Economic Systems 45 (2021) 100872

Contents lists available at ScienceDirect

Economic Systems

journal homepage: www.elsevier.com/locate/ecosys

Financial development, portfolio investments and the real economy in Africa

Michael Effah Asamoah [a,b,*], Imhotep Paul Alagidede [b], Frank Adu [b]

[a] Department of Banking and Finance, Central University, Ghana
[b] Wits Business School, University of the Witwatersrand, Johannesburg, South Africa

ARTICLE INFO

Keywords:
Portfolio investments
Real economy
Financial development
Instrumental variable
Marginal effects
Africa

ABSTRACT

According to the conservative view, capital flows enhance economic growth. Focussing on Africa's real economy, this study investigates the linkage between portfolio investments and real sector growth, and whether financial sector development strengthens this association. The study covers 30 countries over the period 1990–2017. We adopt the Lewbel instrumental variable general method of moments (IV-GMM) two-step robust estimator, which relies on heteroscedasticity for identification, while dealing with instrument insufficiency, unavailability, endogeneity and omitted variable bias. We found that portfolio equity has no growth impact on Africa's real sector. Debt flows deter the growth of the overall real sector as well as the manufacturing and industrial sectors, but have no impact on agriculture and service growth. We found that financial development does strengthen the positive association between capital flows and economic growth, but this is dependent on the type of sector and portfolio investment, as well as on the degree of financial development. We control for known determinants of economic growth.

1. Introduction

Despite the welfare gains associated with capital flows, much of the empirics is skewed towards foreign direct investment (FDI) with a slight emphasis on other flows. However, the distinct features of these flows require that attention to all should be the norm rather than the exception. While FDI differs from other types of flows in terms of control, stability, and resilience to both financial and economic crises, portfolio equity flows favour liquid assets rather than fixed capital investments. Portfolio debt flows impose an obligation on recipient countries and firms as opposed to the other two. In as much as portfolio equity flows and foreign direct investment (FDI) are deemed expensive because of the high required rates of return, they offer a bit of relief since rates on the return are tied to available profit. Whereas portfolio debt flows are relatively cheap in terms of rates of return, payment of interest and principal are not tied to available profit.

Nevertheless, most studies on capital flows have focused on FDI while treating equity and debt flows as an appendix to the relevance of FDI, despite the financial relief they bring to countries. In addition to the financial relief associated with equity flows, they reduce the risk of local firms by sharing risk with foreign partners, enhancing stock market liquidity and capitalization, as well as enforcing the establishment of robust corporate governance mechanisms. It is thus suggested that, given the varied characteristics of each capital flow, each type may have a completely different impact on different sectors of the economy and growth in the recipient

* Corresponding author at: Department of Banking and Finance, Central University, Ghana.
E-mail addresses: iameffah@gmail.com (M.E. Asamoah), Paul.Alagidede@wits.ac.za (I.P. Alagidede), frankadu64@gmail.com (F. Adu).

https://doi.org/10.1016/j.ecosys.2021.100872
Received 23 January 2020; Received in revised form 26 November 2020; Accepted 12 December 2020
Available online 20 October 2021

countries. The United Nations make an important observation about the relevance of portfolio investment flows (equity and debt) relative to dominant FDI, official development assistance (ODA) and migrants' remittances, and state that "it is important to consider FDI in the context of other components of the financial account in the balance of payments – portfolio debt and equity investment." The United Nations further state that "The Addis Ababa Action Agenda on Financing for Development recognizes the important contribution that FDI can make to sustainable development", while noting that the other flows are also critical. An additional motivation for considering other types of capital flows is that the dividing lines between FDI and other types of flows are becoming increasingly blurred, for three main reasons:

- FDI, as measured in the balance of payments, contains components that behave like portfolio flows. They can be relatively short-term and volatile.
- Portfolio equity flows can be used for FDI-like purposes. Multinational Enterprises (MNEs) can acquire long-term strategic stakes in foreign enterprises, with a measure of control.
- Flows used for identical purposes can be classified differently depending on how funds are transferred across borders. For example, when MNEs from developing economies raise debt in developed economies with deeper financial markets, they can either use the services of a bank and transfer the proceeds back to the parent through a cross-border deposit, which would be counted as "other flows" in the balance of payments; or transfer funds through an intracompany loan by way of a local affiliate, which would be counted as FDI (UNCTAD, 2018, pp. 11).

Again, focusing on these types of flows is of utmost significance due to the surge inflows to developing regions including Africa. For instance, UNCTAD notes, "The sharp fall in global FDI contrasted with the trend in other cross-border capital flows. Total capital flows increased from 5.6 to 6.9 percent of global GDP, as bank lending and portfolio investment (mostly portfolio debt) flow compensated for the FDI slump" (UNCTAD, 2018). It is essential to state that portfolio debt flows were a significant component of capital flows as a proportion of GDP, until the onset of the recent global financial crisis, where it accounted for a higher percentage of global GDP. Between 2012 and 2016, the percentage of GDP that constituted portfolio debt flows was much higher than FDI. Though debt and equity flow dipped owing to their volatile nature amidst the crisis, the recovery has been encouraging, though slower (UNCTAD, 2018).

While the impact of FDI on economic growth seemed settled, work on the impact of debt and equity flows on growth is part of the capital-growth literature; as such, relevant studies are limited. Research on the effect of portfolio investment flows on the growth of real sector components and the extent to which financial development facilitates portfolio-real sector growth linkages is even rarer. For instance, although Gossel and Biekpe (2014) found a less robust association between portfolio investments and economic growth, they focused solely on South Africa. Similarly, Calderón and Nguyen (2015) considered the impact of FDI, aid and foreign borrowing growth on output growth of 38 SSA economies with no mention of portfolio equity. Other known capital flows-growth studies such as that by Agbloyor et al. (2014) have treated portfolio investmets virtually as an appendix to FDI flows. However, these studies focused on growth measured by GDP. To address the issue of capital flows, and the real sector in Africa, Kodongo and Ojah (2017) sought to assess the impact of FDI and remittances of growths in manufacturing, agriculture, industry and services. Again, their study ignored the impact of both equity and debt flows. Though Asamoah and Alagidede (2020) explored the causal linkages between portfolio investments (equity and debt) and the real sector, they failed to account for the mediating role of financial development while focusing on countries below the Sahara. In a recent study, Asamoah et al. (2021) examined the linkages between the growth of Africa's real sector and capital flows (FDI, portfolio equity and debt) but the study paid particular attention to the moderating power of institutional quality.

This study therefore adds to the current discussion through the application of macro-level data on the association between portfolio investment flows and the growth of Africa's real sector, and the extent to which financial sector development reinforces the portfolio investments-sectoral growth nexus. The study thus addresses the following shortfalls in the literature: (1) Do portfolio investments (equity and debt) stifle or promote the growth of Africa's real sector? (2) Does financial development promote real sector growth in Africa? (3) At which levels of financial development can any adverse impact of portfolio investment on the real sector be mitigated or reinforce the growth impact of portfolio investments on Africa's real economy? We measure the real sector as the combined growth of the value addition of the sectors that drive economic activity. These include growths in value additions in agriculture, manufacturing, industry and services. These indicators have been used as the main proxies for the real sector in the growth literature (see Aizenman et al., 2013; Ductor and Grechyna, 2015; Kodongo and Ojah, 2017; Igan et al., 2017; Ibrahim and Alagidede, 2017; Asamoah and Alagidede, 2020). Consequently, this study aims to separately assess the impact of portfolio equity and private debt flows on Africa's real economy, and subsequently to determine if the association is conditional on the extent of financial development through a marginal effect analysis.

Although economic growth in Africa as measured by either GDP or GDP per capita has been impressive over the past decade, Fioramonti (2017) cautions that when countries focus largely on GDP, which is an aggregate figure, as the ultimate measure of growth, they may miss out on alternative assessments of development, especially at the disaggregate level. Also, Aizenman et al. (2013) contend that though GDP growth is mostly the first indicator of welfare gains, the value additions of economic sectors show the actual contributions to economic activity. They further maintain that it is within these sectors that social benefits and cost eventually exist. Accordingly, UNECA (2017) notes that growth in real sector components stimulated economic growth in 2016 for two of the four highest growing countries in East Africa. Growth in Rwanda was mainly on the back of agriculture and services, despite falling coffee and tea prices, while in Tanzania demand for manufacturing and services spurred economic growth (UNECA, 2017). Political and economic observers are optimistic that a critical component needed to sustain Africa's growth lies in the transformation of SSA's

economy, which is unattainable without growth in the expansion of the real sector. The growth of the real sector (growth in agriculture and services as well as expansions in manufacturing and industries) linked to productivity and output is essential for growth in SSA. Grabowski (2006) puts forward the argument that broad-based expansions in agricultural productivity, coupled with political developments, are essential for sustained growth in Sub-Saharan Africa. Loayza and Raddatz (2010) found evidence that growth in agriculture, construction and manufacturing matters for poverty alleviation. Warr (2001) also found the growth of the agricultural and services sectors to be essential poverty reduction tools. Accordingly, growth in the manufacturing and agricultural sectors is directly linked to the growth of other sectors and the economy at large.

Against the initial background, the study augments the growth–capital flows debate by empirically examining the relationship between portfolio investment (equity and private debt) flows and the growth of the real economy in Africa. We further test whether the extent of financial development facilitates such a relationship by assessing this relationship at changing levels of financial development (marginal effect analysis). Regarding financial development and the attraction of capital flows in general, Blomström et al. (2003) note the relevance of domestic conditions in the attraction of FDI and other capital flows by local enterprises. Regarding the relevance of the domestic market on capital flows, Bilir et al. (2019) note the importance of domestic financial conditions for attracting multinational enterprises, as they contend that the level of financial sector development is an incentive for entry of multinational affiliates. They show theoretically that one incentive for the influx of foreign firms lies in the development of the host country's financial sector, which comes about through "a financing effect." The financing effect aids the entry and expansion of most multinational enterprises. They show that an increase of private credit from the 10th to the 90th percentile will lead to a 13.9 % surge in the number of foreign affiliates to host countries. Striking a chord between one of the spillover benefits of capital flows and financial development, Hsu et al. (2014) note the benefits of a developed financial sector to technological innovation. Using data on 32 developed and emerging economies, they show a strong correlation between the development of the equity market and higher innovation for industries that are known to depend on seeking external financing. However, credit market development was detrimental to technological innovation.

Additionally, we make use of a new broad-based financial development index that takes into account the extensiveness and intricacies of financial development as opposed to the use of single indices in previous studies. As explained by Svirydzenka (2016), the broad-based financial development index is derived from the development of financial markets and institutions in terms of access, depth and efficiency. In addition, to estimate our empirical relationships, the study adopts an instrumental variable general method of moments (IV-GMM) two–step procedure developed by Lewbel (2012) that is applicable in cases of insufficient or unavailable instruments, while at the same time dealing with issues of endogeneity and omitted variable bias. The strength of the Lewbel IV lies in its ability to augment a precisely identified model to allow for overidentifying restrictions and at the same time gain efficiency. We further focus on Africa as a portfolio investment destination that has received little attention in contrast to the dominant form of private capital flows (FDI). Given the intention of its leaders to build a stronger trade bloc with the intention to set in motion the African Continental Free Trade Agreement (ACFTA), the continent will have the largest bargaining power in terms of trade and investments. Finally, we achieve our objectives in a three-step procedure. First, we evaluate the direct impact of portfolio investments and financial development of the real economy in Africa. Secondly, we determine the interaction effect of portfolio investments and financial development on the real economy. Finally, we evaluate the marginal effect of portfolio investments on the real economy at varying percentiles of financial development.

Succinctly, the main thrust of the current study is the prime focus on the growth of Africa's real economy through the attraction of portfolio investments, given that such capital flows are neither sector- nor firm-specific in nature and could be deployed in place of the traditional type of capital flow (FDI). Subsequently, we extend the preliminary investigation to examine whether financial development is a prerequsite to boost the growth impact of portfolio investments on Africa's real economy. We do this by applying a financial development indicator as well as an estimation procedure not previously employed in the capital flows-growth dynamics literature. The paper provides several policy implications for the growth and sustainability of Africa. The recent growth in Africa has revitalised the African growth agenda and countries growing through the real sector. Issues of industrialisation and revamping of agriculture are deemed essential to the growth agenda, although current growth is led by surges in the services sector. The study alerts countries of sector-specific capital flows needed for growth, as it brings into focus the relevance of other capital flows in addition to the dominant FDI. Additionally, it affords policymakers a framework to analyze the eventual levels of financial development required to mediate the real sector–capital flows dynamics. Section 2 presents the data and the estimation procedure. Section 3 discusses the empirical results, and Section 4 concludes the study with policy recommendations.

2. Data and estimation technique

We specify an econometric model in order to resolve the study's research questions. We employ data on 30 African countries spanning the period 1990 to 2017.[1] The choice of countries is purely dependent on data availability. Aside from data, the choice of the study period is influenced by the fact that financial openness began to expand into most countries by the late 1980s to mid-1990s. Using the financial index component of the Aizenman et al. (2011) de jure index of capital account openness shows that financial

[1] The list of countries can be found in Appendix A.

openness in Africa increased by approximately 23 % between 1990 and 2016.[2]

We employ an empirical model close to Agbloyor et al. (2014), Igan et al. (2017), and Kodongo and Ojah (2017). We exploit an instrumental variable technique in the generalized method of moments (IV-GMM) form developed by Lewbel (2012). The Lewbel (2012) IV estimator relies on heteroscedasticity for identification and produces more efficient estimates than the standard IV with smaller standard errors, while dealing with issues of reverse causality, endogeneity, measurement errors, and omitted variable bias. According to Baum et al. (2013), the Lewbel (2012) IV estimator permits the identification of structural parameters in regression models with regression mismeasurements or endogeneity and is applicable in situations where external instruments do not exist, are challenging to find or insufficient. Mishra et al. (2014) contends that estimates from the Lewbel (2012) IV are very close to those using conventional valid IVs, but more efficient. We employ external instruments to augment internal instruments generated by the IV-GMM estimator. Regarding instrument selection, Baum (2009) posits that they should meet certain criteria. Apart from meeting the conditions on orthogonality, valid instruments should exhibit correlation with the explanatory variable while not correlating with the unobserved factors (error term) in the equation. In this regard, selected instruments should influence the dependent variables, but this must be done indirectly through the endogenous regressors. Wooldridge (2016) shows that estimates generated with better instruments (zero correlation with the error term) are more precise than those generated with inappropriate instruments. We make use of the Lewbel IV-GMM two-step estimator, as it is known to produce efficient and robust standard errors.

The GMM estimator employs the Hansen J test for over identifying restrictions and orthogonality restrictions. The joint null hypothesis is that instrumets are valid and thus uncorrelated with the error term, and that excluded instruments are correctly excluded from the estimated equation. With the application of the GMM version of the Lewbel (2012) IV estimator, issues of identification and restrictions are consistent with the recent literature (see Asongu and Acha-Anyi, 2019; Asongu et al., 2017). Additional diagnostics include tests of exogeneity, weak and over/under-identification of instruments. Under the test of exogeneity of additional instruments, the C-statistics test that the full set of orthogonality conditions and any additional instrument is valid. The under-identification test ensures the equation is properly identified, and that any excluded instrument is correlated with the endogenous regressors. A rejection of the null hypothesis signifies that our set of equations is adequately identified. Lastly, the weak identification test ensures that all excluded instruments are correlated with our endogenous variables, but weakly. The Stock and Yogo (2005) weak identification test is thus employed based on the maximal IV relative bias as the threshold indicator. Using the Kleibergen-Paap rk F test, all our results surpass at least the minimum threshold of 30 % maximal IV relative bias. All results strongly satisfy these conditions. The model has recently been employed in the capital flows-growth literature by Asamoah et al. (2021).

We specify our initial model that ascertains the direct relationships between portfolio investments, and the effect of financial development on real sector growth, in the presence of other control variables. Thus, γ and ψ are the variables of interest in Eq. (1).

$$RSG_{it} = \gamma PI_{it} + \psi \mathrm{FD}_{it} + \chi \mathrm{H}_{it} + \Omega_i + \delta_i + \lambda \mathrm{t}_{it} \tag{1}$$

where RSG_{it} measures annual growth in the real sector for country i at time t, decomposed into annual growth of value additions in the agriculture, industrial, manufacturing and services sectors.[3] Annual growth of agriculture value-added encompasses value additions in forestry, hunting and fishing, as well as cultivation of crops and livestock production. Industrial value-added comprises value additions in mining, manufacturing (also reported as a separate subgroup), construction, electricity, water and gas. Services value added comprises value additions in wholesale and retail trade transport, and government, financial, professional and personal services such as education, health care and real estate services. All aggregates are based on constant 2010 U.S. dollars. Following Asamoah et al. (2016) and Asiedu (2013), we construct an index measure of real sector growth from the four components as an unweighted average of the four components, which we call the Real Sector Growth (RSG) Index. We obtained data on the real sector from the World Development Index (WDI) of the World Bank.

PI_{it} denotes portfolio investment flows, decomposed into portfolio equity and private non-guaranteed debt (PNG). Portfolio equity is equity securities except for those considered direct investments. Portfolio equity flows is considered as a ratio of GDP. PNG is an external obligation of a private debtor that is not backed by a guarantee in terms of repayment by any entity. Net flows received by the borrower during the year are disbursements minus principal repayments. Based on the necolassical theory, we anticipate that inflows of portfolio investments will have a positive direct impact on the growth of all sectors. However, based on the empirical postulation of an allocation puzzle between capital flows and growth, as well as the fickle and unpredictable nature of portfolio investments, an adverse impact is a possibility. Data on portfolio investments were obtained from the World Development Index (WDI) of the World Bank.

FD_{it} is the financial development index. As recently spearheaded by the IMF, Svirydzenka (2016) posits that the current financial development index takes into account the development of both financial institutions and financial markets in terms of efficiency (low-cost financial services amidst sustained revenues, and capital market activities), access (i.e., the ability to access financial services) and depth (liquidity and size of markets). The index is constructed using data from various sources that include the IMF's Financial Access survey, the BIS debt securities database, Dealogic corporate debt database, and the World Bank FinStats 2015. For

[2] The financial openness component of the trilemma index is normalised to lie between 0 (less open) and 1 (most open). The average level of financial openness for all African countries increased from 0.233 in 1990 to 0.309 in 2016. Within the period, the most open African economy to cross-border capital is Djibouti (0.933) while the least open is Somalia (0). For our sample the most open is Uganda (0.77) and the most closed Guinea (0.08).

[3] In this study manufacturing, industry, agriculture and services value additions are the same as manufacturing, industry, agriculture and services sector growth. They are used interchangeably.

robustness, we deploy private sector credit as another measure of financial development. Based on the Schumpeter (1911) view of finance enhancing growth, we anticipate a direct positive association between all indicators of financial development and growth of all sectors. Additionally, given the relevance of absorptive capacities in capital flows and growth empirics, we also expect portfolio investments to have a positive growth impact in the presence of financial development. We obtain data on financial development from the International Monetary Fund (IMF).

X_{it} denotes a set of control variables in a standard growth model that includes financial openness, government expenditure, domestic savings, GDP growth and institutional quality. We measure financial openness with the capital account component of the trillema index (Aizenman et al., 2011). The capital account component of the index is merely a de jure measure and looks at the policy intent of countries regarding financial openness. The index is normalized to range between zero and one. A country with a higher value is deemed to be more susceptible to cross-border capital transactions (Aizenman et al., 2011). We expect that a more liberalized economy will benefit from financial openness. We measure gross domestic savings (GDS) as GDP minus total consumption expenditure, expressed as a percentage of GDP. We expect GDS to have a positive impact on the growth of all sectors. GDP growth is caputured by the annual percentage growth rate of GDP at market prices based on constant 2010 U.S. dollars. We anticipate that growth of the larger economy will have a positive impact on the growth of all sectors. Government expenditure is general government final expenditure as a percentage of GDP. To the extent that government expenditure is beneficial to all sectors, we anticipate a positive association between the growth of the real sector and final government expenditure. We measure institutional quality by the quality of the bureaucaracy, which looks at a country's ability to minimize revisions of state policies when there is a change in government. The index ranges between 1 and 4, with high points given to countries where changes in government do not lead to drastic changes in policies or interruptions in government services. Okada (2013) contends that bureaucracy quality and law and order are deemed important for capital flows attraction. To the extent that bureaucractic quality has the capacity and expertise to govern without radical changes in government policies or interruptions and services, institutional quality will have a positive impact on real sector growth. Again, less bureaucracy in the processing of business activities can enhance growth and the attraction of capital flows. We obtain data on institutional quality from the International Country Risk Guide (ICRG) and financial openness from the Aizenman et al. (2011) trilema index. All other control variables are from the World Development Indicators (WDI) of the World Bank.

$\Omega_i, \delta_t, \lambda t_{it}$ denotes country effects, a time-varying idiosyncratic shock with the standard iid assumption, and a model error term.

In order to capture the effect of portfolio investments on real sector growth, conditioned on financial development, we modify Eq. (1) to include the interaction of portfolio investments and financial development:

$$RSG_{it} = \gamma PI_{it} + \psi \mathrm{FD}_{it} + \chi \mathrm{H}_{it} + \beta(PI\ x\ \mathrm{FD})_{it} + \Omega_i + \delta_t + \lambda t_{it} \tag{2}$$

where $PI\ x$ FD denotes the interaction of portfolio investments for country i at time t, and financial development for country i at time t. From Eq. (2), we can then evaluate the marginal impact of portfolio investments on growth of the real sector at varying levels of financial development. We therefore differentiate Eq. (2) with reference to portfolio investments (PI)

$$\frac{d(RSG)}{d(PI)} = \gamma + \beta FD \tag{3}$$

Table 1
Descriptive statistics.

Variable	Obs.	Mean	Std. Dev	C.V	Pct. 10th	Pct. 50th	Pct. 90th
Agriculture value additions	761	4.485	10.861	2.422	−5.021	3.390	14.559
Industrial value additions	760	4.944	10.799	2.184	−3.219	4.210	12.950
Manufacturing value added	675	5.554	17.312	3.117	−3.671	3.842	15.377
Service value additions	739	4.593	5.172	1.126	−0.011	4.830	9.771
Real sector growth index	840	4.260	6.467	1.518	−0.452	3.629	8.906
Portfolio equity flow	620	0.144	0.632	4.389	−0.035	0.003	0.391
Private non-guaranteed debt	812	0.067	0.914	13.642	−0.244	0.000	0.330
Financial development index	810	0.143	0.103	0.720	0.058	0.110	0.270
Private sector credit	795	19.696	24.309	1.234	3.005	12.032	46.779
Financial openness	801	0.267	0.252	0.944	0.060	0.166	0.699
Government expenditure	814	14.142	5.243	0.371	7.852	13.895	20.807
Gross domestic savings	814	16.163	14.875	0.920	0.558	13.764	39.415
GDP growth	840	3.821	4.357	1.140	−0.791	4.187	7.837
Institutional quality	840	1.406	0.841	0.598	0	1	2.21

Notes: Portfolio investment flow is the summation of portfolio equity and private non-guaranteed debt. Broad money represents money and quasi-money divided by GDP. Private debt is an external obligation of a private debtor that is not guaranteed for repayment by a public entity. Portfolio equity includes net inflows from equity securities scaled by GDP. Real sector growth index is an unweight average of growth in manufacturing, industry, services and agriculture value additions. Service value additions is value additions in wholesale and retail trade transport, and government, financial, professional and personal services such as education, health care and real estate services. Industrial value additions is value additions in mining, manufacturing, construction, electricity, water, and gas. Agriculture value additions is annual growth of agriculture value-added. Manufacturing value additions is annual growth of manufacturing value added. The Chinn and Ito (2008) trilemma index measure financial openness. Government expenditure is general government final expenditure as a percentage of GDP. Gross domestic savings (GDS) is GDP minus total consumption expenditure, expressed as a percentage of GDP. GDP growth is the annual percentage growth rate of GDP at market prices based on constant 2010 U.S. dollars. Institutional quality is indicated by government bureaucaracy.

Table 2A
Real sector growth, portfolio equity flows and financial development.

Dependent Variable	RSG (1)	RSG (2A)	RSG (2B)	RSG (2C)	RSG (2D)	MANVA (3A)	MANVA (3B)	MANVA (3C)	MANVA (3D)	INVA (4A)	INVA (4B)
Portfolio equity flow (PEF)	−0.033 (1.211)	0.626 (1.379)	0.956 (1.111)	−0.003 (0.083)	−0.031 (0.110)	1.386* (0.817)	0.192 (0.668)	−0.075 (0.116)	−0.464 (0.885)	0.189 (0.209)	0.102 (0.092)
Financial Development index		8.649** (4.182)	10.625*** (4.014)			−1.346 (2.730)	−0.873 (2.816)			7.890** (3.796)	10.371** (4.504)
Private sector credit				−0.460** (0.225)	−0.133 (0.094)			0.262 (0.173)	0.151 (0.166)		
Interaction terms			4.751** (2.247)		0.518* (0.288)		3.503** (1.711)		0.122 (0.188)		7.496*** (2.847)
GDP growth	2.583 *** (0.289)	2.580*** (0.365)	2.633*** (0.363)	0.378*** (0.073)	0.142*** (0.023)	2.209*** (0.544)	0.436** (0.208)	0.322*** (0.100)	0.026 (0.027)	0.179*** (0.028)	0.177*** (0.028)
Gov't expenditure	−0.729*** (0.190)	−0.785** (0.306)	−0.827*** (0.300)	0.006 (0.018)	0.045*** (0.017)	−0.213 (0.173)	1.263 (1.755)	−0.060* (0.033)	−0.058* (0.032)	−0.028 (0.024)	−0.028 (0.029)
Financial openness	−4.786*** (1.093)	−4.825*** (1.305)	−4.931*** (1.331)	0.510* (0.276)	−0.182 (0.312)	−4.524* (2.492)	−2.70** (1.053)	−0.746** (0.365)	−0.734** (0.345)	−0.387*** (0.125)	−0.462** (0.219)
Domestic savings	2.020** (0.949)	0.556 (1.577)	0.336 (1.585)	0.033*** (0.010)	0.029** (0.011)	−0.320 (0.094)	1.178 (1.452)	0.050 (0.071)	0.137** (0.054)	0.011 (0.015)	0.012 (0.018)
Institutions	2.374 (1.454)	4.125** (1.190)	3.266* (1.809)	−0.091 (0.179)	0.192 (0.158)	0.027 (1.140)	−0.128 (1.320)	0.015 (0.177)	0.107 (0.135)	0.097 (0.152)	0.366* (0.220)
Net Effects	**n.a**	**n.a**	**1.635**	**n.a**	**10.172**	**n.a**	**0.693**	**n.a**	**1.939**	**n.a**	**1.174**
Diagnostics:											
Observations	430	409	409	353	368	342	327	252	267	370	326
Kleibergen-Paap rk LM test [p -value]	15.749 [0.046]	39.657 [0.000]	42.246 [0.000]	38.071 [0.001]	34.843 [0.007]	31.166 [0.005]	41.668 [0.000]	25.189 [0.033]	32.483 [0.009]	20.518 [0.083]	48.013 [0.000]
Kleibergen-Paap rk Wald F test	6.888	10.638	13.314	8.215	7.463	6.113	13.455	11.513	14.147	6.290	8.526
OID (Hansen J) test; [p-value]	6.334 [0.501]	17.207 [0.190]	18.968 [0.215]	10.190 [0.678]	24.028 [0.089]	17.814 [0.165]	22.881 [0.087]	11.927 [0.534]	14.327 [0.501]	14.220 [0.287]	10.643 [0.778]
Orthog – option: (Hansen J) [p-value]	0.957 [0.916]	5.773 [0.673]	10.758 [0.377]	8.217 [0.413]	9.289 [0.505]	10.824 [0.212	10.596 [0.390]	5.718 [0.679]	8.452 [0.585]	3.009 [0.934]	5.096 [0.885]
Exogeneity (C) test [p-value]	5.377 [0.146]	11.434 [0.043]	8.209 [0.145]	1.972 [0.853]	14.739 [0.022]	6.991 [0.221]	12.285 [0.0311]	6.209 [0.286]	5.875 [0.319]	11.211 [0.024]	5.546 [0.353]
F (Prob > F)	28.86 [0.000]	9.80 [0.000]	9.47 [0.000]	6.31 [0.000]	7.53 [0.000]	3.95 [0.000]	1.86 [0.066]	3.91 [0.001]	2.20 [0.028]	14.99 [0.000]	8.62 [0.000]
F-statistics for FD [Prob > F]			10.01 [0.007]		15.27 [0.000]		5.10 [0.078]		1.18 [0.056]		7.30 [0.026]
F-statistics for PEF [Prob > F]			4.58 [0.1010]		1.50 [0.2237]		4.90 [0.0864]		3.60 [0.166]		13.39 [0.001]

Notes: *, **, *** denote significance levels at 1 %, 5 % and 10 %, respectively. Regarding the components of the real sector, all models under B are an interaction of PEF and the financial development index, while D is an interaction of PEF and private sector credit. RSG is real sector growth index; MANVA is manufacturing value additions; INVA is industrial value additions.

From Eq. (3), β reflects the extent to which the impact of portfolio investments on real sector growth depends on different levels of financial development.

Based on the theoretical propositions of Schumpeter (1911) and Solow (1956), economic growth, and in our case the real sector, may grow as financial development and portfolio investments surge upwards. This means that both portfolio investments and financial development could have an endogenous relationship with the growth of the real sector. To deal with the issue of endogeneity, we employ instruments for the indicators of financial development and portfolio investments. For financial development, we employ lags of the financial development index and private sector credit as instruments. We follow Buchanan et al. (2012), Beck et al. (2003) and Levine (2005) in employing origin of the legal system as an additional instrument for financial development. For portfolio investments, Agbloyor et al. (2014) and Wheeler and Mody (1992) posit that the lag of FDI is a valid instrument for FDI because of its reinforcing nature. Thus, for portfolio investments (equity and debt) we employ their lags as valid instruments. Additional instruments for portfolio investments are the exchange rate and exchange rate volatility (Agbloyor et al., 2014; Alfaro et al., 2004).

Table 1 presents the descriptive results. We present values of the 10th, 50th and 90th percentiles in addition to the mean and standard deviations over the period 1990 to 2017. The percentile values help in the comparison and analysis of the results; given the variations in growth dynamics across countries in our sample, it also allows us to see the extreme ends of the data. We further present the coefficient of variation, which looks at the risk per mean of the variables as an indicator of relative risk. It is evident that the average GDP growth over the study period has fallen slightly below the recent average growth rates in the region. This is not surprising, as the recent surge in growth rates just started in the early 2000s; however, the study period dates to a decade before the surge. Casual observation shows that all real sector components obtained an average growth rate higher than the aggregate economic growth. This supports the recent assertion that the growth of Africa's economy is dependent on the growth of the real sector and its components.

Among the real sector components, growth in manufacturing has overtaken the erstwhile vibrant agriculture economy in Africa. Surprisingly, although the agriculture sector recorded the least average growth among all sectors, it has the second highest standard deviation. This confirms the level of risk associated with the sector compared to the services sector. Though the service sector recorded the third highest average growth, it also has the lowest standard deviation among all sectors. However, looking at the coefficient of variation, the service sector presents the least risk per return, while the manufacturing sector had the highest risk per return. The mean indicates that all sectors performed better than the overall real sector index.

Between the two components of portfolio investments, equity flows recorded an average value of 0.144 %, while debt flows had an average of 0.07 %. These values show that the preference for equity is still higher than debt. This may be due to the level of development across equity-related stock markets in Africa. However, debt flows recorded a higher standard deviation then equity, a testament of the risk that is mostly associated with debt flows in the form of high interest payments. The coefficient of variation further supports the assertion of high risk investors associated with debt flows, as the relative risk is higher than that of portfolio equity flows.

The mean value of the financial development index of 0.143 % shows that financial access, depth and efficiency are still low on the continent compared to other regions of the world (Svirydzenka, 2016). While Ibrahim and Alagidede (2017) suggest that legal system origin may explain the disparities in financial development within the region, Ghura et al. (2009) assert that the relatively low growth of the financial sector is due to the low level of institutional quality across the region. Of the robust indicators of financial development, only about 26.7 % of the sample countries had a mean value of private sector credit higher than the sample mean of 19.67 %. The average value of 0.267 % for financial openness shows that most countries on the continent continue to be fairly closed, notwithstanding the amount of financial reforms and liberalization undertaken over the study period.

3. Regression results

3.1. The real sector, portfolio equity flows and financial development

We begin the discussion of our results with the direct impact of portfolio equity flows on the growth of the real sector and further account for the conditional effect of financial development. We start our analysis at the overall real sector level and take a further look at the association at the decomposed levels (manufacturing, industry, agriculture and services). The results are reported in Tables 2A and 2B.

At the overall level of the real sector, we found portfolio equity flows to have a direct adverse impact on the growth of the real sector, but principally insignificant, when we control only for the baseline determinants of economic growth (see model 1). The effect remains predominantly insignificant even in the presence of both financial sector development indicators (see model 2A and 2C). In as much as the association between growth and equity flows may be germane to the growth literature, our study presents a different dimension regarding the indicators of growth. The adverse association between growth of the real sector and portfolio equity corroborates the findings of Asamoah et al. (2021), but is in contrast to Asamoah and Alagidede (2020), who found that portfolio equity enhances real sector growth. A plausible explanation for the mixed results could be the data size and study period. On the general notion of the equity flow-growth nexus, our results support the conclusions of Durham (2004) that lagged equity flows have no unmitigated significant positive impact on growth but contradict studies that either found portfolio equity to enhance growth (Durham, 2004) or found equity flows to negatively affect growth (Agbloyor et al., 2014; Choong et al., 2010a,b). Perhaps one distinguishing feature is that these studies assessed the impact at an aggregate level of growth (GDP growth) and that Africa's real sector on its own has been unattractive to providers of external capital, especially equity. Again, regarding Africa, we explore a more extensive dataset and period compared to other studies. The outcome supports the IMF (2018) in the assertion that, unlike FDI, equity flows historically have not been known to have a strong positive correlation with economic growth and investment in Africa. We can confidently say

Table 2B
Real sector growth, portfolio equity and financial sector development.

Dep. Variable	INVA (4C)	INVA (4D)	AGVA (5A)	AGVA (5B)	AGVA (5C)	AGVA (5D)	SERVA (6A)	SERVA (6B)	SERVA (6C)	SERVA (6D)
Portfolio equity flows	0.267 (0.165)	−1.873** (0.931)	0.136 (0.248)	0.121 (0.744)	0.200* (0.106)	−0.032 (0.651)	−0.284 (0.335)	−0.037 (0.326)	−0.060 (0.037)	−0.136** (0.056)
Financial dev index			−0.544 (0.397)	−0.595 (0.394)			10.609** (4.189)	11.120*** (3.730)		
Private credit	−0.417*** (0.142)	−0.295*** (0.111)			−0596** (0.272)	−0.705*** (0.224)			−0.039 (0.080)	0.048 (0.092)
Interaction terms		0.454** (0.208)		0.799*** 0.287		0.004 (0.145)		7.879* (4.442)		0.653*** (0.225)
GDP growth	0.099*** (0.025)	0.101*** (0.026)	0.045* (0.024)	0.042 (0.026)	0.026 (0.020)	0.015 (0.02)	0.073*** (0.018)	0.080*** (0.017)	0.358*** (0.075)	0.286*** (0.074)
Gov't expenditure	0.308* (0.180)	0.030* (0.016)	0.284* (0.146)	0.056** (0.028)	0.310* (0.186)	0.086*** (0.032)	0.400*** (0.069)	0.292*** (0.074)	0.025* (0.014)	0.257*** (0.119)
Financial openness	0.043 (0.233)	0.276 (0.270)	−0.093 (0.396)	−0.283 (0.412)	0.222 (0.333)	0.152 (0.313)	−0.315 (0.241)	−0.423* (0.250)	−0.202* (0.104)	−0.034 (0.083)
Domestic savings	0.026*** (0.010)	0.141*** (0.053)	−0.012 (0.015)	−0.024* (0.014)	−0.011 (0.011)	−0.007 (0.011)	0.016** (0.007)	0.007 (0.008)	0.011* (0.007)	0.005 (0.008)
Institutions	−0.102 (0.139)	−0.025 (0.145)	0.458** (0.228)	0.286* (0.173)	0.306* (0.184)	0.310* (0.162)	−0.064 (0.135)	−0.412 (0.135)	−0.057 (0.079)	−0.319*** (0.093)
Net Effects	**n.a**	**7.069**	**n.a**	**0.235**	**n.a**	**0.047**	**n.a**	**1.067**	**n.a**	**12.725**
Diagnostics:										
Observations	340	325	320	315	306	306	382	364	319	319
Kleibergen-Paap rk LM test [p-value]	25.135 [0.033]	24.470 [0.079]	26.952 [0.020]	24.067 [0.088]	36.26 [0.002]	51.858 [0.000]	23.340 [0.055]	38.774 [0.001]	24.454 [0.075]	53.643 [0.000]
Kleibergen-Paap rk Wald F test	6.729	4.713	7.496	5.521	10.297	11.621	7.560	5.293	4.566	6.180
OID (Hansen J) test; [p-value]	12.028 [0.525]	14.128 [0.516]	16.981 [0.200]	14.259 [0.506]	20.987 [0.102]	26.546 [0.050]	13.175 [0.434]	17.349 [0.298]	16.391 [0.290]	15.019 [0.523]
Orthog – option: (Hansen J) [p-value]	8.285 [0.406]	10.675 [0.383]	5.147 [0.742]	5.322 [0.869]	12.987 [0.112]	14.608 [0.147]	7.178 [0.518]	10.838 [0.370]	7.766 [0.457]	6.762 [0.748]
Exogeneity (C) test [p-value]	3.743 [0.587]	3.453 [0.631]	11.834 [0.037]	8.937 [0.112]	8.000 [0.238]	11.938 [0.063]	5.177 [0.307]	6.512 [0.260]	8.626 [0.196]	8.257 [0.220]
F (Prob > F)	7.79 [0.000]	5.05 [0.000]	8.54 [0.000]	2.50 [0.012]	2.05 [0.049]	2.33 [0.019]	14.14 [0.000]	9.59 [0.000]	7.73 [0.000]	9.85 [0.000]
F.Stats for financial development [Prob > F]		8.93 [0.0115]		8.77 [0.013]		10.96 [0.004]		9.30 [0.009]		19.49 [0.000]
F.Statistics for PEF [Prob > F]		7.58 [0.0226]		7.76 [0.020]		0.01 [0.996]		4.49 [0.106]		9.18 [0.0102]

Notes: Standard errors are presented in parentheses. Kleibergen-Paap rk LM = Test of underidentification; Kleibergeen-Paap rk Wald F = Test of weak identification; C-statistics = Test of exogeneity/orthogonality of suspect instruments; Hansen J = Test of overidentifying restrictions. AGVA and SERVA are agriculture and service value additions respectively.

that, just like growth of the larger economy, equity flows may not directly enhance growth at the disaggregated level, as primarily suggested, because of their unpredictability. Their lack of certainty is more likely to have no growth effect than to be damaging to growth, and more importantly, at a disaggregated level of growth. Due to their lack of permanence and search of high returns, equity providers are likely to withdraw their investment at the least turbulence, thereby lacking the long duration negative impact, as suggested by earlier studies. UNCTAD (2018) confirms that portfolio flows are "relatively unstable because of the speed at which positions can be unwound" (UNCTAD, 2018, pp. 29). Therefore, the whimsical and unstable nature of equity flows may also make them less attractive to those who seek external funds and hence may have no growth impact at the overall level of the real sector. The insignificant effect may also result from the relatively low share of equity flows as a proportion of total external finance to developing countries. Data shows that between 2002 and 2017, portfolio equity commanded the least proportion of all global flows, as well as of those to developing economies (UNCTAD, 2018). On their own, equity flows may be potentially unreliable to either enhance or damage growth at the overall level of the real sector.

With the intuition that financial sector development is a necessary ingredient for growth based on the views of Schumpeter, we assess the growth impact of equity flows at the overall level of the real sector, contingent on the levels of financial development. We do this by including an interaction term of portfolio equity and measures of financial development. In line with Brambor et al. (2006), we refrain from explaining the constitutive terms in our interaction equations, although the coefficients of portfolio investments remain statistically insignificant. On the assumption that a developed financial sector combined with the inflows of external capital is a catalyst for economic growth, we see a validation of this assertion to be factual even at a disaggregated level of growth.

We found the coefficient of our multiplicative term to be statistically positive and significant for both the financial development index (see model 2B) and private sector credit (see model 2D). Thus, even though providers of equity capital may be sceptical about the growth prospects of Africa's real sector as a whole, and seekers of external capital may not be confident about the permanence and hot money nature of equity flows, a well-developed financial sector can subdue the fears of both players in attracting equity flows to enhance the growth of the real sector. Thus, financial sector development in terms of markets and institutions will help in resolving matters connected to access, depth and efficiency, while curbing the risks associated with financial integration, moral hazards, information asymmetry and providing liquidity to deficit units and appropriate returns to surplus units through the attraction of equity capital. Though it may be challenging to interpret the magnitude of the impact of capital (equity) flows, depending on the extent of financial development, our results at face value are skewed towards earlier propositions of equity flow enhancing growth due to the conditional effect of financial development (Agbloyor et al., 2014; Choong et al., 2010a,b; Durham, 2004).

Cognizant of the fact that the aggregate growth of the real sector index may not tell the full story, we sought to assess the impact of portfolio equity at a further disaggregation of the real sector. We seek to determine if the initial insignificant but adverse effect of equity flows at the overall level of the real sector is the same across all sectors or is driven by some of the components. Moreover, we assess the conditional effects of financial development on each component. In the presence of the financial development index and private sector credit, the initial insignificant relationship still exists for growth in industry (see model 4A and 4C), and services (see 6A and 6C). However, we found a positive fringe relationship between portfolio equity flows and growth in manufacturing (see model 3A). At a 10 % significance level, a 1 % increase in portfolio equity will expand the manufacturing sector by 1.39 %. The positive direct association is an indication of a possible alternative source of financing for Africa's industrial growth, as some studies have consistently shown that FDI as a source of financing is negatively correlated with the growth of manufacturing in Africa (Gui-Diby and Renard, 2015). However, in the presence of private credit, the effect of equity on manufacturing growth remains mostly negative and insignificant (see model 3C). Again, while private equity was found to enhance the growth of agriculture in the presence of private sector credit, the association remains insignificant when we control for the development index (see models 5A and 5C). The results suggest that the insignificant initial association between growth at the overall level of the real sector and equity flows may not be different within the decomposed sectors.

Again, we test the conditional effect of financial development in the link between portfolio equity and each of the compositions of the real sector. Will the insignificant direct impact be eliminated while reinforcing the positive impact? On the interaction between portfolio equity and the financial development index, we found the coefficient of the interactive term to be robust and positive across all sectors. While the effect on industrial growth was at a 1 % significance level, that of manufacturing and agriculture growth was at a 5 % significance level, with growth in services at 10 % respectively. Thus, at face value, the presence of a strong financial sector is an excellent catalyst for the attraction of equity flows to enhance the growth of Africa's real sector and its components. With the development of tailor-made financial services, these sectors can attract the right quantum of equity flows to aid growth, thus just like the overall level of the real sector, issues of moral hazard and information asymmetry could be eliminated, paving the way for investors of equity flows to channel funds to these sectors. Concerning private sector credit, our results show that this form of finance may only be beneficial to the growth of the industrial and service sectors, as we found the coefficient of the interactive terms to be positive and significant only for these sectors at the 5 % and 1 % significance levels respectively (see models 4D and 6D). Overall, our studies show the relevance of financial sector development for the association between the growth of decomposed real sectors and the attraction of equity flows. The coefficient of the interaction terms shows that, with the right level of financial development, growth in agriculture, industry, manufacturing and services can be enhanced with the attraction and retention of portfolio equity flows.

To avoid pitfalls in interactive estimations, we compute the net effect in line with the contemporary literature (Tchamyou, 2019; Asongu and Nwachukwu, 2018a, b; Asongu et al., 2017). The net effects are computed to assess the impact of the complementary association between financial development and portfolio equity in enhancing the growth of Africa's real economy. The net effects are computed at the mean values of the conditional variables (financial development index and private credit). From Tables 2A and 2B, the net effects of both the financial development index and private sector credit influencing portfolio equity and boosting growth of the combined real sector and its components are positive under all regressions. For instance, in Table 2A, the net effect of the interaction

between financial development index and portfolio equity on the combined real sector under the third regression (2B) is 1.635 [(4.751 × 0.143) + (0.956)]. Similarly, the net effect of the interaction between private sector credit and portfolio equity on the combined real sector under the fifth regression (2D) is 10.172 [(0.518 × 19.969) + (−0.031)]. Consequently, 0.143 and 19.969 are the mean values for the financial development index and private sector credit, respectively.

3.1.1. Test of joint significance and marginal effect analysis – Portfolio equity flows

Ai and Norton (2003) suggest that conclusions born out of only the coefficients of the multiplicative term are very inadequate for drawing valid conclusions. Thus, we estimate the various thresholds and levels of significance of the interaction term between portfolio equity flows and the measures of financial development on the growth of the real sector and its components. We assess various percentile levels of the financial development index (see Table 3A) and private sector credit (see Table 3B).

We evaluate the effect of portfolio equity on growth at the overall real sector, manufacturing and agriculture value additions at the 25th (0.084), 50th (0.110), 75th (0.171), and the 90th (0.270) percentiles of the financial development index. We then evaluate the growth of services and industrial value additions conditioned on the log of financial development at the 25th (0.034), 50th (0.045), 75th (0.066), and the 90th (0.103) percentiles. From Table 3A, the analysis shows that a 1 % increase in portfolio equity flows will lead to growth of the overall real sector by 1.355, 1.479, and 1.768[4] at the 25th, 50th, and 75th percentile of the financial development index. While the marginal effect is significant at the 5 % level at the 25th and 50th percentiles, that of the 75th percentile is significant at the 10 % level (Row 1, Table 3A). The intuition is that at increasing levels of financial development, the growth impact of portfolio equity flows at the overall level of the real sector increases up to the 75th percentile. Beyond the 75th percentile, any further increases in financial development have no bearing on the growth impact of equity flows at the level of the overall real sector. The effect is slightly different when we proxy financial development by private sector credit, as we observe an increasing effect of portfolio equity on the overall level of the real sector at increasing rates of private credit, even up to the 90th percentile, where the effect is significant at the 1 % level (Row 1, Table 3B). Though our marginal effect supports the positive coefficient of the interaction term, increases in private sector credit have more enduring impacts than the financial development index.

At the decomposed level of the real sector, a 1 % increase in portfolio equity flows will spur the growth of the manufacturing value additions by 0.486 %, 0.577 %, 0.791 % and 1.138 % at the 25th, 50th, 75th and 90th percentile of the financial development index at 5 % and 10 % significance levels, respectively (see row 2, Table 3A). The marginal effect shows that as the level of financial development expands, growth in manufacturing also expands from equity flows. However, our marginal effect analysis shows no effect of equity flows conditioned on private sector credit, though the initial adverse effect decreases with increasing private credit (row 2, Table 3B). At a 5 % significance level across all percentiles, a 1 % rise in portfolio equity will spur the growth of industrial value additions by 0.357, 0.439, 0.597 and 0.874 at the 25th, 50th, 75th and 90th percentiles of the financial development index. Thus, increases in financial development will also lead to inflows of equity, leading to industrial sector growth (row 3, Table 3A). However, the conditional effect regarding private credit shows that an increase in private credit can reduce any initial harmful effect of equity flows on industrial growth, but cannot eliminate the effect, even to the 90th percentile, where the effect is at a 1 % significance level (see row 3, Table 3B). The same observation stands regarding growth in agriculture and portfolio equity flows, conditioned on private sector credit, where increases in private credit are yet to attain a threshold level with a positive conditional effect (see row 4, Table 3B). We also noticed that increasing effects of the financial development index combined with increasing inflows of private equity flows would increase the growth of both agriculture and service value additions, respectively. A 1 % rise in equity flows leads to 0.1888, 0.209, 0.258 and 0.338 growth in agriculture value additions at the 25th, 50th, 75th, and 90th percentiles, at 10 %, 5 % and 1 % significance levels (see row 4, Table 3A). Regarding services, at the 1 % significance level, a 1 % increase in equity flows led to 0.231, 0.318, 0.483 and 0.774 increases in services sector growth at the 25th, 50th, 75th and 90th percentiles of financial development (see row 5, Table 3A). The same deduction holds in terms of private credit, where at the 1 % significance level, the marginal effect is positive across all percentile levels (see row 5, Table 3B).

Broadly, the results indicate that financial development reinforces the association between portfolio equity flows and growth of the real sector and its components. Conditioned on the financial development index, increases in portfolio equity flows will lead to growth at the level of the overall real sector and all its components at the 25th, 50th, 75th and 90th percentile of financial development. Regarding private sector credit, conditional increases in the effect of portfolio equity flows increase rates for growth at the overall level of the real sector, and growth of services value-added, at the 25th, 50th, 75th and 90th percentiles of private sector credit. Though increases in private credit are beneficial to enhance the effect of portfolio equity flows on the growth of industry and agriculture, private sector credit has not reached the threshold needed to curb an adverse or insignificant effect of equity flows. Perhaps the reason for the unresponsiveness of equity flows to these sectors could be the fact that equity inflows are more inclined to the stock market than to the banking type of financial development. For instance, Agbloyor et al. (2014) found a positive interaction between stock market turnover and portfolio equity flows, but no significant relationship for the interaction between equity flows and both private sector and bank credit. Although Durham (2004) did not account for bank-based measures, the interaction of equity flows and stock market capitalization was positive and significant.

Though the results show that increases in the financial development index are a necessary condition for the growth effect of portfolio equity flows on the combined real sector and its components, private sector credit was found to be most beneficial to service sector growth in the association between portfolio equity flows and economic growth. Though it benefits both agriculture and

[4] NB: Marginal effect at the 25th percentile of the financial development index = $\gamma + \beta$FD.[RSG = 0.956 +4.751(0.084) = 1.355]. We apply the same proceudure at the 50th, 75th and 90th percentiles of the financial development index.

Table 3A
Marginal effects of portfolio equity flows on real sector growth and its components conditioned on levels of the financial development index.

Fin. Development index at	25th (0.084)	50th (0.110)	75th (0.171)	90th (0.270)	Source
Real sector growth index	1.355** (0.686)	1.479** (0.709)	1.768* (0.761)	2.29 (0.853)	Model 2B, Table 2A
Manufacturing sector growth	0.486** (0.426)	0.577** (0.440)	0.791* (0.475)	1.138* (0.536)	Model 3B, Table 2A
Industrial sector growth	0.357** (0.153)	0.439** (0.203)	0.597** (0.297)	0.874** (0.464)	Model 4B, Table 2A
Agriculture sector growth	0.188* (0.619)	0.209** (0.783)	0.258** (1.209)	0.338*** (1.939)	Model 5B, Table 2B
Service sector growth	0.231*** (0.127)	0.318*** (0.167)	0.483*** (0.246)	0.774*** (0.054)	Model 6B, Table 2B

Table 3B
Marginal effects of portfolio equity on real sector growth and its components at various levels of private sector credit.

Private Sector Credit at	25th (1.888)	50th (2.288)	75th (3.061)	90th (3.845)	Source
Real sector growth index	0.947*** (0.061)	1.258*** (0.073)	1.555*** (0.098)	1.961*** (0.125)	Model 2D, Table 2A
Manufacturing sector growth	−0.234 (0.313)	−0.185 (0.379)	−0.091 (0.507)	0.005 (0.637)	Model 3D, Table 2A
Industrial sector growth	−1.016*** (0.209)	−0.834*** (0.253)	−0.483*** (0.339)	−0.127*** (0.426)	Model 4D, Table 2B
Agriculture sector growth	−0.024** (0.151)	−0.022** (0.189)	−0.020** (0.265)	−0.017 (0.343)	Model 5D, Table 2B
Service sector growth	1.097*** (0.051)	1.489*** (0.062)	1.863*** (0.086)	2.375*** (0.110)	Model 6D, Table 2B

industrial growth, it is yet to attain the beneficial threshold level. The development of Africa's financial sector can therefore not be overlooked in the attraction and retention of portfolio equity, especially at the level of the real sector.

3.2. The real sector, private debt and financial development

Turning our attention to debt flows, we also explore the direct association between private non-guaranteed debt flows and real sector growth both at the overall and decomposed levels. We then extend our analysis to ascertain the conditional effect of the association at levels of financial development. Tables 4A and 4B capture the results on debt flow and the growth of the real sector. At the overall level, we found a strong negative direct association between the growth of the real sector and private debt flows. Thus, the influx of debt flows is damaging to the overall growth of Africa's real sector. We found a significant and adverse relationship between growth at the overall level of the real sector and the private flow debt into Africa (see model 1). At the 5 % significance level, a 1 % increase in private debt will decrease the growth of the overall real sector by 0.06 %. The strong adverse significant association further persists when we control for financial development, proxied by the financial development index (see model 2A), as a 1 % influx of debt flows leads to a 0.067 % fall in real sector growth at the 1 % significance level. Our results differ from the conclusions of Alfaro et al. (2004) and Gourinchas and Jeanne (2013) that, taking away the "sovereign to sovereign" component of total debt flows, there exists a positive correlation between productivity catch-up or growth of the economy and private debt flows. However, it confirms assertions by the International Monetary Fund that portfolio investments, which include debt flows, have not been associated with growth enhancements in the past (IMF, 2018). Perhaps one distinguishing feature of our study is the assessment of the associated relationship at a disaggregated level of growth. It could be possible that the fixed interest payments associated with debt capital make it unattractive to seekers of funds as such funds come with issues of insolvency and potential liquidation. The strong adverse relationship between debt flows and growth supports earlier works by Nyang`oro (2017), Calderón and Nguyen (2015), Agbloyor et al. (2014), Tchereniet et al. (2013) and Fosu (1996) showing that debt flows dissuade economic growth in Sub-Saharan Africa.

Regarding the real sector, the results are in agreement with the findings of Asamoah et al. (2021) that debt flows hinder real sector growth, especially in manufacturing, agriculture and services. We illustrate the effect of our results with data. Specifically, employing our data in model 1 of Table 4A, a one standard deviation surge in private debt (std. dev = 0.914; Table 1) will result in a decline in real sector growth by approximately 0.051 percentage point [$-0.056 \times 0.914 = -0.051$]. The magnitude of the decline is even stronger in the presence of financial development, where in model 2, a one-standard deviation increase in debt flows to Africa will lead to a 0.061 percent decline in growth of the real sector [$-0.067 \times 0.914 = -0.061$]. Thus, our data shows that the direct impact of private debt flows on the growth of Africa's real sector is deemed detrimental and therefore interest in such flows should be minimal, if not altogether discouraged. Employing another indicator of financial development further confirms the adverse impact of debt flows at the overall real sector growth level, as we found a negative relationship between debt and private sector credit, though the effect was insignificant (see model 2C).

On decomposing the real sector, our results show that the initial adverse impact of debt flows is mainly related to growth in industry and manufacturing. We found that at the 5 % significance level, a 1 % increase in debt flows will daunt the growth of industrial value additions by 0.097 % (see model 4A), while at the 10 % significance level, a 1 % rise in debt flows will lead to a 0.534 % fall in the growth of manufacturing value additions. We employ certain countries as part of the sample to ascertain the short-run effects of the negative association between debt flows and growth in industry and manufacturing value additions.

Table 4A
Real sector growth, private debt flows and financial development.

Dep. Variable	RSG (1)	RSG (2A)	RSG (2B)	RSG (2C)	RSG (2D)	MANVA (3A)	MANVA (3B)	MANVA (3C)	MANVA (3D)	INVA (4A)	INVA (4B)
Private debt flow (PDF)	−0.056** (0.024)	−0.067*** (0.012)	−0.077*** (0.028)	−0.252 (0.390)	−0.205 (0.222)	−0.534* (0.038)	−0.306 (0.257)	−0.218 (0.138)	−0.189*** (0.064)	−0.097** (0.019)	−0.274*** (0.072)
Financial development index		1.694 (1.147)	−4.859*** (1.191)			−1.757 (2.191)	−3.212** (1.560)			0.528 (1.447)	−3.266** (1.538)
Private credit				0.225 (0.149)	0.512*** (0.102)			0.456* (0.232)	0.494*** (0.177)		
Interaction terms			0.060 (0.206)		0.002 (0.00)		1.047* (0.634)		0.046*** (0.015)		0.880** (0.466)
GDP growth	0.152*** (0.016)	0.145*** (0.016)	0.116*** (0.014)	0.128*** (0.017)	0.651*** (0.078)	0.071*** (0.018)	0.080*** (0.019)	0.057** (0.028)	0.039 (0.026)	0.094*** (0.017)	0.155*** (0.021)
Gov't expenditure	−0.014 (0.012)	−0.026** (0.012)	−0.025** (0.011)	−0.257*** (0.018)	−0.136** (0.064)	0.022 (0.018)	0.025 (0.019)	−0.017 (0.027)	−0.026 (0.025)	−0.023 (0.015)	0.188* (0.111)
Financial openness	−0.184 (0.165)	−0.286 (0.190)	−0.136 (0.102)	−0.420** (0.202)	−0.543*** (0.208)	−0.078 (0.354)	−0.081 (0.106)	−0.307** (0.130)	−0.306** (0.122)	0.047 (0.262)	0.016 (0.109)
Domestic savings	0.017*** (0.006)	0.012** (0.006)	0.002 (0.005)	0.050 (0.048)	0.006 (0.047)	0.021** (0.009)	0.025*** (0.008)	0.002 (0.012)	0.001 (0.010)	0.018** (0.017)	0.163* (0.086)
Institutions	−0.261** (0.109)	−0.334*** (0.109)	−0.368*** (0.103)	−0.303** (0.120)	−0.090 (0.112)	−0.461*** (0.143)	−0.251** (1.36)	−0.568*** (0.171)	−0.575*** (0.169)	−0.186* (0.104)	−0.186 (0.115)
Net Effects	**n.a**	**n.a**	**−0.068**	**n.a**	**−0.165**	**n.a**	**−0.156**	**n.a**	**0.717**	**n.a**	**−0.148**
Diagnostics:											
Observations	492	492	459	444	441	375	369	387	387	446	410
Kleibergen-Paap rk LM test [p-value]	22.877 [0.007]	65.985 [0.000]	36.580 [0.006]	34.297 [0.005]	26.919 [0.042]	24.985 [0.050]	24.904 [0.096]	29.556 [0.006]	36.695 [0.001]	32.458 [0.003]	47.166 [0.000]
Kleibergen-Paap rk Wald F	130.110	47.861	23.015	4.60	28.975	4.565	6.577	4.349	6.662	6.413	17.347
OID (Hansen J) test; [p-value]	10.935 [0.205]	12.463 [0.490]	13.796 [0.682]	21.313 [0.127]	21.565 [0.120]	8.092 [0.885]	16.135 [0.444]	14.127 [0.293]	16.197 [0.302]	22.637 [0.046]	23.890 [0.092]
Orthog – option: (Hansen J) [p-value]	4.199 [0.380]	7.699 [0.463]	8.171 [0.612]	18.961 [0.015]	9.092 [0.523]	3.260 [0.917]	9.620 [0.474]	9.172 [0.328]	10.207 [0.423]	15.292 [0.054]	5.555 [0.851]
Exogeneity (C) test [p-value]	6.737 [0.151]	4.764 [0.445]	5.625 [0.584]	2.352 [0.938]	12.473 [0.029]	4.832 [0.566]	6.515 [0.368]	4.956 [0.292]	5.990 [0.200]	7.345 [0.196]	18.335 [0.010]
F (Prob > F)	21.06 [0.000]	42.46 [0.000]	42.90 [0.000]	14.72 [0.000]	16.88 [0.000]	4.52 [0.000]	5.37 [0.000]	2.96 [0.005]	5.02 [0.000]	12.01 [0.000]	14.65 [0.000]
F-stat for financial developm't [Prob > F]			16.73 [0.000]		29.46 [0.000]		5.31 [0.070]		16.09 [0.000]		6.58 [0.037]
F.statistics for PDF [Prob > F]			25.46 [0.000]		1.39 [0.499]		4.24 [0.120]		11.57 [0.003]		27.36 [0.000]

Notes: *, **, *** denote significance at 1 %, 5 % and 10 % levels, respectively. Regarding the components of the real sector, all models under B are an interaction of PDF and the financial development index, while D is an interaction of PDF and private sector credit. RSG is the real sector growth index; MANVA is manufacturing value additions; INVA is industrial value additions.

Table 4B
Real Sector Growth and Private Debt Flows.

Dep. Variable	INVA (4C)	INVA (4D)	AGVA (5A)	AGVA (5B)	AGVA (5C)	AGVA (5D)	SERVA (6A)	SERVA (6B)	SERVA (6C)	SERVA (6D)
Private debt flows	−0.096	0.106	0.002 (0.010)	0.114 (0.095)	0.053 (0.067)	−0.262	−0.001	−0.038	−0.293**	−0.109
	(0.101)	(0.095)				(0.213)	(0.007)	(0.025)	(0.037)	(0.116)
Financial dev index			−4.513***	0.882 (1.064)			−1.969**	−2.740**		
			(1.475)				(0.630)	(1.329)		
Private credit	−0.370***	−0.126			0.037 (0.089)	−0.617***			0.817***	0.756***
	(0.142)	(0.112)				(0.162)			(0.123)	(0.117)
Interaction terms		−0.173		−0.206		0.020**		0.298**		0.003 (0.022)
		(0.020)		(0.279)		(0.008)		(0.150)		
GDP growth	0.783***	0.650***	0.034**	0.481***	0.395***	0.336***	0.094***	0.112***	0.122***	0.119***
	(0.113)	(0.101)	(0.016)	(0.062)	(0.096)	(0.111)	(0.013)	(0.015)	(0.014)	(0.013)
Gov't expenditure	0.045**	0.027	0.176 (0.122)	0.137**	0.141*	0.326***	0.034***	0.030**	−0.070***	−0.065***
	(0.020)	(0.111)		(0.069)	(0.072)	(0.100)	(0.009)	(0.012)	(0.017)	(0.016)
Financial openness	−0.120 (0.107	−0.178	0.658**	−0.730***	−0.660**	−0.231	0.488***	0.655***	−0.108	−0.120
		(0.122)	(0.312)	(0.246)	(0.279)	(0.318)	(0.180)	(0.237)	(0.081)	(0.080)
Domestic savings	0.221**	0.217**	0.105*	0.005 (0.005)	0.004 (0.005)	0.041 (0.059)	0.010**	0.022 (0.049)	−0.005	−0.005
	(0.085)	(0.096)	(0.0634)				(0.005)		(0.006)	(0.006)
Institutions	−0.098	−0.011	−0.127	−0.077	0.047 (0.125)	−0.111	−0.417***	−0.428***	−0.176*	−0.175*
	(0.120)	(0.126)	(0.126)	(0.105)		(0.126)	(0.076)	(0.097)	(0.099)	(0.098)
Net Effects	**n.a**	**−3.301**	**n.a**	**0.085**	**n.a**	**0.132**	**n.a**	**0.005**	**n.a**	**−0.050**
Diagnostics:										
Observations	416	416	388	473	474	358	467	429	484	484
Kleibergen-Paap rk LM test [p-value]	33.884 [0.001]	26.517 [0.047]	52.965 [0.000]	55.250 [0.000]	23.326 [0.016]	53.534 [0.000]	23.133 [0.058]	34.620 [0.010]	34.527 [0.001]	37.853 [0.001]
Kleibergen-Paap rk Wald F test	6.022	6.527	44.793	25.768	12.923	12.859	89.408	4.268	6.044	5.620
OID (Hansen J) test; [p-value]	6.485 [0.890]	14.320 [0.501]	19.702 [0.103]	20.663 [0.080]	9.785 [0.460]	17.674 [0.410]	15.689 [0.266]	19.974 [0.276]	11.675 [0.471]	22.560 [0.068]
Orthog – option: (Hansen J) [p-value]	5.117 [0.745]	9.116 [0.521]	11.271 [0.187]	16.583 [0.084]	5.676 [0.684]	9.402 [0.494]	12.294 [0.139]	8.489 [0.581]	9.109 [0.333]	17.387 [0.066]
Exogeneity (C) test [p-value]	1.368 [0.850]	5.204 [0.392]	8.430 [0.134]	4080 [0.253]	4.110 [0.128]	8.272 [0.309]	3.394 [0.639]	11.485 [0.119	2.566 [0.633]	5.173 [0.270]
F (Prob > F)	15.55 [0.000]	12.19 [0.000]	3.30 [0.002]	17.00 [0.012]	14.33 [0.000]	4.97 [0.019]	17.15 [0.000]	15.97 [0.000]	16.07 [0.000]	484 [0.000]
F-statistics for financial development [Prob > F]		2.34 [0.310]		1.24 [0.537]		14.87 [0.001]		5.88 [0.053]		43.76 [0.000]
F-statistics for PDF [Prob > F]		1.24 [0.539]		1.14 [0.485]		6.77 [0.034]		4.00 [0.135]		1.89 [0.389]

Notes: Standard errors are presented in parentheses. Kleibergen-Paap rk LM = Test of underidentification; Kleibergen-Paap rk Wald F = Test of weak identification; C – Statistics = Test of exogeneity/orthogonality of suspect instruments; Hansen J = Test of overidentifying restrictions. AGVA and SERVA are agriculture and services value additions. respectively.

Within our sample, the average inflow of private debt is largest in Zambia (1.331), and least in Niger (−0.422). Using the results from model 3A of Table 4A, an increase in the quantum of debt flows from the level of Niger to that of Zambia, all things being equal, means that growth in manufacturing value additions will fall by approximately 0.936 percentage points.[5] Concerning the effect on growth in industry value additions, an increase in debt flows from Niger to the level of Zambia will lead to a drop in industrial value additions by 0.17 percentage points. The effect of the drop is very significant, as Africa tries to improve its lack of industrialization, and suggests that debt flows are not an option when it comes to the drive towards industrialization in Africa. Though we found a negative association between growth in services and debt flows, the relationship was insignificant, similar to growth in agriculture value additions. We found consistent results of either an adverse or insignificant effect of private debt flows on the various decompositions of the real sector in the presence of private sector credit. While our results show that private debt is detrimental to the growth of service sector value additions in the presence of private sector credit (see model 6C), debt flows do not affect growth in manufacturing, industrial and agriculture value additions (see models 3C, 4C, and 5C). The seemingly insignificant and adverse effect presents a challenge to players in these sectors searching for external financing, mainly private debt flows, as these are known to dampen these sectors' growth or at best have no direct growth impact.

We have shown that the presence of private debt flows undermines growth at the overall level of the real sector and its components, especially manufacturing and industrial growth. We seek to ascertain if the initial adverse impact of debt flows on the growth of the real sector and its components could be mitigated and eliminated in the presence of strong financial institutions. Will the advancement of Africa's financial sector reduce the adverse impact from private debt flows? Proxied by the financial development index, our initial estimations at the overall real sector found the coefficient of the interaction between private debt and financial development to be positive but insignificant (see model 2B). Therefore, our initial results suggest that advancement in financial development may not be an antidote to the negative effect of private debt on the growth of the real sector in Africa. Thus, in as much as private debt flows on their own may not be advantageous to the overall growth of the real sector, the influx of these flows combined with a developed financial sector is still not adequate to overturn the adverse or insignificant impact into positive gains.

Our results are further confirmed when we deploy private sector credit in place of the financial development index, as we still found an insignificant coefficient of the interaction between private sector credit and private debt flows (see model 2D). Therefore, our assertion based on just the coefficient of the interactive term may suggest and disagree with earlier studies that have found financial development as a mitigating variable in the association between economic growth and capital flows. Studies such as Choong et al. (2010a,b) and Durham (2004) found the coefficient of the multiplicative term between debt flows and the financial development index to be positive and significant. However, our results tilt towards Agbloyor et al. (2014), who, apart from stock market capitalization, found the interaction between private debt flows and stock market turnover, bank credit and broad money to be insignificant. The robustness of our results is confirmed when we deploy private sector credit as a measure of financial development, where the coefficient of the interaction term was found to be positive but insignificant. The results of private sector credit are in line with Agbloyor et al. (2014), who also found the coefficient of the interaction between private credit and debt flows in Africa to be positive but insignificant. Again, we give the caveat that our assessment is at a disaggregated level of growth. However, irrespective of whether growth is at an aggregate or disaggregate level, financial development may not be helpful in the association between debt flows and growth.

We further assess the conditional effect of financial development on the various measures of the real sector to determine if the positive but insignificant coefficient of the interactive term on the overall real sector is the same across all sectors. At the decomposed level, we found mixed results regarding the coefficient of the interactive terms and the ability of debt flows to enhance the growth of these sectors, conditioned on financial development. The results at the overall level seem to be primarily driven by growth in agriculture value additions, as we found consistent results for that. We found no significant relationship between growth in agriculture and debt flows conditioned on financial development, as the coefficient of the interaction term was negative and insignificant (see model 5B). However, the coefficients of the interactive terms regarding growth in manufacturing, industry and service value additions were found to be positive and significant at the 5 % level for industry and services (see model 4B an 6B) and marginally at the 10 % level for manufacturing value additions (see model 3B). Therefore, we can conclude that in situations where countries found debt flows to be detrimental or uncorrelated with growth at a disaggregated level, the development of the financial sector could be an essential tool in reinforcing the growth benefits of capital flows, especially regarding growth in services and in manufacturing and industry. Again, our robust indicator of financial development shows consistency regarding the positive effect of the coefficient of the interaction term on growth in manufacturing. However, our analysis shows that private debt flows could spur the growth of the agriculture sector in the presence of private sector credit, while at the same time, the coefficient of the interaction terms for industrial and service sector growth shows no significant effects. Again, net effects are computed at the means of the conditional variables. From Tables 4A and 4B, we found the net effect on the combined real sector, manufacturing and industrial growth to be negative from the complementarity between private debt flows and the financial development index (see regressions 2B, 3B and 4B). Nevertheless, the net effect on the agriculture and services sector growth was positive (see regressions 5B and 6B). In the same way, we found the net effect on the combined real sector, industrial and service sector growth to be negative from the conditional association between private debt flows and private sector credit (see regressions 2D, 4D and 6D). However, the net effect on the manufacturing and agriculture sectors was positive (see regressions 3D and 5D).

[5] In the short run, the effect of a change in PNG on manufacturing growth is given as (β x Δ). Where β is the coefficient of PNG and Δ is 1.753 (-0.422 – 1.331); from Table 4A, $\beta = 0.534$. Therefore, that short-run change is (0.534 x 1.753) = 0.936.

3.2.1. Test of joint significance and marginal effect analysis – Private debt flow

Consistent with equity flows and the literature on the interpretation of estimates from interaction models, we ascertain the marginal effect and the significance of these effects at the 25th, 50th, 75th, and 90th percentiles of the financial development index. As stated earlier, the direction of the coefficient of the interactive term presents limited information and should not be treated as one of the constitutive terms. We therefore carry out a threshold analysis between measures of private debt flows and financial development, both at the overall level of the real sector and its components. Given that the initial relationship between indicators of real sector growth and private debt flows was either negative or insignificant, the marginal effect is carried out to determine the levels of financial development at which the initial adverse and insignificant effects could be either eliminated or wholly eradicated. Table 5A displays the analysis of the marginal effect at the overall level and the various decompositions conditioned on the financial development index. At the 1 % significance level, a 1 % upsurge in the level of private debt flows will decrease the negative growth at the overall level by 0.072 %, 0.070 %, 0.067 % and 0.061 % at the 25th, 50th, 75th and 90th percentiles of financial development. The marginal effect shows a gradual fall at a decreasing rate in the adverse impact of private debt flows at increasing rates of financial development. However, the adverse impact persists even at the highest percentile. The intuition is that the development of the financial sector has the impetus to reduce the negative impact of debt flows on the growth of real sector components.

Our results at the overall level are further confirmed by private sector credit as the insignificant impact of debt flows on the growth of the sector could only be reduced at high levels of private credit, but the adverse impact could not be eliminated. From Table 5B, a 1 % increase in debt will lead to a 0.201 %, 0.2 %, 0.199 % and 0.197 % fall in overall real sector growth at the 25th, 50th, 75th and 90th percentiles of private sector credit at a 5 % significance level. Thus, though financial development may be a useful variable in mitigating the adverse effect of debt flows on growth at the overall level of the real sector, financial development has not reached an appreciable level where it can completely overturn any adverse or insignificant effect into a positive one.

At the decomposed level, the marginal effects show the same conclusion for growth in industry and manufacturing value additions, similar to that at the overall level (see Table 5A). Financial sector development may only reduce the negative effect of debt flows on the growth of these sectors but not wholly eradicate it. From Table 5A, a 1 % rise in the flow of private debt will lead to a 0.218 %, 0.191 %, 0.127 % and 0.023 % reduction in the growth of manufacturing value additions at the 25th 50th, 75th and 90th percentiles of the financial development index at the 5 % significance level. Similarly, at the 5 % level of significance, a 1 % increase in private debt flows leads to a 0.2 %, 0.177 %, 0.124 % and 0.036 % reduction in the growth of industrial value additions at the 25th 50th, 75th and 90th percentiles of the financial development index.

The same applies for private sector credit, where an increase reduces the adverse impact of debt flows on all sectors (Table 5B). Concerning the agriculture sector, financial development had no mitigating effect even at the lowest percentile. For services, the insignificant relationship is only resolved and wholly eradicated at the 75th and 90th percentile of the financial development index, at 5 % significance levels respectively. Perhaps these confirm the assertion that Africa's financial sector is still underdeveloped and unable to perform its allocative function of channelling funds to productive sectors that need them, especially at a lower level of growth. Svirydzenka (2016) notes that Africa's financial market is underdeveloped relative to economies such as Russia and China. Issues of moral hazard, information asymmetry and perhaps nepotism may be at play in the advancement of debt capital to those that need them most. As noted by Honohan and Beck (2007), the slow growth of the financial sector could be due to macroeconomic instability, lack of regulatory independence, weak governance structures and the substantial informal nature of most economies.

3.3. Effect of controls

We found overwhelming evidence of a positive association between the growth of the larger economy, measured by GDP growth and growth of the real sector, for most regressions (37 out of 42). Thus, the growth of Africa's real sector has a direct link with the growth of the larger economy. Government size measured by government expenditure proved to be significant for the growth of the real economy, as it enters most analyses as positive (18/42). The results mean that governments can have a direct effect on the growth of the real sector. The financial liberation of the African economy had no impact on growth at the disaggregated level. Most regressions between financial openness and the real sector are insignificant (22/42). Though we found that savings aid the growth of the real sector, most savings (23/42) entered the analysis as largely positive but insignificant. Finally, the current level of institutional quality as measured by bureaucratic quality is not robust enough to have any impact on the growth of the real sector, as most regressions have no significant impact (21/42).

Table 5A
Marginal effects of private debt flows on real sector growth and its components conditioned on levels of the financial development index.

Fin Development index at	25th (0.084)	50th (0.110)	75th (0.171)	90th (0.270)	Source
Real sector growth index	−0.072*** (0.100)	−0.070*** (0.131)	−0.067*** (0.204)	−0.061*** (0.321)	Model 2B, Table 4A
Manufacturing sector growth	−0.218** (0.131)	−0.191** (0.172)	−0.127** (0.267)	−0.023** (0.421)	Model 3B, Table 4A
Industrial sector growth	−0.200** (0.129)	−0.177** (0.169)	−0.124** (0.263)	−0.036** (0.415)	Model 4B, Table 4A
Agriculture sector growth	0.097 (0.089)	0.091 (0.117)	0.079 (0.182)	0.058 (0.287)	Model 5B, Table 4B
Service sector growth	−0.013** (0.112)	−0.005** (0.146)	0.013** (0.227)	0.043** (0.359)	Model 6B, Table 4B

Table 5B
Marginal effects of private debt flows on real sector growth and its components at varied levels of private sector credit (log).

Private Sector Credit at	25th (1.888)	50th (2.288)	75th (3.061)	90th (3.845)	Source
Real sector growth index	−0.201** (0.193)	−0.200*** (0.233)	−0.199*** (0.312)	−0.197*** (0.392)	Model 2D, Table 4A
Manufacturing sector growth	−0.102*** (0.334)	−0.084*** (0.404)	−0.048*** (0.541)	−0.012*** (0.680)	Model 3D, Table 4A
Industrial sector growth	−0.221 (0.212)	−0.290 (0.257)	−0.424 (0.344)	−0.559 (0.431)	Model 4D, Table 4B
Agriculture sector growth	−0.224*** (0.307)	−0.216*** (0.372)	−0.201*** (0.497)	−0.185*** (0.625)	Model 5D, Table 4B
Service sector growth	−0.103*** (0.220)	−0.102*** (0.267)	−0.099*** (0.357)	−0.097*** (0.449)	Model 6D, Table 4B

4. Conclusions and policy recommendations

We deployed a new and comprehensive measure of financial development that incorporates other financial systems such as insurance, pensions, mutual funds and venture capital in addition to the widely used banking and stock market, but at the same time covers access, depth and efficiency. We sought to evaluate the growth impact of both portfolio equity and private debt flows on Africa's real economy conditioned on the extent of financial development. We deploy the Lewbel (2012) IV estimator that resolves the problems of instrument insufficiency or unavailability, but at the same time accounts for endogeneity, measurement errors, omitted variables, and heteroscedasticity. The study covered thirty African countries over a twenty-eight-year period from 1990 to 2017. We also controlled for GDP growth, government expenditure, domestic savings, financial openness, and institutional development,

The study found that portfolio equity flows on their own have no unmitigated direct impact at a disaggregate level of growth. For the combined growth of the real sector, the insignificant effect exists when we account for both measures of financial development. At the decomposed level, while the insignificant relationship exists for growth in agriculture, industry and services, manufacturing value additions had a positive association with portfolio equity flows. Again, recognizing that equity flows may not have any independent impact on the real economy, we sought the interaction between equity flows and financial development on the real sector and found an overwhelmingly positive effect. Employing the financial development index, the coefficient of the interaction between portfolio equity and financial development proved to be positive and significant under all regressions. Thus, though equity flows have no autonomous impact on growth at both the overall and decomposed levels of the real sector, countries with a sound financial development, which incorporates access, depth and efficiency, can transform the insignificant impact of portfolio equity on the growth of the real economy. More importantly, our marginal analysis shows that increases in financial sector services lead to a high growth impact of equity flows on all components of the real economy.

The positive interaction between portfolio equity flows and financial development and their subsequent marginal effects should help policymakers looking for capital flow alternatives. We also recommend that sectors such as agriculture and manufacturing should try to attract equity flows rather than relying on FDI. Given the fact that manufacturing FDI has been in decline in Africa, a shift to growing portfolio equity could be an alternative source of financing the growth of the manufacturing sector. Allowing equity providers a stake in agriculture and manufacturing firms, either through public or private placements, while further ensuring strong corporate governance and strong internal control mechanisms, could ultimately lead to growth and expansion of these sectors.

On the real economy and debt flows, we found strong evidence that private debt flows have a direct adverse effect on growth at the overall level of the real sector, manufacturing and industrial value additions, and no significant relationship with the agriculture and service sectors. Though we found financial development to be a cure to the initial adverse or insignificant effect, this was deemed beneficial to growth in services only at higher levels of financial development. Although the development of the financial sector could reduce the initial adverse effect on all sectors, Africa's financial sector is yet to reach or attain that turning point where financial development could ultimately overturn the adverse effect of private debt flows on the growth of the real economy. Thus, the study acknowledges the relevance of a developed financial sector as an absorptive capacity in the association between private debt flows and the growth of the real sectors in Africa. However, until the financial sector is well developed, private debt flows are more likely to be misallocated and even detrimental to real sector growth. Given the fixed interest and skittish characteristics of debt flows, their benefit may only be appreciated in an environment with a developed financial sector. For the known disadvantages associated with an ill-developed financial sector coupled with the increasing appetite of African economies for debt flows, a stronger collaboration is needed to increase the current level of financial development on the continent. Individual countries and the continent should work tirelessly towards strengthening all aspects of the financial sector to enjoy the full benefits of private debt flows at the level of the real economy.

Acknowledgement

The corresponding author is grateful to the Bradlow Foundation for their support through the Wits Business School. The authors are grateful to Professor Ali Kutan, the co-editor, and anonymous reviewers for their helpful comments. All remaining errors are the responsibility of the authors.

Appendix A. List of Countries

Algeria	Botswana	Burkina Faso	Cameroun
Congo, Democratic	Congo Republic	Cote D'voire	Egypt
Gabon	Ghana	Guinea	Guinea Bissau
Kenya	Madagascar	Malawi	Mali
Morocco	Mozambique	Namibia	Niger
Nigeria	Senegal	Sierra Leone	South Africa
Sudan	Tanzania	Togo	Tunisia
Uganda	Zambia		

References

Agbloyor, E.K., Abor, J.Y., Adjasi, C.K.D., Yawson, A., 2014. Private capital flows and economic growth in Africa: the role of domestic financial markets. J. Int. Financ. Mark. Inst. Money 30, 137–152.

Ai, C., Norton, E.C., 2003. Interaction terms in logit and probit models. Econ. Lett. 80 (1), 123–129.

Aizenman, J., Chinn, M.D., Ito, H., 2011. Assessing the Emerging Global Financial Architecture: Measuring the Trilemma's Configurations Over Time (No. w14533). National Bureau of Economic Research.

Aizenman, J., Jinjarak, Y., Park, D., 2013. Capital flows and economic growth in the era of financial integration and crisis, 1990–2010. Open Econ. Rev. 24 (3), 371–396.

Alfaro, L., Chanda, A., Kalemli-Ozcan, S., Sayek, S., 2004. FDI and economic growth: the role of local financial markets. J. Int. Econ. 64 (1), 89–112.

Asamoah, M.E., Alagidede, I.P., 2020. Exploring the causal relationships and allocation puzzle between portfolio investments and real sector growth in Sub-Saharan Africa. Res. Int. Bus. Finance 52, 101187.

Asamoah, M.E., Alagidede, I.P., Adu, F., 2021. Private capital flows, real sector growth and institutional quality in Africa. J. Int. Dev. 33 (1), 171–207. https://doi.org/10.1002/jid.3518.

Asamoah, M.E., Charles, K.D., Adjasi, C.K.D., Alhassan, A.L., 2016. Macroeconomic uncertainty, foreign direct investment and institutional quality: evidence from Sub-Saharan Africa. Econ. Syst. 40, 612–621.

Asiedu, E., 2013. Foreign Direct Investment, Natural Resources and Institutions. International Growth Centre. Working Paper.

Asongu, S.A., Acha-Anyi, P.N., 2019. The murder epidemic: a global comparative study. Int. Crim. Justice Rev. 29 (2), 105–120.

Asongu, S.A., Nwachukwu, J.C., 2018a. Openness, ICT and entrepreneurship in sub-Saharan Africa. Inf. Technol. People 31 (1), 278–303.

Asongu, S.A., Nwachukwu, J.C., 2018b. Educational quality thresholds in the diffusion of knowledge with mobile phones for inclusive human development in sub-Saharan Africa. Technol. Forecast. Soc. Change 129, 164–172.

Asongu, S.A., Le Roux, S., Biekpe, N., 2017. Environmental degradation, ICT and inclusive development in Sub-Saharan Africa. Energy Policy 111, 353–361.

Baum, C.F., 2009. Instrumental Variables and Panel Data Methods in Economics and Finance. Boston College and DIW Berlin.

Baum, C.F., Lewbel, A., Schaffer, M.E., Talavera, O., 2013. Instrumental variables estimation using heteroskedasticity-based instruments. In: Germany Stata User's Group Meetings. Potsdam (June).

Beck, T., Demirgüç-Kunt, A., Levine, R., 2003. Law, endowments, and finance. J. Financ. Econ. 70 (2), 137–181.

Bilir, L.K., Chor, D., Manova, K., 2019. Host-country financial development and multinational activity. Eur. Econ. Rev. 115, 192–220.

Blomström, M., Kokko, A., Mucchielli, J.L., 2003. The economics of foreign direct investment incentives. Foreign Direct Investment in the Real and Financial Sector of Industrial Countries. Springer, Berlin, Heidelberg, pp. 37–60.

Brambor, T., Clark, W.R., Golder, M., 2006. Understanding interaction models: improving empirical analyses. Political Anal. 14 (1), 63–82.

Buchanan, B.G., Le, Q.V., Rishi, M., 2012. Foreign direct investment and institutional quality: some empirical evidence. Int. Rev. Financ. Anal. 21, 81–89.

Calderón, C., Nguyen, H., 2015. Do capital inflows boost growth in developing countries? Evidence from Sub-Saharan Africa. The World Bank.

Choong, C.K., Lam, S.Y., Yusop, Z., 2010a. Private capital flows to low-income countries: the role of domestic financial sector. J. Bus. Econ. Manag. 11 (4), 598–612.

Choong, C.K., Baharumshah, A.Z., Yusop, Z., Habibullah, M.S., 2010b. Private capital flows, stock market, and economic growth in developed and developing countries: a comparative analysis. Jpn. World Econ. 22 (2), 107–117.

Ductor, L., Grechyna, D., 2015. Financial development, real sector, and economic growth. Int. Rev. Econ. Finance 37, 393–405.

Durham, J.B., 2004. Absorptive capacity and the effects of foreign direct investment and foreign equity portfolio investment on economic growth. Eur. Econ. Rev. 48, 285–306.

Fioramonti, L., 2017. The World After GDP: Politics, Business, and Society in the Post-Growth Era. John Wiley & Sons.

Fosu, A.K., 1996. The impact of external debt on economic growth in Sub-Saharan Africa. J. Econ. Dev. 21 (1), 93–118.

Ghura, M.D., Kpodar, K., Singh, M.R.J., 2009. Financial Deepening in the CFA Franc Zone: the Role of Institutions (No. 9-113). International Monetary Fund, Washington.

Gossel, S.J., Biekpe, N., 2014. Economic growth, trade, and capital flow: a causal analysis of post-liberalized South Africa. J. Int. Trade Econ. Dev. 23 (6), 815–836.

Gourinchas, P.O., Jeanne, O., 2013. Capital flows to developing countries: the allocation puzzle. Rev. Econ. Stud. 80 (4), 1484–1515.

Grabowski, R., 2006. Political development, agriculture, and ethnic divisions: an African perspective. Afr. Dev. Rev. 18 (2), 163–182.

Gui-Diby, S.L., Renard, M.F., 2015. Foreign direct investment inflows and the industrialization of African countries. World Dev. 74, 43–57.

Honohan, P., Beck, T., 2007. Making Finance Work for Africa. The World Bank. https://doi.org/10.1596/978-0-8213-6909-8.

Hsu, P.H., Tian, X., Xu, Y., 2014. Financial development and innovation: cross-country evidence. J. Financ. Econ. 112 (1), 116–135.

Ibrahim, M., Alagidede, P., 2017. Financial development, growth volatility, and information asymmetry in Sub-Saharan Africa: does law matter? South Afr. J. Econ. 85 (4), 570–588.

Igan, M.D.O., Kutan, A.M., Mirzae, A., 2017. Real Effects of Capital Inflows in Emerging Markets. International Monetary Fund.

International Monetary Fund, 2018. Sub-Saharan Africa: Capital Flows and the Future of Work. World Economic and Financial Surveys. International Monetary Fund (IMF), African Department, Washington DC.

Kodongo, O., Ojah, K., 2017. Cross-border capital flows and economic performance in Africa: a sectoral analysis. Foreign Capital Flows and Economic Development in Africa. Palgrave Macmillan, New York, pp. 163–190.

Levine, R., 2005. Finance and growth: theory and evidence. In: Handbook of Economic Growth, vol. 1, pp. 865–934 (12).

Lewbel, A., 2012. Using heteroscedasticity to identify and estimate mismeasured and endogenous regressor models. J. Bus. Econ. Stat. 30 (1), 67–80.

Loayza, Norman V., Raddatz, Claudio, 2010. The composition of growth matters for poverty alleviation. J. Dev. Econ. 93 (1), 137–151.

Mishra, V., Nielsen, I., Smyth, R., Newman, A., 2014. The Job Satisfaction-Life Satisfaction Relationship Revisited: Using the Lewbel Estimation Technique to Estimate Causal Effects Using Cross-Sectional Data, pp. 26–14. Monash Univ., Department of Economics.

Nyang`oro, O., 2017. Capital Inflows and Economic Growth in Sub-Saharan African Countries. Working Paper Series N° 285. African Development Bank, Abidjan, Côte d'Ivoire.

Okada, K., 2013. The interaction effects of financial openness and institutions on international capital flows. J. Macroecon. 35, 131–143.
Schumpeter, J.A., 1911. The theory of economic development. Brookings Papers on Economic Activity. Harvard University Press, Cambridge, MA, pp. 141–195.
Solow, R.M., 1956. A contribution to the theory of economic growth. Q. J. Econ. 70 (1), 65–94.
Stock, J., Yogo, M., 2005. Asymptotic distributions of instrumental variables statistics with many instruments. Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg, pp. 109–120.
Svirydzenka, K., 2016. Introducing a New Broad-Based Index of Financial Development. International Monetary Fund. Working Paper, WP/16/5.
Tchamyou, V.S., 2019. The role of information sharing in modulating the effect of financial access on inequality. J. Afr. Bus. 20 (3), 317–338.
Tchereniet, B.H.M., Sekhampu, T.J., Ndovi, R.F., 2013. The impact of foreign debt on economic growth in Malawi. Afr. Dev. Rev. 25 (1), 85–90.
UNCTAD, 2018. World Investment Report 2018. Investment and New Industrial Policies. United Nations Publication, New York, and Geneva, 2018. ISBN 978-92-1-112926-112927.
United Nations. Economic Commission for Africa, 2017. Economic Report on Africa 2017: Urbanization and Industrialization for Africa's Transformation. © UN. ECA, Addis Ababa. https://hdl.handle.net/10855/23723.
Warr, P., 2001. Poverty reduction and sectoral growth: evidence from Southeast Asia. May. In: WIDER Development Conference on Growth and Poverty. Helsinki.
Wheeler, D., Mody, A., 1992. International investment location decisions: the case of US firms. J. Int. Econ. 33 (1–2), 57–76.
Wooldridge, J.M., 2016. Introductory Econometrics: A Modern Approach, 6th ed. Southwestern State University, 378, 57. Southwestern, Cengage Learning, USA, pp. 1–771.