desired results.

While this study treats exchange rate regime as exogenous, meaning that it is not directly correlated with investment, some studies establish a direct correlation between currency regime and economic growth instead. But, the interesting question is whether a direct relationship between currency regime and economic growth implies a direct relationship between investment and currency regime, given that economic growth tends to be positively correlated with investment. Petreski (2009) wanted to examine whether there are theoretical and empirical arguments for the relationship between economic growth and the exchange rate

regime, but they concluded that the direct relationship is "blurred and requires more in-depth empirical investigation". They not the only one who got to that conclusion. Another study by Levy-Yeyati and Sturzenegger (2003) finds that the linkage between exchange rate regime and economic growth exists, but the sign of the influence is blurred. From this, we see that there is not a clear direct linkage between currency regime and economic growth. But, is it the same true for investment and currency regime?

Abbott et al. (2012) take the analysis further and try to find other channels through which exchange rate regime correlates with investment beyond exchange rate volatility. Like the results of this paper, the authors agree on the direct and strong correlation between exchange rate regime and exchange rate volatility. But their main argument is that the influence of exchange rate regimes on FDI is not always exclusively mediated through exchange rate volatility. Using both de facto and de jure classifications of exchange rate regimes and drawing heavily on Aizenman (1992) general equilibrium model[1], they investigate the broader mechanisms through which exchange rate regimes shape investment dynamics in developing economies. Their takeaway message from Aizenman's results is that there is an ambiguous correlation between exchange rate volatility and FDI. The reason behind this fuzzy relationship is that the exchange rate volatility for both exogenous monetary (nominal) and productivity (real) shocks fluctuates, which makes its correlation with FDI uncertain(Abbott et al., 2012). It is worth considering these views because they give us a deeper understanding and acknowledgement that a synergy of factors can influence investment behavior in a given region or country. While I believe that the central target of exchange rate regime policy change is still to influence the value of a currency as explained in the Mundel-Flemming Model[2], it is possible that exchange rate regime can still directly influence investors' behavior by signaling other things such as institutional quality, rule of law, etc.

This paper builds upon and extends the existing literature to thoroughly examine the causal relationship between exchange rate volatility and investment. While previous studies in Sub-Saharan Africa (SSA) and other regions have primarily focused on the impact of

[1]The general equilibrium model in Aizenman (1992) provides a theoretical framework to analyze how exchange rate regimes influence domestic and foreign direct investment (FDI). This model assumes a macroeconomic environment where economies experience both real and nominal shocks and investors are risk-neutral. Aizenman's findings suggest that fixed exchange rate regimes tend to encourage higher levels of FDI compared to flexible regimes. The key reason for this conclusion is that fixed exchange rates reduce exchange rate volatility, which diminishes uncertainty and enhances the predictability of returns on investment. This is particularly advantageous for foreign investors, who might otherwise face exchange rate risk. In this context, the model accounts for the presence of a short-run Phillips curve, allowing for the analysis of how nominal and real shocks interact with exchange rate regimes to affect investment decisions.

[2]The main message of the Mundell-Fleming model is that the effect of any economic policy (fiscal, monetary or trade) depends on the exchange rate system of the country under consideration, i.e., whether the country is following a fixed or a floating exchange rate system

exchange rate volatility or exchange rate regimes on foreign direct investment (FDI), it is crucial to consider other forms of investment as well. Sustainable economic growth in SSA depends on collaborative efforts to mobilize extensive capital accumulation and investment, as well as create a favorable institutional environment. This study contributes to the literature by employing an instrumental variable strategy to analyze the effects of exchange rate volatility at a more granular level of investment, including domestic, foreign direct, public, and private investment. By broadening the scope beyond FDI, this research provides a more comprehensive understanding of how exchange rate dynamics influence various investment categories in SSA.

III. Empirical Method

One can empirically examine the relationship between exchange rate volatility and investment using a simple Ordinary Least Squares (OLS) regression model with a following equation:

$$Y_{c,t} = \beta_0 + \beta_1 \text{Volatility}_{c,t} + \beta_2 X_{c,t} + \sum_{c=1}^{27} \gamma_c I(c = \text{currency}) + \sum_{t=1999}^{2017} \delta_t I(t = \text{year}) + \epsilon_{c,t} \quad (1)$$

Where, $Y_{c,t}$ is dependent variable for country's currency c at time t. The dependent variables are foreign direct investment net inflow, domestic investment, public investment, and private investment, all expressed as percentage of a country's GDP. $Volatility_{c,t}$ is exchange rate volatility for currency c in year t. $X_{c,t}$ is a set of other controls that have been proven to be among the key drivers of investment and economic development for country's currency c in year t. $\sum_{c=1}^{27} \gamma_c \cdot I(c = \text{currency})$ is currency fixed effects, where $I(c = \text{country's currency})$ is an indicator function for each country's currency. Currency fixed effects are used to control for other potential unobserved time-invariant endogeneities that are correlated with the outcome variable. $\sum_{t=1999}^{2017} \delta_t \cdot I(t = \text{year})$ is year fixed effects from 1999 to 2017, which are used to control for unobserved currency-invariant endogeneities that are correlated with the outcome variables. And $\epsilon_{c,t}$ is the error term.

This equation is suitable for examining the relationship between exchange rate volatility and investment, but it does not establish causality. The primary limitation of using ordinary least squares (OLS) in this context is the endogeneity problem, as highlighted by Russ (2007). Endogeneity arises from reverse causality between investment and exchange rate volatility. For example, changes in investment in a country can influence its currency value, thereby affecting exchange rate volatility. Conversely, fluctuations in exchange rates can alter investor

behavior, impacting investment levels. Just implement OLS cannot unravel this bidirectional relationship, making causal inference unreliable. One possible way to use OLS and still avoid reverse causality is when the main regressor (exchange rate volatility) is lagged, see (Hanusch et al., 2018)). While it is possible to get the reverse causality problem away with the lag method,it other endogeneity issues are still present.

Specification errors caused by omitted variable issues, as discussed by Cunningham (2021) can still be big threats to the accuracy of the results, undermining causal affirmation. Certain unobserved or unmeasured factors, such as cultural, political, religious, or security dynamics, might simultaneously affect both exchange rate volatility and investment behavior. If these variables are not accounted for, we might still get ambiguous effect of exchange rate volatility on investment because the effect might be contaminated by other background factors. One solution to this is to include more variables in the model, but it is impossible to include all potential factors due to data limitation.

Measurement error is another threat that further complicates the analysis. Inaccurate or poorly recorded data can distort estimates, leading to spurious conclusions. Measurement error can either mask an actual causal relationship or suggest causation where none exists. It can be difficult to address measurement errors, especially when they occur during data collection and reporting. Inaccuracy in data entry and reporting can bias the analysis.

To address all these herein challenges, two-stage least squares (2SLS) provides a robust alternative, as supported by Acemoglu et al. (2003); Angrist and Krueger (2001); Cunningham (2021); Miguel et al. (2004). The 2SLS-IV method uses instruments that are strongly correlated with exchange rate volatility but exogenous to investment outcomes, ensuring more reliable causal estimates. This approach mitigates the issues of reverse causality, omitted variable bias, and measurement error, enabling a more credible understanding of the causal effect of exchange rate volatility on investment.

I use exchange rate arrangement as my instrument. As both Angrist and Krueger (2001) and Cunningham (2021) show, this instrument needs to be correlated with the endogenous regressor, which is, in this case, exchange rate volatility. Moreover, the instrument should be orthogonal to any other omitted characteristics and should not be correlated with the outcome of interests, in this case investment, through any other channel than the endogenous regressor (Acemoglu et al., 2003). The validity of this instrument will thus solve the problems of endogeneity, measurement error, and omitted variable bias.

The 2SLS model is estimated using the following equations:

$$\text{Volatility}_{c,t} = \alpha_1 + \sum_{r=1}^{n} \alpha_r \mathbf{Regime}_{c,t} + X_{c,t}\beta_1 + \sum_{c=1}^{27} \gamma_{1c} I(c = \text{currency}) + \sum_{t=1999}^{2017} \delta_{1t} I(t = \text{year}) + \epsilon_{1c,t} \tag{2}$$

$$Y_{c,t} = \alpha_2 + \beta_2 \widehat{\mathbf{Volatility}}_{c,t} + X_{c,t}\beta_2 + \sum_{c=1}^{27} \gamma_{2c} I(c = \text{currency}) + \sum_{t=1999}^{2017} \delta_{2t} I(t = \text{year}) + \epsilon_{2c,t} \tag{3}$$

Most of the variables are defined the same as in equation (1) except that now we have a system of two equations. Equation 2 is the first stage which estimates a relationship between exchange rate arrangement and exchange rate volatility. $Regime_{c,t}$ is a set of indicator variables of exchange rate regime classification. More details on the classification can be found in the data section. The first stage model helps us empirically analyze how a country's exchange rate arrangement affects the local currency's exchange rate and how changes in exchange rates due to changes in arrangement differ across regimes.

Equation 3 is the second stage regression model. $\widehat{\mathbf{Volatility}}_{c,t}$, is the predicted volatility of the exchange rate for a given currency in a given year from equation 2. I employ the IV-2SLS estimation to obtain the estimates for the outcome variables in the second stage. Alternatively, a non-linear two-stage approach can be used, which involves estimating the first stage and then the second stage separately. Achen 1986 highlights that this method is particularly useful for correcting standard errors when the second-stage dependent variable is dichotomous. However, Angrist and Krueger 2001 demonstrate that the IV-2SLS method is still preferred even when the dependent variable is dichotomous.

IV. Data and Measurement

To analyze the impact of exchange rate volatility on investment in sub-Saharan Africa, I use multi-country panel data, primarily obtained from the World Bank, IMF, and UNCTAD data bases. The data set that contains FDI-inflow and gross capital formation covers the period from 1999 to 2021, selected due to constraints in data availability. The second data set that contains variables such as private investment and public investment, downloaded from the IMF data-base covers only until 2017. For the sake of consistency, my regression models are only based on data from 1999-2017. Using the data up to 2017 also helps us avoid any biases in the results that are due to the Covid-19 pandemic.

The primary data set comprises country-level time series data, which includes key macroeconomic indicators for the nations whose currencies are featured in the study. These indicators encompass GDP per capita growth, foreign direct investment, gross domestic investment, inflation, and political variables such as corruption control which measures the government's effectiveness in majors deterring institutional inefficiency or corruption. These factors have been widely identified in the literature as significant determinants of investments and other economic activities that lead to economic growth in a given country.

The second data set comprises monthly exchange rate data obtained from the International Monetary Fund (IMF) for the period 1999–2021. This data set includes exchange rates of local currencies against both the US dollar and the Euro. However, the analysis focuses on exchange rates against the US dollar because of its dominant role in international trade. Lack of data for many currencies'exchange rates against the Euro is another factor preventing the use of it in the analysis. Monthly exchange rate data are used instead of annual averages to capture greater variation, which allows for more precise estimates of exchange rate volatility.

Following the methodology outlined by Hanusch et al. (2018), exchange rate volatility is measured using the coefficient of variation (CV) of exchange rates. CV is calculated by dividing the monthly standard deviation of an exchange rate of a country's local currency against the U.S. dollar (LCU/USD) by the annual mean exchange rate for the same currency against the dollar. This calculation is represented as follows:

$$CV = \frac{\sigma_{\text{monthly}}(\text{LCU/USD})}{\mu_{\text{annual}}(\text{LCU/USD})} \tag{4}$$

The coefficient of variation serves as a reliable proxy for exchange rate volatility, reflecting how much a currency's exchange rate fluctuates within a given year. A higher CV for a currency in a specific year indicates greater volatility in its exchange rate. This measure is particularly useful for capturing the uncertainty faced by investors and businesses in sub-Saharan Africa. In my sample, the average of exchange rate volatility index is 0.047 while the min and the maximum are, respectively, 0 and 0.76. However, to make the interpretation more intuitive given how small these indices are, I scale it up to 100, making the mean become 4.7% the the maximum 76% (see Table 1).

The third data is the IMF de facto exchange rate regime, obtained from the IMF's Annual Report on Exchange Rate Arrangements and Exchange Restrictions (AREAER). After the year 2000, the IMF shifted from its de jure classification to de facto classification system. This system is based on the IMF members' actual, de facto, arrangements, which is identified

by IMF staff. Note that this classification may differ from their officially announced (de jure) arrangements[3]. The raw data set contains 15 categories, which I combine into 11 (detailed categories) by putting together those with closely similar names (e.g. Conventional peg = Conventional pegged arrangement). I also use a tripartite categorization to classify the regimes according to Floating, Fixed (Hard Pegs), and Managed (intermediate) regime. Fixed/Hard peg regime consists of conventional peg, Exchange rate arrangement with no separate legal tender, and currency board. The Floating regime consist of floating and free floating/independently floating. Then, I put the rest into intermediate or Managed arrangement. This categorization is consistent with the categories in (Bleaney and Francisco, 2007; Fischer, 2001; Rogoff et al., 2003).

The sample consists of 36 sub-Saharan African countries, included based on data availability. Since the analysis focuses on understanding how exchange rate volatility impacts investment, the unit of observation is currency-year. However, aggregating data at the currency level introduces duplicates due to shared currencies among certain countries. To address this issue, countries with shared currencies are grouped to maintain analytical coherence.

Eight countries using the West African CFA franc (Benin, Burkina Faso, Guinea-Bissau, Mali, Niger, Senegal, and Togo) are combined into a group labeled CEMAC, while five countries using the Central African CFA franc (Cameroon, the Central African Republic, Chad, the Republic of the Congo, and Gabon) are grouped as CFA-XOF. Equatorial Guinea, which also uses the CFA franc, is excluded due to unavailable data. For the South African Rand (ZAR), legally used by members of the Common Monetary Area (Lesotho, Namibia, and Eswatini), local currencies are analyzed separately, as these countries continue to use their national currencies alongside the ZAR.

This grouping approach facilitates a consistent analysis of exchange rate volatility's effect on foreign direct investment (FDI) and domestic investment, while accounting for shared currency structures in the region. Grouping these countries based on their common currency into one observation is also applied to their respective variables. For each group, variables are calculated as weighted averages, with each country's GDP serving as the weight. For instance, to determine foreign direct investment (FDI) for the Central African Economic and Monetary Community (CEMAC), I calculate the GDP-weighted average of FDI inflows for the member countries. Using GDP as a weight corrects for unequal contributions and serves as a proxy for each country's economic size and health, ensuring that the averages reflect

[3] See IMF exchange rate arrangement classification for more details: https://www.imf.org/external/np/mfd/er/2004/eng/0604.htm

the economic influence of each country within the group.

Table 1: Summary Statistics

	Mean	SD	Min	Max	Obs
FDI-Inflow(%GDP)	3.63	5.04	-11.19	40.17	618
Public Investment(%GDP)	8.90	5.78	0.00	39.86	570
Private Investment(%GDP)	20.82	12.40	0.69	71.57	570
G.Domestic Investment(%GDP)	18.63	8.35	-5.39	51.71	550
Volatility-ExRate(to USD)	4.74	6.65	0.00	76.17	621
Per Capita GDP Growth	1.85	3.94	-22.38	19.56	621
G.Domestic Saving	14.60	14.78	-38.83	55.61	541
Board Money Growth	20.05	29.90	-99.89	528.19	589
Electrification	36.07	24.15	1.30	100.00	614
Corruption control	-0.57	0.60	-1.60	1.24	567
Totoal N. Resource Rents	10.29	8.93	0.00	59.14	621
Crop Prod. Index	89.26	25.04	20.90	179.04	608
Inflation	13.07	37.44	-16.86	513.91	589
Food Prod Index	89.02	22.45	27.58	153.68	608
Marchandise Trade	53.56	27.75	7.81	152.66	621

Table 1 provides summary statistics for the key and other control variables used in this study. The statistics represent averages across all countries and years, while country-specific averages are presented in Table 2 in the appendix section. The dependent variable is investment, categorized into foreign direct investment, gross domestic investment, and public and private investments, all as percentage of a country's GDP. Foreign direct investment (FDI), net inflow, represents the net difference between capital inflows (foreign investments into the host country) and outflows (capital repatriation by foreign investors or domestic investors), capturing the net inward value of direct investment flows. FDI inflows are a crucial indicator of a country's appeal to foreign investors, reflecting the extent to which foreign capital enters a country to support productive economic activities and spur economic development.

The second outcome variable is a proxy of Domestic Investment. Following Nath (2009), I approximate the gross domestic investment by subtracting FDI net inflow from Gross Capital Formation (GCF), both measured as a percentage of GDP. GCF encompasses all investments in fixed assets and inventories within a country, irrespective of origin (domestic or foreign), and includes investments from both the private and public sectors. By subtracting FDI inflows from GCF, this measure provides a proxy for domestic investment, revealing the

portion of investment generated independently of foreign capital. The private and public investments variables are directly sourced from the IMF database, which, unlike FDI and DI, covers a period of 1999-2017 due to unavailability of data for the other 4 years.

The study also includes other controls that have been empirically proven to be driving factors of investment. The set of controls includes macroeconomic variables (GDP per capita growth, which is a proxy of market growth, Inflation rate, Gross money growth, Crop production index, and gross domestic savings). Other controls are institutional factors (Corruption control estimates) and Trade Openness with Marchandise Trade (% of GDP) as a proxy.

V. Empirical Results

1. First stage results: Relevance of the Instrument

The first stage regression is estimated using ordinary least squares (OLS) to examine the relationship between the exchange rate regime and exchange rate volatility. The results, presented in Table 2, are obtained using indicator variables of exchange rate regime. The right-hand side of the equation consists of both extended and non-extended classifications of exchange rate regimes. Columns 1 to 3 and 6 and 7 of the table display the results from three distinct groups: Floating, Managed, and Fixed regimes, with the fixed regime omitted in the first 3 columns and floating regime omitted in the last 2 columns due to multicollinearity. The coefficients are compared relative to the fixed regime in the first three columns and the floating regime in the last 2.

There is a strong correlation between exchange rate volatility and currency regime. The results indicate that floating and managed regimes are more likely to experience higher exchange rate volatility compared to fixed regimes. In the first and second columns, which do not include other control variables, the exchange rate volatility in floating regimes is approximately 7.5% higher than in the fixed regimes. After incorporating all control variables, the coefficient decreases to 2.2% but remains significant at 90-percent confidence interval. Notably, there is no significant change in the coefficient or significance level in the first three columns.

The volatility in Managed regimes is not statistically different from that in Fixed regimes after all the controls have been added (column 3). This outcome is somewhat expected because countries often manage their exchange rates to minimize variations in currency value. Managing currency value means that central banks intervene to maintain stable

official exchange rates, even if it might not always align with economic conditions. This shows that there might be other factors that explain the volatility in currency values beyond the managed regime alone, which is the reason why the coefficient becomes insignificant after adding all controls.

With the detailed classification, we observe the same pattern. The coefficients are compared with the conventional peg regime, which is also omitted because of perfect colinearity. A conventional peg is like a fixed peg regime. It is an exchange rate regime where a country's currency is tied to another currency. In my sample, the CFA franc is conventionally pegged to the Euro, which in turn floats against the US dollar. Although the CFA franc floats against the dollar indirectly through its peg to the Euro, its exchange rate volatility against the dollar remains relatively low because of the stability of the Euro against the dollar. In contrast, floating regimes such as free floating, floating and managed floating exhibit higher exchange rate volatility compared to pegged regimes. These findings demonstrate a clear correlation between the exchange rate regime and the level of exchange rate volatility. Specifically, pegged regimes tend to have lower volatility, while floating regimes are associated with greater fluctuations in exchange rates.

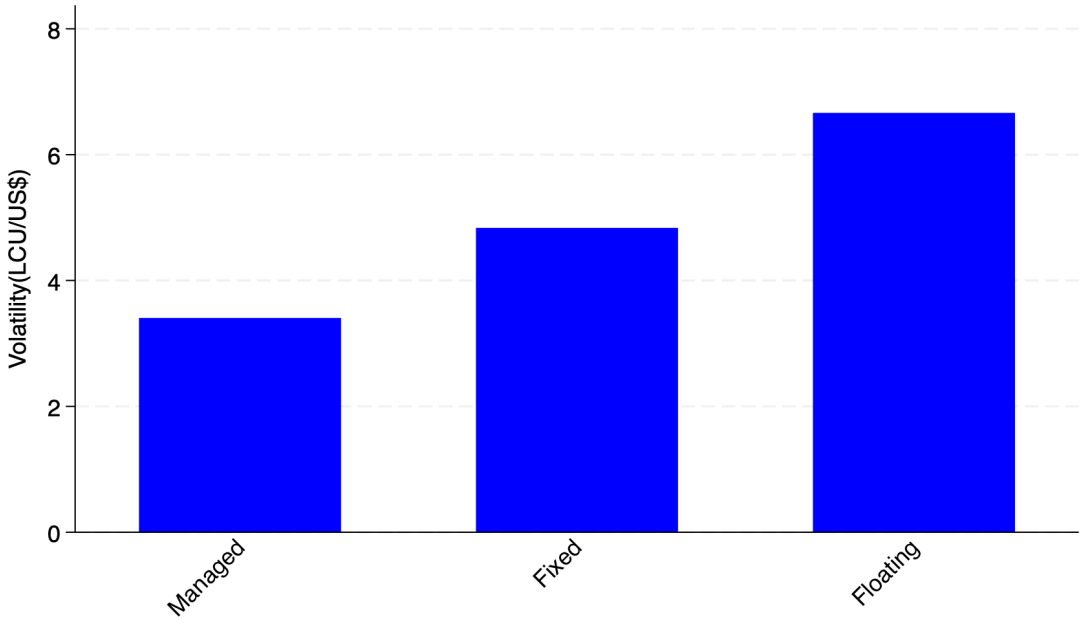
Table 2: Exchange Rate Regime with Exchange Rate Volatility(1st Stage)

	(1) ERV	(2) ERV	(3) ERV	(4) ERV	(5) ERV	(6) ERV	(7) ERV
Floating	7.248***	7.754***	2.153*				
	(1.906)	(2.159)	(1.118)				
Managed	2.458***	3.360***	1.026				
	(0.882)	(1.017)	(0.868)				
Managed						-4.394***	-1.127*
						(1.493)	(0.652)
Fixed						-7.754***	-2.153*
						(2.159)	(1.118)
Crawl Peg				1.561	-0.214		
				(1.277)	(1.512)		
Crawlike				2.573*	0.200		
				(1.434)	(1.168)		
Floating				6.492***	1.964		
				(1.839)	(1.257)		
Free Floating				8.389***	2.840*		
				(2.306)	(1.496)		
Managed Floating				3.970***	2.178*		
				(1.163)	(1.230)		
No Sep. Legal Tender				-0.508	0.534		
				(0.969)	(0.884)		
Other Managed				3.675**	1.039		
				(1.476)	(1.186)		
Stabilized				-0.106	-1.137		
				(1.591)	(1.172)		
N	513	513	358	513	358	513	358
Currency fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed-effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	Yes	No	Yes	No	Yes
R^2	0.177	0.250	0.411	0.266	0.430	0.250	0.411

Note: The oucome variable is Exchange Rate Volatility. Robust Standard Errors are in Paranthesis. This first stage regression shows the relationship between exchange rate regime and exchange rate volatility. All regimes, tripartite classification and detailed classification, are included. Columns 6 and 7 have Floating as an omitted(referrence) category. The Stars are significant level where * 0.10 ** 0.05 *** 0.01.

Figure 1 tells the same story. It plots the averages of exchange rate volatility of local currency against the US. dollar. Volatility in floating regimes are the highest, which perfectly aligns with the results in the regression table above. It is not surprising to see higher volatility in the fixed regimes than managed regimes, which is a little different from the empirical results. The reason why this is plausible is that fixed regimes tend to be hard pegs where a currency's exchange rate is fixed to another currency. This graph shows exchange volatility against the US.dollar across currency regimes, so if a currency is fixed to another currency that is floating to the dollar, the latter becomes floating to the dollar as well. The volatility is still minimal because currencies tend to be pegged to presumably stronger ones (e.g. the Euro whose volatility against the dollar is not high). Unlike fixed regime, in managed regime, the value of a currency is monitored to be stable against the major currency, such as the US. dollar or the Euro, which is a plausible reason why we see a lower volatility in the managed regime. This intervention in the exchange rate can also have an influence on the exchange rate of the managed currency against other currencies too. In general, both empirical results and the figure show that there is a strong relationship between exchange rate regime and exchange rate volatility in sub-Saharan Africa, which makes the instrument relevant.

Figure 2: Exchange Rate Regime and Exchange Rate Volatility (Local currency against the USD)



Notes: Author's calculations using data from the IMF's de facto currency regime classification.

However, even if there is a strong correlation, the currency regime instrument is somewhat

weak. We find an F-statistics of 11.5 in column 1 where no controls or fixed effects are added and it remains less than 10 as more controls are included. This weak instrument may suggest that the 2SLS-IV estimates may be biased towards OLS estimates (Crosby et al., 2010). I address this concern by including both OLS and IV results in the second-stage regression tables to analyze how they compare.

2. Reduced Form: Does exchange rate regime predict investment?

I use the reduced form to provide evidence that the instrument has predictive power for the dependent variable. The relationship is estimated using the following equation:

$$Y_{c,t} = \beta_0 + \beta_1 \text{Regime}_{c,t} + \beta_2 X_{c,t} + \sum_{c=1}^{27} \gamma_c I(c = \text{currency}) + \sum_{t=1999}^{2017} \delta_t I(t = \text{year}) + \epsilon_{c,t} \quad (5)$$

Where $Regime_{c,t}$ is an in a tripartite categories (floating, managed, and fixed) in a for a currency c in year t.

Table 3: Investment and Exchange Rate Regime, Reduced Form

	(1) FDI-Inflow	(2) GDI	(3) Pub-Inv	(4) Priv-Inv	(5) FDI-Inflow	(6) GDI	(7) Pub-Inv	(8) Priv-Inv
Fixed	0.557	-0.708	0.403	-2.095	0.306	-0.350	1.727	-2.255
	(1.680)	(1.432)	(0.997)	(1.611)	(1.192)	(1.176)	(1.459)	(1.990)
Floating	2.112***	-3.793***	-2.430***	-0.960	2.467***	-2.910***	-1.482**	-0.915
	(0.810)	(0.826)	(0.533)	(1.264)	(0.866)	(0.898)	(0.666)	(1.435)
N	510	450	494	494	355	355	346	346
Controls	No	No	No	No	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.316	0.491	0.561	0.746	0.542	0.707	0.631	0.820

This is a reduced form regressing exchange rate regime on investment. Robust standard errors are in paranthesis. The Stars are significant level where * 0.10 ** 0.05 *** 0.01.

The table presents the results from an OLS regression of currency regime on investment, with both controls and not controls included. Managed regime is omitted and serves as a reference. The results show that floating regime is associated with 2% point more than managed regime (column 1). In addition, there is fewer gross domestic and public invest-

ment in floating regime than intermediate regime. All these coefficients remain significant and constantly signed despite more controls. There is no statistically significant distinction between fixed and managed regimes. But overall, the results suggest a predictive power of exchange rate policy on investment.

3. Main Results

Table 4: Exchange Rate Volatility and Investments

	OLS			IV-2SLS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: FDI Inflow							
Exchange Rate Volatility	0.148	0.170	0.040	0.384***	0.523**	1.016	1.816
	(0.097)	(0.105)	(0.094)	(0.141)	(0.256)	(0.628)	(1.128)
N	510	510	355	510	456	439	355
R-Squared	0.039	0.341	0.528	0.277	0.197	0.010	0.12
Panel B: Gross Domestic Investment							
Exchange Rate Volatility	-0.114*	-0.017	0.072	-1.075**	-1.293*	-2.743	-2.144*
	(0.058)	(0.055)	(0.083)	(0.461)	(0.724)	(1.671)	(1.286)
N	450	450	355	450	406	389	355
R-Squared	0.006	0.475	0.696	0.049	0.510	0.600	0.678
Panel C: Public Investment							
Exchange Rate Volatility	-0.071**	-0.063**	0.035	-0.484***	-0.661**	-1.372**	-1.364
	(0.029)	(0.024)	(0.076)	(0.166)	(0.271)	(0.637)	(0.854)
N	494	494	346	494	442	425	346
R-Squared	0.008	0.549	0.624	0.338	0.300	0.423	0.678
Panel D: Private Investment							
Exchange Rate Volatility	0.137	0.199	-0.000	-0.092	-0.091	-0.439	-0.299
	(0.169)	(0.133)	(0.115)	(0.262)	(0.321)	(0.634)	(0.940)
N	494	494	346	494	442	425	346
R-Squared	0.005	0.754	0.819	0.736	0.777	0.764	0.814
Currency fixed-effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed-effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	Yes	No	Yes	Yes	Yes

This is a panel of all investments used in this study. Robust standard errors are in parentheses. Model 1-3 are estimated with simple OLS and 4-7 are estimated with two-stage instrumental variable method. Each panel has its own outcome variable. Column 1 and 4 are run without controls and controls are included for other columns(See Appendix section for detailed regression tables with all the controls showns). Also, fixed effects are included in certain columns(see on the bottom of panel D for more information about each column). All the outcome variables are expressed as percentage of GDP. The sample include 27 currencies, used in 36 sub-Saharan African countries covering a period of 1999-2017 for all the specifications.The Stars are significant level where * 0.10 ** 0.05 *** 0.01.

Table 3 summarizes the main results of four different outcome variables in four different panels. Both the OLS and IV-2SLS models are included in each panel, and the controls are included but not reported. The detailed tables for each outcome variable with all control variables reported are in the appendix section.

In panel A, we observe consistently positive coefficients in both the OLS and IV models. But, none of the coefficients are statistically significant in the OLS specifications. The IV models show significant coefficients (columns 4 and 5). Column 4 which includes fixed effects only shows that a one-percentage point increase in exchange volatility induced by a currency regime leads to 0.38% point increase in FDI net inflow. The coefficient is statistically significant at 99-percent. As more controls are added, the effect becomes less significant, but remains positive. We find no significant effect in the OLS model, which is not unprecedented in the existing literature. For example, Abbott et al. (2012) also does not find any significant coefficient of exchange rate volatility on foreign direct investment across all their specifications. This shows that using IV strategy adds more insights on how the effect of exchange rate volatility on investment is interpreted.

Panel B shows a generally negative effect of exchange rate volatility on domestic investment. In the OLS model, we only have a significant negative effect (at 5% significance level) when neither controls nor fixed effects are included. Adding more controls make the coefficient insignificant, and the sign is not consistent. Unlike the OLS, the 2SLS models show a negative effect and significantly in almost all regression specifications. The IV-models are showing strong and robust results compared to OLS, suggesting that countries experiencing higher exchange rate volatility see significant decrease domestic investment, on average.

Higher exchange rate volatility also adversely drives public investment. A one percentage point increase in exchange rate volatility, induced by a currency regime, leads to 0.5% point decline in public investment on average (panel C, column 4). The coefficient is also significant at 1% significance level and remain at least significant as more controls are added, except the last column. These IV estimate are also more robust than OLS as the sign changes in column 3 when we add controls. These results make much sense in the context of many countries in sub-Saharan Africa who tend to rely heavily on foreign debt or grants to finance major public investments in projects such as roads and electricity. High exchange rate volatility can negatively impact the financing part of those big projects, which is what the results here are suggesting.

Regarding the effect on private investment, we observe a negative effect. None of the coefficients are significant and the sign on the coefficients is not consistent in the OLS specification. However, same as the FDI, the sign remains consistent in the IV specifications,

which shows a negative effect of exchange rate volatility on private investment, but we cannot establish a causal relationship here as well.

When interpreting these results, it is crucial to note that they reflect short-term effects, capturing the immediate response of exchange rate volatility on investments. However, analyzing the long-term impact of exchange rate volatility on investment would provide additional insights. Extreme volatility often occurs in the initial years following a currency devaluation, typically triggered by a shift from fixed or managed exchange rate regimes to a free-floating regime (e.g., South Africa between 1988–2001, Nigeria in 2016 and 2024) or during major financial crises (e.g., Zimbabwe in 2008). Analyzing potential long-term consequences is crucial. To account for such dynamics, I include lagged exchange rate volatility in Table 4, estimated using the following equation:

$$Y_{c,t} = \beta_0 + \beta_1 \text{Volatility}_{c,t-1} + \beta_2 X_{c,t} + \sum_{c=1}^{27} \gamma_c I(c = \text{currency}) + \sum_{t=1999}^{2017} \delta_t I(t = \text{year}) + \epsilon_{c,t} \quad (6)$$

where $\text{Volatility}_{c,t-1}$ is one year lag of exchange rate volatility. Using a lag in the OLS specification will solve the reverse causality issues, but will not solve other issues such as measurement error.

Table 4 reports the key coefficients of the endogenous regressor along with other control variables whose coefficients remained consistent either in their signs and significance across the majority of the regression specifications(See the appendix section for more details). These regression tables in the appendix section show detailed results and you can see how variables like corruption control and merchandise trade remain positively consistent and mostly significant in most of the tables and almost all columns. Including these controls is important because it helps as assess the effect of exchange rate volatility, induced by currency regime, which is distinct from other factors such as institutional quality, trade openness, or per capita GDP.

As in the previous table, this table shows the results from both OLS and IV-2SLS models for comparison purposes and accounting for potential bias towards OLS that the instrument signaled. The results remain consistent with those in table 3. We still see a significant positive effect of volatility on FDI inflow and negative effects on both GDI and public investment. The effect on private investment is still negative, but not significant. Something to note here is that none of the coefficients are significant in the OLS regression models.

We find a very strong positive effect of Corruption control on all types of investment. The impact of increasing majors to prevent corruption remain positive and pretty much signifi-

cant in almost all regression specifications. With one unit increase in corruption control in a country for a given year is associated with 3.7 percentage point increase in domestic investment, 3%-point increase in public investment, and 2.3% point increase in private investment on average (column 6, 7 and 8). Unlike exchange rate volatility, the effect of corruption controls remains robust even when estimated using OLS. This shows a very important role that quality of institution plays in stimulating economic growth through investment in sub-Saharan Africa. These results are consistent with the findings in a wide range of literature such as Asiedu and Freeman (2009); Ibrahim et al. (2015); Zhao et al. (2003).

Table 5: Investment, with key Control Variables

	OLS				IV-2SLS			
	(1) FDI-Inflow	(2) GDI	(3) Pub-Inv	(4) Priv-Inv	(5) FDI-Inflow	(6) GDI	(7) Pub-Inv	(8) Priv-Inv
Exchange Rate Volatility	0.050	0.030	-0.009	0.061	0.657**	-1.126*	-0.753**	-0.109
	(0.048)	(0.072)	(0.039)	(0.055)	(0.305)	(0.584)	(0.309)	(0.331)
LandlockedXVolatility	-0.053	0.131	-0.035	-0.054	-0.573**	1.116**	0.607**	0.093
	(0.070)	(0.232)	(0.094)	(0.131)	(0.292)	(0.563)	(0.293)	(0.307)
Corruption control	0.812	4.686***	3.285***	2.362*	0.939	3.742**	3.224***	2.315*
	(0.613)	(1.348)	(0.753)	(1.315)	(0.736)	(1.621)	(0.906)	(1.256)
GDP per Capita Growth	0.074	0.028	0.075	-0.009	0.228**	-0.244	-0.117	-0.061
	(0.057)	(0.091)	(0.071)	(0.086)	(0.103)	(0.180)	(0.120)	(0.127)
Marchandise Trade(%gdp)	0.111***	0.077**	0.058*	0.226***	0.105***	0.069	0.062	0.230***
	(0.026)	(0.032)	(0.031)	(0.035)	(0.033)	(0.048)	(0.040)	(0.033)
Exchange Rate Volatility(t-1)	0.047	-0.022	-0.085***	0.024				
	(0.030)	(0.062)	(0.031)	(0.045)				
N	456	406	442	442	456	406	442	442
Currency fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.443	0.494	0.587	0.812	0.183	0.143	0.286	0.809

Robust standard errors are in parentheses. Model 1-4 are estimated with simple OLS and 5-8 are estimated with two-stage instrumental variable method. The outcome variables are expressed as percentage of GDP.All models control for time and currency fixed effects. The sample include 27 currencies, used in 36 sub-Saharan African countries covering a period of 1999-2017 in all specifications.The Stars are significant level where * 0.10 ** 0.05 *** 0.01.

Another consistent variable is the merchandise trade(% of GDP). This is a proxy of a country's trade openness, which includes both exports and imports. A country's increase in trade openness in a given year is associated with higher FDI-inflows, GDI, public investment, and private investment. The coefficients are statistically significant in OLS. The

effect is only significant on FDI inflow and private investment in the IV-models. To address potential reverse causality between investment and a country's openness to trade, I tested how a one-year lag of merchandise trade affects investment and the results remain consistent with the results reported in Table 4, which can ensure that there is a significant impact of trade on investment. Increased trade in a country can signal economic diversification and strength, which attracts more investment, especially foreign direct and private investment, while growing private sector in that country. These results are also consistent with Cantah et al. (2013); Kandiero and Chitiga (2006).

Controlling for a one-year lag of exchange rate volatility in the OLS model does not divert from the results in the IV models. I use one-year lag to assess long-term effect of exchange rate volatility and also address potential reverse causality issues between the regressor and outcome variables that might affect the accuracy of my estimates. I find significant negative effect of lagged exchange rate volatility on public investment where one unit increase in exchange rate volatility in year t leads to 0.085%-point decline in public investment in year $t+1$, on average. The coefficient is also statistically significant at 1% significance level. Other coefficients are not significant, but remain consistently signed with the previous models. The significant positive effect of lagged exchange rate volatility on investment suggests that higher volatility in a given year may lead to increased investment in the subsequent year.

VI. Result Discussion

The first stage model demonstrates a strong association between exchange rate volatility and currency regime choice, although high exchange rate volatility is not exclusively attributable to exchange rate policy. Floating regimes exhibit higher exchange rate volatility compared to other regimes. This increased volatility stems from the fact that in floating regimes, exchange rates are determined solely by the supply and demand of foreign currency in the economy. This system contrasts with managed regimes, where central banks play a significant role in setting the currency's value or preventing currency depreciation, even if the established value may not align with market or economic conditions.

Seeing a positive effect of high volatility caused by a floating regime in SSA can hint us to the investors' perception about an economy in a floating regime. It has been hard for a good number of countries to keep a floating regime as their currency regime. Successful floating regime signals a strong and stable institutional structure to foreign investors. The IMF emphasizes that freely floating exchange market arrangements must be supported by a sustained pursuit of appropriate domestic economic policies to ensure their efficient operation

over time (Huh et al., 1987). This perception can attract more investment, as investors are drawn to environments with strong rule of law, freedom, and property rights. This is consistent with research indicating that institutional qualities such as these are key drivers of investment flows(Alfaro et al., 2008; Bertrand and Betschinger, 2024; Chen and Jiang, 2023; Saha et al., 2022).

There are two channels through which high exchange rate volatility can positively influence foreign direct investment net inflow. Remember that FDI net inflow is the difference between capital outflow and capital inflow from abroad. If a high volatility is inclined towards currency depreciation, it becomes cheaper to invest in that country from abroad because the foreign currency is worth more. This can also discourage capital outflow because it gets more expensive to invest abroad. Another channel is what I have already talked about. If the volatility is because the currency is in a floating regime, there is a plausible correlation with good institutional quality, which can sway foreign investors to bring their money to that country.

Unlike FDI inflow, high volatility negatively affects domestic investment. One possible explanation is that this is more likely to occur when FDI clouds out domestic investment, which makes it harder for domestic investors to compete. The same explanation can also be applied to public investment, but the negative impact of high volatility on public investment can give us deeper insights on why central banks in many sub-Saharan African countries prefer managing the value of their currency. Understanding this can also help us understand the reasons behind adjusting exchange rate policies. Most of SSA countries have to borrow money, mainly in the US dollar, to realize major public projects. According to the African Futures journal, about 40% of public dept is external in SSA and over 60% of that dept is in US dollars for most countries. So, the depreciation of a country's currency contributes an increase of public dept, making it a burden to pay back. This can also have a larger effect on the economy, such as inflation and increase in debt services, which is more likely to impose burden on consumers (See Kenya in 2024).

This study uses an instrumental variable approach, utilizing exchange rate regime as an instrument. The relevance of this instrument has been empirically established, demonstrating a robust association between exchange rate volatility and exchange rate regime. However, the exogeneity of the instrument warrants careful consideration. Many sub-Saharan African countries have undergone multiple currency regime changes. Understanding the underlying reasons for these policy shifts is crucial in assessing the potential exogeneity of the exchange rate regime. A key concern is the possibility that changes in currency regimes might affect investment through channels other than exchange rate volatility. For instance, as Abbott

et al. (2012), and Huh et al. (1987) suggest, floating regimes might directly attract FDI by signaling enhanced institutional quality or policy credibility, potentially violating the exogeneity assumption. To mitigate potential biases, the study incorporates controls for institutional quality proxies, such as corruption control, and trade openness. The persistence of significant coefficients on exchange rate volatility, despite the inclusion of additional controls, suggests that the effect of exchange rate volatility is distinct from other factors included in the model.

0.1 Potential exclusion restriction: Why do SSA countries change their currency regime?

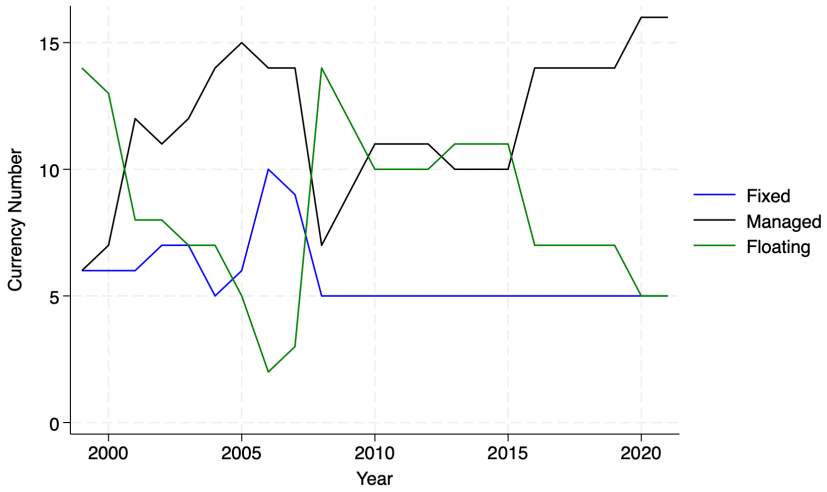
a. Evidence from the existing literature

Central banks adjust their exchange rate policies primarily to stimulate economic activities, which can be achieved through the adoption of majors to regulate a currency's value. These majors can be fiscal policy, monetary policy, exchange rate regulation, or any major that can affect economic performance in a given country. This paper focuses on exchange rate regulation to generally understand the rationale behind exchange rate policy changes. Eduardo Levy-Yeyati and Reggio (2010) empirically test three theoretical frameworks to explain the reasons behind the choice or change of exchange rate arrangements [4]. Their findings indicate that the selection of exchange rate regimes is determined by a combination of trade, financial, and political variables. According to these authors, three theories, which underscore the complex interplay of economic, financial, and political factors, can explain the driving forces behind exchange rate policy changes (See the Appendix section for more granularity).

Currency value misalignment with the actual economic condition have been one of the biggest drivers of policy changes in many countries in the SSA region. Presence of parallel exchange rate market is a sign of that misalignment. Since 1980s, many countries in the SSA have been trying to correct that currency value mismatch with the economic condition by adopting currency unification majors (Rouis et al., 1994). This process basically involves allowing the market to regulate the value of a currency by implementing more flexible or floating exchange rate policy. The successful efforts to float the currency value significantly discouraged parallel market development (South Africa Case). Nonetheless, a good number of countries did not refrain from changing their currency policies more towards intermediate regimes (soft pegs, stabilized regimes, etc) starting late 2000 (Figure 2). The gap between intermediate or managed regimes and floating regimes gets very pronounced between 2001 and

[4]See more details in the appendix section

Figure 3: Currencies by Exchange Rate Regime Over Time:



Notes: Author's computation using exchange rate regime categories. De facto classification by the IMF staff members.

2008 and then after 2015, with a growing inclination toward the intermediate arrangement (Figure 2).

It is worth discussing potential reasons behind this subsequent near-to-proclivity for intermediate regimes. The main potential reason for many countries giving up their commitments to floating arrangement might be due to its failure to provide expected results, currency stability. Rouis et al. (1994) explain that the declining trend of floating regimes in the 1990s is the byproduct of the mixed results of the currency unification efforts in the 1980s. The same authors add that the success of currency unification, by implementing a floating regime, highly depends on supportive monetary and fiscal policy and official credible commitment to the reform (Rouis et al., 1994). The same argument was also emphasized by the IMF paper by Huh et al. (1987), showing that the success of a floating regime is contingent upon effective domestic policies. From that, we can draw a good explanation of the choice of managed regime as a reliable alternative. Esaka (2010) adds that free-floating regimes have greater degree of monetary autonomy than other regimes. Adopting a market regulated exchange rate regime in a nation devoid of the governance and credibility for monetary regimes is likely to produce adverse outcomes such as high inflation and/or currency crisis(Esaka, 2010). For a country without strong institutional quality, but does not also want to give up its independent monetary policy, intermediate regime can be a good back-pocket option.

However, adopting intermediate regimes did not necessarily improve the currency mismatch issues. Managing the currency value was more likely to revitalize parallel foreign

currency markets. Esaka (2010) show that managed regimes tend to lack "verification and transparency" due to heavy government intervention to stabilize the currency value. Many countries in sub-Saharan Africa, including those represented in the sample, have been grappling with foreign reserve shortages and currency depreciation, resulting in a significant disparity between the official exchange rate and the black-market rate. For example, according to the African Futures journal, countries such as Burundi, Ghana, Malawi, Nigeria, South Sudan, and Sierra Leone saw a depreciation of the official exchange rate exceeding 20% between 2022 and 2023 alone. That depreciation was worse in countries with dual exchange rate market, like Burundi, Nigeria, and Ethiopia as the gap between an official and black market exchange rate kept increasingly getting wider. Note that all these countries' exchange rate regimes have been managed for at least the past seven years. However, it is good to be clear that managing currency regime does not always lead to adverse results. It depends on the level of central bank intervention and how fair, economically speaking, that intervention is. It also depends on the government's balance sheets in both domestic and foreign reserves. If the government is facing scarcity of foreign reserves and it has to intervene to regulate exchange rate using those scarce reserves, that intervention will not fully materialize. Another example is when a country has too much debt in foreign currency, foreign reserve scarcity poses a huge debt burden, which can affect the rest of the economy. Nigeria and South Africa cases are the concrete examples.

b. Case study 1: How did Nigeria cope with its declining currency value and foreign reserve scarcity

After a long period of government intervention to stabilize its currency value, Nigeria attempted to adopt a floating regime where the market would only determine the value of the naira. The first attempt was in 2016, which did not succeed due to high inflation and the government's continual intervention despite the policy ratification[5]. Unlike the unrealized 2016 policy, the second announcement of a floating policy took place in the year 2023. Understanding the underlying reasons behind this desire to let the market freely controls the supply and demand of foreign currency is paramount.

Nigeria is a country that heavily dependent on oil exports and imports other goods, including primary commodities. The decline in oil price in 2014 began to cripple the economy, leading to higher inflation and a decrease in the US. dollar reserves amid local currency depreciation[6]. The solution was to alleviate the government's burden in stabilizing the

[5]https://techpoint.africa/2023/06/16/cbn-naira-float-2016-failed/

[6]https://theconversation.com/explainer-nigerias-move-from-a-fixed-to-a-floating-exchange-rate-policy-61588

currency by allowing the market to take over. However, the attempt to float the regime in 2016 did not fully materialize. The Nigerian central bank kept controlling internally the value of the currency and the exchange rate for public purchases (Mondi, 2016). The central bank continued to use its scarce foreign reserve to stabilize the naira, despite the increasing ubiquity of other parallel markets. Parallel markets continued to operate alongside the official exchange rate market, leading to fewer money coming into the central bank given the increased globalization and money transfer technologies.

In 2023, the Nigerian president Tinubu announced a new commitment to the floating regime and vowed to stabilize the value of their local currency, naira, by allowing market forces to unify the official and parallel markets. Like the 2016 policy, the economic consequences of this policy, such as double digit high inflation and depreciation of the naira, were devastating (Okonkwo, 2024)[7]. For example, inflation rose from 29.9% in January 2024 to 32.7% by September 2024. This high inflation, the worst since 1996, was caused by a 230% loss of the value of the naira (Okonkwo, 2024, Asadu, 2024). Despite that, the policy change successfully unified the country's multiple exchange rate markets in the hope of starting to stabilize the naira by attracting foreign investors and increasing accessibility of the dollar on the market (Asadu, 2024)[8].

c. Case study 2: Success story of South Africa's adoption of the floating currency regime

In the year 2000, South Africa central bank changed its exchange rate policy from rigidly managed, which put a heavy burden on the South Africa Reserve Bank, to free floating regime [9]. According to Daniel Mminele, the Deputy Governor of South African Reserve Bank (SARB), the central bank's goal was to eliminate the Net Open Forward Position (NOFP), which augmented up to $25 billion in 1995. The heavy involvement of the South African Reserve Bank (SARB) in the foreign exchange market began in the 1980s, marked by its provision of forward cover to state-owned enterprises and its active role in exchange rate regulation. During this period, both the central government and the SARB engaged in significant interventions in the foreign exchange market. These efforts included extensive forward cover arrangements aimed at mitigating currency depreciation while simultaneously ensuring the accumulation of foreign reserves (mostly in US dollars)(Mminele). However, this accumulation of reserves did not prevent its scarcity, which prompted the central bank

[7]https://dataphyte.com/latest-reports/currency-woes-the-nairas-nadir/

[8]https://apnews.com/article/nigeria-currency-economy-naira-tinubu-cbn-49f5686d9638e9db2ac42ae3cecd2f24

[9]https://theconversation.com/explainer-nigerias-move-from-a-fixed-to-a-floating-exchange-rate-policy-61588

to start borrowing money in dollars to make sure that they had enough of it to curb the depreciation of the local currency. In the early 1990s, the country's foreign debt was around $24 billion in addition to $25 billion of NOFP in 1995 (Mminele). The bank's goal was to eliminate the dual exchange rate market [10], which means abolishing the forward market to allow supply and demand to determine the exchange price.

The central bank announced in 1980 a new policy to allow the market to determine the price of the price of the dollar in the local currency. This policy did not go without adverse consequences: local currency depreciation exacerbated inflation. For example, in 2001, according to Mminele, the rand depreciated by almost 40% against the US dollar. Despite the falling value of the rand, South Africa did not give up its vow and determination to maintain the floating exchange rate regime. This perseverance paid off later on. The central bank had eliminated all NOFP shortly after 2003 and started to accumulate foreign reserves, which was up to $47.9 billion in liquid reserves in 2012. Investors started trusting the new regime and more foreign currency continued pouring in. The increase in foreign direct investment stabilized the currency in the floating regime without extreme adverse consequences such as currency crisis or hyperinflation.

A common theme in these cases is the significant burden associated with effectively managing currency value. Unintended consequences of such efforts include foreign reserve depletion and the emergence of dual foreign exchange markets. Both examples highlight that the primary goal is often to stabilize the currency by establishing a system that garners investor confidence while minimizing the financial strain on the government. As Eduardo Levy-Yeyati and Reggio (2010) explains, in non-industrialized economies, policy shifts are frequently influenced by the composition of foreign assets and liabilities. For instance, local currency appreciation against the U.S. dollar can adversely affect holders of dollar-denominated debt, prompting central banks in these economies to prioritize managing currency depreciation. However, as illustrated by the case of Nigeria, challenges become exacerbated when governments lack sufficient foreign currency reserves to defend their local currency. Regardless of the underlying reasons for shifting policy regimes, central banks typically adjust currency policies to achieve short-term objectives, primarily stabilizing currency values, with the expectation of realizing long-term benefits such as increased investment, enhanced trade, and reduced inflation. Consequently, it is plausible to consider the exchange rate regime as ex-

[10]The Bank mainly conducts spot purchases from the market, funded by both the Bank and the National Treasury (NT). In addition to conducting spot purchases, the Bank utilizes foreign exchange swaps with maturities of up to 12 months (forward market) to fund purchases and for purposes of general domestic money-market liquidity management.

ogenous, implying that its impact on investment operates indirectly through its influence on the exchange rate of the local currency relative to foreign currencies.

0.2 Limitation

The primary limitation of this study lies in the sample size. For an instrumental variable (IV) approach to produce reliable estimates, a sufficiently large sample is crucial. A sample size of approximately 500 observations may not be adequate to fully capture the relationship between instrumented exchange rate volatility and investment. A small sample size can lead to less precise estimates and larger standard errors, which in turn may affect the statistical significance of the results. Also, a small sample can prevent us from establishing external validity. Another potential improvement involves using a substantially larger sample size to carry out the IV estimation. Including a lager sample size to conduct the same analysis is something that future researchers can do to build on this work.

Additionally, the lack of data on bilateral investment is a significant constraint. Understanding how the volatility of a country's exchange rate against the US dollar, for instance, affects investments from countries using the US. dollar could provide more precise insights into the relationship between exchange rate volatility and investment. Also, due to bilateral agreement, some companies or countries can accept to invest in the host country without other considerations other than the signed agreement between the two parties. Being able to isolate shares of FDI only attracted by conditions of the host countries would be another way to effectively reduce aggregation bias in the data. Expanding this study to include bilateral investment data would enhance the analysis.

Finally, the analysis could benefit from using alternative de facto exchange rate regime classifications beyond the IMF's classification. Existing research has shown discrepancies in findings when using the IMF's classification compared to other classifications developed by scholars. Due to data limitations, this study relied solely on the IMF de facto classification. Exploring other regime classifications in future studies could yield additional insights while making a valuable contribution.

VII. Conclusion

This paper addresses factors affecting investment, a core tool for economic growth, in sub-Saharan Africa. It builds on a good number of literature to understand how exchange rate volatility affect that investment. The main contribution to the existing literature lie in the study methodology to establish causal effect. I use a 2SLS instrumental variable

strategy, with a country's currency regime as an instrument. I also use multiple types of investment such as foreign direct investment, net inflow, domestic investment, private and public investment to analyze how each type is affected by exchange rate volatility. Using currency exchange rate regime as an instrument means I am isolating all other endogeneity issues, which helps me analyze the effect of the exchange rate volatility caused by exchange rate regime alone. I find that a positive effect of exchange rate volatility on foreign direct investment and a negative effect on both public and domestic investment. The results also show a very positive association between investment and both improved corruption control majors and trade openness.

The results suggest that higher exchange rate volatility, potentially triggered by a shift in the exchange rate regime, may attract foreign investors. This could happen if foreign investors perceive volatility as an opportunity for higher returns, especially if it signals a move toward a more flexible regime like floating. Such a regime could indicate that the country is committed to market-oriented reforms, making it more attractive to foreign investors. Additionally, currency depreciation during volatile periods might lower the cost of investment for foreign investors in terms of their home currency. Higher exchange rate volatility could deter domestic and public investments because it increases uncertainty in the local economy. For domestic investors, fluctuating exchange rates may make it challenging to plan or secure financing, particularly for businesses relying on imported goods or inputs. For governments, volatility might strain public finances by increasing the cost of external debt servicing (if debt is dollar-denominated).

The implication of these results are important from a policy perspective in sub-Saharan Africa. The literature and empirical findings underscore the pivotal role of institutional quality in ensuring currency stability and attracting investment. Eliminating corruption can increase foreign and domestic investor confidence, reducing the uncertainty and other hurdles deterring both domestic and public investment. Strengthening institutions would help mitigate the negative effects of exchange rate volatility on domestic, private and public investment while enhancing the positive impact on FDI. These efforts would also improve trade and global integration, which in return will create an an economic environment,which attract all investors. However while I give these recommendation based on the results of the study, further studies are still needed. Improving on this study by conducting more analysis at country level with a large sample and conducting more detailed case studies tailored at each country's economic, geographic, political and historical conditions can help in establishing a more firm causal effect that can results in very targeted policy recommendations.

References

Abbott, A., D. O. Cushman, and G. De Vita (2012). Exchange rate regimes and foreign direct investment flows to developing countries. *Review of international economics 20*(1), 95–107.

Acemoglu, D., S. Johnson, J. Robinson, and Y. Thaicharoen (2003). Institutional causes, macroeconomic symptoms: volatility, crises and growth. *Journal of monetary economics 50*(1), 49–123.

Achen, C. H. (1986). *The statistical analysis of quasi-experiments*. Univ of California Press.

Adams, S. (2009). Foreign direct investment, domestic investment, and economic growth in sub-saharan africa. *Journal of policy modeling 31*(6), 939–949.

Agosin, M. R. and R. Machado (2005). Foreign investment in developing countries: does it crowd in domestic investment? *Oxford Development Studies 33*(2), 149–162.

Aizenman, J. (1992). Exchange rate flexibility, volatility, and domestic and foreign direct investment. *Staff Papers (International Monetary Fund) 39*(4), 890–922.

Alfaro, L., S. Kalemli-Ozcan, and V. Volosovych (2008). Why doesn't capital flow from rich to poor countries? an empirical investigation. *The review of economics and statistics 90*(2), 347–368.

Angrist, J. D. and A. B. Krueger (2001). Instrumental variables and the search for identification: From supply and demand to natural experiments. *Journal of Economic perspectives 15*(4), 69–85.

Asiedu, E. and J. Freeman (2009). The effect of corruption on investment growth: Evidence from firms in latin america, sub-saharan africa, and transition countries. *Review of Development Economics 13*(2), 200–214.

Azhar, A., N. Ullah, and Q. A. Malik (2015). Effect of exchange rate volatility on foreign direct investment in saarc countries. *Middle-East Journal of Scientific Research 23*(2), 350–356.

Bertrand, O. and M.-A. Betschinger (2024). Exploring the relationship between development aid and fdi from developed countries in developing countries: empirical insights from japanese firm-level data. *Journal of International Business Studies*, 1–14.

Bleaney, M. and M. Francisco (2007). Classifying exchange rate regimes: a statistical analysis of alternative methods. Technical report, CREDIT Research Paper.

Bleaney, M. and D. Greenaway (2001). The impact of terms of trade and real exchange rate volatility on investment and growth in sub-saharan africa. *Journal of development Economics 65*(2), 491–500.

Campa, M. J. (1993). Entry by foreign firms in the united states under exchange rate uncertainty. *Review of Economics and Statistics 75*, 614–622.

Cantah, W. G., E. A. Wiafe, and A. Adams (2013). Foreign direct investment and trade policy openness in sub-saharan africa.

Chen, F. and G. Jiang (2023). The impact of institutional quality on foreign direct investment: empirical analysis based on mediating and moderating effects. *Economic research-Ekonomska istraživanja 36*(2).

Crosby, D. A., C. J. Dowsett, L. A. Gennetian, and A. C. Huston (2010). A tale of two methods: comparing regression and instrumental variables estimates of the effects of preschool child care type on the subsequent externalizing behavior of children in low-income families. *Developmental psychology 46*(5), 1030.

Cunningham, S. (2021). *Causal inference: The mixtape*. Yale university press.

Cushman, D. O. (1985). Real exchange rate risk, expectations, and the level of foreign direct investment. *Review of Economics and Statistics 67*, 297–308.

Eduardo Levy-Yeyati, F. S. and I. Reggio (2010). On the endogeneity of exchange rate regimes. *European Economic Review 54*(5), 659–677.

Esaka, T. (2010). Exchange rate regimes, capital controls, and currency crises: Does the bipolar view hold? *Journal of International Financial Markets, Institutions and Money 20*(1), 91–108.

Fischer, S. (2001). Distinguished lecture on economics in government: Exchange rate regimes: Is the bipolar view correct? *The Journal of Economic Perspectives 15*(2), 3–24.

for Africa, U. N. E. C. et al. (2006). Economic report on africa 2006: capital flows and development financing in africa. *(No Title)*.

Goldberg, L. S. and C. Kolstad (1995). Foreign direct investment, exchange rate variability, and demand uncertainty. *International Economic Review 36*, 855–873.

Gorg, H. and K. Wakelin (2002). The impact of exchange rate volatility on us direct investment. *The Manchester School 70*, 380–397.

Hanusch, M., H. Nguyen, and Y. Algu (2018). Exchange rate volatility and fdi inflows.

Heckscher, E. and B. Ohlin (1933). *Interregional and International Trade*. Harvard University Press.

Huh, K. M., B. V. Christensen, P. J. Quirk, and T. Sasaki (1987). Floating exchange rates in developing countries: Experience with auction and interbank markets. In *Floating Exchange Rates in Developing Countries*. International Monetary Fund.

Ibrahim, M., E. Kumi, and T. Yeboah (2015). Greasing or sanding the wheels? effect of corruption on economic growth in sub-saharan africa. *African Journal of Economic and Sustainable Development 4*(2), 157–173.

Kandiero, T. and M. Chitiga (2006). Trade openness and foreign direct investment in africa: economics. *South African Journal of Economic and Management Sciences 9*(3), 355–370.

Latief, R. and L. Lefen (2018). The effect of exchange rate volatility on international trade and foreign direct investment (fdi) in developing countries along "one belt and one road". *International Journal of Financial Studies 6*, 86.

Levy-Yeyati, E. and F. Sturzenegger (2003). To float or to fix: Evidence on the impact of exchange rate regimes on growth. *American economic review 93*(4), 1173–1193.

Menil, G. D. (1999). Real capital market integration: How far has integration gone? what euro effect? *Economic Policy 14*, 167–201.

Miguel, E., S. Satyanath, and E. Sergenti (2004). Economic shocks and civil conflict: An instrumental variables approach. *Journal of political Economy 112*(4), 725–753.

Muhammad, S. D., N. P. Azu, and N. F. Oko (2018). Influence of real exchange rate and volatility on fdi inflow in nigeria. *International Business Research 11*(6), 73–82.

Nath, H. K. (2009). Trade, foreign direct investment, and growth: Evidence from transition economies. *Comparative Economic Studies 51*, 20–50.

Ndikumana, L. and S. Verick (2008). The linkages between fdi and domestic investment: Unravelling the developmental impact of foreign investment in sub-saharan africa. *Development Policy Review 26*(6), 713–726.

Osinubi, T. S. and L. A. Amaghionyeodiwe (2009). Foreign direct investment and exchange rate volatility in nigeria. *International journal of applied econometrics and quantitative studies 6*(2), 83–116.

Petreski, M. (2009). Exchange-rate regime and economic growth: a review of the theoretical and empirical literature. *Economics Discussion Paper* (2009-31).

Robert E. Lucas, J. (1990). Why doesn't capital flow from rich to poor countries? *American Economic Review 80*(2), 92–96.

Rogoff, M. K., M. A. Mody, N. Oomes, M. R. Brooks, and M. A. M. Husain (2003). *Evolution and performance of exchange rate regimes*. International monetary fund.

Rouis, M., W. Razzak, and C. Mollinedo (1994). *The Supply Response to Exchange Rate Reform in Sub-Saharan Africa:(empirical Evidence)*, Volume 1311. World Bank Publications.

Russ, K. (2007). The endogeneity of the exchange rate as a determinant of fdi: A model of entry and multinational firms. *Journal of International Economics 71*, 344–372.

Saha, S., M. N. Sadekin, and S. K. Saha (2022). Effects of institutional quality on foreign direct investment inflow in lower-middle income countries. *Heliyon 8*(10).

Sauvant, K. P. (2015). Attracting foreign direct investment and benefiting from it: Challenges for the least developed countries. *Transnational Corporations Review 7*(2), 125–127.

Solow, R. M. (1956). A contribution to the theory of economic growth. *The quarterly journal of economics 70*(1), 65–94.

Swan, T. W. (1956). Economic growth and capital accumulation. *Economic Record 32*(2), 334–361.

Udomkerdmongkol, M., O. Morrissey, and H. Gorg (2009). Exchange rates and outward foreign direct investment: Us fdi in emerging economies. *Review of Development Economics 13*, 754–764.

Vita, G. D. and A. J. Abbott (2007). Do exchange rates have any impact upon uk inward foreign direct investment? *Applied Economics 39*, 2553–2564.

Zhao, J. H., S. H. Kim, and J. Du (2003). The impact of corruption and transparency on foreign direct investment: An empirical analysis. *MIR: Management International Review*, 41–62.

Appendix

A Reasons behind currency regime change: Additional theoretical notes

The first theory is the optimal currency areas theory, which identifies geographical and trade aspects that inform exchange regime change. This is mostly common in countries that engage in international trade. They can chose to have a fixed exchange rate or floating one based on whether they are export or import oriented and who they trade with. For example, it makes sense for a country whose main trade partners in Europe to fixed their exchange rate to the Euro.

The second perspective is the financial view, rooted in the Mundell-Fleming framework, often referred to as the "impossible trinity"[11] and currency mismatch, particularly in financially dollarized economies (see Yeyati et al. 2010).Through their empirical analysis, Yeyati et al. find that in non-industrialized economies, it is challenging to distinguish between the impossible trinity and currency mismatch, both of which significantly influence the choice of exchange rate regime. They use a country's foreign liabilities as a proxy for currency mismatch, indicating that countries' incentives to change policy can vary depending on whether they hold foreign assets or liabilities. For instance, an appreciation of the local currency against the dollar can harm dollar debtors, making it more advantageous for central banks in those countries to fix the exchange rate

Ultimately, the choice of an exchange rate regime is significantly influenced by a country's political structure. In the context of non-industrial economies, institutional quality and sustainability considerations play a crucial role in shaping exchange rate policy decisions. Governments often utilize exchange rate regimes as a tool to manage inflation. For example, research has shown that governments facing economic pressures may opt for a pegged exchange rate as a means to reduce inflation. This is supported by empirical analyses, such as those conducted by Yeyati and his colleagues, which indicate that the selection of an exchange rate regime is subject to a multitude of factors beyond merely boosting investments. Countries must navigate various trade-offs when deciding on an exchange rate policy, and the choice of a particular arrangement is contingent upon the specific economic challenges they aim to address. This decision-making process is centered around the exchange rate,

[11]Mundel-Flemming framework assuming a perfect capital mobility states that monetary policy in open economies cannot be aimed at both maintaining stable exchange rates and reducing changes in output due to productivity shock. Policymakers can choose at most two out of the three vertexes of the trinity (capital mobility, monetary policy and a fixed exchange rate).

which is a key variable directly correlated with the chosen exchange rate policy regime.

B Appendix: Additional Tables and Figures

Table 6: Regression Table: Foreign Direct Investment Net Inflow

	FDI:OLS			FDI:IV-2SLS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Exchange Rate Volatility	0.148	0.170	0.040	0.384***	0.523**	1.016	1.816
	(0.097)	(0.105)	(0.094)	(0.141)	(0.256)	(0.628)	(1.128)
GDP per Capita Growth			0.036		0.238**	0.267**	0.255
			(0.060)		(0.103)	(0.114)	(0.183)
Gross Domestic Saving			0.042				-0.017
			(0.041)				(0.082)
Broad Money Growth			0.027				-0.015
			(0.017)				(0.045)
Electrification			0.033			-0.085*	0.021
			(0.042)			(0.045)	(0.067)
Corruption control			0.063		0.612	1.195	0.520
			(0.697)		(0.707)	(1.022)	(1.397)
Total N.Resource Rents			-0.103			0.088	-0.037
			(0.072)			(0.075)	(0.099)
Crop Prod. Index			0.026				0.075
			(0.018)				(0.047)
Inflation			0.090*			-0.113	-0.140
			(0.053)			(0.078)	(0.159)
Marchandise Trade(%gdp)			0.094***				0.061
			(0.030)				(0.042)
N	510	510	355	510	456	439	355
Currency fixed-effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed-effects	No	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.039	0.341	0.528	0.277	0.197	0.010	.

Robust standard errors are in parentheses; it is important to use robust due to potential serial correlation, which can lead to understated standard errors and inflated statistical significance. Model 1-3 are estimated with simple OLS. The dependent variable isNet Foreign direct investment inflow (percentage of GDP). The sample include 27 currencies, from 1999-2017, used in 36 sub-Saharan African countries.The Stars are significant level where * 0.10 ** 0.05 *** 0.01.

Table 7: Regression Table: Domestic Investment

	GDI:OLS			GDI:IV-2SLS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Exchange Rate Volatility	-0.114*	-0.017	0.072	-1.075**	-1.293*	-2.743	-2.144*
	(0.058)	(0.055)	(0.083)	(0.461)	(0.724)	(1.671)	(1.286)
GDP per Capita Growth			-0.131*		-0.243	-0.176	-0.405*
			(0.075)		(0.202)	(0.223)	(0.232)
Gross Domestic Saving			0.183***				0.257***
			(0.068)				(0.078)
Broad Money Growth			-0.028				0.025
			(0.018)				(0.059)
Electrification			-0.024			0.034	-0.008
			(0.056)			(0.125)	(0.080)
Corruption control			2.701***		3.582**	4.423	2.130
			(0.937)		(1.792)	(3.790)	(1.951)
Total N.Resource Rents			-0.032				-0.114
			(0.062)				(0.134)
Crop Prod. Index			0.041**				-0.020
			(0.020)				(0.054)
Inflation			-0.056			0.361*	0.231
			(0.049)			(0.216)	(0.175)
Marchandise Trade(%gdp)			0.126***				0.167***
			(0.024)				(0.047)
N	450	450	355	450	406	389	355
Currency fixed-effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed-effects	No	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.006	0.475	0.696	0.049	.	.	.

Robust standard errors are in parentheses; it is important to use robust due to potential serial correlation, which can lead to understated standard errors and inflated statistical significance. Model 1-3 are estimated with simple OLS. The dependent variable is Gross Domestic investment (percentage of GDP). The sample include 27 currencies, from 1999-2017, used in 36 sub-Saharan African countries.The Stars are significant level where * 0.10 ** 0.05 *** 0.01.

Table 8: Private Investment

	Priv-Inv:OLS			Priv-Inv:IV-2SLS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Exchange Rate Volatility	0.137	0.199	-0.000	-0.092	-0.091	-0.439	-0.299
	(0.169)	(0.133)	(0.115)	(0.262)	(0.321)	(0.634)	(0.940)
GDP per Capita Growth			-0.011		0.015	0.016	-0.045
			(0.110)		(0.122)	(0.122)	(0.154)
Gross Domestic Saving			-0.047				-0.037
			(0.077)				(0.077)
Broad Money Growth			-0.003				0.005
			(0.023)				(0.036)
Electrification			-0.051			-0.112	-0.047
			(0.074)			(0.081)	(0.064)
Corruption control			1.447		2.665**	3.550***	1.464
			(1.379)		(1.234)	(1.373)	(1.342)
Total N.Resource Rents			-0.016			-0.032	-0.034
			(0.105)			(0.101)	(0.114)
Crop Prod. Index			0.027				0.020
			(0.027)				(0.038)
Inflation			0.058			0.066	0.093
			(0.038)			(0.078)	(0.108)
Marchandise Trade(%gdp)			0.262***				0.267***
			(0.038)				(0.037)
N	494	494	346	494	442	425	346
Currency fixed-effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed-effects	No	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.005	0.754	0.819	0.736	0.777	0.764	0.814

Robust standard errors are in parentheses; it is important to use robust due to potential serial correlation, which can lead to understated standard errors and inflated statistical significance. Model 1-3 are estimated with simple OLS. The dependent variable is Private Investment (percentage of GDP). The sample include 27 currencies, from 1999-2017, used in 36 sub-Saharan African countries.The Stars are significant level where * 0.10 ** 0.05 *** 0.01.

Table 9: Public Investment

	Pub-Inv:OLS			Pub-Inv:IV-2SLS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Exchange Rate Volatility	-0.071**	-0.063**	0.035	-0.484***	-0.661**	-1.372**	-1.364
	(0.029)	(0.024)	(0.076)	(0.166)	(0.271)	(0.637)	(0.854)
GDP per Capita Growth			-0.000		-0.081	-0.051	-0.159
			(0.088)		(0.121)	(0.133)	(0.156)
Gross Domestic Saving			0.007				0.052
			(0.044)				(0.064)
Broad Money Growth			0.006				0.045
			(0.013)				(0.035)
Electrification			0.033			0.058	0.052
			(0.045)			(0.068)	(0.063)
Corruption control			3.984***		3.583***	4.117***	4.063***
			(0.862)		(0.956)	(1.439)	(1.394)
Total N.Resource Rents			0.000			-0.170*	-0.081
			(0.062)			(0.097)	(0.114)
Crop Prod. Index			0.029*				-0.006
			(0.016)				(0.033)
Inflation			-0.040*			0.157**	0.125
			(0.024)			(0.078)	(0.100)
Marchandise Trade(%gdp)			0.067**				0.090**
			(0.033)				(0.042)
N	494	494	346	494	442	425	346
Currency fixed-effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed-effects	No	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.008	0.549	0.624	0.338	0.300	.	.

Robust standard errors are in parentheses; it is important to use robust due to potential serial correlation, which can lead to understated standard errors and inflated statistical significance. Model 1-3 are estimated with simple OLS. The dependent variable is Public Investment (percentage of GDP). The sample include 27 currencies, from 1999-2017, used in 36 sub-Saharan African countries.The Stars are significant level where * 0.10 ** 0.05 *** 0.01.

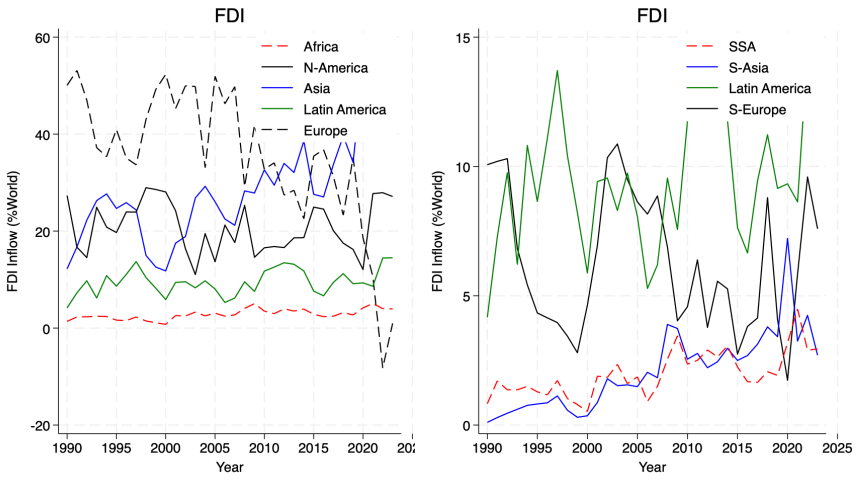
Table 10: FDI and DI, with Lagged Volatility

	(1) FDI-Inflow	(2) FDI-Inflow	(3) FDI-Inflow	(4) GDI	(5) GDI	(6) GDI
Exchange Rate Volatility(t-1)	0.065	0.082*	-0.005	-0.108*	-0.022	-0.004
	(0.042)	(0.042)	(0.052)	(0.063)	(0.049)	(0.043)
GDP per Capita Growth			0.031			-0.140*
			(0.059)			(0.076)
Gross Domestic Saving			0.043			0.186***
			(0.040)			(0.068)
Broad Money Growth			0.028			-0.026
			(0.017)			(0.019)
Electrification			0.034			-0.023
			(0.042)			(0.056)
Corruption control			0.046			2.677***
			(0.699)			(0.945)
Total N.Resource Rents			-0.104			-0.035
			(0.072)			(0.062)
Crop Prod. Index			0.025			0.039*
			(0.018)			(0.021)
Inflation			0.096*			-0.046
			(0.054)			(0.051)
Marchandise Trade(%gdp)			0.094***			0.127***
			(0.030)			(0.024)
N	483	483	355	428	428	355
Currency fixed-effects	No	Yes	Yes	No	Yes	Yes
Time Fixed-effects	No	Yes	Yes	No	Yes	Yes
R^2	0.008	0.354	0.527	0.006	0.467	0.695

Robust standard errors are in parentheses. The models are estimated with OLS with one year lag of exchange rate volatility.The outcome variables are expressed as percentage of GDP. The sample include 27 currencies, used in 36 sub-Saharan African countries covering a period of 1999-2017.The Stars are significant level where * 0.10 ** 0.05 *** 0.01.

High natural resource rents can discourage investments because they are more likey to lead to economic volatility such as Dutch disease, which causes currency overvaluation, weak governance or high likelihood of venality(natural resource curse), and limited economic diversification, preventing investments in other sectors. These can explain why we observe

Figure 4: FDI-Inflows Across Regions, Average(1990-2023)



Notes: Author's calculations using data from the UNCTAD

negative relationships between investments and total natural resource rents.

Figure 5 plots exchange rate volatility over time for certain countries in my sample. These countries switched from floating exchange rate arrangements to another type of exchange rate arrangement (managed or fixed). In the period before the red line, a country's regime is floating. The country has adopted another regime after the red line. In all of these countries, we observe a higher level of volatility when their exchange rate regime is floating. After changing from floating to another regime, we observe a direct change in pattern or a direct feedback.

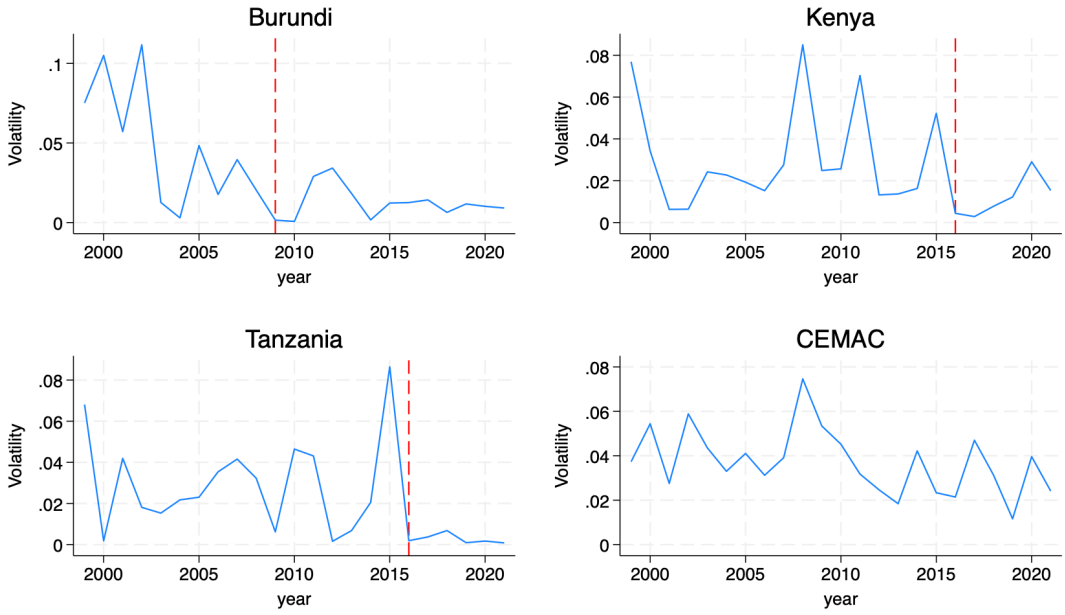
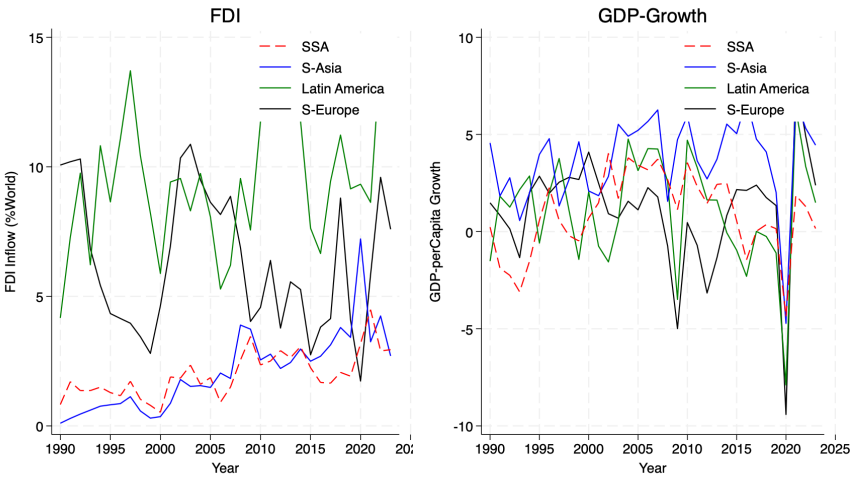


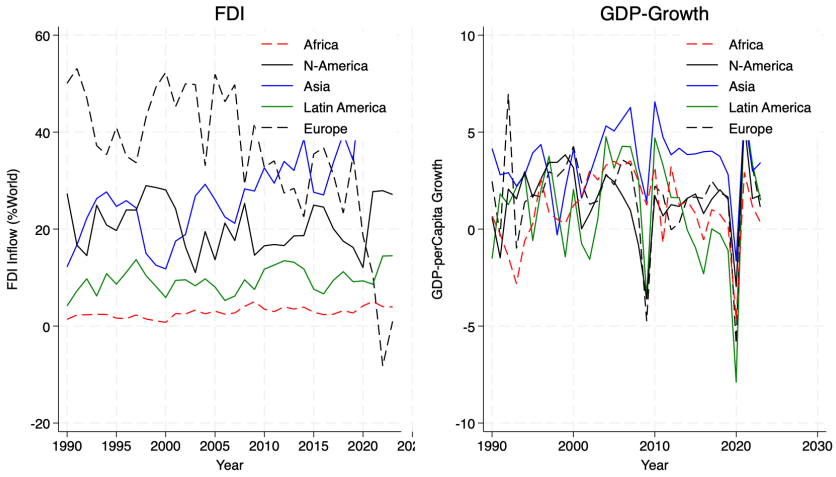
Figure 5: Country level Exchange Rate Volatility

Figure 6: FDI-Inflows and Per Capita GDP growth Across Regions, Average(1990-2023)



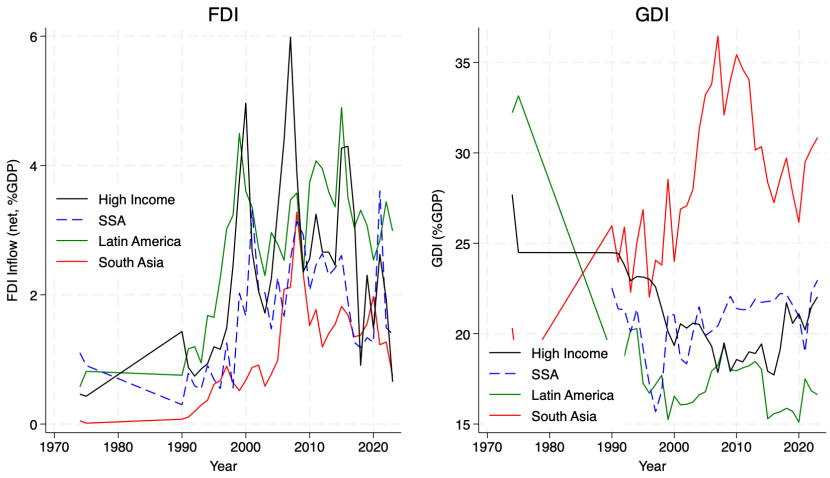
Notes: Author's calculations using data from the UNCTAD

Figure 7: FDI-Inflows and Per Capita GDP growth Across Regions/Continents, Average(1990-2023)



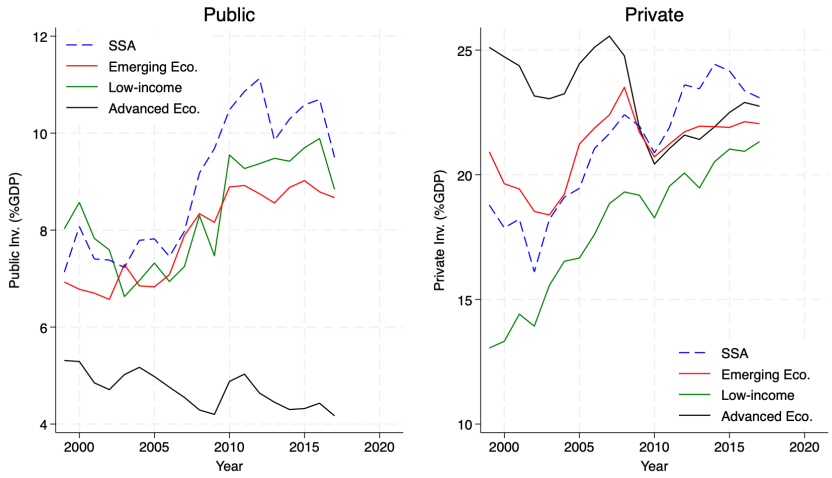
Notes: Author's calculations using data from the UNCTAD

Figure 8: FDI and GDI Across Regions, Average(197-2023)



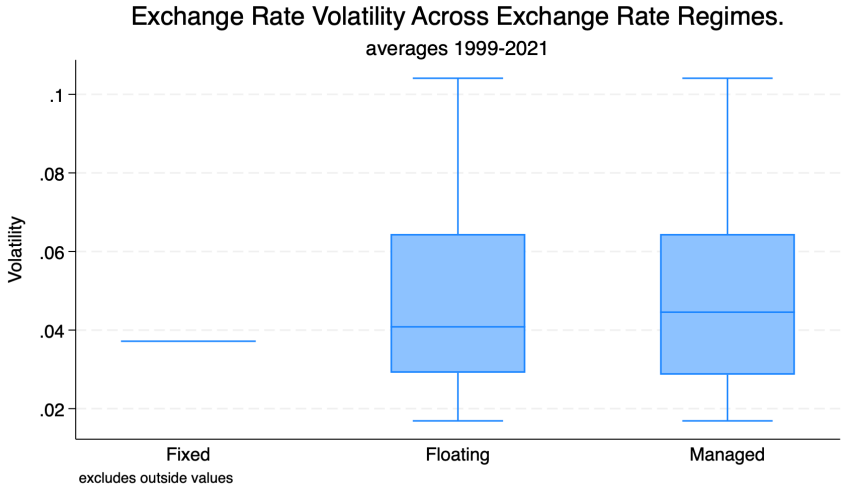
Notes: Author's calculations using data from the WorldBank Development Indicator

Figure 9: Private and Public Investment Across Regions, Average(199-2017)



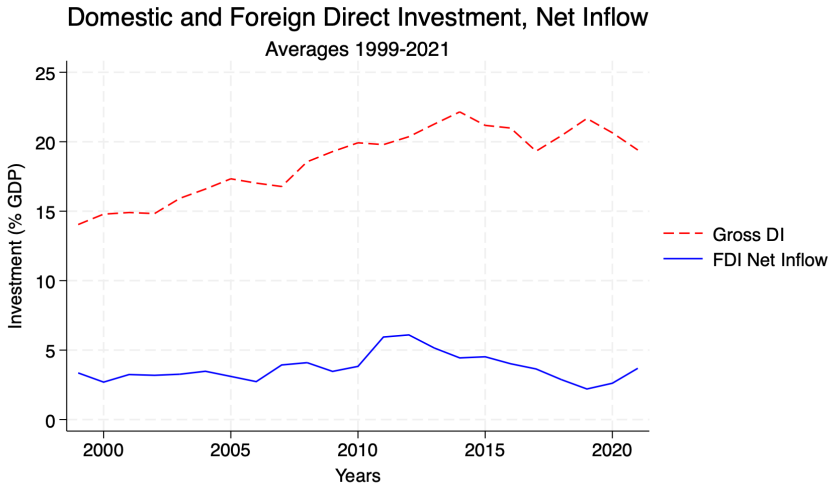
Notes: Author's calculations using data from the WorldBank Development Indicator and IMF

Figure 10: FDI and Exchange Rate Regime



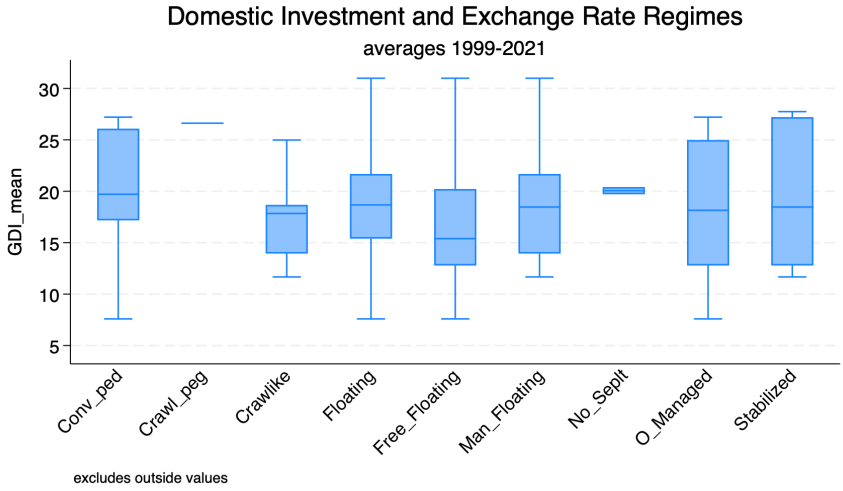
Notes: Author's calculations using data from the WorldBank, and IMF.

Figure 11: FDI-Net Inflow and Gross Domestic Investment



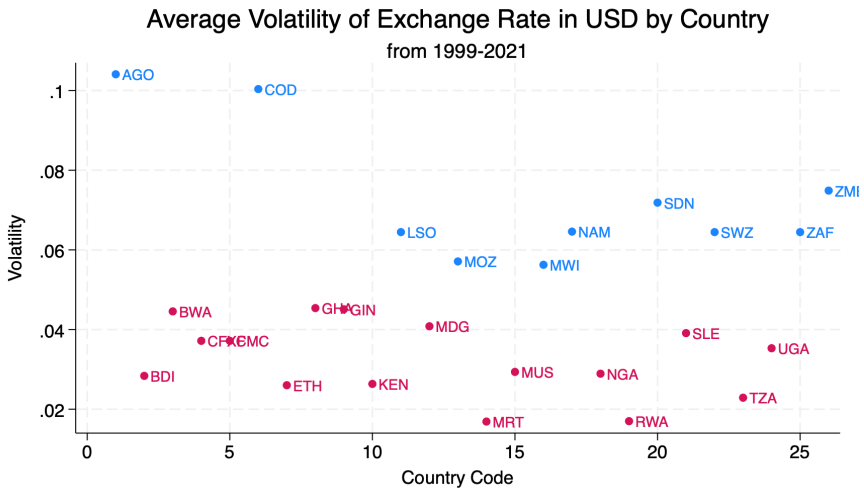
Notes: Author's calculations using data from the WorldBank, and IMF.

Figure 12: GDI and Exchange Rate Regime



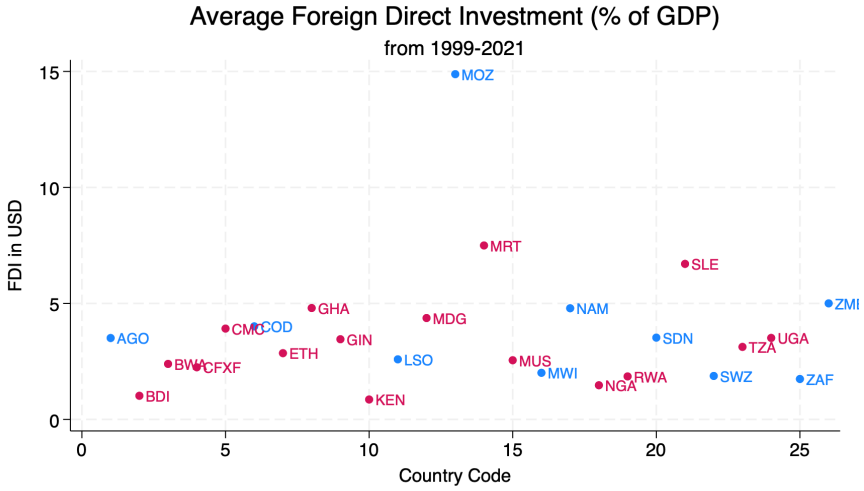
Notes: Author's calculations using data from the WorldBank, and IMF.

Figure 13: Volatility



Notes: Author's calculations using data from the WorldBank, and IMF.

Figure 14: FDI



Notes: Author's calculations using data from the WorldBank, and IMF.

Table 11: Summary Statistics on Country Level

	Advanced Economy	Angola	Botswana	Burundi	CEMAC	CFA$_XOF$	Cote d'Ivoire	DR Congo	Emerging Economy	Equatorial Guinea	Eswatini	Ethiopia	Ghana	Guinea	Kenya	Lesotho	Low Income Developing	Madagascar	Malawi	Mauritania	Mauritius	Mozambique	Namibia	Nigeria	Rwanda	Sierra Leone	South Africa	Sudan	Tanzania	Uganda	Zambia	Total
FDI-Inflow(%GDP)	.	3.51	2.39	1.02	3.92	2.25	1.24	4.01	.	.	1.87	2.86	4.80	3.46	0.86	2.59	.	4.37	2.01	7.50	2.55	14.88	4.79	1.47	1.85	6.70	1.74	3.53	3.12	3.51	5.00	3.63
	(.)	(11.85)	(2.18)	(2.04)	(2.30)	(1.03)	(0.30)	(3.51)	(.)	(.)	(2.25)	(1.66)	(2.62)	(4.83)	(0.84)	(1.50)	(.)	(3.51)	(1.96)	(7.85)	(1.60)	(11.82)	(3.31)	(0.77)	(1.28)	(6.96)	(2.07)	(1.20)	(1.25)	(1.22)	(2.23)	(5.04)
G.Domestic Investment(%GDP)	.	27.21	26.62	11.67	20.41	19.71	17.07	12.78	.	.	13.77	13.94	16.31	18.47	18.67	26.08	.	15.40	.	24.98	19.60	21.68	17.17	.	17.84	7.59	15.22	13.58	27.75	20.22	30.99	18.63
	(.)	(6.26)	(5.26)	(5.26)	(3.87)	(1.88)	(4.09)	(6.91)	(.)	(.)	(3.50)	(17.74)	(6.70)	(6.75)	(2.01)	(4.15)	(.)	(4.39)	(.)	(10.39)	(3.29)	(9.17)	(4.49)	(.)	(4.26)	(5.04)	(3.39)	(5.73)	(7.95)	(3.46)	(5.24)	(8.35)
Public Investment(%GDP)	4.70	10.69	17.43	4.82	7.36	8.28	5.51	3.31	7.89	18.83	11.82	17.22	7.96	7.03	5.04	15.45	8.34	5.95	7.34	.	8.92	13.32	12.38	3.79	10.21	6.71	4.07	6.86	8.00	9.77	7.91	8.90
	(0.37)	(5.32)	(4.23)	(2.79)	(4.00)	(1.57)	(2.66)	(3.60)	(0.93)	(9.41)	(2.71)	(7.74)	(4.47)	(9.26)	(2.62)	(7.07)	(1.08)	(2.19)	(3.39)	(.)	(2.11)	(4.97)	(2.86)	(1.29)	(2.79)	(4.24)	(0.46)	(3.58)	(1.60)	(1.85)	(3.64)	(5.78)
Private Investment(%GDP)	23.16	29.44	34.93	6.10	19.24	16.46	11.08	12.01	21.08	19.82	18.25	16.34	47.60	9.90	15.46	19.25	17.87	13.94	9.92	.	23.19	15.02	29.69	11.95	10.51	9.83	21.75	40.45	35.69	27.48	37.32	20.82
	(1.54)	(10.89)	(7.82)	(1.92)	(3.03)	(2.77)	(3.00)	(5.19)	(1.40)	(11.78)	(8.33)	(10.31)	(14.27)	(4.44)	(2.66)	(2.58)	(2.72)	(6.25)	(4.06)	(.)	(2.63)	(14.31)	(11.32)	(5.11)	(3.91)	(7.72)	(2.98)	(10.60)	(8.66)	(3.66)	(8.56)	(12.40)
Volatility-ExRate(to USD)	.	10.41	4.46	2.84	3.72	3.72	3.72	10.04	.	.	6.45	2.60	4.54	4.51	2.63	6.45	.	4.08	5.63	1.69	2.94	5.71	6.46	2.89	1.70	3.91	6.45	7.19	2.29	3.53	7.49	4.74
	(.)	(16.87)	(2.51)	(3.16)	(1.46)	(1.46)	(1.46)	(18.58)	(.)	(.)	(3.38)	(2.90)	(5.41)	(5.28)	(2.31)	(3.38)	(.)	(3.30)	(7.05)	(1.29)	(1.46)	(4.81)	(3.27)	(4.50)	(1.54)	(3.50)	(3.38)	(13.15)	(2.34)	(2.47)	(5.30)	(6.65)
Per Capita GDP Growth	.	1.06	1.64	-0.94	0.41	1.52	0.96	1.01	.	.	2.38	5.51	3.16	2.09	1.49	1.39	.	-0.02	1.31	0.75	2.80	3.39	1.55	2.31	4.80	2.32	1.23	-0.14	2.97	2.83	2.14	1.85
	(.)	(5.48)	(6.06)	(2.03)	(2.11)	(1.27)	(4.42)	(3.78)	(.)	(.)	(2.46)	(3.55)	(2.75)	(2.50)	(2.34)	(3.50)	(.)	(4.63)	(2.81)	(4.42)	(4.02)	(3.41)	(3.90)	(3.61)	(3.36)	(8.39)	(2.61)	(3.82)	(1.31)	(2.22)	(2.57)	(3.94)
G.Domestic Saving	.	42.11	31.20	-6.28	29.94	11.09	19.96	12.84	.	.	11.14	20.46	9.19	15.92	9.62	-25.54	.	11.09	.	21.94	17.02	9.88	10.85	.	4.81	-5.34	18.54	20.77	25.28	14.12	38.63	14.60
	(.)	(8.25)	(8.28)	(3.88)	(4.26)	(2.71)	(3.58)	(6.69)	(.)	(.)	(4.54)	(2.15)	(7.48)	(19.08)	(3.01)	(7.43)	(.)	(3.91)	(.)	(12.15)	(6.10)	(4.12)	(7.37)	(.)	(4.93)	(7.55)	(1.56)	(13.21)	(6.44)	(5.42)	(6.23)	(14.78)
Board Money Growth	.	75.35	13.77	19.18	10.95	12.47	10.78	35.82	.	.	11.33	16.83	29.75	24.02	12.77	10.46	.	14.07	26.45	12.92	10.68	19.97	13.50	22.53	16.48	17.72	10.88	35.96	16.79	16.09	23.11	20.05
	(.)	(121.35)	(15.26)	(10.46)	(8.01)	(6.28)	(12.15)	(18.56)	(.)	(.)	(8.58)	(4.55)	(10.95)	(25.30)	(6.02)	(10.77)	(.)	(7.09)	(11.87)	(6.83)	(5.05)	(10.46)	(11.89)	(19.11)	(7.34)	(26.99)	(6.34)	(25.24)	(8.26)	(7.41)	(16.82)	(29.90)
Electrification	.	35.73	49.37	5.85	49.62	31.36	58.98	13.43	.	.	50.55	27.81	63.12	28.52	36.28	22.38	.	20.10	8.73	33.50	99.35	18.03	44.61	51.28	18.47	16.20	81.88	39.27	19.89	19.14	28.20	36.07
	(.)	(7.86)	(16.34)	(2.67)	(6.09)	(7.75)	(6.84)	(4.63)	(.)	(.)	(19.61)	(13.82)	(15.31)	(9.76)	(19.49)	(15.59)	(.)	(7.36)	(3.49)	(9.21)	(0.30)	(8.80)	(6.45)	(4.94)	(14.63)	(6.10)	(5.14)	(12.35)	(11.18)	(12.70)	(9.37)	(24.15)
Corruption control	.	-1.27	0.87	-1.21	-1.12	-0.48	-0.83	-1.44	.	.	-0.18	-0.61	-0.14	-1.04	-0.96	-0.01	.	-0.58	-0.61	-0.67	0.29	-0.64	0.30	-1.17	0.17	-0.80	0.10	-1.33	-0.57	-0.98	-0.54	-0.57
	(.)	(0.19)	(0.17)	(0.24)	(0.06)	(0.09)	(0.30)	(0.09)	(.)	(.)	(0.16)	(0.14)	(0.12)	(0.12)	(0.10)	(0.16)	(.)	(0.36)	(0.20)	(0.24)	(0.12)	(0.15)	(0.15)	(0.14)	(0.51)	(0.20)	(0.23)	(0.17)	(0.17)	(0.11)	(0.16)	(0.60)
Totoal N. Resource Rents	.	34.18	2.07	21.74	18.86	6.33	3.68	23.51	.	.	3.24	16.30	11.30	13.94	2.91	4.63	.	5.79	7.55	14.31	0.03	10.84	1.89	12.95	6.06	10.59	5.14	8.84	5.23	11.82	14.08	10.29
	(.)	(10.75)	(1.76)	(7.57)	(5.75)	(1.69)	(1.14)	(6.49)	(.)	(.)	(0.76)	(7.48)	(2.53)	(4.39)	(0.98)	(1.13)	(.)	(1.56)	(2.11)	(11.29)	(0.04)	(3.35)	(1.25)	(5.25)	(1.26)	(2.36)	(2.07)	(4.38)	(1.11)	(3.36)	(6.19)	(8.93)
Crop Prod. Index	.	74.75	93.14	98.52	81.17	84.87	86.52	74.43	.	.	93.39	73.11	85.05	88.02	89.28	108.14	.	93.20	77.62	81.99	105.17	101.64	90.20	87.03	97.81	80.89	96.92	106.27	74.19	112.61	83.74	89.26
	(.)	(32.10)	(28.73)	(13.43)	(20.68)	(30.17)	(21.61)	(28.29)	(.)	(.)	(9.10)	(28.90)	(24.19)	(25.00)	(20.96)	(18.49)	(.)	(13.08)	(30.93)	(26.20)	(16.46)	(25.64)	(16.44)	(17.73)	(15.57)	(28.49)	(12.73)	(19.56)	(24.11)	(19.32)	(30.56)	(25.04)
Inflation	.	54.78	6.64	8.69	2.23	1.85	2.17	73.13	.	.	6.79	12.76	15.52	14.88	8.57	4.89	.	8.64	16.07	4.76	4.47	7.77	5.33	12.09	5.82	10.00	5.17	41.93	6.74	6.04	14.13	13.07
	(.)	(82.70)	(2.85)	(7.07)	(1.56)	(2.17)	(1.74)	(149.77)	(.)	(.)	(2.75)	(11.34)	(9.56)	(8.45)	(4.95)	(8.82)	(.)	(4.16)	(9.30)	(2.62)	(2.48)	(5.11)	(2.00)	(3.75)	(4.78)	(4.18)	(2.21)	(76.73)	(3.23)	(4.17)	(6.77)	(37.44)
Food Prod Index	.	76.67	102.86	97.27	81.75	85.63	86.37	75.56	.	.	93.15	77.83	84.97	85.83	89.76	101.00	.	93.12	76.42	87.96	100.35	100.82	98.12	87.27	94.16	79.95	88.99	103.57	75.66	105.77	81.03	89.02
	(.)	(29.73)	(12.60)	(14.02)	(20.15)	(27.60)	(18.96)	(27.12)	(.)	(.)	(9.50)	(26.12)	(23.91)	(25.61)	(17.90)	(7.94)	(.)	(11.91)	(35.34)	(14.51)	(8.90)	(24.93)	(4.36)	(17.28)	(16.56)	(28.56)	(14.57)	(11.77)	(24.88)	(14.77)	(29.59)	(22.45)
Marchandise Trade	.	82.40	84.43	31.10	55.00	42.15	47.21	38.99	.	.	99.88	29.57	58.97	48.23	35.84	131.27	.	42.08	35.96	66.73	68.28	59.97	86.06	31.17	28.36	42.89	47.63	31.82	28.35	30.17	61.61	53.56
	(.)	(18.18)	(12.09)	(7.17)	(10.52)	(4.44)	(7.74)	(10.55)	(.)	(.)	(23.57)	(7.61)	(16.80)	(19.78)	(7.87)	(13.87)	(.)	(7.08)	(6.59)	(15.71)	(10.07)	(20.16)	(15.46)	(8.44)	(9.66)	(17.74)	(6.64)	(6.94)	(8.14)	(5.10)	(8.74)	(27.75)

This is a summary table per country's currency level. Standard errors are in parenthesis