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August 2019

# A G D I Working Paper

## WP/19/047

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2019 African Governance and Development Institute WP/19/047

Research Department

# The Role of Asymmetry and Uncertainties in the Capital Flows- Economic Growth Nexus

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## Abstract

This study examines the asymmetry between capital flows and economic growth in 42 countries for the period 1990-2017. It further argues that uncertainty is an important channel through which asymmetry operates. As such, the three measures of uncertainty are macroeconomic, fiscal and institutional. The Generalised Method of Moments is used as an empirical strategy. The existence of an asymmetry is confirmed by the findings as capital flows are more reactive to economic drag when compared to economic growth. Furthermore, the channels through which asymmetry operate are heterogeneous to measures of capital flows and proxies for uncertainty.

**Keywords:** Capital flows, Economic growth, Asymmetry, Uncertainty and Emerging countries
**JEL Classifications :**C13; F3, G15; O16

## Introduction

The liberalization of the global economy in the post Bretton Woods system has led to an increase in cross-border flows of capital. Theoretical underpinnings have shown that there is a positive relationship between capital flows (CF) and economic growth. The positive relationship could run in either direction. For instance, neoclassical growth theory is hinged on capital accumulation. The other side of the coin has postulated that economic growth is a precondition for capital flow.

However, empirical findings have shown that the positive relationship between CF and economic growth is not always established, at least for some countries. For instance, Gourinchas and Jeanne (2006) and Prasad et al. (2007) show that the fastest growing economies only recorded meagre capital inflows. A more general aspersion of the growth effect of CF is the aftermath of the global financial crisis, as there is decline and lack of recovery in the cross-border CF.

Summarizing the literature, it can be posited that there is no consensus as regards the exact effect of capital flows on economic growth. A large number of these studies has found the positive effect of capital inflows on economic growth conditional upon factors such as a strong and viable institutional framework (Bekaert et al., 2005; Alfaro et al. 2007, Ajide and Raheem, 2016 a,b)[1],level of economic development (Shen et al. 2010), financial depth/development (Alfaro et al. 2004, Reinhardt et al. 2013, Raheem and Oyinlola, 2015), nature and/or types of CF (Furceci et al. 2012; and Caldera-Sanchez et al. 2016) and absorptive capacity, which includes macroeconomic management, human capital and infrastructure (Prasad et al. 2003). Thus, the positive relationship between economic growth and CF seems to be elusive. The negative effect of capital flows has also been documented in the literature (Bordo et al., 2010 and Jeane et al., 2012). In sum, the exact relationship between capital flows and economic growth is difficult to infer or ascertain.

This study offers plausible explanations for the lack of consensus in the literature, by considering the important effect of "asymmetry" in the world of CF. Coincidentally, there has been evidence that suggests that CF does not necessarily depict theoretical underpinnings. For instance, Lucas (1990) documents that capital flows "uphill" i.e. the relatively

[1] However, there are concerns that the legitimacy of the claim above is in doubt (Prasad et al., 2007; Kose et al., 2009; Gamra, 2009; Jeanne et al., 2012).

poorer/developing countries are the exporters of capital to their developed/richer counterparts. This phenomenon is termed the Lucas Paradox. This pattern of capital movement is a clear contradiction of the standard neoclassical growth theory, although, several factors have been identified to solve the paradox[2]. Another phenomenon related to the Lucas Paradox is the "Global Imbalances" (GI), which could be described as the continuous financing of the United States' consumption by relatively poorer countries or regions (e.g. Asia, Middle East, OPEC countries and Russia). Another anomaly being experienced in the international finance literature is the allocation puzzle (Gourinchas and Jeanne, 2013), which shows that capital does not necessarily flow to the countries with the fastest productivity growth rate. This is the exact opposite of neoclassical growth theory. Although, several attempts have been made to explain the puzzle, the fact remains that to date the puzzle has not been solved (see Benhima 2013). Also, Prasad et al. (2007) championed a strand of the literature that found that capital outflows and economic growth are positively correlated. In addition to the above, Gente et al. (2015) documented that the gains from CF are caused by total factor productivity growth rather than capital accumulation.

The CF-economic growth nexus could be examined either with the CF model or the with economic growth model. The same argument extends to the asymmetric relationship in the nexus. This study favours the CF model due to the modelling and measurement intricacies related to CF. Accordingly, the CF compilation approach makes distinctive differences between capital inflows and capital outflows. The implementation of the asymmetry model for economic growth model would undermine this measurement[3].

The dynamic nature of the world in which we live has led to an increase in uncertainty among socio-economic fundamentals. As such, enormous attention has been devoted to understand the concept of uncertainty (see Castelnuovo et al, 2017; López-Pérez, 2015 and Rossi et al., 2016). However, only a handful of studies have linked uncertainty to the international context, specifically CF. This strand of the literature has examined uncertainty as an

[2] They include differences in technologies, factors of production, and government policies. Other factors include the role of institutions and capital market imperfections, encompassing the quality of enforcement of private contracts, asymmetric information and moral hazard, risks of expropriation, and sovereign default (see Reinhardt et al. 2013 and the references therein).

[3] The implicit data generating process of the positive partial sum decomposition of CF is likened to capital inflow, while the exact opposite is seen as capital outflow. The original data used is the capital inflow. There seems to be some anomalies and mismatches between the output of the data generating process and its implied meaning. However, the economic growth variable does not suffer from this concern. Positive partial sum is considered to be economic growth and the negative partial sum decomposition denotes economic growth drag.

important determinant of CF. On the surface, uncertainty can be grouped into macroeconomic, political and financial uncertainties. These various forms of uncertainties can further be decomposed into global and domestic uncertainties (Fratzscher, 2012; Ahmed Zlate, 2014; Baker et al., 2016; Bruno and Shin, 2014; Passari and Rey, 2015). The major shortcoming of these studies is the restriction of the measure of uncertainty to global fundamentals. In other words, these studies have examined the spillover effect of uncertainties (mainly in the advanced countries) on capital inflows to emerging and other developing countries. The available few studies that have considered the cross-country heterogeneity of uncertainty to explain CFs include Gurio et al (2015), Julio and Yook (2016), and Choi and Fureuri (2018).This study aligns with the strand of the literature that considers the importance of cross-country heterogeneity. However, the measure of uncertainty is limited to macroeconomic fundamentals (see Aizenman and Marion 1993. Also, Neanidis and Savva, 2013 provides a review of the literature).

Again, the macroeconomic uncertainty-CF nexus literature has ignored the role of asymmetry. For instance, high uncertainty in a country has the tendency to have a dual functionality on capital flows. On the positive effect, high uncertainty implies higher risk, which is being compensated for by higher rates of return[4]. Hence, portfolio diversification would be skewed towards such an environment. The negative effect is more common and the narrative states that uncertainty has a dampening growth effect, thus rendering the economy unattractive to investors. In this way, there might be a reduction in capital inflows (capital reversal) and/or an increase in capital outflows (capital flight). Gauvin et al. (2014) recognised the existence of asymmetry in the uncertainty-capital flow nexus. However, it was not empirically validated.

Based on the foregoing, the objective of this study is to examine the asymmetry between capital flows and economic growth. Subsequent to this, we determine the extent to which macroeconomic uncertainty matters for the capital flows-economic growth nexus. The logic here is to determine how much of the uncertainties in capital flows-growth nexus are attributable to the macroeconomic, fiscal or institutional conditions of the investigated economies.The objective of the study serves as the novelty to the literature of capital flows and economic growth nexus.

[4]Pastor and Veronesi (2013) confirmed the positive relationship between macroeconomic uncertainty and US equity risk premium.

Using a sample size of 42 emerging countries, we find that CF asymmetrically reacts to economic growth, with negative partial sum decomposition taking precedence over positive partial sum decomposition. Further, the channel through which the asymmetry operates is heterogeneous to: (i) measures of capital flows; and (ii) proxies for uncertainty.

The rest of the paper is structured as follows: data and methodology are presented in the second section. Section three discusses the empirical results. Conclusion and suggestions for future research are discussed in the last section.

## 2. Data and Methodology

### 2.1 Data

Based on the World Bank's classification, the global economy can be categorized into developed, emerging and developing countries. Our scope will be restricted to the emerging countries because of the following issues: first, these countries are increasingly being recognized as the destination of capital flows (Caballero et al. 2008; Alfaro et al., 2011, Rothenberg and Warnock, 2011); second, the region has shaped the direction, magnitude and components of capital flows (Lane, 2013; and Eichengreen et al., 2017). Table 1 shows the trend of capital flows across the globe.

We build a dataset for 42 emerging countries for the period 1990-2017. The selected countries are Argentina, Belarus, Brazil, Bulgaria, Chile, China, Colombia, Costa Rica, Croatia, Cyprus, Czech Republic, Egypt, Estonia, Guatemala, Hungary, India, Israel, Kazakhstan, Kuwait, Latvia, Libya, Lithuania, Malaysia, Malta, Mexico, Panama, Peru, Philippines, Poland, Romania, Russia, Saudi Arabia, Singapore, Slovakia Republic, Slovenia, South Africa, Sri Lanka, Thailand, Turkey, Ukraine, Uruguay and Venezuela. These countries are selected based on data availability. The components of CF are sourced from the International Monetary Fund (IMF) Balance of Payment databank. Other macroeconomic variables are collected from the World Development Indicators dataset.

Table 1: Trend of Global Capital Flows

| | Net Flows | | Gross Inflows | | Gross Outflows | |
|---|---|---|---|---|---|---|
| | Mean | Std Dev | Mean | Std Dev | Mean | Std Dev |
| Advanced | 0.086 | 0.797 | 0.130 | 0.375 | 0.204 | 0.242 |
| Emerging | 0.222 | 0.661 | 0.635 | 1.125 | 0.263 | 0.759 |
| Developing | -0.014 | 0.225 | 0.342 | 1.751 | 0.62 | 0.854 |

Source: Authors' computation with underlining dataset from IMF BoP Data bank.
Note: Statistics reported here are measured as a percentage of GDP. Std Dev implies standard deviation

## 2.2 Methodology

There are three broad issues that led this study to adopt the system generalised method of moments (SGMM): *specification, identification and exclusion restrictions.* Accordingly, the methodology requires that the dependent variable (capital flows) be persistent (Tchamyou, 2019a). A section of the literature has confirmed the existence of persistence of capital flows (Bluedorn et al. 2013). In this study, the correlation between CF and its first lag statistically and economically significant, at about 0.87, this is higher than the threshold used to ascertain persistence of the dependent variable (Tchamyou, 2019b; Tchamyou et al., 2019). Another requirement is that the number of cross-section (N) should be higher than the number of observation (T). In our case, N (45) > T (35). There is an implicit assumption about the existence of simultaneity in the model prior to the use of GMM. The reverse causality between CF and its determinants cannot be overlooked. Other causes of endogeneity are omitted variable bias and measurement error. Thus, accounting for these features requires the use of instrumental variables. In addition, cross-country variations are being accounted for when estimating a SGMM equation

### 2.2.1 Specification

The better performance of the SGMM over the difference GMM is well documented in the literature (Blundell and Bond, 1998; Arellano and Bond, 1991; Bond et al. 2001). However, we improve on this methodology by using forward orthogonal deviation, as recommended by Roodman (2009a,b). The orthogonal deviation solves the problem of difference GMM that is known to restrict over-identification and limits instruments proliferation (Asongu and Nwachukwu, 2016a). In order to control for heteroscedasticity, we adopt the use of *two-step* as against *one-step*.

$$CF_{it} = \propto + \beta CF_{i,t-1} + \gamma GDP_{i,t} + \sum_{h=1}^{2} \delta_h X_{h,i,t-1} + \pi_i + \rho_t + \varepsilon_{i,t} \quad (1)$$

Where CF is capital flows, measured as a percentage of GDP. Both the aggregate and individual components of the variable are adopted here. Specifically, we use total capital

flows while the considered components are foreign direct investment (FDI), portfolio investment (PI), bank flows (BF) and other investments (OI). The premise for this usage is attributed to the fact that determinants of capital flows have been identified to be heterogeneous to the components of capital flows (Bluedorn et al. 2013; Broner et al. 2013, and Eichengreen et al. 2017). These flows are measure in gross, rather than net[5].

The main variable of interest is the GDP growth (i.e. first difference of economic growth). X is a vector of control variables. Essentially, the literature offers two main types of determinants: push and pull factors. In this study, we align with the strand that lay credence for the push factors (Milessi-Ferretti and Tille, 2011; Bruno and Shin, 2014; Rey 2013; Ahmed and Zlate, 2014 and Cerutti et al. 2015). As such, the control variables used are VIX index, a proxy for risk appetite; economic growth rate of the advanced (G7) countries. The performance of these two variables has been consistent across various empirical studies.

Equation 1 is the commonly used linear CF equation, which does not account for the possible existence of asymmetry. Thus, we decompose GDP into positive and negative partial sums, in line with Shin et al. (2014). It should be recalled that GDP was not chosen arbitrarily; rather we are guided by issues already identified in the literature (global imbalances, Lucas paradox, among others, as already discussed in the introductory section). The asymmetry version of equation (1) is specified below:

$$CF_{it} = \propto + \beta CF_{i,t-1} + \gamma GDP^{+}{}_{i,t} + \theta GDP^{-}{}_{i,t} + \vartheta UNC_{it} + \mu UNC * GDP_{it} + \sum_{h=1}^{2} \delta_h X_{h,t-1} + \pi_i + \rho_t + \varepsilon_{i,t} \quad (2)$$

Where,$GDP^{+}$ and $GDP^{-}$ are the positive and negative partial sum decompositions of economic growth, respectively; UNC is an index of uncertainty, which are more related to the pull factors. Specifically, three broad measures of uncertainty were adopted in this study and each broad measure is captured using two variables. They are macroeconomic uncertainty (using inflation [INF] and credit provided to the private sector [CRE]), institutional uncertainty (government stability [STA] and political risk rating [POL]) and fiscal uncertainty (general government balance [GGB] and broad money supply [FMB]). CRE, GGB, FMB are measured as ratios of GDP; STA and POL are index while INF is the log of consumer price index.

[5] The preference for measuring CF in gross is due to its ability to reveal some microeconomic tendencies that would normally be hidden (Schmidt and Zwick, 2015; and Alberola et al., 2016).

### 2.2.2. Identification and exclusion restrictions

It is difficult to think of any variable, in macroeconomics, as strictly exogenous. Rather, all independent variable are susceptible to be predetermined or endogenous. However, "years", as a variable, offers some form of consolation, hence is seen as strictly exogenous (see Dewan and Ramaprasad, 2014; Tchamyou and Asongu, 2017; Asongu and Nwachukwu, 2016a). In fact, Roodman (2009b) argued that it is not apparent for years to become endogenous in first-difference. Therefore, the technique treating ivstyle (years) is 'iv(years, eq(diff))' whereas the gmmstyle is adopted for predetermined variables[6].

Based on the foregoing, the strictly exogenous instrument, i.e. years, affects capital flows wholly through the predetermined or endogenous variables. Moreover, the relevance of the exclusion restriction can be statistically examined using Difference in Hansen Test (DHT) for instrument exogeneity (Asongu and Nwachukwu, 2016b). The non-rejection of the null hypothesis implies that the instruments explain CF wholly through the endogenous indicators. In the GMM approach that employs forward orthogonal deviations, the information criterion used to examine whether years exhibit strict exogeneity is the DHT.

### 2.2.3 Interactive Model

An interactive model is estimated to examine the role of uncertainty in the asymmetric capital flows-economic growth nexus. However, caution must be exercised when interpreting the estimated coefficients of the interactive term (Nier et al. 2014). The statistics of interest in the model are slope coefficients of economic growth (with and without the interactive term).

These coefficients can be computed theoretically as follows:

Let us recall equation (2). $CF_{it} = \propto CF_{i,t-1} + \gamma GDP^{+}_{i,t} + \theta GDP^{-}_{i,t} + \vartheta UNC_{it} + \mu UNC * GDP_{it} + \sum_{h=1}^{2} \delta_h X_{h,i,t-\tau} + \pi_i + \rho_t + \varepsilon_{i,t}$. The slope coefficient for the interactive model i.e. the net effect is $\frac{\partial CF_{it}}{\partial GDP_{it}} = \gamma + \theta + \mu UNC_{it}$, where $UNC_{it}$ is evaluated via its mean value. The slope coefficient for the non-interactive model is evaluated at $UNC_{it} = 0$, which yields $\gamma + \vartheta$[7].

[6] Note, this treatment is implementable in Stata.

[7] This summation arises from the fact that GDP is decomposed into two (positive and negative partial sums). However, in a situation in which GDP is not decomposed, only one parameter would be estimated.

The coefficient $\mu$ indicates whether there is a change in the relationship between the interactive variable (GDP) and the dependent variable (CF) with a one-unit change in the other interactive variable (UNC). Also, the standard error on the coefficient can be used to examine the level of significance (if any) of the change in slope. It should also be noted that $\beta$, $\gamma$, and $\vartheta$ are conditional marginal effects.

## 3. Empirical Results

The starting point of our analysis is to examine the existence, if any, of asymmetry in the capital flows-economic growth nexus. As such, the partial sum decomposition of economic growth into positive and negative changes helps achieve this task. The result of this exercise is presented in Table 2. An overview of the results confirms that asymmetry is important in the nexus. All measures of capital flows, with the exception of portfolio investment, respond positively to either economic growth or drag. This implies that irrespective of the economic performance of the countries, capital flows will still be recorded. The fact that countries respond more to economic drag than economic growth further justifies the importance and existence of asymmetry. This being the case, it could be argued that CF does not respond to the dynamics of economic activities (i.e. GDP). This stance can be justified on the ground that non-FDI inflows (portfolio and investment) are more synchronised with return on investment, government's credibility, among other variables, rather than economic performance. The inability of FDI to respond asymmetrically to economic growth might be hinged on the stance that a section of the literature argues that the positive relationship between capital flows and economic growth is conditional upon a host of other variables (see introduction for more details).

Next to this, we explore the channels through which asymmetry operates. Put differently, we want to ascertain the contribution of uncertainty to the asymmetric effect obtained above. We present these results in Tables 3-6.

**Table2: Asymmetry (no control variables and channels)**

| | ICAP | FDI | IPORT | OITH |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| LAG | 0.676*** (0.029) | 0.747*** (0.012) | 0.363*** (0.055) | 0.758*** (0.039) |
| GDPP | 0.285*** (0.077) | 0.051** (0.026) | -0.048* (0.027) | 0.145** (0.059) |
| GDPN | 0.524*** (0.126) | 0.171** (0.065) | -0.165** (0.087) | 0.366*** (0.113) |
| AR(1) | 0.108 | 0.222 | 0.196 | 0.058 |
| AR(2) | 0.966 | 0.476 | 0.227 | 0.176 |
| Sargan OIR | 0.087 | 0.293 | 0.201 | 0.228 |
| Hansen OIR | 0.265 | 0.137 | 0.114 | 0.167 |
| | | | | |
| **DHT for instruments** | | | | |
| (a)Instruments in levels | | | | |
| H excluding group | 0.170 | 0.221 | 0.046 | 0.163 |
| Dif(null, H=exogenous) | 0.330 | 0.144 | 0.277 | 0.208 |
| (b) IV (years, eq (diff)) | | | | |
| H excluding group | 0.214 | 0.287 | 0.214 | 0.158 |
| Dif(null, H=exogenous) | 0.126 | 0.321 | 0.551 | 0.236 |
| | | | | |
| Fisher | 815*** | 1519*** | 15*** | 660*** |
| Instruments | 26 | 26 | 18 | 26 |
| Countries | 42 | 42 | 42 | 42 |
| Observations | 973 | 970 | 956 | 968 |

Source: Authors' computation

Note: Lag is the first lag of the dependent variabale. GDPP and GDPN are positive and negative partial sums decomposition, respectively. ***,**,*: significance levels at 1%, 5% and 10% respectively. GDPP and GDPN imply positive and negative atrial sum decompositions, respectively. DHT: Difference in Hansen Test for Exogeneity of Instruments' Subsets. Dif: Difference. OIR: Over-identifying Restrictions Test. The significance of bold values is twofold. 1) The significance of estimated coefficients, Hausman test and the Fisher statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(1) & AR(2) tests and; b) the validity of the instruments in the Sargan OIR test.

In interpreting the main results, we start with the control variables. The following results could be reported from tables 3-6. First, there is high degree of persistence in the various measures of capital flows. This is represented by the estimated first lag of the dependent variable. The estimated coefficients are positive, large and statistically significant at the 5% level. A large body of the literature has also confirmed the high persistence of the components of capital flows (see Levchenko and Mauro, 2007; Becker and Noone, 2009; Bluedorn et al. 2013 and Eichengreen et al. 2017). Second, the estimated coefficients for VIX validate the theoretical argument about the level of risk averseness of investors. The higher the level of risk aversion, the lower would the willingness of investors to diversify their portfolio balances via capital flows. The significance of the VIX index across the estimated models could be hinged on the argument in the literature that VIX is more enhanced in the

dynamics of capital flows for emerging countries, to which the scope of this study is not an exemption (see Rey, 2013; Ahmed and Zlate, 2014; Nier et al. 2014; Cerruti et al., 2015; and Hanan 2017).

The exact effect of global liquidity is difficult to ascertain and is dependent upon the measures and types of capital flow. From the theoretical perspective, a positive relationship should ensue between global liquidity and capital flows. This is because higher growth in money supply implies a high level of liquidity; hence investors have an edge to expand their portfolios. Conversely, liquidity crunch reduces capital inflows and also encourage capital reversal. In this study, the effect of the global money supply is heterogeneous to the various measures of capital flows. For instance, global liquidity has a positive effect on portfolio and other investments flows, while its effect is mixed for FDI. This stance can be corroborated with the intuition that global liquidity is a short-term phenomenon and as such, affects short-term based capital flows. This mixed finding is supported by both theoretical and empirical arguments (see Fratzcher, 2012 and Hanan, 2017).

We now turn to interpreting the main variables of interest (the interactive terms).Results for total gross capital flows are presented in Table 3.The prowess of the asymmetric effect has significantly reduced as compared to results reported in Table 2. This shows that accounting for some control variables has a dampening effect on the significance of asymmetry. On the one hand, negative decomposition only matters. On the other hand, asymmetry is now limited to macroeconomic fundamentals. It could be seen that the interactive terms of GDP with inflation yields negative and significant results. In other words, the strong effect of the negative component of economic growth decomposition could be attributed to the macroeconomic factors.

Results obtained are similar to earlier studies that have found that the VIX index and the average growth rate of the advanced countries are important determinants of capital flows (see Milessi-Ferretti and Tille, 2011; Bruno and Shin, 2014; Rey 2013; and Ahmed and Zlate, 2014). In contrast to these studies, that have advocated for the importance of push factors, we show that some domestic factors have a high explanatory power on capital flows. For instance, we show that specific types (macroeconomic fundamentals) of domestic factors are important for capital flows. Results also show that the fiscal channel have positive net effect, while the inverse holds for the institutional channel. For instance, the net effect of inflation is -1.114 (0.139+0.450+[-0.037*46.02]).

**Table 3: Channels of Asymmetry of Capital Flow (Dependent Variable: Total Capital Flows)**

| | Macroeconomic | | Fiscal | | Institutional | |
|---|---|---|---|---|---|---|
| Lag | 0.703*** (0.013) | 0.660*** (0.022) | 0.683*** (0.020) | 0.169*** (0.082) | 0.965*** (0.012) | 0.687*** (0.013) |
| GDPP | 0.139 (0.098) | -0.361* (0.203) | 0.265* (0.156) | 0.227 (0.141) | -0.678 (0.626) | -0.510 (0.675) |
| GDPN | 0.450*** (0.120) | -0.554*** (0.177) | -0.067 (0.125) | -0.282 (0.170) | -0.799 (0.716) | -0.513 (0.627) |
| G7 | -0.114*** (0.040) | -0.295** (0.118) | -0.082 (0.076) | 0.561*** (0.158) | -0.082 (0.057) | -0.208* (0.111) |
| VIX | -0.431*** (0.139) | -0.326*** (0.116) | -0.434** (0.227) | -0.059 (0.040) | -0.487*** (0.126) | -0.391*** (0.138) |
| INF | -0.064** (0.028) | | | | | |
| GDP×INF | -0.037*** (0.003) | | | | | |
| CRE | | 0.125 (0.078) | | | | |
| GDP×CRE | | 0.026*** (0.007) | | | | |
| GGB | | | 0.004 (0.004) | | | |
| GDP×GGB | | | -0.008 (0.005) | | | |
| FMB | | | | -0.001* (0.000) | | |
| GDP×FMB | | | | 0.001* (0.000) | | |
| POL | | | | | 0.558** (0.214) | |
| GDP×POL | | | | | 0.013 (0.011) | |
| STA | | | | | | 2.043** (0.836) |
| GDP×STA | | | | | | 0.074 (0.094) |
| Net effect | -1.114 | 0.671 | 0.202 | 0.193 | -0.600 | -0.434 |
| **Diagnostics** | | | | | | |
| AR(1) | 0.099 | 0.110 | 0.115 | 0.200 | 0.102 | 0.104 |
| AR(2) | 0.816 | 0.970 | 0.910 | 0.093 | 0.955 | 0.943 |
| Sargan OIR | 0.154 | 0.169 | 0.068 | 0.852 | 0.085 | 0.141 |
| Hansen OIR | 0.178 | 0.268 | 0.536 | 0.255 | 0.176 | 0.260 |
| | | | | | | |
| DHT for instruments | | | | | | |
| (a)Instruments in levels | | | | | | |
| H excluding group | 0.060 | 0.140 | 0.160 | 0.239 | 0.147 | 0.091 |
| Dif(null, H=exogenous) | 0.697 | 0.588 | 0.872 | 0.255 | 0.711 | 0.759 |
| (b) IV (years, eq (diff)) | | | | | | |
| H excluding group | 0.144 | 0.250 | 0.182 | 0.563 | 0.361 | 0.085 |
| Dif(null, H=exogenous) | 0.540 | 0.762 | 0.485 | 0.159 | 0.614 | 0.644 |
| | | | | | | |
| Fisher | 1461*** | 431*** | 780*** | 10.820*** | 1200*** | 853*** |
| Instruments | 28 | 28 | 28 | 25 | 28 | 28 |
| Countries | 43 | 42 | 42 | 39 | 41 | 41 |
| Observations | 973 | 956 | 848 | 877 | 921 | 921 |

Source: Authors' computation

Note: Lag is the first lag of the dependent variable. GDPP and GDPN are positive and negative partial sums decomposition, respectively. G7 is the average economic growth rate of the advanced (G7) countries, while VIX is the VIX index. INF is inflation (46.02), CRE is credit provided to the private sector (51.04); STA is government stability (7.96); POL is political risk rating (67.40); GGB is government balance (-1.72), while FMB is the broad money supply (248.17). The values in parenthesis represent the mean values of the associated variables. ***,**,*: significance levels at 1%, 5% and 10% respectively. GDPP and GDPN imply positive and negative atrial sum decompositions, respectively. DHT: Difference in Hansen Test for Exogeneity of Instruments' Subsets. Dif: Difference. OIR: Over-identifying Restrictions Test. The significance of bold values is twofold. 1) The significance of estimated coefficients, Hausman test and the Fisher statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(1) & AR(2) tests and; b) the validity of the instruments in the Sargan.

Table 4 presents the results of FDI. It could be deduced from the table that asymmetry is more prone to macroeconomic fundamental (inflation) and fiscal (broad money supply) channels. Countries respond more to negative changes in economic growth in both the inflation and broad money supply equations. The net effect of inflation and broad money supply are the channels through which the asymmetry operates. These results are realistic and intuitive. For instance, investors are more concerned about safety of their investments. As such, anything that could easily erode the level of their wealth would be avoided. Inflation and broad money supply are important candidates in this case. As an analogy, high inflation has the propensity to reduce the value of investment. Excessive high money supply could negatively affect the wealth of investors, through inflationary pressure. The marginal effects of other variables are important determinants of capital flows. However, when these variables are interacted with GDP, they seem to lose statistical significance. Thus, asymmetry does not operate via these variables.

**Table 4: Channels of Asymmetry of Capital Flow (Foreign Direct Investment)**

| | Macroeconomic | | Fiscal | | Institutional | |
|---|---|---|---|---|---|---|
| Lag | 0.781*** (0.004) | 0.769*** (0.010) | 0.768*** (0.003) | 0.630*** (0.035) | 0.779*** (0.004) | 0.778*** (0.002) |
| GDPP | 0.091*** (0.028) | 0.058 (0.091) | 0.090*** (0.026) | 0.035 (0.029) | 0.026 (0.170) | 0.134 (0.169) |
| GDPN | 0.244*** (0.089) | -0.093** (0.054) | 0.037 (0.030) | 0.059*** (0.016) | 0.263 (0.263) | 0.168 (0.150) |
| G7 | -0.049** (0.020) | -0.136*** (0.044) | -0.024 (0.200) | 0.059*** (0.016) | -0.029 (0.030) | 0.056*** (0.012) |
| VIX | -0.240*** (0.057) | -0.180*** (0.056) | -0.0137*** (0.047) | -0.056*** (0.014) | -0.218*** (0.063) | -0.288*** (0.036) |
| INF | -0.013 (0.013) | | | | | |
| GDP×INF | -0.043** (0.001) | | | | | |
| CRE | | 0.070*** (0.021) | | | | |
| GDP×CRE | | 0.001 (0.002) | | | | |
| GGB | | | 0.001 (0.001) | | | |
| GDP×GGB | | | -0.006** (0.002) | | | |
| FMB | | | | 0.023** (0.008) | | |
| GDP×FMB | | | | 0.036** (0.012) | | |
| POL | | | | | 0.270** (0.104) | |
| GDP×POL | | | | | -0.003 (0.003) | |
| STA | | | | | | 1.067*** (0.162) |
| GDP×STA | | | | | | -0.020 (0.022) |
| Net effect | -1.643 | 0.016 | 0.137 | 2.522 | 0.086 | 0.143 |
| AR(1) | 0.219 | 0.222 | 0.220 | 0.304 | 0.220 | 0.220 |
| AR(2) | 0.482 | 0.469 | 0.471 | 0.436 | 0.481 | 0.476 |
| Sargan OIR | 0.579 | 0.337 | 0.120 | 0.087 | 0.647 | 0.875 |
| Hansen OIR | 0.147 | 0.558 | 0.544 | 0.332 | 0.472 | 0.141 |
| DHT for instruments | | | | | | |
| (a)Instruments in levels | | | | | | |
| H excluding group | 0.204 | 242 | 0.403 | 0.094 | 0.372 | 0.154 |
| Dif(null, H=exogenous) | 0.195 | 882 | 0.587 | 0.125 | 0.472 | 0.269 |
| (b) IV (years, eq (diff)) | | | | | | |
| H excluding group | 0.102 | 147 | | 0.386 | 0.099 | 0.127 |
| Dif(null, H=exogenous) | 0.214 | 688 | | 0.134 | 0.635 | 0.276 |
| | | | | | | |
| Fisher | 10003*** | 3217*** | 34361*** | 121*** | 11451*** | 12477*** |
| Instruments | 28 | 28 | 36 | 34 | 28 | 28 |
| Countries | 42 | 42 | 42 | 39 | 41 | 41 |
| Observations | 970 | 953 | 845 | 874 | 918 | 918 |

Source: Authors' computation

Note: Lag is the first lag of the dependent variable. GDPP and GDPN are positive and negative partial sums decomposition, respectively. G7 is the average economic growth rate of the advanced (G7) countries, while VIX is the VIX index. INF is inflation (46.02), CRE is credit provided to the private sector (51.04); STA is government stability (7.96); POL is political risk rating (67.40); GGB is government balance (-1.72), while FMB is the broad money supply (248.17). The values in parenthesis represent the mean values of the associated variables.

***,**,*: significance levels at 1%, 5% and 10% respectively. GDPP and GDPN imply positive and negative atrial sum decompositions, respectively. DHT: Difference in Hansen Test for Exogeneity of Instruments' Subsets. Dif: Difference. OIR: Over-identifying Restrictions Test. The significance of bold values is twofold. 1) The significance of estimated coefficients, Hausman test and the Fisher statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(1) & AR(2) tests and; b) the validity of the instruments in the Sargan.

The results for portfolio investment as well as other investments are presented in Tables 5 and 6, in that order. These two components of capital flows are similar in terms of characteristics and behaviour. These flows are very volatile and short-termed based (Broner et al. 2013). Hence, it is not surprising that these variables have similar determinants. These variables asymmetrically react heterogeneously to the decomposition of GDP. In the case of other investments, both the marginal and net coefficients are statistically significant, carrying the expected signs. Thus, all the three channels of uncertainty this study hypothesizes are valid for explaining reasons for capital asymmetry. The significance of the institutional uncertainty could be justified by the fact that investors using these instruments interact with governments. Hence, for effective transaction and to secure the trust of the investors, government's (or any of its agencies) credibility should not be in doubt. To a large extent, similar results were replicated for portfolio investment (see table 6).

**Table 5: Channels of Asymmetry of Capital Flow (Other Investments)**

| | Macroeconomic | | Fiscal | | Institutional | |
|---|---|---|---|---|---|---|
| LAG | 0.440*** (0.022) | 0.661*** (0.039) | 0.425*** (0.019) | 0.205*** (0.009) | 0.482*** (0.015) | 0.448*** (0.049) |
| GDPP | 0.191*** (0.039) | -0.174* (0.101) | 0.215** (0.092) | 0.266*** (0.042) | -1.497*** (0.549) | -0.757 (0.705) |
| GDPN | 0.0295*** (0.052) | -0.240* (0.124) | -0.019 (0.041) | -0.149** (0.069) | -1.535** (0.570) | -0.777 (0.0684) |
| G7 | 0.019 (0.011) | 0.116** (0.043) | 0.075*** (0.017) | 0.080*** (0.020) | 0.047 (0.034) | 0.217** (0.119) |
| VIX | -0.170*** (0.030) | -0.109** (0.048) | -0.036 (0.026) | -0.094*** (0.017) | -0.153*** (0.053) | -0.121** (0.058) |
| INF | -0.007*** (0.001) | | | | | |
| GDP×INF | -0.002*** (0.000) | | | | | |
| CRE | | -0.139*** (0.023) | | | | |
| GDP×CRE | | 0.008** (0.003) | | | | |
| GGB | | | 0.003* (0.002) | | | |
| GDP×GGB | | | -0.008** (0.002) | | | |
| FMB | | | | -0.002** (0.000) | | |
| GDP×FMB | | | | 0.001*** (0.000) | | |
| POL | | | | | 0.382*** (0.118) | |
| GDP×POL | | | | | 0.025*** (0.009) | |
| STA | | | | | | 1.401** (0.541) |
| GDP×STA | | | | | | 0.105 (0.097) |
| Net effect | 0.127 | -0.005 | 0.210 | 0.365 | -1.345 | -0.695 |
| | | | | | | |
| AR(1) | 0.101 | 0.104 | 0.080 | 0.180 | 0.101 | 0.063 |
| AR(2) | 0.169 | 0.065 | 0.135 | 0.197 | 0.183 | 0.159 |
| Sargan OIR | 0.221 | 0.168 | 0.112 | 0.287 | 0.283 | 0.056 |
| Hansen OIR | 0.105 | 0.193 | 0.420 | 0.309 | 0.098 | 0.152 |
| DHT for instruments | | | | | | |
| (a)Instruments in levels | | | | | | |
| H excluding group | 0.054 | 0.120 | 0.150 | 0.180 | 0.193 | 0.126 |
| Dif(null, H=exogenous) | 0.642 | 0.305 | 0.830 | 0.197 | 0.454 | 0.631 |
| (b) IV (years, eq (diff)) | | | | | | |
| H excluding group | 0.051 | 0.093 | 0.079 | 0.287 | 0.149 | 0.154 |
| Dif(null, H=exogenous) | 0.495 | 0.520 | 0.415 | 0.309 | 0.182 | 0.266 |
| | | | | | | |
| Fisher | 94*** | 46*** | 166*** | 316*** | 23*** | 30*** |
| Instruments | 28 | 28 | 36 | 36 | 28 | 28 |
| Countries | 42 | 42 | 42 | 39 | 41 | 41 |
| Observations | 968 | 948 | 843 | 872 | 916 | 916 |

Source: Authors' computation

Note: Lag is the first lag of the dependent variable. GDPP and GDPN are positive and negative partial sums decomposition, respectively. G7 is the average economic growth rate of the advanced (G7) countries, while VIX is the VIX index. INF is inflation (46.02), CRE is credit provided to the private sector (51.04); STA is government stability (7.96); POL is political risk rating (67.40); GGB is government balance (-1.72), while FMB is the broad money supply (248.17). The values in parenthesis represent the mean values of the associated variables.

***,**,*: significance levels at 1%, 5% and 10% respectively. GDPP and GDPN imply positive and negative atrial sum decompositions, respectively. DHT: Difference in Hansen Test for Exogeneity of Instruments' Subsets. Dif: Difference. OIR: Over-identifying Restrictions Test. The significance of bold values is twofold. 1) The significance of estimated coefficients, Hausman test and the Fisher statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(1) & AR(2) tests and; b) the validity of the instruments in the Sargan.

**Table 6: Channels of Asymmetry of Capital Flow (Portfolio Investments)**

| | Macroeconomic | | Fiscal | | Institutional | |
|---|---|---|---|---|---|---|
| LAG | 0.062*** (0.014) | 0.137*** (0.026) | 0.032*** (0.009) | 0.082*** (0.000) | 0.097*** (0.025) | 0.758*** (0.018) |
| GDPP | -0.023** (0.010) | 0.050** (0.020) | 0.023** (0.009) | -0.015 (0.0108) | 0.606*** (0.177) | 0.926*** (0.162) |
| GDPN | 0.042 (0.027) | 0.184*** (0.041) | 0.013 (0.023) | 0.064** (0.025) | 0.663*** (0.181) | 0.917*** (0.147) |
| G7 | 0.028*** (0.008) | 0.036 (0.022) | -0.003 (0.005) | 0.014** (0.006) | 0.006 (0.017) | 0.019 (0.041) |
| VIX | -0.075*** (0.013) | -0.131*** (0.021) | -0.089*** (0.008) | -0.049*** (0.005) | -0.124*** (0.024) | -0.105*** (0.029) |
| INF | 0.003 (0.004) | | | | | |
| GDP×INF | 0.001 (0.005) | | | | | |
| CRE | | -0.023** (0.012) | | | | |
| GDP×CRE | | -0.004*** (0.001) | | | | |
| GGB | | | -0.002*** (0.000) | | | |
| GDP×GGB | | | -0.001** (0.00) | | | |
| FMB | | | | 0.0001 (0.0001) | | |
| GDP×FMB | | | | -0.0003 (0.0002) | | |
| POL | | | | | 0.128*** (0.039) | |
| GDP×POL | | | | | -0.010*** (0.003) | |
| STA | | | | | | 0.333 (0.252) |
| GDP×STA | | | | | | -0.124*** (0.020) |
| Net effect | 0.045 | 0.029 | 1.769 | -0.025 | 0.594 | 0.856 |
| AR(1) | 0.084 | 0.093 | 0.086 | 0.053 | 0.076 | 0.120 |
| AR(2) | 0.109 | 0.283 | 0.553 | 0.841 | 0.301 | 0.344 |
| Sargan OIR | 0.487 | 0.284 | 0.249 | 0.404 | 0.293 | 0.154 |
| Hansen OIR | 0.066 | 0.283 | 0.101 | 0.263 | 0.378 | 0.479 |
| H excluding group | 0.205 | 0.114 | 0.126 | 0.140 | 0.057 | 0.373 |
| Dif(null, H=exogenous) | 0.144 | 0.464 | 0.227 | 0.489 | 0.316 | 0.533 |
| H excluding group | 0.203 | 0.114 | 0.100 | 0.404 | 0.268 | 0.205 |
| Dif(null, H=exogenous) | 0.109 | 0.464 | 0.218 | 0.843 | 0.200 | 0.534 |
| | | | | | | |
| Fisher | 17*** | 21*** | 60*** | 92*** | 16*** | 13*** |
| Instruments | 28 | 28 | 36 | 36 | 28 | 28 |
| Countries | 42 | 42 | 42 | 39 | 41 | 41 |
| Observations | 956 | 942 | 841 | 868 | 912 | 912 |

Source: Authors' computation

Note: Lag is the first lag of the dependent variable. GDPP and GDPN are positive and negative partial sums decomposition, respectively. G7 is the average economic growth rate of the advanced (G7) countries, while VIX is the VIX index. INF is inflation (46.02), CRE is credit provided to the private sector (51.04); STA is government stability (7.96); POL is political risk rating (67.40); GGB is government balance (-1.72), while FMB is the broad money supply (248.17). The values in parenthesis represent the mean values of the associated variables.

***,**,*: significance levels at 1%, 5% and 10% respectively. GDPP and GDPN imply positive and negative atrial sum decompositions, respectively. DHT: Difference in Hansen Test for Exogeneity of Instruments' Subsets. Dif: Difference. OIR: Over-identifying Restrictions Test. The significance of bold values is twofold. 1) The significance of estimated coefficients, Hausman test and the Fisher statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(1) & AR(2) tests and; b) the validity of the instruments in the Sargan.

A number of post estimations exercises were conducted. First, the Hansen/Sagan test reveals that our model does not suffer from over-identification of instruments. Second, we conducted the Arellano and Bond test and its results fail to accept the null hypothesis that the models suffer from autocorrelation. Thirdly, the F-statics results confirm the joint and individual significance of the independent variables in the model.

## 4. Concluding implications and future research directions

This paper hypothesizes that capital flows and economic growth are asymmetrically related. This hypothesis stems from already established argument in the literature (examples include the Lucas paradox, global imbalances, allocation puzzle). The study further examines the channel through which the asymmetry operates focusing on uncertainty. In other words, we further explore the contribution of uncertainty in the capital flows-growth nexus. Essentially, we categorized uncertainty into macroeconomic, fiscal, and institutional dimensions.

Using data from42 emerging countries over the period 1990-2015, we establish that capital flows and economic growth have an asymmetric relationship. Results reveal that capital flows respond more to economic drag (negative partial sum decomposition) than to economic growth. We hinged this scenario-based ground that non-FDI flows have been found to respond more to interest rate, government credibility, and institutional quality among others. On the roles of uncertainty in the nexus, the following findings were established: (i) macroeconomic uncertainties are important for total gross capital flows; (ii) fiscal and macroeconomic uncertainties contribute to FDI-based capital flows; and (iii) all the three types of uncertainties contribute to asymmetry between "portfolio and other investments" and economic growth. Future studies could explore the possibility of replicating this exercise within the context of other determinant(s) of capital flows. This suggestion is owing to the fact that determinants of capital flows are heterogeneous to their various components.

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