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Volatile capital flows and economic growth in sub-Saharan Africa: the role of transparency

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Abstract

The study set out to investigate whether transparency can mitigate the negative effects volatile capital flows have on growth using cross-section panel data from 21 sub-Saharan African countries from 2000 to 2019. Using the IVQR model, the study finds that at 75th quantile, poor growth performance in SSA is explained mostly by the volatility in debt net inflows compared to other categories of capital, while portfolio net inflow contributes most significantly to the low-level growth for low and medium income countries. Focusing on the interaction between transparency and capital net inflows, the study finds evidence that transparency reduces most of the negative effects of the volatility in debt net inflow compared to other categories of capital inflow. Thus, the study provides evidence that transparency can reduce the negative effects of volatile capital inflows on growth by a significant amount, which varies depending on the type of capital inflow. The implication is that the extent transparency dampens the negative impact of volatile capital flows depend on both the capital type and the level of income of the country concerned. Regarding FDI and FPI, transparency is most effective in reducing volatility of the flow for low income countries, while for debt flows transparency penalizes the volatility of flows for high income countries. On this basis, it recommends that central banks should adopt transparency as a policy tool, particularly in SSA economies with probably low initial transparency to help mitigate the harmful effects of large and volatile capital inflows.

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1 Introduction

Foreign capital flow remains one of the veritable sources of growth and development in most countries, especially developing countries. They can leverage the flow to achieve convergence with developed countries, promote economic development, attract new technologies and earn more foreign exchange (Mowlaei 2018). It is an important measure for risk diversification or mitigation, a source for increasing returns to investment and growth, and consumption smoothing (Ostry et al. 2010; IMF 2012, 2017; Kawai and Lamberte 2010). The improved performances of most regions of the world in the areas of growth acceleration, stock market fundamentals, and recovery of world trade among others in 2017 were attributed to the growth in global foreign direct investment (UNCTAD 2017). The growth in capital flows to Africa has been phenomenal over the years. For instance, Africa recorded 11 percent growth in foreign direct investment (FDI) inflow compared with − 27 percent global growth, − 13 percent growth in developed economies, and 4 percent growth in Asia-showing it had the fastest growth in FDI inflow in 2018 (African Development Bank 2020). In sub-Saharan Africa (SSA) in particular, capital inflows have grown over the years, averaging about $4 billion between the 1980s and 1990s, $25 billion in 2007, and $60 billion in 2017 (Abdychev et al. 2018). Figure 1 illustrates an upward trend in net FDI and foreign portfolio investment (FPI) inflows albeit volatile growth per capita from the 1980s, reflecting the increasing volumes of capital inflows to SSA.

Not only have capital flows shown an upward trend over the years in SSA but also exhibit a high level of volatility. As shown in Fig. 1, both net FDI and FPI for all SSA counntries show moderate fluctuations from early 1980s while GDP per capita growth exhibited a large but upward fluctuation. From 2007 and 2008, net FDI and

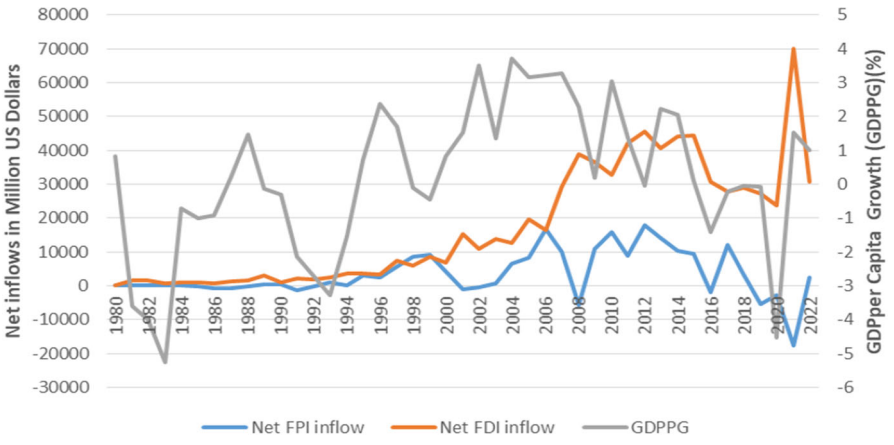

Fig. 1 Trend of, Growth rate per capital, Net FDI and FPI inflows. Source: World Development Indicators, 2023

FPI to SSA began to fluctuate widely as they rose and fall by 80.7 percent and 24.9 percent respectively between the two periods. At the inception of the wide fluctuation in capital flows, GDP per capita growth took a different dimension, by exhibiting downward fluctuation.

From the foregoing, it is evident that capital flows to SSA have not only been large in scale but quite volatile. The concern about the nature of capital flow to SSA is that when capital flows exhibit volatile characteristics, they can trigger a crisis (Nabli 1999; Stiglitz 2000). The 1994 Tequila crisis in Mexico, the 1997 Asian financial crisis, the 1998 Russian financial crisis, and the emerging markets financial crises of the 1990s were all due to volatile capital inflows (Benmelech and Dvir 2013). Furthermore, the volatility of capital can also retards economic growth. Nyangòro (2017) finds evidence that for SSA, both gross and net capital inflows contribute negatively to economic growth. Dinh et al. (2019) show in their study that FDI contributes negatively to growth in the short run but positively in the long run. Waqas et al. (2015) also find that less volatile international portfolio investment is associated with a low rate of inflation and a high rate of growth while Lensink and Morrissey (2006) find a positive association between FDI and growth, and a negative relationship between economic growth and volatility of FDI. To this end, much concern should be placed on the volatility of capital flows to developing countries, especially in sub-Saharan Africa where an undeveloped financial system makes it difficult to deal with volatile capital inflow (Nabli 1999; Lee et al. 2013).

Evidently, volatile capital can hurt growth, but there are suggestions in literature that macroprudential frameworks can mitigate its negative effects (Nwosa et al. 2020; Mugenzi et al. 2022). Studies on the capital flow-growth relationship exist in both developed and developing countries (see Gabriel et al. 2019; Nwosa et al. 2020; Adeola and Aziakpono 2022; Mugenzi et al. 2022). However, very few studies investigated how policies can mitigate the negative effects of volatile capital flows on growth in SSA with the exception of Neanides (2015, 2019) and, Agbloyor et al. (2014). Neanides (2015, 2019) show that macroprudential policies can mitigate the negative impact of the volatility of capital flows on growth. Specifically, Neanides (2015) finds evidence that volatile capital retards growth while macroprudential regulations proxied by the macroprudential index reduce the negative effect of the volatility of capital inflows on growth. In the second study, Neanides (2019) shows that the volatility of capital flows hampers growth but banking supervision mitigates the negative effects of volatile capital on growth. Agbloyor et al. (2014) find that the negative effect of foreign direct investment, foreign equity portfolio investment and private debt flows on growth turned positive after each interacted with domestic financial markets, signifying that strong domestic financial markets can upturn the negative effects of capital flows on growth to positive.

Furthermore, there is also evidence of the mitigating potentials of transparency on volatile financial flows. Shin and Glennerste (2003) report indicates that more transparent countries have less sovereign bond spread than less transparent countries. Brandoa-Marques et al. (2013) find, from 27 emerging market economies between 1997 and 2011, that a 10-percentage point increase in the global market conditions reduces the returns of countries that rate low in terms of transparency by about 0.29 percentage points more than those that have high transparency rating within one week.

Nwosa et al. (2020), having observed an inverse link between capital flow volatility and economic growth, noted that robust management policy and proper supervisory and regulatory framework might mitigate its negative influence. Regardless, evidence that transparency can reduce the detrimental effect of volatile capital flows on growth has received little or no attention. Accordingly, the fundamental objective of this study is to determine whether transparency can dampen the negative effects of capital flow volatility on growth.

Extending beyond the influence of transparency on the volatility of capital flows to examine whether it can lessen the detrimental consequences of volatile capital on growth set this study apart from previous ones. Therefore, the study aims to contribute to the strand of economic literature by examining the extent transparency can lessen the detrimental effects of capital flow volatility on growth.

In addition to the introductory section, the remaining parts of the study are organized as follows: section two reviews the literature, section three discusses the methodological framework, section four discusses empirical results and findings, and section five concludes with policy implications and recommendations.

2 Empirical review

There are two perspectives on the theoretical relationship between capital inflows and economic growth. The optimists presume that inflows of capital positively contribute to the economy, while the pessimists believe that there must be certain necessary prerequisites before inflows of capital can have a positive impact on an economy. Following pessimists view, the literature also explained why volalility of capital flows may be negatively related with growth. According to Lensink and Morrissey (2006) idea which emanates from endogenous growth theory, FDI can impact growth positively by stimulating innovation, which reduces the cost of research and development (R&D). However, when FDI is volatile, R&D becomes uncertain and this negatively affect innovation. By extension, volatility of FDI will reduce investment and hence growth. They also likened volatility of FDI to political and economic uncertainty which is a disincentive to domestic investment, and hence contributing to poor economic performamce.

These following points of view are substantiated by the empirical review of this study. Beginning with the optimist view, Ben-Salha and Zmami (2020) investigated the impact of capital flows in 11 MENA countries using fixed effects panel quantile regression and OLS techniques. The OLS and fixed effects results, based on their conditional means showed evidence that total capital flows do not have any significant effect on growth, even when disaggregated. The fixed-effect panel quantile regression estimates reveal that from the 70th to the 100th quantile, total private capital flows have a significant positive impact on economic growth but from the 60th quantile and below, they are undistinguishable to zero. More so, when disaggregated into foreign direct investment, portfolio flows and debt, the evidence is that foreign direct investment could only exert a significant effect on growth from the 70th quantile and portfolio flows exert a significant positive impact from the 10th quantile to the 40th quantile, but debt could exert a positive impact on growth except for 10th, 40th, 70th and

80th quantiles. The indication from this is that the impact of capital flows on growth is conditional upon the income level of the economy concerned as well the type of capital.

Mody and Murshid (2011) in their study estimated the impact of capital flows on growth from a different perspective of high volatility regime and low volatility regime. They find that for countries within the volatility of real GDP per capita above 5.35 percent (regarded as high volatility), capital flows negatively influence growth and for those that have real GDP per capita within the range of low volatility, capital flows are positively correlated with growth. The explanation for this is that countries with low volatility usually provide an environment that favours investment of the capital inflows while high-volatility countries do not provide a favourable investment climate. These results were found to be the same for different types of capital inflows save debt flow which is negatively correlated to growth not minding the regime.

Without distinguishing between low and high volatility, the study showed a negative relationship between growth and capital inflows, signifying that countries with low volatility outnumbered high-volatility countries. Kim (2011) considered the impact of capital flow on growth based on the perspective of the time and types of capital flows and the country classifications. The study finds that total capital flows did not impact positively growth in the entire period and even in the sub-periods of 1980–1996 and 1997–2006. With disaggregation of the capital, it was revealed that foreign direct investment has a significant positive impact on growth for the entire period and the sub-period of 1980–1996, but not for the 1997–2006 sub-period. The evidence also shows that foreign direct investment has a significant positive impact on growth in developing countries but does not impact significantly on developed countries, albeit having a positive relation.

In trying to unravel the connection between capital flow and economic growth in Kenya, Adeola and Aziapono (2022) employed the ARDL estimation technique to examine the nexus between the series. The study used different forms of capital flow such as (foreign portfolio investment (FPI), FDI, ODA and remittances in the model. The study's observed outcome indicates a strong positive connection between FPI and growth in the short term while a positive but weak link exists between the country's growth and other forms of capital flow. Similarly, Gabriel et al. (2019) examined the influence of capital flows on the growth of the Nigerian economy by employing a similar econometric tool. The research's outcome indicates a direct connection between the investigated series.

In line with the pessimists' view, Neanidis (2015) investigated the impact of capital flows on economic growth using a sample of 78 sub-Saharan Africa between 1973 and 2013, and based on the generalized method of moments (GMM) find empirical evidence that aligns with the theory that with some sound policies, the negative effects of volatile capital inflows dissipate. The study finds that for all the countries used in the study, volatility of the different types of capital flows; FDI flows, Equity flows, Debt flows and total flows contributed negatively to growth, but when volatile capital interacts with a macroprudential policy such as macroprudential index, the effect became positive even in the OLS estimation. The results were the same for other types of capital flows and even for different macroprudential regulations indicators such as banking activity restriction and banking entry requirements.

However, when the countries were disaggregated into low, medium, and high-income, volatile capital still exerted a negative impact and remained so for low-income countries regardless of its interaction with macroprudential regulations variable. Neanidis (2019) in another study investigated the impact of banking supervision in mitigating the effects of volatile capital flows in 73 Sub-Saharan African countries between 1973 and 2013. The results show that for the GMM models of volatilities of the total and different financial flows, a negative relationship exists between growth and each of the volatilities, but banking supervision impacted positively on growth. The coefficient of the interaction of volatilities of the total and individual financial flows with the banking supervision appeared positive, suggesting that the negative effects of volatilities of financial flows have been mitigated. Furthermore, the results were robust for other regulatory policy indicators. A similar result was arrived at following the study by Agbloyor et al.(2014). They find that the negative effect of foreign direct investment, foreign equity portfolio investment and private debt flows on growth turned positive after each interacted with domestic financial markets. This signifies that strong domestic financial markets can upturn the negative effects of capital flows on growth to positive.

Nwosa et al. (2020), in the context of Nigeria, investigated the volatility in capital flow and economic growth nexus between 1986 and 2018. The study adopted the ARDL estimation technique and observed that, on the aggregated level, both series are inversely connected but on the disaggregated level, the capital flow volatility affects growth differently in terms of magnitude and significance. The study therefore noted that robust management policy and proper supervisory and regulatory framework might mitigate its negative influence. Mugenzi et al. (2022) estimated the impact volatility of financial flows on economic growth in SSA on one hand and Rwanda on the other using yearly data between 2000 and 2019 and quarterly data between 2000Q1 and 2019Q4 respectively. While the Bias-Corrected Least Squares Dummy Variable (BC-LSDV) estimator results show that volatility of financial flows albeit being negative does not impact growth significantly, the impact of volatility of financial flows for Rwanda is significantly negative following Dynamic Ordinary Least Squares (DOLS) estimation.

Choong and Liwe (2009) found for Asean-5 using autoregressive distributed lag (ARDL) model a long-run negative relationship between the volatility of FDI flows and economic growth. Their finding was found to be robust for alternative measure of volatility of FDI flows. Ustarz (2023) conducted an investigation into the effects of the volatility of Foreign Direct Investment (FDI), cross-border lending (CBL), and remittances, as well as their interplay with financial development, across various sectors in Ghana, including agriculture, services, and industry. The findings for the agricultural sector reveal a positive association between FDI volatility and the sector, with the interaction term being the only one significantly influencing the sector positively. Conversely, the volatilities of remittances and CBL have a negative impact on the agricultural sector, but their interactions exhibit a positive and significant influence on the sector. In the industrial sector, the volatilities of remittances and CBL, along with their interactions with financial development, exhibit a significant negative correlation with the sector. Meanwhile, FDI volatility and its interaction demonstrate both positive

and negative impacts, although the coefficient of FDI volatility lacks statistical significance. For the service sector, there is a positive relationship between FDI volatility and the sector, with only the coefficient of the interaction term proving significant. The volatilities of CBL and its interaction with financial development have significant positive and negative effects on the service sector, respectively. Similarly,

Pertainining to transparency, Glennerster and Shin (2003) examined the effects of three different transparency reforms, including the publication of article iv staff reports, the special data dissemination standard (SDDS), and reports on the observance of standards and codes (ROSC), on both the sovereign spread and the volatility of sovereign debt. Evidence from the fixed-effect panel shows that each of the three different transparency measures has a negative relationship with the sovereign spread but only article iv staff reports impact spread significantly. This means that transparency reduces sovereign spread. On the other hand, the volatility of sovereign spread has a significant negative relationship with only article iv while the other two have a positive but non-significant relationship with the volatility of sovereign spread. The estimates based on two-stage least squares agree with the fixed-effect panel that the three measures of transparency are negatively related to sovereign spread but similar to the fixed-effect panel, the relationship between volatility and transparency is rather mixed.

3 Econometric model and data

3.1 Econometric model

The objective of the study is to determine whether transparency can mitigate the damaging effects of capital flow volatility on growth. The model for estimation is presented as follows, closely following Neanidis (2019).

$$\begin{aligned} GRPC_{i,t} = \beta_0 + \beta_1 Capfl_{i,t} + \beta_2 Vlcapfl_{i,t} + \beta_3 PTI_{i,t} \\ + \pi\,(PTI * VlCapfl)_{i,t} + \delta \Pi_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{1}$$

where the i(t) subscript indicates country (time); GRPC represents growth per capita income; Capfl represents various categories of net and gross capital flows; Vlcapfl stands for the volatility of various categories of net and gross capital flows; PTI stands for transparency; $(PTI * VlCapfl)$ is the interaction term between transparency and the volatility of capital flows; Π is a vector of control variables as obtained from literature of other cross-country studies which includes quality of the institution,[1] investment, financial depth and inflation, and ε is the error term which is supposed to be independent and normally distributed.

Literature reveals two unique features in the empirical relationship between the volatility of capital flow and growth. Some studies found that the impact of capital flows on the growth rate of per capita income varies with the quantile conditional

[1] Institution which is a proxy for indicator of Government Quality is the mean of six aggregate governance indicators with each ranging from approximately − 2.5 (weak) to 2.5 (strong) governance performance.

distributions of growth (see Huo et al. 2015; Kamara 2014; Cai et al. 2018; Khobai et al. 2019). Other empirical studies report simultaneity bias in the relationship between capital flows and economic growth (Agbloyor et al. 2014; Bailliu 2000; Neanidis 2015; Ben-Salha and Zmami 2020). The above strands of empirical evidence point to the econometric issue of heterogeneity and endogeneity on the link between the volatility of capital flow and growth. Omitted variable bias and measurement error are two additional endogeneity-causing factors (Raheem et al. 2019). Furthermore, the fact that countries may adopt transparency in response to low economic growth also lends credence to the presence of endogeneity. In light of the foregoing, the study employed the Instrumental Variable Quantile Regression (IVQR) model by Chernozhukov and Hansen (2008) utilizing the method of Machado and Silva (2019). This takes into account these dual econometric issues of heterogeneity and endogeneity, to estimate the extent transparency can dampen the detrimental effects of capital flow volatility on growth.

To this effect, Eq. (1) can be transformed into the model as below;

$$Q_{GRPC}(\tau) = \alpha_\tau Capf_i + \beta_\tau X_i + \mu_i \tag{2}$$

Suppose that we can predict $Capf_i$ as;

$$Capf_i = \eta_{1\tau} X_i + \eta_{2\tau} Z_i + \upsilon_i \tag{3}$$

where Z_i is a vector of instruments which is correlated with $Capf_i$, and υ_i denotes a disturbance term. The quantile regression model at the quantile of GRPC is then identified by:

$$P[GPRC_i \leq \alpha_\tau Capf_i + \beta_\tau + \mu_i | X_i\,,\, Z_i] = \tau \tag{4}$$

This leads to the simplified objective function:

$$\text{Arg min} \sum_{i=1}^{n} P_\tau (GPRC - \alpha_t Capf_i - \beta_\tau X_i - \eta_\tau Z_i) \tag{5}$$

where denotes the quantile loss function, and then, we can estimate the coefficient by tackling the minimization problem. Following (Kostakis 2021), we include as instruments all the exogenous variables.

3.2 Data

The study's data description and their sources are illustrated in Table 1

The paper employs cross-section panel data of 21 SSA countries from 2000 to 2019 selected subject to data availability. We use data by Alfaro et al. (2014) updated to include 2019 data for all capital flows comprising the net and gross flows obtained from the International Financial Statistics (IFS) and issued by the International Monetary Fund (IMF). The data include total capital net inflows, FDI net and gross inflows,

Table 1 Data descriptions

Variable	Definition	Source
Growth rate of GDP per capita	The annual percentage growth rate of GDP per capita based on constant USD	World Bank, WDI
Initial GDP per capita	The logarithm of GDP per capita in constant 2015 USD for the first year of each average	World Bank, WDI
Total capital flows_IFS (net)	The sum of FDI, Portfolio equity, total debt from private sources flows (% of GDP),	Alfaro et al. (2014) updated to 2019
FDI flows_IFS (Net and Gross)	Foreign direct investment, net and gross inflows (as a percentage of GDP), calculated using IFS data	Alfaro et al. (2014) updated to 2019
Equity flows_IFS (Net and Gross)	Portfolio equity, net and gross inflows (as a percentage of GDP), calculated using IFS data	Alfaro et al. (2014) updated to 2019
Debt flows IFS (Net and Gross)	Total debt net and gross flows (as a percentage of GDP). Contains portfolio debt and other investment flows derived from IFS data	Alfaro et al. (2014) updated to 2019
The volatility of capital flows	The standard deviation of each category of capital flows	Computed by the authors
Financial depth	Broad money supply (M2) as a ratio of GDP	World Bank, WDI
Inflation	GDP Deflator	World Economic Outlook Database
Investment	Gross capital formation (% of GDP)	Penn World Table
Institutions	The ICRG indicator of Government Quality, which is the mean of the ICRG variables of Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law and control of corruption	Kaufmann, D and Kraay, A (2023). Worldwide Governance Indicators, (www.govindicators.org)
Transparency	It is an index measure comprising five component indices of Political transparency, Economic transparency, Procedural transparency, Policy transparency and operational transparency	Dincer et al.. (2022)

portfolio net, and gross inflows, and debt net and gross inflows, all expressed as a ratio of GDP. The standard deviation of each category of capital flow was used as a measure for the variable volatility (see Neanidis 2019; Pagliari and Hannan 2017; Neumann et al. 2009; Bluedorn et al. 2013; Ustarz 2023; Mugenzi et al. 2022). The study computed the standard deviations of each capital flow relative to GDP over a 5-year rolling window using the asrol stata command. It latter rescaled the standard deviation by the absolute mean to get the coefficient of variation (an alternative measure of volatility) which ensures that larger flow does not lead to higher dispersion. The dependent variable in the study is the growth of real per capita GDP. The covariates were selected from the literature and include, the initial value of GDP per capita, quality of government institutions, gross capital formation as a proxy for investment, financial depth, inflation rate, and transparency.

3.3 Justification of variable

The quality of government institutions is one of the factor that can impact economic growth. It is closely tied to economic growth because it plays a crucial role in improving the capital market and investment climate, maintaining a stable bureaucratic system with professionalization, establishing effective economic and political power structures, fostering system reforms, and delivering public services; all of which support growth (Lin 2014). There is also a correlation between investment and growth as explained by the Harrod-Domar growth theory, which is a synthesis of classical and Keynesian viewpoints. As per this theory, investment serves to augment both aggregate demand and aggregate supply in the economy. This signifies that an upswing in investment results in the enlargement of gross domestic capital formation, the establishment of additional businesses, and growth in overall output (Onwiodiokit and Otolorin 2021). The theoretical link between inflation and growth explains it as a correlate of growth. Though it is yet unsettled whether inflation contributes positively or negatively to growth based on the structuralist or monetarist perspectives to growth, there is no doubt that it impacts growth (Mallik and Chowdhury 2001). The inclusion of financial depth as an exanatory variable is because of it close association with growth. It can facilite growth as it can reduce information, enforcement, and transaction costs (Mordi 2010). It can as well impact growth through its contribution to innovative investment (Abbas et al. 2022). Regarding the inclusion of transparency as a factor that can influence growth, Teig (2006) noted that countries that are less fiscally transparent tend to experience lower levels of foreign direct investments (FDIs), higher level of corruption, slower growth rates, and lower levels of per capita GDP. Amiri et al.(2017) pointed out that transparency advances the condition for development and economic growth.

In literature, several indices have been used as a measure of transparency, and this includes Opacity Index developed by PricewaterhouseCoopers (PwC) in 2001, Corruption Perceptions computed by Transparency International in 2001, Corporate Opacity produced by the World Economic Forum, Transparency of Government Policies as contained in the Global Competitiveness Reports (Brandao-Marques et al. 2013), the IMF Article IV Report, Reports on Observance of Standards (ROSCs) and

Codes and creation of the Special Data Dissemination Standards (SDDS) which are dummy variables depending on whether the country has the reports (Glennerster and Shin 2003) and monetary policy transparency index first compiled by Eijffinger and Geraats for nine central banks and modified in Dincer, Eichengreen and Geraats in 2022 (Dincer et al. 2022). This study used the monetary policy transparency index by Dincer et al. (2022) because of its wide coverage and availability compared to other indices. Dincer et al. (2022) aggregate transparency index measure comprise five component indices of Political transparency, Economic transparency, Procedural transparency, Policy transparency and operational transparency. Each of the five component indices is captured by a sub-index that consists of three separate items, each of which receives a score of 0, 1/2, or 1 with overall index summing the scores across all items, ranging from 0 to a maximum of 15.

4 Empirical findings and discussion

The summary statistics in Table 2 show that financial depth and Volatility of FDI net inflow have the widest spreads, with standard deviations of 20.15 and 25.63, respectively. More so, all the capital flow variables have standard deviations that are above the mean. This suggest a relative large spread around the mean, indicating a high volatility. For example, FDI net inflow, portfolio net inflow, debt net inflow, and total capital net inflow with standard deviations of 4.723, 2.912, 6.128, and 12.63 have mean values of 2.818, − 0.355, − 1.067, and 4.873, respectively. This reflects in their high

Table 2 Summary statistics

Variables	(1) *N*	(2) Mean	(3) SD	(4) Min	(5) Max
Transparency	420	4.026	2.917	0.500	12
FDI net inflow	420	2.818	4.723	− 8.584	36.38
Portfolio net inflow	420	− 0.355	2.912	− 40.00	7.322
Debt net inflow	420	− 1.067	6.128	− 47.32	19.91
Total capital net inflow	420	4.873	12.63	− 31.06	147.0
Institution	420	− 0.005	0.973	− 2.326	2.106
Growth rate of per capita income	420	2.331	2.932	− 9.442	12.46
Investment	420	0.194	0.079	0.026	0.488
Financial depth	420	32.77	20.15	6.556	120.8
Vol. of FDI net inflow	420	9.412	25.63	− 16.76	418.0
Vol. of portfolio net inflow	420	4.384	1.472	2.190	6.769
Vol. of debt net inflow	420	2.547	0.835	1.753	4.471
Vol. of total net inflow	420	6.079	1.086	4.605	8.543
Inflation	420	9.745	5.798	3.377	18.98
Log of initial income	420	7.813	0.856	6.376	9.738

volatility, and by extension suggests that traditional mean-based estimation methods may result in biased estimates. For this reason, the study adopted the IVQR regression model estimates as the baseline results, and for comparison purposes included Method of Moments Quantile Regression (MMQR) model estimates.

4.1 Main findings

The baseline results were estimated based on IVQR and presented in four different parts in Table 3, representing each category of net capital inflows, including the total net inflows. To this end, the study obtained the estimates of IVQR results with fixed effects for these categories of capital flows. It is worth mentioning that the study stayed focused on capital flows, their volatility, the interaction term between capital flow volatility and transparency, and how they impact growth.

4.1.1 Net capital inflow

Table 3 provides the estimates of the impact on economic growth of various components of net capital flows and their interactions with transparency. The results show that total capital net inflow has a significant association with growth across all quantiles, and this contradict the finding by Neanidis (2019) that total capital net inflow doest not impact growth significantly.

We find evidence that the impact of total capital net inflow on the growth of per capita income is heterogeneous across quantiles. The significant correlation between growth and total net capital inflow corroborates the findings of Alfaro et al. (2014) and Nyangóro (2017), but contradicts Ben-Salha and Zmami (2020) who find that total capital net inflow does not impact growth between 70 and 100th quantile for MENA countries. However, at the 25th and 50th quantiles, our evidence confirms the finding of Ben-Salha and Zmami (2020) that capital flows at low and medium quantiles contribute positively to growth. Other related studies also find a positive correlation between economic growth and capital inflow (see Combes et al. 2017). The scenarios of a positive correlation between total capital net inflow at 25th and 50th percentiles could be that countries at a low and medium level of growth may be in dire need of growth, and as a result, capital flows are utilized efficiently to grow the economy, while economies at high growth rates represented by the 75th percentile may care less about efficiency in the use of capital inflow which diminishes growth (Ben-Salha and Zmami 2020). The impact of FDI net inflow on growth showed evidence of a significant negative correlation across quantiles. This shows that FDI net inflow penalizes per capita GDP growth at the three levels of growth distributions. However, this does not correspond to Neanidis (2019) finding that net FDI inflow does not exert any significant impact on the per capita GDP growth rate. Moreover, the two other categories of capital inflows; portfolio and debt net inflows have similar significant negative coefficients across other quantiles. The volatility of total capital net inflow is significantly negative across quantiles suggesting that the volatility of total capital net inflow is detrimental to growth. In line with, Neanidis (2019) and Nyangóro (2017), this cut across all other categories of capital, signifying that volatile

Table 3 Impact of volatility net capital inflow on the growth of GDP per capita

Total net inflow

Variables	Log of initial income	Total net inflow	Volatility total net inflow	Volatility total net inflow* transparency	Transparency	Quality of institution	Investment	Financial depth	Inflation
qtile_25	− 0.7035** (0.302)	0.044*** (0.0159)	− 0.0670** (0.0476)	0.0329*** (0.0094)	0.518*** (0.120)	0.208 (0.188)	− 0.626 (2.301)	− 0.0015 (0.0197)	− 0.0067 (0.0098)
qtile_50	− .525 ** (0.253)	0.0275** (0.0125)	− 0.0378** (0.0151)	0.0280*** (0.0089)	0.435*** (0.1154)	0.0168 (0.151)	0.766 (2.004)	− 0.0035 (0.0138)	− 0.0026 (0.0102)
qtile_75	0.367 (0.281)	− 0.0134*** (0.0019)	− 0.0118** (0.0547)	0.0236** (0.0109)	0.361*** (0.135)	− 0.153*** (0.152)	2.00** (2.16)	− 0.0052 (0.0126)	0.0012 (0.01501)

FDI net inflow

Variables	Log of initial income	FDI net inflow	Volatility FDI net inflow	Volatility FDI net inflow * transparency	Transparency	Quality of institution	Investment	Financial depth	Inflation
qtile_25	− 0.711** (0.355)	− 0.440** (0.0490)	− 0.263** (0.1215)	0.117*** (0.0357)	0.666*** (0.192)	0.0316 (0.185)	− 0.180 (2.70)	0.0109 (0.092)	− 0.0052 (0.0094)
qtile_50	− 0.526* (0.279)	− 0.100** (0.0469)	− 0.0403*** (0.00071)	0.00679*** (0.00077)	0.946*** (0.117)	− 0.125*** (0.0134)	9.049*** ((3.004)	− 0.071*** (0.0242)	− 0.00660 (0.00814)

Table 3 (continued)

FDI net inflow

Variables	Log of initial income	FDI net inflow	Volatility FDI net inflow	Volatility FDI net inflow * transparency	Transparency	Quality of institution	Investment	Financial depth	Inflation
qtile_75	0.334 (0.276)	− 0.0156 (0.0305)	− 0.128*** (0.029)	0.108** (0.0466)	0.584*** (0.220)	− 0.321*** (0.1445)	1.560 (2.229)	0.0006*** (0.0106)	− 0.0027 (0.0151)

Portfolio net inflow

Variables	Log of initial income	Portfolio net inflow	Volatility portfolio net inflow	Portfolio net inflow * transparency	Transparency	Quality of institution	Investment	Financial depth	Inflation
qtile_25	− 0.971*** (0.309)	− 0.107* (0.0550)	− 0.253** (0.126)	0.128** (0.0557)	0.450*** (0.164)	0.119 (0.196)	1.11 (2.56)	0.0224 (0.0169)	− 0.0027 (0.0088)
qtile_50	− 0.676*** (0.237)	− 0.130* (0.0754)	− 0.267** (0.134)	0.125* (0.0644)	0.446** (0.183)	− 0.067 (0.160)	1.35 (1.99)	0.0079 (0.0118)	0.0011 (0.0105)

Table 3 (continued)

Portfolio net inflow

Variables	Log of initial income	Portfolio net inflow	Volatility portfolio net inflow	Portfolio net inflow * transparency	Transparency	Quality of institution	Investment	Financial depth	Inflation
qtile_75	− 0.419 (0.255)	− 0.149 (0.110)	− 0.278* (0.135)	− 0.1222*** (0.0089)	0.443** (0.242)	− 0.229 (0.164)	1.554 (2.182)	− 0.0045 (0.0154)	0.0045 (0.0154)

Debt net inflow

Variables	Log of initial income	Debt net inflow	Volatility debt net inflow	Volatility debt net inflow * transparency	Transparency	Quality of institution	Investment	Financial depth	Inflation
qtile_25	− 0.911*** (0.3013)	− 0.0470* (0.0267)	− 0.0491** (0.0247)	0.104** (0.0448)	− 0.492 (0.266)	0.103* (0.203)	0.679 (2.401)	0.0208 (0.0205)	− 0.0052 (0.0092)
qtile_50	− 0.5911*** (0.218)	− 0.048* * (0.0230)	− 0.152** (0.0237)	0.132*** (0.049)	0.682** (0.298)	− 0.1338 (0.152)	0.921 (1.88))	0.0101 (0.0129)	0.00083 (0.0109))
qtile_75	− 0.354 (0.217)	− 0.0479* (0.0248)	− 0.302** (0.0286)	0.152** (0.061)	0.820** (0.374)	− 0.309** (0.0145)	1.00 (1.88)	0.0022 (0.0100)	0.0024 (0.0157))

Standard errors in parentheses
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

capital of any category can harm economic growth. However, Mugenzi et al. (2022) contradict the above findings as their study shows a negative but non-significant impact of the volatility of total capital net inflows on growth. The positive association between transparency and growth across all categories of capital inflow equations supports the earlier studies by Islam and Lederman (2020) and is consistent with the view by Sumanjeet (2015) that institutional transparency strengthens economic growth.

A focus on the interaction term reveals evidence of a positive correlation with growth across most of the quantiles for different categories of capital net inflow. This implies that the volatility of capital inflow across all categories penalizes growth at all levels of distribution but transparency mitigates their harmful effects. The economic implications of these are as follows: at the 25th quantile, a percent increase in the volatility of the total net inflow of capital reduces growth by 0.067 percent, while a similar increase in the interaction term boosts GDP per capita growth by 0.033 percent. One percent increase in the volatility of the total net inflow of capital reduces growth by 0.038 and 0.012 percent at the 50th and 75th quantiles respectively, while a one percent increase in the interaction term boosts growth by 0.028 and 0.024 percent at the 50th and 75th quantiles respectively. By implication, despite the negative impact of volatility on growth, transparency reduced the negative effects thereby ensuring that capital flows impact growth positively. In like manner, for FDI net inflow transparency dampened the negative effect of its volatility and increased growth by 0.12, 0.0068, and 0.108 percent respectively at 25th, 50th, and 75th quantiles), Portfolio net inflow (by 0.128, 0.125, and 0.122 percent respectively at 25th, 50th, and 75th quantiles) and debt net inflow (0.104, 0.132 and 0.152 percent respectively at 25th, 50th, and 75th quantiles.

4.2 Sensitivity tests

The study confirms the robustness of the benchmark results to a different measure of capital flows, alternative choice of econometric modeling, different measures of volatility (coefficient of variation),and using sub-components of transparency. The study first considered whether transparency can mitigate the negative effect of the volatility of gross capital inflows on growth. Secondly, the study utilized the Method of Moments Quantile Regression (MMQR) Approach with the fixed effects method developed by Machado and Silva (2019). While IVQR takes into account the dual econometric issues of heterogeneity and endogeneity, MMQR takes cognisance of heterogeneity in the distribution only. Furthermore, it allows individual effects to impact entire distribution by the incorporation of fixed effects, and the covariate only to impact the distribution of the interest variables through the location and scale functions rather than just location shifters (Alhassan et al. 2020).

4.2.1 Gross capital inflow

The 2008 global financial crisis revealed the disparity in the behaviour of gross capital inflow and net capital inflow, as it was evident in the United States that, while net capital flows remained largely stable during the crisis, gross capital inflow decreased

significantly (Broner et al. 2011; Crystallin et al. 2015). Some studies have also noted that gross inflow is not only volatile but also larger than net capital inflow (Janus and Riera-Crichton 2013; Forbes and Warnock 2012**, Neanidis 2019). These show that if gross capital inflows are not considered, some empirical evidence may not be interpreted correctly or even made manifest, especially as it concerns sudden stops or sudden flights (Calderón and Kubota 2013). Furthermore, gross capital flows should not be ignored when analyzing capital flows due to the possibility that they may lead to the non-revelation of certain economic vulnerabilities(Committee on the Global Financial System 2021).

For robustness checks, Table 4 shows the extent transparency mitigates the detrimental impact of capital gross inflows on the growth of GDP per capita. The results show that gross FDI inflow impacts per capita GDP growth positively across all quantiles, signifying that FDI inflow does benefit economic growth. This finding does not agree with the benchmark results where the net FDI inflow shows a negative correlation with the growth of GDP per capita. Similarly, it contradicts the outcome of Nyangóro (2017) study of the evidence of a negative but non-significant impact of gross FDI inflow on the growth of GDP per capita. However, it aligns with the findings of Neanidis (2019) that FDI inflow impacts positively the growth of GDP per capita. The further finding shows that across all quantiles, gross portfolio and debt inflows are negatively correlated with the growth of GDP per capita. The above outcomes hold for both gross and net flows but contradict Neanidis (2019). The volatility variables exhibit a negative and significant impact across all quantiles and components of capital flows, signifying that volatile capital of any sort hurts growth. Similar to the case of net capital inflow, the interaction terms show a significant positive impact across all components of capital flows and quantiles. This evidence confirms the potency of transparency in mitigating the negative effect of volatile capital flows on growth, and hence the robustness of the benchmark outcomes (Table 5).

4.3 Method of moments quantile regression (MMQR) approach

The study used the variables as contained in the benchmark IVQR regressions of Table 3 and estimated the model using MMQR. The findings show that total net inflow has a negative impact on the growth of GDP per capita only at 75 percent quantile. This corresponds with the benchmark results except that it is not significant. The results of other categories of capital inflows are mixed across quantiles.

Similar to the benchmark results, the volatility of all the categories of net capital including the total capital net flows, is significantly negative, indicating that volatile capital flows penalize growth.

The interaction term across all categories of capital flows including the total net flow has the required positive sign, except that debt net inflow does not significantly impact growth per capital. The results show that volatile capital flows on average intend to disrupt economic growth, but transparency mitigates that negative impact.

Table 4 Impact of gross capital inflow on the growth of GDP per capita

Gross FDI inflow

Variables	Log of initial income	Gross FDI inflow	Volatility total net inflow	Volatility total net inflow* transparency	Transparency
qtile_25	− 0.911**	0.083*	− 0.0956**	0.0999*	− 0.230
	(0.287)	(0.0436)	(0.038)	(0.0523)	(0.044)
qtile_50	− 0.644**	0.0767**	− 0.0309**	0.0274***	0.0237***
	(0.239)	(0.037)	(0.0156)	(0.0056)	(0.208)
qtile_75	− 0.381	0.0702*	− 0.519*	0.0441**	0.274
	(0.262)	(0.0402)	(0.295)	(0.0216)	(0.273)

Gross portfolio inflow

Variables	Log of initial income	Gross portfolio inflow	Volatility gross portfolio inflow	Volatility gross portfolio inflow * transparency	Transparency
qtile_25	− 1.102***	− 0.152***	− 0.258**	0.203***	0.419*
	(0.298)	(0.058)	(0.123)	(0.0704)	(0.224)
qtile_50	− 0.763***	− 0.0958***	− 0.119***	0.170***	0.361***
	(0.2411)	(0.0318)	(0.008)	(0.0643)	(0.120)
qtile_75	0.452	0.0440***	− 0.0087***	0.139*	0.307***
	(0.263)	(0.00189)	(0.0033)	(0.0774)	(0.141)

Gross debt inflow

Variables	Log of initial income	Gross debt inflow	Volatility gross debt inflow	Volatility gross debt inflow * transparency	Transparency
qile_25	− 0.829***	− 0.030***	− 0.108***	0.0349*	0.279
	(0.290)	(0.00585)	(0.029)	(0.0195)	(0.224)
qtile_50	− 0.552**	− 0.082**	− 0.147***	0.0055***	0.074
	(0.602)	(0.0368)	(0.01660)	(0.00160)	(0.199)
qtile_75	− 0.297	− 0.0129	− 0.128**	0.0429**	0.114
	(0.244)	(0.0214)	(0.0196)	(0.0211)	(0.221)

Standard errors in parentheses

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Notes: Regressions are based on IVQR. The table only includes the coefficient estimates for the components of capital flows and their volatility terms, transparency, and the interaction term between the volatility of capital flows and transparency for various types of flows to conserve space. All other control variables are taken into account in the regressions even though they are not reported

Table 5 Impact of Net capital inflow on the growth of GDP per capita using MMQR approach

Total net inflow					
Variables	Log of initial income	Total net inflow	Volatility total net inflow	Volatility total net inflow* transparency	Transparency
Location	2.301** (0.417)	− 0.0138 (0.0101)	0.0938* (0.0566)	0.0295*** (0.0079)	0.474*** (0.168)
Scale	− 1.454*** (0.431)	− 0.0116* (0.0068)	− 0.0523 (0.0368)	− 0.00079 (0.0051)	0.103*** 0.109)
qtile_25	3.57*** (0.722)	0.0239** (0.0114)	− 0.139** (0.0636)	0.0301*** (0.0089)	0.385** (0.1886)
qtile_50	2.236*** (0.648)	0.0132*** 0.0101)	0.0912 (0.0569)	0.0294*** (0.00795)	0.479*** (0.169)
qtile_75	1.119 (0.7431)	− 0.0043 (0.0117)	− 0.051 (0.066)	0.0287*** (0.0091)	0.558 (0.195)
FDI net inflow					
Variables	Log of initial income	FDI net inflow	Volatility FDI net inflow	Volatility FDI net inflow * transparency	Transparency
Location	1.836*** (0.591)	− 0.06** (0.0268)	0.423 (0.182)	0.117*** (0.290)	0.665*** (0.1794)
Scale	− 1.557*** ((0.370)	− 0.0094 (0.0293)	− 0.0593 (0.114)	0.0105 (0.0182)	0.0699 (0.1124)
qtile_25	3.121*** (0.688)	0.0072 (0.0541)	− 0472** (0.210)	0.108*** (0.0335)	0.607*** (0.207)
qtile_50	1.774*** (0.596)	− 0.0009 (0.04678	− 0.421** (0.1811)	0.117*** (0.0289)	0.667*** (0.179)
qtile_75	0.530 (0.661)	− 0.0084 (0.0515)	− 0.0374 (0.1998)	0.126*** (0.0319)	0.733*** (0.197)
Portfolio net inflow					
Variables	Log of initial income	Portfolio net inflow	Volatility portfolio net inflow	Portfolio net inflow * transparency	Transparency
Location	2.057*** (0.637)	0.0939* (0.0555)	0.376 (0.317)	0.1034*** (0.051)	0.0429*** (0.110)
Scale	− 1.38*** (0.384)	− 0.0278 (0.0336)	0.0174** (0.192)	0.0186** (0.0311)	− 0.09 (0.0719)
qtile_25	3.28*** (0.741}	− 0.0694 (0.0644)	− 03610 (0.368)	0.0871 (0.0598)	0.343 (0.212)

Table 5 (continued)

Portfolio net inflow					
Variables	Log of initial income	Portfolio net inflow	Volatility portfolio net inflow	Portfolio net inflow * transparency	Transparency
qtile_50	1.991*** (0.641)	− 0.0952* (0.0555)	− 0.377 (0.317)	0.104** (0.515)	0.383*** (0.182)
qtile_75	0.886 (0.701)	− 0.1174* (0.061)	− 0.391* (0.348)	0.119** (0.0565)	0.417** (0.200)
Debt net inflow					
Variables	Log of initial income	Debt net inflow	Volatility debt net inflow	Volatility debt net inflow * transparency	Transparency
Location	2.43*** (0.644)	− 0.040* (0.0229)	− 0.144 (0.236)	0.1006** (0.0419)	− 0.481 (0.272)
Scale	− 1.32*** (0.421)	0.0077 (0.0145)	− 0.270 (0.154)	0.056** 0.0274)	− 0.362** (0.1775)
qtile_25	3.59*** (0.809)	− 0.0468 (0.0287)	− 0.0933 (0.269)	0.0512 (0.0523)	− 0.162 (0.341)
qtile_50	2.35*** (.643)	− 0.0395* (0.0228)	− 0.1597 (0.235)	0.104** (0.0417)	− 0.502* (0.270)
qtile_75	1.358** (0.654)	− 0.0337* (0.0236)	− 0.362 (0.242)	0.146*** (0.0431)	− 0.774*** (0.280)

Standard errors in parentheses
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
The coefficients of location and scale indicate the extent the changes in the exogenous variable affect respectively the variability and the mean of the distribution dependent variable

4.4 Using coefficient of variation to measure volatility

Table 6 tries to reproduce the results of Table 3 using the coefficient of variation as an alternative measure of volatility(see Pagliari and Hannan 2017). This corrects for the problem of standard deviation by scaling the standard deviation by the absolute value of the mean of the flow and gives the volatility of each unit of the cross-border flow relative to GDP. The estimates produced by this measure are similar with the earlier findings, thereby confirming the potency of transparency in mitigating the negative influence of volatile capital flows on growth.

4.5 Results with the exclusion of the interation term

Table 7 depicts the impact of volatility of capital flows on economic growth excluding

Table 6 Using coefficient of variation to measure volatility

Total net inflow

Variables	Log of initial income	Total net inflow	Volatility total net inflow	Volatility total net inflow* transparency	Transparency	Quality of institution	Investment	Financial depth	Inflation
qtile_25	− 0.696** (0.311)	0.0440*** (0.011)	− 0.314 (0.230)	0.158*** (0.0456)	0.507*** (0.128)	0.107 (0.188)	− 0.660 (2.34)	− 0.0010 (0.0196)	− 0.0062 (0.0094)
qtile_50	− .517 ** (0.248)	0.0294*** (0.0111)	− 0.191 (0.219)	0.138*** (0.0431)	0.439*** (0.115)	− 0.0768 (0.153)	0.641 (2.014)	− 0.0038 (0.0135)	− 0.0027 (0.010)
qtile_75	− 0.336 (0.263)	0.0147 (0.0130)	− 0.0679 (0.268)	0.119** (0.0537)	0.370*** (0.134)	− 0.261* (0.152)	1.95 (2.14)	− 0.0065 (0.0111)	0.009 (0.0151)

FDI net inflow

Variables	Log of initial income	FDI net inflow	Volatility FDI net inflow	Volatility FDI net inflow * transparency	Transparency	Quality of institution	Investment	Financial Depth	Inflation
qtile_25	− 0.711** (0.355)	− 0.440*** (0.0490)	− 0.742* (0.$12)	− 0.330*** (0.100)	0.666*** (0.192)	0.0316 (0.185)	− 0.180 (2.70)	0.0109 (0.0192)	− 0.0052 (0.0094)
qtile_50	− 0.526* (0.279)	− 0.0301 (0.0469)	− 0.556*** (0.512)	− 0.317*** (0.104)	0.626*** (0.183)	− 0.141 (0.150)	0.673 ((2.248)	0.0059 (0.0134)	− 0.0133 (0.0103,.)
qtile_75	− 0.334 (0.276)	− 0.0156 (0.0305)	− 0.362 (0.645)	0.303** (0.1311)	0.584*** (0.220)	− 0.321*** (0.1445)	1.560 (2.229)	0.0005 (0.0106)	− 0.0027 (0.0151)

Table 6 (continued)

Portfolio net inflow

Variables	Log of initial income	Portfolio net inflow	Volatility portfolio net inflow	Portfolio net inflow * transparency	Transparency	Quality of institution	Investment	Financial depth	Inflation
qtile_25	− 0.971***	− 0.107*	− 0.0899	0.0453**	0.450**	0.119	1.11	0.0224	− 0.0027
	(0.309)	(0.0550)	(0.116)	(0.0198)	(0.164)	(0.196)	(2.56)	(0.0169)	(0.0088)
qtile_50	− 0.676	− 0.130	− 0.0947	0.0444	0.446**	− 0.063	1.35	− 0.0079	0.0015
	(0.237)	(0.754)	(0.1187)	(0.183)	(0.183)	(0.160)	(1.99)	(0.0118)	(0.0105)
qtile_75	− 0.419	− 0.149	− 0.0988	0.0443***	0.443*	− 0.229	1.554	− 0.0047	0.0045
	(0.255)	(0.110)	(0.155)	(0.0017)	(0.242)	(0.164)	(2.182)	(0.0105)	(0.0154)

Debt net inflow

Variables	Log of initial income	Debt net inflow	Volatility debt net inflow	Volatility debt net inflow * transparency	Transparency	Quality of institution	Investment	Financial depth	Inflation
qtile_25	− 0.911***	− 0.0470*	− 0.053*	0.111**	− 0.492**	0.103	0.679	0.0208	− 0.0052
	(0.3013)	(0.0267)	(0.0264)	(0.0478)	(0.266)	(0.203)	(2.401)	(0.0205)	(0.0092)
qtile_50	− 0.5911***	− 0.048**	− 0.163***	0.140***	− 0.681**	− 0.1338	0.921	0.0101	0.00083
	(0.218)	(0.0230)	(0.0253)	(0.0522)	(0.298)	(0.152)	(1.88))	(0.0129)	(0.0109))
qtile_75	− 0.354	− 0.0479*	− 0.323	0.162**	− 0.820**	− 0.309**	1.100	0.0022	0.0024
	(0.217)	(0.0248)	(0.305)	(0.0651)	(0.374)	(0.145)	(1.88)	(0.0100)	(0.0157))

Standard errors in parentheses
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 7 Impact of volatility net capital inflow on the growth of GDP per capita without the interaction terms

Total net inflow				
Variables	Log of initial income	Total net inflow	Volatility total net inflow	Transparency
qtile_25	− 0.815**	0.0353***	− 0.0712**	0.145**
	(0.3112)	(0.008)	(0.335)	(0717)
qtile_50	− 0.618**	0.0220***	− 0.081***	0.137**
	(0.239)	(0.0069)	(0.0260)	(0.0675)
qtile_75	− 0.420*	0.0087	− 0.0900***	0.129
	(0.241)	(0.0075)	(0.0253)	(0.080)
FDI net inflow				
Variables	Log of initial income	FDI net inflow	Volatility FDI net inflow	Transparency
qtile_25	− 0.787**	− 0.0977	− 0.382**	0.112
	(0.309)	(0.0596)	(0.204)	(0.0689)
qtile_50	− 0.581**	0.0170	− 0.286***	0.119
	(0.278)	(0.0309)	(0.095)	(0.0688)
qtile_75	− 0.386	− 0.0029	− 0.343***	0.110
	(0.260)	(0.0303)	(0.102)	(0.0828)
Portfolio net inflow				
Variables	Log of initial income	Portfolio net inflow	Volatility portfolio net inflow	Transparency
qtile_25	− 0.968***	− 0.0977*	− 0.382*	0.119
	(0.309)	(0.0596)	(0.204)	(0.069)
qtile_50	− 0.676***	− 0.126*	− 0.319*	0.119*
	(0.234)	(0.0739)	(0.170)	(0.0667)
qtile_75	− 0.444*	− 0.149	− 0.270	0.124
	(0.252)	(0.0100)	(0.187)	(0.077)
Debt net inflow				
Variables	Log of initial income	Debt net inflow	Volatility debt net inflow	Transparency
qtile_25	− 0.955***	− 0.0505*	− 0.488***	0.126*
	(0.293)	(0.0257)	(0.148)	(0.070)
qtile_50	− 0.599***	− 0.048**	− 0.420***	0.108
	(0.219)	(0.0220)	(0.126)	(0.0694)
qtile_75	− 0.323	− 0.0467**	− 0.368***	0.093
	(0.223)	(0.0236)	(0.140)	(0.083)

the interaction term. Comparing the results of the impact of the volatility of capital flows on growth with and without the interaction term reveals some significant implications. The cofficients of the volatility of capital flows remained negative and significant for most catergories of capital flows. This confirms the earlier results in Table 3 that volatile capital flows are detrimental to economic growth. However, the coefficients of the most categories of capital flow volatility show large explanatory powers without the interation term than with the interaction term. This further confirms that transparency can help weather the negative effect of capital flow volatility on economic growth.

5 Conclusion and policy recommendation

While capital inflows are expected to stimulate economic growth in theory, empirical findings present a mixed perspective, indicating both positive and negative impacts on economic growth. Therefore, this study aimed to assess whether transparency could mitigate the adverse effects of capital flows on growth in sub-Saharan African countries. Employing a novel IVQR model, the study sought to determine the extent to which transparency can counteract the negative impact of volatile capital inflows on growth. This model offers advantages such as addressing endogeneity and omitted variable issues while considering income distribution heterogeneity. Findings indicate that while total net capital inflow negatively affects growth at the 75th quantile, it contributes positively at lower growth levels (25th and 50th quantiles). Across all quantiles, FDI, portfolio, and debt net inflows exhibit significant negative coefficients on growth. Interestingly, for high-income countries, FDI and FPI, despite their negative impact, do not pose a significant threat unlike in low and medium-income countries. Debt inflows have consistent impacts across all income levels.

Regarding capital flow volatility, debt net inflows significantly impact poor growth performance in SSA, while portfolio net inflows contribute significantly to low-level growth in low and medium-income countries. The study also highlights the interaction between transparency and capital net inflows, suggesting that transparency can effectively mitigate the negative effects of volatile capital inflows on growth, with varying effectiveness depending on the type of capital inflow and the country's income level. It recommends that central banks, especially in SSA economies with low initial transparency, adopt transparency as a policy tool to mitigate the harmful effects of large and volatile capital inflows.

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Declarations

Conflict of interest The authors have no conflict of interest that are relevant to this work.

Ethical approval The article does not contain any studies with human participants or animal participants by any of the authors.

Appendix: Country sample

Angola, Benin, Botswana, Burkina -Faso, Cameroon, Ghana, Guinea-Bissau, Kenya, Lesotho, Malawi, Mali, Mauritius, Togo, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa, Uganda,

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