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## The Comparative African Regional Economics of Globalization in Financial Allocation Efficiency: Pre-Crisis Era Revisited

Forthcoming: Financial Innovation

**Simplice A. Asongu**
African Governance and Development Institute,
P. O. Box 8413, Yaoundé, Cameroon
E-mails: asongusimplice@yahoo.com /
asongus@afridev.org

**Joseph Nnanna**
The Development Bank of Nigeria,
The Clan Place, Plot 1386A Tigris Crescent,
Maitama, Abuja, Nigeria
E-mail: jnnanna@devbankng.com

**Vanessa S. Tchamyou**
African Governance and Development Institute,
P. O. Box 8413, Yaoundé, Cameroon
E-mail: simenvanessa@yahoo.com

## Abstract

The study assesses the role of globalization-fuelled regionalization policies on financial allocation efficiency in four economic and monetary regions in Africa for the period 1980 to 2008. Banking system and financial system efficiency proxies are used as dependent variables whereas seven bundled and unbundled globalization variables are employed as independent indicators. The bundling exercise is achieved by means of principal component analysis while the empirical evidence is based on interactive Fixed Effects regressions. The following findings are established; first, financial allocation efficiency is more sensitive to financial openness compared to trade openness and most sensitive to globalization. The relationship between allocation efficiency and globalization-fuelled regionalization policies is: (i) Kuznets or inverted U-shape in the UEMOA and CEMAC zones (evidence of decreasing returns to allocation efficiency from globalization-fuelled regionalization) and (ii) U-shape overwhelmingly in the COMESA and scantily in the EAC (increasing returns to allocation efficiency from globalization-fuelled regionalization). Established shapes are relevant to specific globalization dynamics within regions. Economic and monetary regions are more prone to surplus liquidity than purely economic regions. Policy implications and measures of fighting surplus liquidity are discussed.

**Compliance with Ethical Standards**
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This article does not contain any studies with human participants or animals performed by the authors.

# 1. Introduction

There are at least three motives for positioning an inquiry on the comparative African regional economics of globalization in financial allocation efficiency, notably, the growing relevance of regional integration; substantially documented concerns of surplus liquidity and ongoing debates surrounding the effects of globalization[1].

First, consistent with Asongu (2013a), integrated economies have a plethora of advantages, namely: more efficiency in capital allocation (Chen et al., 2002); stimulation of cross-border flow of funds, improved volumes of trade transactions, more market liquidity, lower cost for investors (Kim et al., 2005); financial stability owing to minimization of the probability for asymmetric shocks (Umutlu et al., 2010) and amelioration of the capacity of economies to absorb shocks (Yu et al., 2010). These advantages, *inter alia*, have motivated a growing stream of literature on economic integration in Africa (Njifen, 2014; Kayizzi-Mugerwa et al., 2014; Akpan, 2014)[2]. Second, financial intermediary development in Africa is seriously being limited by the substantially documented concerns of surplus liquidity that are constraining optimal transformation of mobilised deposits into credit for economic operators (Saxegaard, 2006; Asongu, 2014a).

The recent global financial and European Monetary Union (EMU) crises have reignited the debate about potential advantages from liberalisation and regionalisation, especially within the framework of financial allocation efficiency in developing countries (Asongu, 2013b). Some authors are of the position that the recent global financial crisis has substantially unravelled the drawbacks of regionalisation and liberalisation because many developing economies which had previously experienced surges in inflows of foreign capital have also experienced a sharp reversal in the same flows (Rodrik & Subramanian, 2009; Kose et al., 2011; Asongu, 2014b). In essence, financial channels that have fuelled the global economic turmoil have resurfaced issues surrounding the lofty appeals of globalisation and corresponding externalities (e.g. of volatility and growth) in undeveloped countries[3].

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[1] Openness and globalisation are used interchangeably throughout the study.

[2] Other recent studies within this stream of literature include: Baricako and Ndongo (2014);  Ebaidalla and Yahia (2014); Charaf-Eddine and Strauss (2014); Nshimbi and Fioramonti (2014); Ofa and Karingi (2014); Shuaibu (2015) and Tumwebaze and Ijjo (2015).

[3] The benefits of globalization to developing countries are still subject to heated debate.  Though there is more consensus on the positive welfare effects of openness (Spatareanu & Manole, 2010; Welch & Romain, 2008), some authors still caution on the need to progressively lift trade barriers only in tandem with economic development (Henry, 2007). Capital and trade

The sceptical strand starkly contrasts with the theoretical appeals of globalisation and regionalisation, which are expected to be high in developing nations. From a theoretical perspective, globalisation/regionalisation should promote international/regional risk-sharing and efficient allocation of capital. These potential rewards are expected to be higher in developing nations compared to their developed counterparts because poor countries are labour-rich but scarce in capital. Hence, given their higher marginal productivity of capital, globalisation/regionalisation enables the flow of capital from capital-rich to capital-poor countries. Moreover, developing countries are also expected to enjoy higher welfare gains because they are characterised by more volatile output compared to their developed counterparts (Kose et al., 2011; Asongu, 2014b).

The current wave of regionalisation/globalisation efforts began in the 1980s with growing cross-border trade and financial flows between advanced and developing nations. The integration processes were facilitated by the liberalisation of capital controls in many nations because it was estimated that growing cross-border flows would engender substantial rewards in capital allocation and enhanced international risk-sharing possibilities. According to Kose et al. (2006), many developing countries quickly embraced integration polices because the anticipated rewards were higher for developing countries compared to developed nations. Unfortunately, the surge in financial flows was associated with financial and currency crises in the late 1980s and 1990s. The pattern of these crises motivated a stream of scholars to start advocating that compared to developed countries; developing nations that liberalised their capital and trade accounts have been more affected by global crises (Henry, 2007; Kose et al., 2011; Asongu, 2013b).

Contemporary literature on the effect of globalisation on financial development has failed to engage the comparative economics of regional integration in African countries. The Henry (2007) and Kose et al. (2011) hypothesis for initial financial development conditions for financial development benefits from financial globalisation has been investigated by Asongu (2014b) and Asongu and De Moor (2015, 2017) who has established threshold

account openness (globalization) are perceived by many authors not only as a source of growth, but also as a means to financial development (Baltagi et al., 2009; Hanh, 2010).

conditions for the rewards of financial globalisation in financial development. In the post-crisis literature, Price and Elu (2014) have concluded that credit contraction during the 2008-2009 financial crises has been associated with more adverse growth externalities in sub-Saharan African (SSA) nations that belong to the CFA (French African Colonies) currency union. Asongu (2013c) has investigated real and monetary policy convergence in the CFA zone in light of the EMU crisis and concluded on a substantial absence of the convergence needed for policy harmonization in common responses to serious disequilibria. Motelle and Biekpe (2015) have examined whether enhanced financial integration is the source of domestic financial sector instability to confirm the Kose et al. (2011) hypothesis within the framework of the Southern African Development Community (SADC). Asongu et al. (2015a) have extended Price and Elu (2014) and Motelle and Biekpe (2015) in the context of pre- and post-crisis effects of financial globalization in domestic financial development to confirm the contemporary relevance of the debate on the rewards of liberalization.

In the 1980s and 1990s, most African countries embarked on a plethora of structural and policy adjustments that had the ultimate goal of stimulating financial development and economic growth (Janine & Elbadawi, 1992; Asongu, 2013b). In the first generation of reforms, the policies that were adopted consisted of: abolishing explicit controls on the allocation and price of credit, allowance of interest rates to be determined by the market, reduction of direct government intervention in bank credit decisions and relaxation of controls on international capital flows (see Asongu, 2013b). Second generation reforms targeted institutional and structural constraints, namely: (i) enhancement of regulatory, legal, institutional and supervisory environments; (ii) restoration of bank soundness and (iii) rehabilitation of financial infrastructure (Batuo et al., 2010; Batuo & Asongu, 2015).

Unfortunately, despite two decades of globalization-fuelled regionalization policies and reforms in the financial sector, African economies have not achieved remarkable progress in tackling substantially documented concerns of surplus liquidity (Saxegaard, 2006; Fouda, 2009; Asongu, 2014a). Hence, the positioning of this inquiry on financial allocation efficiency is justified by an apparent policy syndrome on the one hand and a missing link in the literature on the other hand. On the latter contribution, whereas a substantial body of the

literature has investigated the effect of financial reforms on financial development (Cho et al., 1986; Arestis et al., 2002; Batuo & Kupukile, 2010), to the best of our knowledge, literature on financial efficiency has been scarce. Moreover, the concept of financial efficiency has not been conceived within the framework of the fundamental mission of banking institutions, which is to transform mobilized deposits into credit for economic operators (Ataullah et al., 2004; Saxegaard, 2006; Al-Obaidan, 2008; Kiyato, 2009; Kablan, 2010). Some mainstream measurements of financial efficiency in African-centric literature include cost efficiency (Chen, 2009; Mensah et al., 2012); profit efficiency (Hauner & Peiris, 2005) and the Data Envelopment Analysis (DEA) for technical efficiency (Kablan, 2009). Kukenova (2011, p.1) has suggested that the principal hurdle in assessing the nexus between liberalization and allocation efficiency is traceable to the fact that capital allocation efficiency is not directly observable.

In the light of the above, the contribution of this study to the literature is twofold, notably, in the: (i) definition, conception and measurement of financial allocation efficiency and focus on a continent with severe concerns of surplus liquidity in financial institutions and, (ii) comparative analysis of regionalization policies owing to ongoing efforts of regional integration across the continent. First, the conception of efficiency is contrary to the two mainstream measurements of financial allocation efficiency, namely: (i) the efficiency of decision making by means of DEA[4] and, (ii) Overall Economic Efficiency (OEE) with regard to scale and technical efficiencies[5] or profitability- and cost-related perspectives[6]. In essence, the conception of allocation efficiency adopted in this study appreciates the ability of financial institutions to transform mobilized financial deposits into credit for economic operators. Hence, this measurement is consistent with the discussed policy syndrome of surplus liquidity in African financial institutions. Second, the study simultaneously

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[4] The interested reader can refer to, among others: Ataullah et al. (2004) who have employed the DEA approach to assess the scale and technical efficiencies of financial institutions in Pakistan and India. Also see Kablan (2009).

[5] We invite the interested reader to consult Al-Obaidan (2008) who has employed a composite indicator for banking system efficiency in the Gulf region to establish that openness improves technical efficiency.

[6] This is in accordance with the attendant literature on financial efficiency in Africa (Kiyato, 2009; Kablan, 2010). Four main variables on financial efficiency have been discussed in the literature (Demirgüç-Kunt & Beck, 2009; Asongu, 2012ab). "*They include: the ratio of bank deposits (which measures the extent to which savings can fund private credit), the net interest margin (which is the accounting value of a bank's net interest revenues as a share of its total assets), overhead cost (or the accounting value of the bank's overhead cost as a share of its total assets) and, cost/income ratio (which assesses overhead costs relative to revenues)*" (Asongu, 2013b, p.665). Whereas the last-three are related to profitability, the concept of efficiency employed in this study is the first.

contributes to the ongoing debate on the effects of globalization and the evolving stream of literature on regionalization in Africa by assessing the effects of regionalization policies on financial allocation efficiency. For this purpose, the timing of regionalization policies is specifically tailored to comparatively investigate whether regionalization has improved or reduced financial allocation efficiency.

The rest of the study is organized as follows; Section 2 discusses theoretical underpinnings in light of the debates on financial allocation. The data and methodology employed are covered in Section 3. Section 4 presents the empirical results while Section 5 concludes with implications and future directions.

## 2. Theoretical perspectives on the nexus between financial allocation efficiency and globalization

In accordance with Asongu (2013b), the decision on whether to adopt integration/ liberalization in order to facilitate financial allocation efficiency and enjoy the benefits of regional/ international risk sharing has been much debated in policy and academic circles. There are two main theoretical narratives on the relevance of integration as a policy choice by developing nations in their attempts to benefit from capital allocation efficiency.

The first argument, which supports the rewards of 'allocation efficiency' relies heavily on the predictions of neoclassical growth models from the seminal studies of Solow (1956). According to the neoclassical growth model, liberalization and integration policies enable efficient allocation of capital because resources flow from developed countries that are characterized with capital abundance to developing countries that are scarce in capital but rich in labour. Moreover, the return of capital is low in developed and high in developing countries. The bulk of literature on this perspective is broadly consistent with the advantages that developing countries might enjoy, namely: reduction of capital cost, improvements in investment and economic prosperity that ultimately enhances living standards permanently (see Fischer, 1998; Obstfeld, 1998; Rogoff, 1999; Summers, 2000; Batuo & Asongu, 2015; Javid & Katircioglu, 2017; Katircioglu & Zabolotnov, 2019). Hence, arguments on gains in 'allocation efficiency' have been used by developing countries to

justify their adoption of liberalization and regionalization policies, from Santiago to Seoul over the past decades (Asongu, 2014b).

The second strand is of the perspective that the argument of 'allocation efficiency' is a fanciful means by which to extend the gains from international trade in commodities to international trade in financial assets. According to this strand, the predictions of 'allocation efficiency' are apparent only in the absence of distortions from the free movement of capital. Hence, given the distortions experienced by developing countries during financial crises, there is some inconsistency between the reality of liberalization policies and the theoretical predictions of the neoclassical model. Within this framework, some notable studies that best articulate this perspective include provocative titles like '*Who Needs Capital Account Convertibility?*' (Rodrik, 1998) and '*Why Did Financial Globalization Disappoint?*' (Rodrik & Subramanian, 2009). According to the narrative, the correlation between globalization and allocation efficiency is not very apparent because of costs incurred from recurrent financial crises, which far outweigh potential benefits (Rodrik, 1998).

Rodrik and Subramanian (2009) have documented that in the wake of the recent sub-prime crisis, arguments about the externalities of financial engineering generating substantial gains in developing countries are less plausible. According to the narrative, even without the financial crisis, at the international level it is increasingly evident that the rewards of integration/globalization/ liberalization are not apparent[7]. The narrative further maintains that the postulated gains in terms of higher investment and growth in less developed countries are hard to find because countries that have been developing remarkably have been those that have relied less on liberalization. Therefore, globalization policies have not smoothened consumption and reduced volatility as hypothesized. Another perspective argues that: the rewards of globalization today are unpersuasive, speculative and indirect (Asongu, 2014b) and it is time for a new paradigm shift in liberalization policies because more from globalization is not necessarily better (Asongu,

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[7] The position is still subject to intense debate. Some arguments include: (i) Leung (2003) concluding that increasing external debts in developing countries is worsening business cycles; (ii) Mulwa et al. (2009) suggesting that liberalization has not resulted in improved productivity and efficiency in developing countries and (iii) Kholdy and Sohrabian (2008) establishing that financial globalization may be associated with negative governance externalities in developing countries and (iv) Asongu et al. (2015b) concluding that globalization-driven debts are contributing to reducing inclusive human development in African countries.

2013b). In the light of above literature, the hypothesis investigated by this study is as follows: the policy of regionalization increases financial allocation efficiency.

## 3. Data and Methodology

### 3.1 Data

*3.1.1 Globalization, financial and control variables*

We assess economic and monetary regional panels with data from the Financial Development and Structure Database (FDSD) and African Development Indicators (ADI) of the World Bank for the period 1980 to 2008. Financial variables are obtained from the FDSD whereas macroeconomic variables are from ADI. Two financial allocation efficiency indicators are used, namely: (i) banking system efficiency measured with '*banking system credit on banking system deposits*' and (ii) financial system efficiency proxied with '*financial system credit on financial system deposits*'. The allocation efficiency variables appreciate the ability of banks to transform mobilized deposits into credit for economic operators (Demirgüç-Kunt et al., 1999; Demirgüç-Kunt & Beck, 2009; Asongu, 2013a). It is important to note that formal banking institutions are included in the financial system efficiency measurement. Accordingly, financial system efficiency is banking system efficiency plus efficiency of other financial institutions. The understanding of financial system that embodies the formal and semi-formal financial sectors is clarified in Appendix 1 (Tchamyou & Asongu, 2017; Meniago and Asongu, 2018; Tchamyou et al., 2019). As shown in Appendix 1, the financial system entails formal banks and the semi-informal financial sector (i.e. consisting of specialized non-bank financial institutions and other non-bank financial institutions). In the light of the appendix: (i) formal banks and specialized non-bank financial institutions are licensed by the central bank while (ii) other non-bank financial institutions are legally registered but not licensed as financial institutions by the central bank and government. Not included in the definition of the financial system is the informal financial sector, largely consisting of informal banks that are not registered at the national level, although they could be registered as associations. The informal sector mostly entails savings collectors, savings and credit associations and money lenders.

Three openness indicators are used, namely: financial openness, trade openness and globalization. Trade openness consists of three measurements: imports, exports and 'imports

plus exports'. Financial openness consists of foreign direct investment (FDI), private capital flows (PCF) and a composite index from FDI and PCF. The globalization variable is the composite index of financial openness and trade openness. These composite indicators are derived by means of principal component analysis. The definitions and classification of variables in Appendices 2-3 are consistent with recent openness and finance literature. The financial openness variables are in line with Lane and Milesi-Ferreti (2006) and Baltagi et al. (2009) while the composite financial and trade openness indicators are in accordance with Gries et al. (2009) and Hanh (2010).

Selected control variables are consistent with recent financial development literature, namely: GDP growth, inflation, public investment and foreign aid (Asongu, 2014b; Asongu & De Moor, 2015). The relationship between economic growth and financial development has been substantially documented in the literature. First, a growing economy is linked to reduced cost of financial intermediation because of *inter alia*: availability of more funds for productive investments and competition (Greenwood & Jovanovic, 1990; Saint-Paul, 1992; Tchamyou & Asongu, 2017). This relationship has been confirmed in more contemporary literature (Levine, 1997, 2003a, 2003b). Second, both empirical (Boyd et al., 2001) and theoretical (Huybens & Smith, 1999) views maintain that higher levels of inflation are associated with less efficient, less active and smaller financial institutions. Essentially, macroeconomic policies conducive to low/stable inflation and higher levels of investment have been documented to be associated with higher levels of financial development (Asongu, 2014b; Asongu & De Moor, 2015). Third, a positive relationship between investment and financial development has also been established in the literature (Huang, 2011). Fourth, the theoretical basis supporting policies of development assistance towards developing countries is to mitigate the investment-financing gap (Easterly, 2005). However, from a practical standpoint, the impact of foreign aid on domestic financial development can also be negative if a substantial chunk of donor funds is: (i) siphoned by corrupt officials in recipients nations and subsequently deposited in tax havens whose jurisdictions are traceable to the donor community and (ii) spent in donor countries.

The summary statistics and correlation matrices are disclosed in Appendix 4 and Appendix 5 respectively. From the summary statistics, it is apparent that the variables are quite

comparable based on means. Moreover, the substantial degree of variation from corresponding standard deviations is an indication that reasonable estimated linkages should be expected. Given that imports, exports and trade openness variables are in tens whereas some indicators are in decimals, we define the dependent variables both in ratio and percentage in order to account for this slight difference in denomination. Hence, banking system efficiency is in ratio whereas financial system efficiency is in percentage.

This variation in the conception of the dependent variables does not affect their degrees of substitutions in Appendix 5, since corresponding correlation coefficients of the two variables are: 98.50% (Panel A), 92.50% (Panel B), 89.90% (Panel C) and 94.20% (Panel D) for the UEMOA, CEMAC, COMESA and EAC respectively[8]. Hence, the purpose of the correlation matrices is to avoid concerns of multicollinearity. The concern in the financial development variables is not much of an issue because they are employed as dependent variables. Moreover, the concern in openness variables is addressed by employing them in distinct specifications. Given that the specification consists of interactive regressions, it is important to note that contrary to linear additive models, multicollinearity is not an issue with interactive models (Brambor et al., 2006; Asongu & De Moor, 2015, 2017). This is essentially because the effect of the interactive policy variable of regionalization is considered as a conditional marginal impact.

*3.1.2 Categorization of regions and determination of regionalization policy dummies*
As shown in Table 1 below, at the time of this study, there are eleven main economic and/or monetary regions in Africa, namely, the: *Economic Community of West African States (ECOWAS); West African Economic and Monetary Union (UEMOA); Economic Community of Central African States (ECCAS); Economic and Monetary Community of Central Africa (CEMAC); Franc Zone (CEMAC plus UEMOA countries)[9]; South African Development Community (SADC); East African Community (EAC); South African Customs Union (SACU); Common Market for East and Southern Africa (COMESA); Intergovernmental*

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[8] UEMOA: West African Economic and Monetary Union. CEMAC: Economic and Monetary Community of Central Africa. COMESA: Common Market for Eastern and Southern Africa. EAC: East African Community.
[9] Whereas, the WAEMU and CEMAC are within the Franc zone, we can take a minimalist approach by also considering them as distinct economic/monetary zones because they have different central banks.

*Authority on Development (IGAD)* and *Arab Maghreb Union (UMA)*. The policy dummies are from the year when regionalization policies become effective.

ECOWAS, The Franc Zone, SADC, SACU, IGAD and UMA are not retained for our study because with respect to their creation dates, data was either unavailable or very limited for the application of a 'policy dummy'-oriented fixed effects estimation technique. For the remaining economic and/or monetary unions, as shown in Table 2, because of data availability constraints, the study narrows the number of countries in the database to the following: (i) Benin, Ivory Coast, Mali, Niger and Senegal are retained for the UEMOA region; (ii) Cameroon, Gabon and the Congo Republic for the CEMAC zone; (iii) Kenya, Tanzania and Uganda constitute the EAC and (iv) Burundi, Kenya, Madagascar, Mauritius, Malawi, Rwanda, Sudan, Swaziland, Uganda and Zambia for the COMESA zone.

**Table 1: Presentation of regions with corresponding balanced panels**

| Regions | Definitions (Number of member states) | Constituent countries(Founding dates) | Panel/ Dummy |
|---|---|---|---|
| ECOWAS (CDEAO) | Economic Community of West African States. (15) | Benin, Burkina Faso, Cape Verde(1976), Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone , Togo, *Mauritania(2000)*. **(5/1975)** | **N/A** |
| UEMOA | West African Economic and Monetary Union(8) | Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau (5/1997) °, Mali, Niger, Senegal, and Togo. **(1/1994)** | **(80-08) /(94-08)** |
| ECCAS (UDEAC)* | Economic Community of Central African States(11) | Angola(1999)°, Burundi, Cameroon, Central African Republic, Chad, D.R. Congo, Equatorial Guinea, Gabon, Congo, Rwanda, Sao Tomé and Principe. **(1985)** | **(90-08)/ (99-08)** |
| CEMAC | Economic and Monetary Community of Central Africa(6) | Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea, and Gabon. **(1999)** | **(90-08)/ (99-08)** |
| Franc ZONE | CEMAC plus UEMOA (14) | Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea, Gabon, Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo**(9/1939)** | **N/A** |
| SADC | South African Development Community (15) | Angola, Botswana, D.R Congo(1997)°, Lesotho, Malawi, Mauritius(1995)°, Mozambique, Namibia (1990)°, Swaziland, Tanzania, Zambia, Zimbabwe, South | **N/A** |

| | | | |
|---|---|---|---|
| | | Africa(1990)°, *Seychelles(2004-2007°)* and Madagascar(2005)° **(1980)** | |
| SACU | South Africa Customs Union( 4) | South Africa, Botswana, Lesotho and Swaziland. **(1970)** | **N/A** |
| EAC | East African Community (5) | Burundi (2007), Kenya, Rwanda (2007), Tanzania and Uganda. **(2001)** | **(90-08)/ (02-08)** |
| COMESA | Common Market for Eastern and Southern Africa (19) | Burundi, Comoros, D.R Congo, Djibouti, Egypt(1999)°, Eritrea, Ethiopia, Kenya, Libya(2006)°, Madagascar, Malawi, Mauritius, Rwanda, Seychelles(2001)°, Sudan, Swaziland, Uganda, Zambia, Zimbabwe.**(1994)** | **(80-08) /(95-08)** |
| IGAD | Intergovernmental Authority on Development (7) | Djibouti, Ethiopia, Eritrea (1993)°, Kenya, Somalia, Sudan, Uganda. **(1986)** | **N/A** |
| UMA | Arab Maghreb Union (5) | Algeria, Morocco, Tunisia, Libya, Mauritania **(1989)** | **N/A** |

Countries with dates in brackets are non-founding members. Countries in italics have withdrawn their membership. °: Countries not considered for panel because they entered the region very late or withdrew over time. N/A; denotes the region cannot be included in the study because creation date renders data incompatible with application of the adopted estimated technique.* Founded in 1985 but became effective only by 1999. Policy dummies are based on the year the regional body became effective. This is why the policy dummy for ECCAS is from 1999 though it was founded in 1985.

In the Economic Community of Central African States (ECCAS), Burundi, Cameroon, the Congo Republic, Gabon and Rwanda are selected. However, after analysis we are unable to check for robustness because the financial efficiency indicator used to assess the results of the banking efficiency proxy has a different degree of integration[10].

**Table 2:  Selected regions and countries**

| Regions | Selected countries | Panels | Policy Dummies |
|---|---|---|---|
| UEMOA | Benin, Ivory Coast, Mali, Niger and Senegal | 1980-08 | 1994-08 |
| COMESA | Burundi, Kenya, Madagascar, Mauritius, Malawi, Rwanda, Sudan, Swaziland, Uganda, Zambia | 1980-08 | 1995-08 |
| CEMAC | Cameron, Gabon, Congo Republic | 1990-08 | 1999-08 |
| ECCAS | Burundi, Cameroon, Congo Republic, Gabon, Rwanda | 1990-08 | 1999-08 |
| EAC | Kenya, Tanzania, Uganda | 1990-08 | 2002-08 |

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[10] From an empirical point of view, the high correlation (88%) between banking system efficiency and financial system efficiency for ECCAS is a necessary but insufficient condition for a robustness test application. Compatibility of integration orders in endogenous variables is also crucial for the robustness check.

UEMOA: West African Economic and Monetary Union. CEMAC: Central African Economic and Monetary Community. COMESA: Common Markets for Eastern and Southern Africa. EAC: East African Community. We dropped ECCAS because of incompatibility of robustness test. The Panel column represents the full sample whereas the policy dummy column denotes the year a common regional treaty was adopted for the sampled countries.

The policy dummies are adopted from the year treaties for the establishment of the regional bodies came into force in respective countries. While these are called 'time policy dummies', they are indeed country-specific and contingent on the time the countries adopted the common treaty in the regional body, relative to the full sample. For instance, with respect to Kenya, the sample for the EAC is from 1990 to 2008 while the 'policy dummy' is used from 2001 to 2008. This is not the case for the COMESA, which has a full sample for the period 1980 to 2008 and the 'policy dummy' starts from the year 1994. Hence, the full samples for the two regions as well as the time the regional treaties were adopted are different, which justifies the difference in adopted policy dummies. Hence, the policy dummies are regional-specific and start from the year the regional treaties were adopted. Moreover, it is also important to note that the policy dummy may be the same year as the year the regional treaty was adopted or a year ahead depending on the date of adoption. For instance, only the following year is considered if a treaty is adopted late in a given year. In other words, if a treaty is adopted in December 2000, the policy dummy begins in 2001 while if a treaty is adopted in January 2000; the policy dummy begins in 2000.

## 3.2 Methodology

*3.2.1 Principal Component Analysis (PCA)*

Given the high degree of substitution between globalization variables, we are consistent with recent literature in employing principal component analysis (PCA) to derive composite indicators (Andrés et al., 2015; Tchamyou, 2017; Asongu & Nwachukwu, 2016a). The PCA is a widely used technique to reduce a set of highly correlated variables into a smaller set of uncorrelated indicators called principal components (PCs) which represent a substantial proportion of information or variability in the constituent indicators. The criterion used to decide which information to retain is from Jolliffe (2002) and Kaiser (1974) who have recommended that PCs with an eigenvalue greater than the mean or one should be retained.

Table 3 shows the derivation of composite indices. The eigenvalues and corresponding variations of retained first PCs are consistent with the criterion highlighted above. For example, the financial globalisation indicator (*Finopex*) in Panel A for the UEMOA region which consists of FDI and PCF has an eigenvalue of 1.898 and accounts for about 94.9% of information in the constituent indicators. *Finopex* is the financial openness index and is the first principal component of foreign direct investment and private capital flows while *Globex* is the globalisation index and is the first principal component of *Finopex* and trade openness. Trade openness consists of imports plus exports (i.e. I+X). The linear combinations are provided in the component matrix disclosed in Table 3 and the constituting variables have equal weights on the corresponding principal components.

"*We use PCA because we aim to reduce the observed correlated variables into a smaller set of independent and/or uncorrelated composite variables. In other words, we wish to extract linear composites of observed variables. Factor analysis is inappropriate because we are not testing a theoretical model of latent factors causing observed variables. Accordingly, it is consistent with the test for a theoretical model of latent factors causing observed variables*" (Asongu, 2015, p. 12).

It is important to discuss the statistical relevance of the PC-derived globalisation indicators. These can be engaged at two levels, namely: general and specific points (Asongu & Nwachukwu, 2015, 2016b). First, from a general perspective, Pagan (1984, p. 242) has documented an interesting analysis on concerns that could arise when regressors are obtained from initial estimations. The underlying concerns are related to efficiency, consistency and inferential validity of estimated parameters. Whereas *two-step* estimators are reliable when it comes to consistency and efficiency, only few valid inferences may be provided by the underlying estimates. The concern about inferential validity has been confirmed by a stream of contemporary literature (Oxley & McAleer, 1993; Ba & Ng, 2006; McKenzie & McAleer, 1997; Westerlund & Urban, 2013a).

**Table 3:  Derivation of Indices (Financial Openness and Globalization indices)**

| Principal Indicator | Indexes | Cor. coef. (t-stats) | Eigen Value | First PC variation | Component Matrix | |
|---|---|---|---|---|---|---|
| | | | Panel A: UEMOA | | | |
| Financial Openness | Finopex | 0.898*** (23.53) | 1.898 | 0.949 | FDIgdp 0.707 | PCFgdp 0.707 |
| Globalization | Globex | 0.199** (2.34) | 1.199 | 0.599 | Finopex 0.707 | (I+X)gdp 0.707 |
| | | | Panel B: COMESA | | | |
| Financial Openness | Finopex | 0.981*** (82.51) | 1.981 | 0.990 | FDIgdp 0.707 | PCFgdp 0.707 |
| Globalization | Globex | 0.250*** (4.15) | 1.250 | 0.625 | Finopex 0.707 | (I+X)gdp 0.707 |
| | | | Panel C: CEMAC | | | |
| Financial Openness | Finopex | 0.994*** (64.94) | 1.994 | 0.997 | FDIgdp 0.707 | PCFgdp 0.707 |
| Globalization | Globex | 0.360** (2.58) | 1.360 | 0.680 | Finopex 0.707 | (I+X)gdp 0.707 |
| | | | Panel D: EAC | | | |
| Financial Openness | Finopex | 0.996*** (88.912) | 1.996 | 0.998 | FDIgdp 0.707 | PCFgdp 0.707 |
| Globalization | Globex | -0.352*** (-2.744) | 1.352 | 0.676 | Finopex -0.707 | (I+X)gdp -0.707 |

Globex: Globalization Index.  Finopex: Financial Openness Index.  FDIgdp and PCFgdp are capital account openness indicators. (I+X) gdp is the trade openness variable.  PC: Principal Component. Cor. Coef: Correlation coefficient. *, **, ***: are respectively 10%, 5% and 1% significance levels.


Second, on the specific angle, we are employing PC indicators within the framework of this study. Concerns about PC-derived variables have been documented by Westerlund and Urbain (2012, 2013b) who have built on previous works highlighted in the preceding paragraph as well as more contemporary literature on the subject, notably: Stock and Watson (2002); Pesaran (2006); Bai (2003, 2009) and Greenaway-McGrevy et al. (2012). The authors have cautioned that normal inferences can be made if PC-factor augmented estimators converge towards their values at the rate of $\sqrt{TN}$ (where N represents cross-section observations and T denotes the number of time series). Furthermore, Westerlund and Urbain (2012, 2013b) have argued that conditions for convergence required for good inferences from PC-derived estimators are more feasible when the sample is relatively large. Unfortunately, the authors have not disclosed how large should be large. Concerning the

sample used in the study, we can neither extend T nor N for two reasons. First, N selected for the sampled economic and monetary regions is based data availability. Accordingly, economic regions by definition have a limited number of countries. Second, the adopted time series is tailored to increase T as much as possible. In essence, the policy time dummies are from the year when regionalization policies became effective. In addition to these clarifications, Asongu and Nwachukwu (2016b) have recently concluded on the feasibility of inferences from PC-augmented regressors using sub-samples that are comparatively lower in terms of T and N values.

*3.2.2 Estimation technique*

There is an abundant supply of literature supporting the position that the choice of an estimation technique is contingent on the objective of the study and behavior of corresponding data (Kou et al., 2012, 2014, 2016, 2019a, 2019b; Li et al., 2014, 2016; Zhang et al., 2019; Chao et al., 2019).  In the light of this attendant literature, the choice of the estimation technique in this study is contingent on both the objective of the study and behavior of data. The objective of this study is to assess post-regionalization policy effects. This requires the application of policy-time dummies which is by definition consistent with a fixed effects (FE) regression. The economic relevance of the FE regression is that it accounts for the unobserved heterogeneity in the sub-samples. In panel data analysis, the estimator from FE is also called a 'within estimator' and there is an assumption of time independent impacts for every country that is potentially correlated with the regressors.

Moreover, FE regressions have the added advantage of not hypothetically assuming that explanatory variables are not correlated with residuals. Furthermore, the use of FE accounts for the unobserved heterogeneity between countries in the region. More generally, in the literature, when a panel consists of observations on a fixed and relatively small sets of interest units (say member states of a given region), there is a presumption in favor of country FE (Asongu, 2016).

In spite of this intuition for a FE estimator, we still employ the Hausman test to assess if the intuition for the estimation technique is consistent with the behavior of data. On whether Ordinary Least Squares (OLS) with FE or Generalized Least Squares (GLS) with FE should be

applied, we opt for the latter and justify our choice after regression by testing for the significance of heteroskedasticity.

The adopted estimation is as follows in Eq. (1).

$$FE_{i,t} = \alpha_0 + \sigma_1 G_{i,t} + \sigma_2 P_{i,t} + \sigma_3 GP_{i,t} + \sum_{h=1}^{4} \delta_h W_{h,i,t} + \eta_i + \varepsilon_{i,t}, \quad (1)$$

where, $FE_{i,t}$, is either 'banking system efficiency' or 'financial system efficiency' of country $i$ in period $t$; $G_{i,t}$ is a globalisation indicator (imports, exports, trade openness, private capital flows, foreign direct investment, financial globalisation (*Finopex*) and globalisation (*Globex*)); $P_{i,t}$ is a regionalisation policy variable that may either take the values of 0 (before the regionalisation) or 1 (after regionalisation) ; $PG_{i,t}$ is the interaction between globalisation and the regionalisation policy variable; $\alpha_0$ is a constant; $W$ is the vector of control variables (*GDP growth, inflation, public investment* and *foreign aid*), $\eta_i$ is a country-specific effect, and $\varepsilon_{i,t}$ the error term. The specifications are Heteroscedasticity and Autocorrelation Consistent (HAC) in standard errors. Moreover, specifications are tailored to avoid the potential issues of multicollinearity associated with globalisation indicators.

## 4. Empirical results

### 4.1 Presentation of results

Tables 4-5 present estimated results. Whereas Table 4 discloses findings on the UEMOA (Panel A) and CEMAC (Panel B) regions, Table 5 shows results for the COMESA (Panel A) and EAC (Panel B) regions. Each panel consists of two sets of specifications, namely, regressions with: 'banking system efficiency' on the left-hand side (LHS) and estimations with 'financial system efficiency' on the right-hand side (RHS).

The following can be established from Panel A of Table 4 on the UEMOA region. First, whereas the effects imports, exports, trade openness and globalization are positive on banking system efficiency, the marginal effects from the interaction with regionalization are negative. This is evidence of decreasing returns to allocation efficiency from globalization-fuelled regionalization. Hence, it can be inferred that the effect of regionalization is likely to

take a Kuznets or inverted U-shape because the unconditional globalization estimates are positively significant whereas the unconditional effects based on an interaction with regionalization policy are negative. This evidence is supported by the unconditional negative effect from regionalization policy. Second, most of the significant control variables have expected signs. Third, findings from financial system efficiency on the RHS are consistent with those of banking system efficiency on the LHS. Fourth, the Hausman test confirms that the data behavior is consistent with the intuition for adopting a FE regression technique because the null hypothesis which is the position of Random Effects (RE) or between estimators is overwhelmingly rejected.

In Panel B of the same table for the CEMAC region: (i) unconditional regionalization variables have negative effects on allocation efficiency; (ii) the marginal effect of globalization is negative on the LHS; (iii) most significant control variables display expected signs and (iv) the Hausman test does not validate the choice of a FE estimator.

We clarify two concerns, notably: the negative effect from GDP growth and the relevance of a threshold effect for a Kuznets shape relationship from globalization on the LHS even when the unconditional effect from globalization is not significant. First, the negative impact of GDP growth could be traceable to the lack of broad-based growth in Africa. Accordingly, whereas prior to the mid 1990s, the growth experienced by the continent was substantially low, the recent period of growth resurgence that began in the mid 1990s (Fosu, 2015) has been very immiserizing because from the mid 1990s extreme poverty has been decreasing in all regions of the world with the exception of Africa (Asongu & Kodila-Tedika, 2018; Asongu & le Roux, 2019;-Tchamyou, 2019a, 2019b; Tchamyou et al., 2019).

Second, the notion of threshold is in accordance with Cummins (2000) on a minimum level in language proficiency before a 'second language speaker' can begin reaping the benefits from a given language. Moreover, the definition of threshold is also consistent with the critical mass theory that has been substantially covered in economic development studies (e.g. Roller & Waverman, 2001; Ashraf & Galor, 2013). Batuo (2015) and Asongu and Odhiambo (2019a, 2019b) have recently applied the threshold or critical mass theory using interactive variables. Therefore, within the framework of this research, the notion of

threshold is consistent with the: (i) critical mass for positive/negative effects (Roller & Waverman, 2001; Batuo, 2015); (ii) minimum requirement for enjoying of positive/negative effects (Cummins, 2000) and (iii) criteria for Kuznets and U shapes (Ashraf & Galor, 2013; Asongu et al., 2019).

In interactive regressions, when the unconditional effect is positive and the corresponding interactive or conditional effect is negative, an inverted U-shaped nexus can be established. Conversely, when the unconditional effect is negative and the corresponding interactive or conditional effect is positive, a U-shaped nexus can be established (see Ashraf & Galor, 2013; Asongu & Kodila-Tedika, 2017).

In Table 5 on the COMESA and EAC regions, the following findings are apparent. First, for the COMESA region, while the regionalisation policy coefficient is consistently negative, the marginal effects from interaction with globalisation are: (i) positive from trade globalisation and globalisation on the LHS and (ii) positive from all globalisation estimates on the RHS. The finding is exclusively consistent with the significant estimates from exports and trade openness on the LHS of Panel B for the EAC region. It follows that the relationship between banking efficiency and globalisation-fuelled regionalisation is likely to be U-shape for the COMESA and EAC regions.  Third, the significant control variables display expected signs for the most part.

## Table 4: Interactive regression results for UEMOA and CEMAC (Economic and Monetary Regions)

**Panel A: The UEMOA Region**

| | Banking System Efficiency | | | | | | | Financial System Efficiency | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Imports | Exports | Trade | FDI | PCF | Finopex | Globex | Imports | Exports | Trade | FDI | PCF | Finopex | Globex |
| Constant | 1.138*** (0.000) | 0.841*** (0.002) | 0.780*** (0.000) | 1.788*** (0.000) | 1.758*** (0.000) | 1.812*** (0.000) | 1.808*** (0.000) | 116.53*** (0.000) | 63.756*** (0.008) | 72.585*** (0.005) | 178.583*** (0.000) | 176.35*** (0.000) | 179.92*** (0.000) | 180.37*** (0.000) |
| Imports | 0.019*** (0.002) | --- | --- | --- | --- | --- | --- | 1.890*** (0.002) | --- | --- | --- | --- | --- | --- |
| Exports | --- | 0.031*** (0.000) | --- | --- | --- | --- | --- | --- | 3.827*** (0.000) | --- | --- | --- | --- | --- |
| Trade | --- | --- | 0.015*** (0.000) | --- | --- | --- | --- | --- | --- | 1.651*** (0.000) | --- | --- | --- | --- |
| FDI | --- | --- | --- | 0.009 (0.870) | --- | --- | --- | --- | --- | --- | 1.161 (0.826) | --- | --- | --- |
| PCF | --- | --- | --- | --- | 0.050 (0.302) | --- | --- | --- | --- | --- | --- | 2.731 (0.557) | --- | --- |
| Finopex | --- | --- | --- | --- | --- | 0.043 (0.488) | --- | --- | --- | --- | --- | --- | 2.795 (0.642) | --- |
| Globex | --- | --- | --- | --- | --- | --- | 0.337*** (0.000) | --- | --- | --- | --- | --- | --- | 32.717*** (0.000) |
| Policy | 0.316 (0.180) | 0.032 (0.833) | 0.451** (0.037) | -0.706*** (0.000) | -0.718*** (0.000) | -0.720*** (0.000) | -0.769*** (0.000) | 22.064 (0.326) | 7.074 (0.612) | 42.717** (0.035) | -69.760*** (0.000) | -71.30*** (0.000) | -70.42*** (0.000) | -76.40*** (0.000) |
| Imports.Policy | -0.030*** (0.000) | --- | --- | --- | --- | --- | --- | -2.720*** (0.000) | --- | --- | --- | --- | --- | --- |
| Exports.Policy | --- | -0.028*** (0.000) | --- | --- | --- | --- | --- | --- | -2.986*** (0.000) | --- | --- | --- | --- | --- |
| Trade.Policy | --- | --- | -0.018*** (0.000) | --- | --- | --- | --- | --- | --- | -1.847*** (0.000) | --- | --- | --- | --- |
| FDI.Policy | --- | --- | --- | 0.016 (0.792) | --- | --- | --- | --- | --- | --- | 0.961 (0.871) | --- | --- | --- |
| PCF.Policy | --- | --- | --- | --- | -0.012 (0.811) | --- | --- | --- | --- | --- | --- | 0.553 (0.913) | --- | --- |
| Finopex.Policy | --- | --- | --- | --- | --- | -0.007 (0.909) | --- | --- | --- | --- | --- | --- | 0.310 (0.962) | --- |
| Globex.Policy | --- | --- | --- | --- | --- | --- | -0.314*** (0.000) | --- | --- | --- | --- | --- | --- | -30.52*** (0.000) |
| GDP growth | -0.00006 (0.992) | -0.001 (0.836) | -0.002 (0.733) | 0.001 (0.831) | 0.001 (0.835) | 0.001 (0.842) | -0.0007 (0.899) | -0.548 (0.366) | -0.714 (0.205) | -0.758 (0.188) | -0.395 (0.544) | -0.411 (0.524) | -0.407 (0.530) | -0.618 (0.296) |
| Inflation | 0.007** (0.045) | 0.005 (0.110) | 0.004 (0.221) | 0.013*** (0.000) | 0.013*** (0.000) | 0.013*** (0.000) | 0.005 (0.136) | 1.014*** (0.006) | 0.671** (0.048) | 0.645* (0.069) | 1.588*** (0.000) | 1.580*** (0.000) | 1.583*** (0.000) | 0.789** (0.027) |
| Public Investment | 0.013 (0.134) | 0.018** (0.040) | 0.015* (0.064) | 0.016 (0.104) | 0.015 (0.104) | 0.015 (0.120) | 0.009 (0.309) | 1.111 (0.202) | 1.754** (0.029) | 1.326* (0.094) | 1.350 (0.156) | 1.398 (0.136) | 1.336 (0.160) | 0.666 (0.433) |
| Foreign Aid | -0.031*** (0.000) | -0.021*** (0.009) | -0.023*** (0.003) | -0.036*** (0.000) | -0.034*** (0.000) | -0.035*** (0.000) | -0.021** (0.010) | -2.66*** (0.001) | -1.394* (0.058) | -1.875** (0.012) | -3.231*** (0.000) | -3.067*** (0.000) | -3.124*** (0.000) | -1.745** (0.026) |
| Hausman test | 25.23*** | 21.77*** | 25.11*** | 27.14*** | 26.24*** | 26.60*** | 19.02*** | 28.11*** | 26.19*** | 27.86*** | 30.79*** | 30.02*** | 30.31*** | 22.67*** |

| | Imports | Exports | Trade | FDI | PCF | Finopex | Globex | Imports | Exports | Trade | FDI | PCF | Finopex | Globex |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R² within | 0.718 | 0.729 | 0.731 | 0.664 | 0.673 | 0.669 | 0.722 | 0.736 | 0.773 | 0.757 | 0.688 | 0.693 | 0.691 | 0.744 |
| Fisher | **37.84\*\*\*** | **40.12\*\*\*** | **42.06\*\*\*** | **29.14\*\*\*** | **30.38\*\*\*** | **29.74\*\*\*** | **38.23\*\*\*** | **41.58\*\*\*** | **50.68\*\*\*** | **48.15\*\*\*** | **32.45\*\*\*** | **33.35\*\*\*** | **32.91\*\*\*** | **42.85\*\*\*** |
| Observations | 116 | 116 | 120 | 115 | 115 | 115 | 115 | 116 | 116 | 120 | 115 | 115 | 115 | 115 |

**Panel B: The CEMAC Region**

| | Banking System Efficiency | | | | | | | Financial System Efficiency | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Imports | Exports | Trade | FDI | PCF | Finopex | Globex | Imports | Exports | Trade | FDI | PCF | Finopex | Globex |
| Constant | **0.731\*\*\*** (0.002) | **1.148\*\*\*** (0.001) | **1.183\*\*\*** (0.000) | **1.031\*\*\*** (0.000) | **1.040\*\*\*** (0.000) | **1.079\*\*\*** (0.000) | **1.138\*\*\*** (0.000) | **91.805\*\*\*** (0.000) | **122.03\*\*\*** (0.000) | **126.75\*\*\*** (0.000) | **103.02\*\*\*** (0.000) | **103.42\*\*\*** (0.000) | **105.15\*\*\*** (0.000) | **107.47\*\*\*** (0.000) |
| Imports | **0.012\*** **(0.082)** | --- | --- | --- | --- | --- | --- | 0.612 (0.327) | --- | --- | --- | --- | --- | --- |
| Exports | --- | -0.001 (0.858) | --- | --- | --- | --- | --- | --- | -0.343 (0.648)) | --- | --- | --- | --- | --- |
| Trade | --- | --- | -0.001 (0.530) | --- | --- | --- | --- | --- | --- | -0.304 (0.333) | --- | --- | --- | --- |
| FDI | --- | --- | --- | 0.013 (0.481) | --- | --- | --- | --- | --- | --- | 0.596 (0.722) | --- | --- | --- |
| PCF | --- | --- | --- | --- | 0.020 (0.310) | --- | --- | --- | --- | --- | --- | 0.878 (0.619) | --- | --- |
| Finopex | --- | --- | --- | --- | --- | 0.084 (0.387) | --- | --- | --- | --- | --- | --- | 3.781 (0.667) | --- |
| Globex | --- | --- | --- | --- | --- | --- | 0.084 (0.518) | --- | --- | --- | --- | --- | --- | 0.080 (0.994) |
| Policy | -0.237 (0.237) | -0.100 (0.595) | 0.068 (0.733) | **-0.225\*\*** (0.017) | **-0.223\*\*** (0.016) | **-0.295\*\*\*** (0.005) | **-0.314\*\*\*** (0.005) | -17.473 (0.322) | -15.980 (0.329) | 3.259 (0.848) | **-20.621\*\*** (0.015) | **-20.480\*\*** (0.015) | **-25.51\*\*\*** (0.008) | **-25.610\*\*** (0.011) |
| Imports.Policy | -0.0009 (0.867) | --- | --- | --- | --- | --- | --- | -0.287 (0.558) | --- | --- | --- | --- | --- | --- |
| Exports.Policy | --- | -0.002 (0.568) | --- | --- | --- | --- | --- | --- | -0.132 (0.740) | --- | --- | --- | --- | --- |
| Trade.Policy | --- | --- | -0.003 (0.156) | --- | --- | --- | --- | --- | --- | -0.278 (0.154) | --- | --- | --- | --- |
| FDI.Policy | --- | --- | --- | -0.023 (0.224) | --- | --- | --- | --- | --- | --- | -1.711 (0.310) | --- | --- | --- |
| PCF.Policy | --- | --- | --- | --- | -0.030 (0.130) | --- | --- | --- | --- | --- | --- | -2.025 (0.251) | --- | --- |
| Finopex.Policy | --- | --- | --- | --- | --- | -0.135 (0.171) | --- | --- | --- | --- | --- | --- | -9.494 (0.280) | --- |
| Globex.Policy | --- | --- | --- | --- | --- | --- | **-0.183\*** **(0.079)** | --- | --- | --- | --- | --- | --- | -11.996 (0.193) |
| GDP growth | **-0.026\*\*** (0.011) | **-0.029\*\*** (0.010) | **-0.032\*\*\*** (0.002) | **-0.032\*\*\*** (0.005) | **-0.033\*\*\*** (0.004) | **-0.032\*\*\*** (0.004) | **-0.038\*\*\*** (0.001) | **-3.024\*\*\*** (0.001) | **-2.975\*\*\*** (0.003) | **-3.350\*\*\*** (0.000) | **-3.556\*\*\*** (0.001) | **-3.573\*\*\*** (0.001) | **-3.560\*\*\*** (0.001) | **-3.944\*\*\*** (0.000) |
| Inflation | **-0.010\*\*** (0.019) | -0.007 (0.117) | -0.007 (0.114) | -0.006 (0.185) | -0.006 (0.195) | -0.006 (0.190) | -0.007 (0.151) | **-0.923\*\*** (0.020) | **-0.696\*** (0.087) | **-0.661\*** (0.092) | -0.608 (0.170) | -0.596 (0.176) | -0.602 (0.173) | -0.612 (0.161) |
| Public Investment | -0.020 (0.168) | -0.008 (0.585) | -0.001 (0.926) | 0.0001 (0.995) | -0.001 (0.923) | -0.0005 (0.975) | -0.004 (0.800) | -1.361 (0.293) | -0.680 (0.618) | 0.110 (0.938) | 0.109 (0.948) | 0.031 (0.985) | 0.080 (0.961) | -0.108 (0.948) |
| Foreign Aid | -0.003 | -0.0004 | 0.0007 | 0.001 | 0.001 | 0.001 | -0.001 | -0.102 | 0.089 | 0.248 | 0.226 | 0.227 | 0.225 | 0.040 |

| | (0.758) | (0.968) | (0.941) | (0.899) | (0.890) | (0.897) | (0.887) | (0.906) | (0.916) | (0.772) | (0.811) | (0.809) | (0.811) | (0.966) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hausman test | 1.48 | 0.79 | 2.70 | 0.35 | 0.35 | 0.33 | 1.37 | 0.92 | 1.55 | 3.51 | 0.81 | 0.82 | 0.80 | 2.15 |
| R² within | 0.432 | 0.409 | 0.458 | 0.400 | 0.413 | 0.406 | 0.432 | 0.507 | 0.508 | 0.558 | 0.468 | 0.474 | 0.471 | 0.486 |
| Fisher | **4.78***** | **4.35***** | **5.45***** | **3.34***** | **3.53***** | **3.43***** | **3.81***** | **6.17***** | **6.21***** | **7.76***** | **4.28***** | **4.38***** | **4.33***** | **4.60***** |
| Observations | 54 | 54 | 55 | 45 | 45 | 45 | 45 | 52 | 52 | 53 | 44 | 44 | 44 | 44 |

*, **, ***: significance levels of 10%, 5% and 1% respectively. Policy: Regionalisation Policy. Imports: Imports of Goods and Services. Exports: Exports of Goods and Services. Trade: Imports plus Exports of Goods and Services. FDI: Foreign Direct Investment. PCF: Private Capital Flows. Finopex: Financial Openness Index. Globex: Globalisation Index. GDPg: Gross Domestic Product Growth rate. Pub. Ivt: Public Investment. Aid: Foreign Aid or Development Assistance. UEMOA: West African Economic and Monetary Union. CEMAC: Central African Economic and Monetary Community.

### Table 5: Interactive regression results for COMESA and EAC (Economic Regions)

**Panel A: The COMESA Region**

| | Banking System Efficiency | | | | | | | Financial System Efficiency | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Imports | Exports | Trade | FDI | PCF | Finopex | Globex | Imports | Exports | Trade | FDI | PCF | Finopex | Globex |
| Constant | **1.048***** (0.000) | **1.084***** (0.000) | **1.109***** (0.000) | **0.934***** (0.000) | **0.964***** (0.000) | **0.904***** (0.000) | **0.890***** (0.000) | **111.40***** (0.000) | **113.60***** (0.000) | **118.65***** (0.000) | **97.826***** (0.000) | **101.15***** (0.000) | **94.285***** (0.000) | **92.972***** (0.000) |
| Imports | **-0.003*** (0.081) | --- | --- | --- | --- | --- | --- | **-0.523***** (0.007) | --- | --- | --- | --- | --- | --- |
| Exports | --- | **-0.005**** (0.021) | --- | --- | --- | --- | --- | --- | **-0.665***** (0.003) | --- | --- | --- | --- | --- |
| Trade | --- | --- | **-0.003**** (0.014) | --- | --- | --- | --- | --- | --- | **-0.390***** (0.001) | --- | --- | --- | --- |
| FDI | --- | --- | --- | **-0.022*** (0.081) | --- | --- | --- | --- | --- | --- | **-2.570**** (0.028) | --- | --- | --- |
| PCF | --- | --- | --- | --- | **-0.021*** (0.082) | --- | --- | --- | --- | --- | --- | **-2.437**** (0.030) | --- | --- |
| Finopex | --- | --- | --- | --- | --- | **-0.035*** (0.074) | --- | --- | --- | --- | --- | --- | **-4.079**** (0.025) | --- |
| Globex | --- | --- | --- | --- | --- | --- | **-0.061**** (0.020) | --- | --- | --- | --- | --- | --- | **-6.790***** (0.005) |
| Policy | **-0.187***** (0.001) | **-0.213***** (0.000) | **-0.198***** (0.000) | **-0.127***** (0.000) | **-0.119***** (0.000) | **-0.098***** (0.001) | **-0.100***** (0.001) | **-19.74***** (0.000) | **-22.81***** (0.000) | **-21.97***** (0.000) | **-14.72***** (0.000) | **-13.84***** (0.000) | **-10.96***** (0.000) | **-11.27***** (0.000) |
| Imports.Policy | **0.002*** (0.059) | --- | --- | --- | --- | --- | --- | **0.238**** (0.023) | --- | --- | --- | --- | --- | --- |
| Exports.Policy | --- | **0.003***** (0.002) | --- | --- | --- | --- | --- | --- | **0.399***** (0.000) | --- | --- | --- | --- | --- |
| Trade.Policy | --- | --- | **0.001**** (0.014) | --- | --- | --- | --- | --- | --- | **0.161***** (0.003) | --- | --- | --- | --- |
| FDI.Policy | --- | --- | --- | 0.020 (0.167) | --- | --- | --- | --- | --- | --- | **2.658*** (0.050) | --- | --- | --- |
| PCF.Policy | --- | --- | --- | --- | 0.016 (0.236) | --- | --- | --- | --- | --- | --- | **2.260*** (0.084) | --- | --- |
| Finopex.Policy | --- | --- | --- | --- | --- | 0.031 (0.174) | --- | --- | --- | --- | --- | --- | **4.100*** (0.054) | --- |

| | Imports | Exports | Trade | FDI | PCF | Finopex | Globex | Imports | Exports | Trade | FDI | PCF | Finopex | Globex |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Globex.Policy | --- | --- | --- | --- | --- | --- | **0.056**<br>**(0.022)** | --- | --- | --- | --- | --- | --- | **6.651***<br>**(0.003)** |
| GDP growth | -0.002<br>(0.380) | -0.001<br>(0.585) | -0.001<br>(0.552) | -0.004<br>(0.176) | -0.003<br>(0.220) | -0.004<br>(0.180) | -0.003<br>(0.317) | -0.291<br>(0.300) | -0.199<br>(0.478) | -0.221<br>(0.438) | -0.406<br>(0.177) | -0.395<br>(0.183) | -0.402<br>(0.181) | -0.278<br>(0.355) |
| Inflation | **-0.001***<br>**(0.000)** | **-0.001***<br>**(0.000)** | **-0.001***<br>**(0.000)** | **-0.001***<br>**(0.000)** | **-0.001***<br>**(0.001)** | **-0.001***<br>**(0.001)** | **-0.001***<br>**(0.000)** | **-0.194***<br>**(0.000)** | **-0.198***<br>**(0.000)** | **-0.200***<br>**(0.000)** | **-0.207***<br>**(0.000)** | **-0.212***<br>**(0.000)** | **-0.208***<br>**(0.000)** | **-0.219***<br>**(0.000)** |
| Public Investment | -0.007<br>(0.134) | **-0.010**<br>**(0.044)** | -0.007<br>(0.176) | -0.006<br>(0.196) | **-0.008***<br>**(0.097)** | -0.006<br>(0.196) | -0.006<br>(0.217) | 0.191<br>(0.692) | -0.131<br>(0.774) | 0.230<br>(0.640) | -0.101<br>(0.836) | -0.239<br>(0.621) | -0.102<br>(0.836) | -0.065<br>(0.894) |
| Foreign Aid | -0.003<br>(0.137) | **-0.003***<br>**(0.072)** | -0.003<br>(0.103) | **-0.004***<br>**(0.051)** | **-0.005**<br>**(0.015)** | **-0.004***<br>**(0.050)** | -0.004<br>(0.107) | **-0.504**<br>**(0.017)** | **-0.601***<br>**(0.002)** | **-0.630***<br>**(0.002)** | **-0.774***<br>**(0.001)** | **-0.878***<br>**(0.000)** | **-0.778***<br>**(0.001)** | **-0.685***<br>**(0.003)** |
| Hausman test | 6.67 | 9.73 | 7.44 | 7.81 | 9.06 | 7.30 | 9.73 | 7.44 | 4.16 | 6.70 | 5.91 | 18.28** | 5.80 | 8.31 |
| R² within | 0.133 | 0.151 | 0.155 | 0.133 | 0.133 | 0.133 | 0.147 | 0.208 | 0.224 | 0.246 | 0.207 | 0.206 | 0.208 | 0.227 |
| Fisher | **5.34*** | **6.17*** | **6.40*** | **4.73*** | **4.83*** | **4.76*** | **5.35*** | **9.08*** | **9.99*** | **11.42*** | **8.10*** | **8.18*** | **8.12*** | **9.11*** |
| Observations | 259 | 259 | 261 | 233 | 237 | 233 | 233 | 259 | 259 | 261 | 233 | 237 | 233 | 233 |

**Panel B: The EAC Region**

| | Banking System Efficiency | | | | | | | Financial System Efficiency | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Imports | Exports | Trade | FDI | PCF | Finopex | Globex | Imports | Exports | Trade | FDI | PCF | Finopex | Globex |
| Constant | **0.265**<br>**(0.039)** | **0.557***<br>**(0.000)** | **0.426***<br>**(0.000)** | **0.435***<br>**(0.000)** | **0.424***<br>**(0.000)** | **0.316***<br>**(0.000)** | **0.239***<br>**(0.009)** | 14.870<br>(0.218) | **53.842***<br>**(0.000)** | **34.199***<br>**(0.003)** | **42.848***<br>**(0.000)** | **41.931***<br>**(0.000)** | **33.333***<br>**(0.000)** | **28.188***<br>**(0.002)** |
| Imports | 0.0002<br>(0.957) | --- | --- | --- | --- | --- | --- | 0.540<br>(0.175) | --- | --- | --- | --- | --- | --- |
| Exports | --- | **-0.019***<br>**(0.000)** | --- | --- | --- | --- | --- | --- | **-1.785***<br>**(0.000)** | --- | --- | --- | --- | --- |
| Trade | --- | --- | **-0.004**<br>**(0.045)** | --- | --- | --- | --- | --- | --- | -0.190<br>(0.406) | --- | --- | --- | --- |
| FDI | --- | --- | --- | **-0.057***<br>**(0.002)** | --- | --- | --- | --- | --- | --- | **-4.562**<br>**(0.013)** | --- | --- | --- |
| PCF | --- | --- | --- | --- | **-0.057***<br>**(0.002)** | --- | --- | --- | --- | --- | --- | **-4.541**<br>**(0.012)** | --- | --- |
| Finopex | --- | --- | --- | --- | --- | **-0.075***<br>**(0.002)** | --- | --- | --- | --- | --- | --- | **-6.003**<br>**(0.012)** | --- |
| Globex | --- | --- | --- | --- | --- | --- | -0.017<br>(0.646) | --- | --- | --- | --- | --- | --- | -3.657<br>(0.326) |
| Policy | -0.414<br>(0.107) | -0.165<br>(0.125) | **-0.372**<br>**(0.012)** | -0.034<br>(0.611) | -0.029<br>(0.645) | 0.012<br>(0.759) | 0.002<br>(0.959) | -17.746<br>(0.462) | 7.914<br>(0.484) | -14.378<br>(0.330) | -2.236<br>(0.747) | -1.383<br>(0.834) | 4.807<br>(0.253) | 4.712<br>(0.274) |
| Imports.Policy | 0.013<br>(0.125) | --- | --- | --- | --- | --- | --- | 0.698<br>(0.401) | --- | --- | --- | --- | --- | --- |
| Exports.Policy | --- | **0.009***<br>**(0.060)** | --- | --- | --- | --- | --- | --- | 0.014<br>(0.980) | --- | --- | --- | --- | --- |
| Trade.Policy | --- | --- | **0.007***<br>**(0.008)** | --- | --- | --- | --- | --- | --- | 0.394<br>(0.170) | --- | --- | --- | --- |
| FDI.Policy | --- | --- | --- | 0.022<br>(0.301) | --- | --- | --- | --- | --- | --- | 3.436<br>(0.133) | --- | --- | --- |
| PCF.Policy | --- | --- | --- | --- | 0.021<br>(0.302) | --- | --- | --- | --- | --- | --- | 3.194<br>(0.141) | --- | --- |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Finopex.Policy | --- | --- | --- | --- | --- | 0.029 (0.300) | --- | --- | --- | --- | --- | --- | 4.367 (0.136) | --- |
| Globex.Policy | --- | --- | --- | --- | --- | --- | -0.034 (0.370) | --- | --- | --- | --- | --- | --- | 0.191 (0.959) |
| GDP growth | 0.006 (0.491) | **0.015\*\*** **(0.047)** | 0.008 (0.366) | **0.015\*** **(0.070)** | **0.016\*** **(0.063)** | **0.015\*** **(0.066)** | 0.013 (0.156) | 0.171 (0.856) | 1.040 (0.193) | 0.221 (0.812) | 0.583 (0.505) | 0.629 (0.471) | 0.607 (0.487) | 0.580 (0.526) |
| Inflation | 0.0003 (0.875) | **0.003\*\*** **(0.043)** | 0.001 (0.472) | 0.0006 (0.780) | 0.0004 (0.832) | 0.0005 (0.806) | 0.001 (0.656) | 0.075 (0.750) | **0.425\*\*** **(0.037)** | 0.183 (0.436) | 0.120 (0.603) | 0.113 (0.623) | 0.117 (0.613) | 0.135 (0.589) |
| Public Investment | **0.047\*\*\*** **(0.007)** | **0.047\*\*\*** **(0.000)** | **0.047\*\*\*** **(0.001)** | **0.030\*\*** **(0.047)** | **0.030\*\*** **(0.047)** | **0.030\*\*** **(0.047)** | **0.046\*\*\*** **(0.008)** | **4.212\*\*** **(0.010)** | **3.781\*\*\*** **(0.006)** | **3.681\*\*\*** **(0.007)** | 2.361 (0.135) | 2.383 (0.130) | 2.370 (0.133) | **3.538\*\*** **(0.036)** |
| Foreign Aid | 0.001 (0.849) | -0.0007 (0.903) | 0.003 (0.602) | -0.0003 (0.962) | 0.0002 (0.968) | -0.00004 (0.995) | 0.0005 (0.942) | 0.448 (0.554) | 0.587 (0.349) | 0.885 (0.194) | 0.638 (0.380) | 0.669 (0.355) | 0.652 (0.369) | 0.622 (0.420) |
| Hausman test | **5.73\*** | **18.96\*\*\*\*** | **11.93\*\*\*** | 4.55 | 4.45 | 4.49 | 4.48 | **12.31\*\*\*** | **21.82\*\*\*** | **17.28\*\*\*** | **9.98\*\*\*** | **9.75\*\*\*** | **9.85\*\*\*** | **10.84\*\*\*** |
| R² within | 0.406 | 0.655 | 0.490 | 0.520 | 0.524 | 0.522 | 0.406 | 0.496 | 0.634 | 0.478 | 0.523 | 0.525 | 0.524 | 0.469 |
| Fisher | **4.40\*\*\*** | **12.24\*\*\*** | **6.45\*\*\*** | **6.99\*\*\*** | **7.08\*\*\*** | **7.05\*\*\*** | **4.41\*\*\*** | **6.33\*\*\*** | **11.16\*\*\*** | **6.16\*\*\*** | **7.06\*\*\*** | **7.11\*\*\*** | **7.09\*\*\*** | **5.69\*\*\*** |
| Observations | 55 | 55 | 57 | 55 | 55 | 55 | 55 | 55 | 55 | 57 | 55 | 55 | 55 | 55 |

\*, \*\*, \*\*\*: significance levels of 10%, 5% and 1% respectively. Policy: Regionalisation Policy. Imports: Imports of Goods and Services. Exports: Exports of Goods and Services. Trade: Imports plus Exports of Goods and Services. FDI: Foreign Direct Investment. PCF: Private Capital Flows. Finopex: Financial Openness Index. Globex: Globalisation Index. GDPg: Gross Domestic Product Growth rate. Pub. Ivt: Public Investment. Aid: Foreign Aid or Development Assistance. COMESA: Common Markets for Eastern and Southern Africa. EAC: East African Community.

## 4.2 Robustness checks

We employ an alternative estimation technique to assess the robustness of established findings. This new technique is different from that used to obtain results in Tables 4-5 from three perspectives: (i) an 'after policy' estimate and full sample estimate are directly compared to assess the effect of regionalization;  (ii) regressions are based on some consistency in the degree of integration from unit root tests and (iii) dependent variables are both in ratios. Appendix 6, Appendix 7 and Appendix 8 present the 'unit root tests', 'UEMOA and CEMAC' and 'COMESA and EAC' findings, respectively.

The purpose of the panel unit test is to ensure that variables of the same degree of integration (for the most part) within an economic or a monetary region are used in estimations. It is essentially to control for this factor that the ECCAS region selected in Table 2 has not been further retained because corresponding dependent variables do not have the same order of integration.

The choice of both homogenous (Levin, Lin & Chu, LLC-2002) and heterogeneous (Im, Pesaran & Shin, IPS-2003) panel unit tests is consistent with Hanh (2010). Following Liew (2004), optimal lags selection for LLC and IPS tests are determined by Hannan-Quinn Information Criterion (HQC) and Akaike Information Criterion (AIC) respectively[11]. Results are presented in Appendix 6, with variables without unit roots (stationary) in bold. In accordance with Asongu (2014c), the IPS test is given priority in event of conflict of interest[12].

The following can be established after comparing the results of the findings of Tables 4-5 with those of Appendices 7-8. First, from Appendix 7: (i) results on the LHS for UEMAO on a potential Kuznets shape are confirmed because the 'after policy' estimates have negative magnitudes while corresponding estimates for the 'whole sample' are positive and (ii) concerning findings on the RHS for the CEMAC zone, the previously scanty evidence of a Kuznets shape is now overwhelmingly confirmed. Second, from Appendix

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[11] While the AIC and Final Prediction Error (FPE) more efficiently estimate lags when observations are more or less 60, the HQC best avoids the underestimation of lags when observations are about 120 and above. It is important to disclose that the LLC is based on pooled data.  The Schwarz Information Criterion (SIC) also known as the Bayesian Information Criterion (BIC) presents the shortcoming of underestimating lags in the auto-regression process.
[12] As articulated by Maddala and Wu (1999), the alternative hypothesis of the LLC test (on the absence of a common unit root) is too strong.

8, results for COMESA on a potential U-shape are confirmed because the 'after policy estimates' have: (i) negative magnitudes of lower negative order while corresponding estimates for the 'whole sample' are negative with a higher order of negative magnitude and (ii) positive magnitudes, while corresponding estimates for the 'whole sample' are negative. This conception of positive threshold based on decreasing negative magnitude is consistent with Asongu (2014b). The results for the EAC region are not significant.

**4.3 Further discussion and implications**

This section is discussed in five main strands, namely: the sensitivity of globalization dynamics; insights into the Rajan and Zingales (2003) hypothesis; increasing marginal effects; decreasing marginal impacts and policy tools towards fighting surplus liquidity in African financial institutions.

First, it is apparent from the findings that financial allocation efficiency is more sensitive to financial openness compared to trade openness and most sensitive to globalization. This may somewhat reflect the narrative in the literature on a less negative impact of trade openness on financial development, compared to financial openness. Whereas there is some consensus in the literature on the beneficial effects of trade globalization, the impact of financial globalization on financial development remains an object of heated debate (Asongu, 2014b).

Second, contrary to the Rajan and Zingales (2003) hypothesis which stipulates that the beneficial effects in financial development from globalization are more apparent when trade and capital accounts are liberalized simultaneously, we are consistent with Baltagi et al. (2009) and Hanh (2010) in partially rejecting the underlying hypothesis. Hence, we establish that trade openness and financial openness are independent significant determinants of bank sector efficiency or inefficiency.

Third, the increasing marginal effects from globalization-fuelled regionalization in financial allocation efficiency established from the COMESA region substantiates the stream of literature that has confirmed the importance of openness in financial

development (Kandiero & Chitiga, 2003; Mbabazi et al., 2008; Kim et al., 2010). This includes African-specific studies on the importance of regional integration in stock market (Okeahalam, 2001; Irving, 2005; Yartey & Adjasi, 2007) and financial intermediary market (Wakeman-Linn & Wagh, 2008) development.

Fourth, the increasing marginal effects supports the views of a strand of the literature which argues that regionalization has not increased banking competitive pressures to the benefit of regional banks (Claessens et al., 2001; Peria et al., 2003; Shumkler, 2004). According to this argument, regionalization from a financial view-point has increased asymmetric information which remains an important concern for lenders (banks) who might not always have a good knowledge of what exactly economic operators intent to do with borrowed funds, especially if the project/activity is to be implemented across national borders. This has greatly affected intermediation efficiency because savings are not fully exploited by financial institutions. This discourse also aligns with the stream of literature suggesting that some initial conditions may be essential in order to materialize the financial development benefits from globalization (Henry, 2007; Kose et al., 2011; Asongu, 2014b; Asongu & De Moor, 2015, 2017). As a policy implication, public information sharing offices like public credit registries and private credit bureaus which contribute to reducing information asymmetry may be relevant initial conditions for the rewards in financial allocation efficiency from globalization-fuelled regionalization policies.

It is reasonable to infer from our findings that whereas for UEMOA and CEMAC, globalization-fuelled regionalization has decreased the ability of the financial intermediary sector to provide funds for investment projects, COMESA has experienced the opposite effect while findings for the EAC are inconclusive or insignificant. It follows that regionalization for the most part has not been instrumental in financial intermediary efficiency over the past decades. Hence, our results reveal that 'economic and monetary' regions have more surplus liquidity than purely economic regions. Therefore, the impact of globalization may be more detrimental to 'economic and monetary'

regions (UEMOA and CEMAC) than to purely economic regions (COMESA and EAC)[13]. This inference is consistent with documented issues of surplus liquidity in the FCFA zone (Saxegaard, 2006; Fouda, 2009) and recent findings from Price and Elu (2014) which have shown that African countries within the FCFA zone were more likely to experience credit contraction during the recent financial crisis. Moreover, it is important to note that, central banks of the FCFA zone are obsessed with fighting inflation which has led to low credit access and surplus liquidity in the attendant countries compared to other countries in Africa that have preferred monetary experience to monetary stability pertaining to use of a common currency (Asongu, 2013c).

Fifth, consistent with Asongu (2014a, p. 70), we provide some policy directions on how to fight surplus liquidity in sampled countries. In essence, the holding of excess cash could be either voluntary or involuntary. First, involuntary holding of surplus liquidity can be mitigated by: (i) reducing the lending inability of banks, especially in scenarios of regulated interest rates; (ii) providing an enabling environment that encourages the spread of reserves and bonds in order to enable commercial banks invest surplus cash in bond markets; (iii) establishing mechanisms that reduce information asymmetry and enhance competition in order to limit the unwillingness of financial institutions to lend and, (iv) developing regional stock markets that contribute towards availing more investment opportunities to commercial banks. Second, the voluntary holding of surplus liquidity can be reduced by: (i) easing constraints financial institutions face in tracking their positions within central banks, which may ultimately require them to hold cash above statutory limits; (ii) consolidating institutions that are favorable to interbank lending in order to facilitate interbank borrowing for contingency motives and (iii) improving infrastructure so that bank branches in remote areas are not obliged to hold excess cash because of logistical and infrastructural issues.

## 5. Conclusion and future research directions

The study assesses the role of globalization-fuelled regionalization policies on financial allocation efficiency in four economic and monetary regions in Africa for the period

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[13] Should we increase the significance level for the EAC, the sign-effect of the globalization parameter would satisfy this inference.

1980 to 2008. Banking system and financial system efficiency proxies are used as dependent variables whereas seven bundled and unbundled globalization variables are employed as independent indicators. The bundling exercise is achieved by means of principal component analysis while the empirical evidence is based on interactive Fixed Effects regressions. The following findings are established; financial allocation efficiency is more sensitive to financial openness compared to trade openness and most sensitive to globalization. The relationship between allocation efficiency and globalization-fuelled regionalization policies is: (i) Kuznets or inverted U-shape in the UEMOA and CEMAC zones (evidence of decreasing returns to allocation efficiency from globalization-fuelled regionalization) and (ii) U-shape overwhelmingly in the COMESA and scantily in the EAC (increasing returns to allocation efficiency from globalization-fuelled regionalization). Established shapes are relevant to specific globalization dynamics within regions. 'Economic and monetary' regions are more prone to surplus liquidity than purely economic regions. The findings should be understood as correlations because the research does not claim to establish causality. Policy implications and measures of fighting surplus liquidity have been discussed.

Further research devoted to enriching the extant literature could focus on directly assessing the interactive effect of trade openness and financial openness on financial allocation efficiency in order to investigate the hypothesis of simultaneous trade and financial liberalizations as an essential condition for rewards in financial allocation efficiency. Moreover, using more updated data and appropriate time series estimation techniques to assess whether the established findings withstand empirical scrutiny within country-specific frameworks is also worthwhile for more targeted or country-specific policy implications. Although principal component analysis has been used in this study to construct financial openness and globalization indicators, future research efforts should take note that these composite indicators are also readily available in the databases of the International Monetary Fund and other international development institutions. The study does not measure regionalization policies in the strict sense but uses policy dummies based on the date at which the treaty on the regional body was enforced by the respective countries. Hence, future studies should engage in-depth

policy variables in order to clarify the established findings, notably: the opposite effects found in the UEMOA and CEMAC zones as compared to the COMESA and EAC zones.

## 6. List of Abbreviations

ECCAS: Economic Community of Central African States
UEMOA: West African Economic and Monetary Union
CEMAC: Economic and Monetary Community of Central Africa
COMESA: Common Market for East and Southern Africa
SADC:  Southern African Development Community
SACU: South African Customs Union
ECOWAS: Economic Community of West African States
EAC: East African Community
IGAD: Intergovernmental Authority on Development
UMA: Arab Maghreb Union
EMU: European Monetary Union
SSA:   sub-Saharan Africa
CFA:   French African Colonies
DEA:   Data Envelopment Analysis
OEE:   Overall Economic Efficiency
FDSD: Financial Development and Structure Database
ADI: African Development Indicators
FDI: Foreign Direct Investment
PCF: Private Capital Flows
PCA: Principal Component Analysis
PCs:  Principal Components
Finopex: Financial globalisation indicator
FE: Fixed-effect
OLS: Ordinary Least Squares
GLS: Generalized Least Squares
HAC: Heteroscedasticity and Autocorrelation Consistent
LHS: left hand-side
RHS:  right hand-side
LLC: Levin, Lin & Chu
IPS: Im, Pesaran & Shin
HQC: Hannan-Quinn Information Criterion
AIC: Akaike Information Criterion
FPE: Final Prediction Error
SIC: Schwarz Information Criterion
BIC: Bayesian Information Criterion

## 7. Declaration

**Availability of supporting data**: the data for this paper is available upon request.

**Funding**: this is an unfunded paper.

## Appendices

### Appendix 1: Segments of the financial system by degree of formality in Paper's context

| Paper's context | | | Tiers | Definitions | Institutions | Principal Clients |
|---|---|---|---|---|---|---|
| Formal financial system | IMF Definition of Financial System from International Financial Statistics (IFS) | Formal Financial sector (Deposit Banks) | Formal banks | Licensed by central bank | Commercial and development banks | Large businesses, Government |
| Semi-formal and informal financial systems | | Semi-formal financial sector (Other Financial Institutions) | Specialized non-bank financial institutions | | Rural banks, Post banks, Saving and Loan Companies, Deposit taking Micro Finance banks | Large rural enterprises, Salaried Workers, Small and medium enterprises |
| | | | Other non-bank financial institutions | Legally registered but not licensed as financial institution by central bank and government | Credit Unions, Micro Finance NGOs | Microenterprises, Entrepreneurial poor |
| | Missing component in IFS definition | Informal financial sector | Informal banks | Not legally registered at national level (though may be linked to a registered association) | Savings collectors, Savings and credit associations, Money lenders | Self-employed poor |

**Source**: Asongu and Acha-Anyi (2017)

### Appendix 2: Definitions and Sources of Variables

| Variable(s) | Definitions of Variables (Measurements) | Source(s) |
|---|---|---|
| Banking efficiency | Bank system credit on Banking system deposits | FDSD (World Bank) |
| Financial efficiency | Financial system credit on Financial system deposits (%) | |
| Imports | Imports of goods and services (% of GDP) | |
| Exports | Exports of goods and services (% of GDP) | |
| Trade Globalisation | Imports plus Exports of goods and services (% of GDP) | |
| Foreign investment | Gross Foreign Direct Investment (% of GDP) | |
| Private Capital Flows | Gross Private Capital Flows (% of GDP) | ADI (World Bank) |
| Financial Globalisation | First PC of Foreign Investment and Private Capital Flows | |
| Globalisation | First PC of Financial Globalisation and Trade Globalisation | |
| Economic growth | Gross Domestic Product (GDP) Growth (annual %) | |
| Inflation | Annual Consumer Price Index | |
| Public Investment | Gross Public Investment (% of GDP) | |
| Foreign Aid | Total Development Assistances (% of GDP) | |

PC: Principal Component. FDSD: Financial Development and Structure Database. ADI: African Development Indicators

## Appendix 3: Openness and financial data

| Variables | Panel A: Globalization (Openness) | | | | | |
|---|---|---|---|---|---|---|
| | Financial Openness(F.O) | | | Trade Openness(T.O) | | |
| | GPCFgdp | GFDIgdp | Finopex | Igdp | Xgdp | Tropex |
| Definitions | Gross Private Capital Flows on GDP | Gross Foreign Direct Investment on GDP | Financial Openness Index | Imports on GDP | Exports on GDP | Imports plus Exports on GDP |
| Sources | ADI | ADI | PCA | ADI | ADI | ADI |
| Usages in the Openness literature | Lane and Milesi-Ferreti (2006), Baltagi et al. (2009), Hanh(2010) | | Gries et al.(2009) | Standard Proxies | | Hanh(2010), Gries et al.(2009) |

| Variables | Panel B: Principal Financial Development Indicators | | | | |
|---|---|---|---|---|---|
| | **D**epth | **E**fficiency | **S**ize | **A**ctivity | **DESA-1** |
| | llgdp | bcbd | dbacba | prdcgdp | Findex1 |
| Definitions | Liquid liability on GDP | Bank Credit on Bank Deposits | Deposit bank assets on Total financial assets | Private credit by domestic banks on GDP | Financial development Index1 |
| Sources | FDSD | FDSD | FDSD | FDSD | PCA |
| Usages in the Financial development literature | Hanh (2010), Gries et al.(2009) | Demirgüç-Kunt et al. (1999), Demirgüç-Kunt & Beck (2009) | | Baltagi et al. (2009), Hanh(2010) | Gries et al.(2009) |

| Variables | Panel C: Robustness tests financial development Indicators | | | | |
|---|---|---|---|---|---|
| | **D**epth | **E**fficiency | **S**ize | **A**ctivity | **DESA-2** |
| | fdgdp | prdcfsd | **?** | prdcofgdp | Findex 2 |
| Definitions | Financial system deposits on GDP | Private domestic credit on financial system deposit | | Private credit from domestic banks and other financial institutions | Financial development index |
| Sources | FDSD | FDSD | **?** | FDSD | PCA |
| Usages in the literature/ justification | Authors correlation analysis | Authors correlation analysis | **?** | Authors correlation analysis | Gries et al. (2009) |

ADI: African Development Indicators. PCA: Principal Component Analysis. FDSD: Financial Development and Structure Database.

## Appendix 4: Summary Statistics

| | UEMOA | | | | | CEMAC | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | S.D | Min. | Max | Obs. | Mean | S.D | Min. | Max | Obs. |
| Banking System Efficiency | 1.248 | 0.604 | 0.338 | 3.698 | 145 | 0.806 | 0.298 | 0.188 | 1.601 | 57 |
| Financial System Efficiency | **117.52** | **48.413** | **41.300** | **234.39** | **125** | **79.493** | **27.865** | **22.20** | **160.70** | **53** |
| Imports | 33.055 | 6.929 | 17.836 | 51.780 | 138 | 35.685 | 15.507 | 14.639 | 74.219 | 56 |
| Exports | 24.823 | 9.984 | 13.319 | 52.650 | 138 | 49.452 | 22.803 | 16.179 | 86.884 | 56 |
| Trade Globalisation | 59.015 | 13.678 | 32.781 | 95.007 | 142 | 86.026 | 36.722 | 31.745 | 156.861 | 57 |
| Foreign Investment | 1.018 | 1.421 | -2.496 | 7.246 | 136 | 2.609 | 7.225 | -8.629 | 34.507 | 47 |
| Private Capital Flows | 0.975 | 1.545 | -2.517 | 8.849 | 135 | 2.665 | 7.065 | -8.918 | 34.488 | 47 |
| Financial Globalisation | -0.001 | 1.380 | -2.929 | 6.701 | 135 | 0.000 | 1.412 | -2.259 | 6.306 | 47 |
| Globalisation | 0.062 | 1.009 | -1.973 | 4.032 | 135 | -0.014 | 1.175 | -1.285 | 3.762 | 47 |
| Economic Growth | 2.583 | 4.264 | -16.825 | 12.100 | 145 | 2.203 | 3.549 | -8.932 | 7.700 | 57 |
| Inflation | 4.571 | 7.486 | -7.796 | 38.530 | 130 | 4.121 | 9.144 | -11.686 | 42.439 | 55 |
| Public Investment | 6.758 | 3.093 | 1.853 | 20.358 | 123 | 4.733 | 2.902 | 0.759 | 13.716 | 57 |
| Foreign Aid | 11.361 | 5.645 | 0.557 | 28.823 | 145 | 4.449 | 4.591 | -0.174 | 23.418 | 57 |

| | COMESA | | | | | EAC | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | S.D | Min. | Max | Obs. | Mean | S.D | Min. | Max | Obs. |
| Banking System Efficiency | 0.711 | 0.283 | 0.275 | 1.876 | 287 | 0.588 | 0.185 | 0.206 | 1.075 | 57 |
| Financial System Efficiency | 76.392 | 33.572 | 30.532 | 200.079 | 276 | 62.121 | 18.783 | 22.767 | 111.830 | 57 |
| Imports | 37.540 | 21.921 | 7.066 | 114.046 | 288 | 29.340 | 6.486 | 19.098 | 47.707 | 55 |
| Exports | 27.569 | 21.778 | 3.335 | 104.213 | 288 | 18.508 | 7.441 | 7.062 | 38.903 | 55 |
| Trade Globalisation | 64.424 | 42.170 | 11.087 | 202.849 | 290 | 48.225 | 13.260 | 26.609 | 72.858 | 57 |
| Foreign Investment | 1.429 | 2.222 | -4.302 | 9.708 | 260 | 2.016 | 1.827 | 0.000 | 6.470 | 55 |
| Private Capital Flows | 1.415 | 2.271 | -4.322 | 9.611 | 264 | 1.971 | 1.893 | -0.253 | 6.688 | 55 |
| Financial Globalisation | 0.006 | 1.410 | -3.610 | 5.186 | 260 | 0.000 | 1.413 | -1.539 | 3.484 | 55 |
| Globalisation | 0.012 | 1.134 | -1.498 | 4.366 | 260 | -0.024 | 1.113 | -1.903 | 2.876 | 55 |
| Economic Growth | 3.790 | 5.780 | -50.248 | 35.224 | 286 | 4.974 | 2.732 | -0.799 | 11.523 | 57 |
| Inflation | 21.859 | 32.028 | -2.405 | 200.026 | 280 | 13.023 | 10.753 | -0.287 | 45.978 | 57 |
| Public Investment | 6.999 | 3.410 | 0.000 | 17.451 | 268 | 5.559 | 1.851 | 2.492 | 10.452 | 57 |
| Foreign Aid | 12.015 | 10.534 | -0.251 | 94.442 | 290 | 12.294 | 6.280 | 2.407 | 28.992 | 57 |

UEMOA: West African Economic and Monetary Union. CEMAC: Central African Economic and Monetary Community. COMESA: Common Markets for Eastern and Southern Africa. EAC: East African Community. S.D: Standard Deviation. Min: Minimum. Max: Maximum. Obs: Observations.

# Appendix 5: Correlation matrices

**Panel A: UEMOA**

| | Imports | Exports | Trade | FDI | PCF | Finopex | Globex | GDPg | Pub. Ivt | Inflation | Aid | BcBd | FcFd |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Imports | 1.000 | | | | | | | | | | | | |
| Exports | 0.520 | 1.000 | | | | | | | | | | | |
| Trade | 0.810 | 0.862 | 1.000 | | | | | | | | | | |
| FDI | 0.313 | 0.290 | 0.375 | 1.000 | | | | | | | | | |
| PCF | 0.286 | 0.273 | 0.329 | 0.867 | 1.000 | | | | | | | | |
| Finopex | 0.310 | 0.292 | 0.364 | 0.965 | 0.967 | 1.000 | | | | | | | |
| Globex | 0.661 | 0.699 | 0.773 | 0.831 | 0.819 | 0.854 | 1.000 | | | | | | |
| GDPg | 0.099 | -0.156 | -0.010 | 0.203 | 0.167 | 0.191 | 0.092 | 1.000 | | | | | |
| Pub. Ivt | 0.105 | -0.290 | -0.168 | 0.081 | 0.047 | 0.066 | -0.034 | 0.002 | 1.000 | | | | |
| Inflation | 0.225 | 0.130 | 0.252 | -0.030 | -0.045 | -0.039 | 0.089 | -0.059 | 0.129 | 1.000 | | | |
| Aid | -0.211 | -0.627 | -0.566 | -0.156 | -0.149 | -0.158 | -0.391 | 0.265 | 0.236 | 0.124 | 1.000 | | |
| BcBd | 0.245 | 0.325 | 0.235 | -0.208 | -0.149 | -0.184 | 0.061 | -0.361 | 0.061 | 0.052 | -0.356 | 1.000 | |
| FcFd | 0.243 | 0.344 | 0.241 | -0.233 | -0.182 | -0.215 | 0.047 | -0.400 | 0.048 | 0.094 | -0.334 | 0.985 | 1.000 |

**Panel B: CEMAC**

| | Imports | Exports | Trade | FDI | PCF | Finopex | Globex | GDPg | Pub. Ivt | Inflation | Aid | BcBd | FcFd |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Imports | 1.000 | | | | | | | | | | | | |
| Exports | 0.878 | 1.000 | | | | | | | | | | | |
| Trade | 0.935 | 0.967 | 1.000 | | | | | | | | | | |
| FDI | 0.383 | 0.355 | 0.457 | 1.000 | | | | | | | | | |
| PCF | 0.395 | 0.369 | 0.473 | 0.994 | 1.000 | | | | | | | | |
| Finopex | 0.390 | 0.363 | 0.466 | 0.998 | 0.998 | 1.000 | | | | | | | |
| Globex | 0.799 | 0.801 | 0.865 | 0.834 | 0.842 | 0.839 | 1.000 | | | | | | |
| GDPg | 0.177 | 0.179 | 0.206 | -0.015 | 0.004 | -0.005 | 0.104 | 1.000 | | | | | |
| Pub. Ivt | 0.703 | 0.651 | 0.689 | 0.328 | 0.368 | 0.348 | 0.620 | 0.163 | 1.000 | | | | |
| Inflation | 0.022 | 0.005 | 0.0007 | -0.028 | -0.033 | -0.030 | -0.011 | 0.073 | -0.014 | 1.000 | | | |
| Aid | 0.060 | -0.088 | -0.008 | 0.093 | 0.078 | 0.085 | 0.032 | 0.219 | 0.0008 | 0.235 | 1.000 | | |
| BcBd | -0.076 | -0.278 | -0.279 | -0.241 | -0.249 | -0.245 | -0.274 | -0.457 | -0.080 | -0.135 | -0.024 | 1.000 | |
| FcFd | -0.164 | -0.317 | -0.347 | -0.285 | -0.299 | -0.292 | -0.337 | -0.493 | -0.1264 | -0.114 | -0.014 | 0.925 | 1.000 |

**Panel C: COMESA**

| | Imports | Exports | Trade | FDI | PCF | Finopex | Globex | GDPg | Pub. Ivt | Inflation | Aid | BcBd | FcFd |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Imports | 1.000 | | | | | | | | | | | | |
| Exports | 0.944 | 1.000 | | | | | | | | | | | |
| Trade | 0.979 | 0.985 | 1.000 | | | | | | | | | | |
| FDI | 0.221 | 0.241 | 0.235 | 1.000 | | | | | | | | | |
| PCF | 0.214 | 0.234 | 0.229 | 0.980 | 1.000 | | | | | | | | |
| Finopex | 0.218 | 0.238 | 0.233 | 0.995 | 0.995 | 1.000 | | | | | | | |
| Globex | 0.772 | 0.784 | 0.787 | 0.778 | 0.774 | 0.780 | 1.000 | | | | | | |
| GDPg | 0.114 | 0.116 | 0.130 | 0.244 | 0.245 | 0.246 | 0.230 | 1.000 | | | | | |
| Pub. Ivt | 0.165 | 0.082 | 0.133 | -0.043 | -0.033 | -0.038 | 0.056 | -0.083 | 1.000 | | | | |
| Inflation | -0.225 | 0.199 | -0.212 | -0.107 | -0.103 | -0.106 | -0.205 | -0.070 | -0.230 | 1.000 | | | |
| Aid | -0.317 | -0.464 | -0.408 | -0.106 | -0.091 | -0.099 | -0.317 | -0.157 | 0.372 | -0.001 | 1.000 | | |
| BcBd | 0.056 | 0.036 | 0.043 | -0.256 | -0.264 | -0.261 | -0.135 | -0.205 | -0.205 | 0.087 | -0.058 | 1.000 | |

| | Imports | Exports | Trade | FDI | PCF | Finopex | Globex | GDPg | Pub. Ivt | Inflation | Aid | BcBd | FcFd |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FcFd | -0.032 | -0.079 | -0.062 | -0.282 | -0.288 | -0.286 | -0.217 | -0.238 | 0.191 | -0.305 | 0.087 | 0.899 | 1.000 |

**Panel D: EAC**

| | Imports | Exports | Trade | FDI | PCF | Finopex | Globex | GDPg | Pub. Ivt | Inflation | Aid | BcBd | FcFd |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Imports | 1.000 | | | | | | | | | | | | |
| Exports | 0.567 | 1.000 | | | | | | | | | | | |
| Trade | 0.857 | 0.879 | 1.000 | | | | | | | | | | |
| FDI | -0.311 | -0.258 | -0.328 | 1.000 | | | | | | | | | |
| PCF | -0.319 | -0.283 | -0.349 | 0.996 | 1.000 | | | | | | | | |
| Finopex | -0.316 | -0.271 | -0.339 | 0.999 | 0.999 | 1.000 | | | | | | | |
| Globex | -0.689 | -0.679 | -0.768 | 0.848 | 0.859 | 0.854 | 1.000 | | | | | | |
| GDPg | -0.397 | -0.424 | -0.421 | 0.549 | 0.558 | 0.554 | 0.628 | 1.000 | | | | | |
| Pub. Ivt | 0.204 | 0.033 | 0.149 | -0.397 | -0.378 | -0.388 | -0.331 | -0.278 | 1.000 | | | | |
| Inflation | 0.409 | 0.191 | 0.335 | -0.413 | -0.406 | -0.410 | -0.457 | -0.425 | 0.499 | 1.000 | | | |
| Aid | 0.040 | -0.502 | -0.274 | 0.074 | 0.111 | 0.093 | 0.218 | 0.091 | 0.544 | 0.493 | 1.000 | | |
| BcBd | 0.358 | 0.295 | 0.403 | -0.712 | -0.719 | -0.716 | -0.683 | -0.344 | 0.483 | 0.318 | -0.135 | 1.000 | |
| FcFd | 0.393 | 0.267 | 0.420 | -0.617 | -0.624 | -0.621 | -0.620 | -0.317 | 0.521 | 0.346 | -0.057 | 0.942 | 1.000 |

Imports: Imports of Goods and Services. Exports: Exports of Goods and Services. Trade: Imports plus Exports of Goods and Services. FDI: Foreign Direct Investment. PCF: Private Capital Flows. Finopex: Financial Openness Index. Globex: Globalisation Index. GDPg: Gross Domestic Product Growth rate. Pub. Ivt: Public Investment. Aid: Foreign Aid or Development Assistance. BcBd: Banking system credit on banking system deposits for Banking System Efficiency. FcFd: Financial system credit on financial system deposits for Financial System Efficiency. UEMOA: West African Economic and Monetary Union. CEMAC: Central African Economic and Monetary Community. COMESA: Common Markets for Eastern and Southern Africa. EAC: East African Community.

**Appendix 6: Homogenous and heterogeneous panel unit root tests**

| Zones | Vbles | Homogenous(LLC) tests Level c | ct | First diff. c | ct | Heterogeneous(IPS) tests Level c | ct | First diff. c | ct | | Homogenous(LLC) tests Level c | ct | First diff. c | ct | Heterogeneous(IPS) tests Level c | ct | First diff. c | ct |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FDIgdp | **-2.90***** | **-3.01***** | n.a | n.a | **-3.89***** | **-4.68***** | n.a | n.a | | -1.78** | -2.97*** | n.a | n.a | -1.18 | -1.16 | **-6.24***** | **-5.05***** |
| | PCFgdp | **-2.86***** | **-2.79***** | n.a | n.a | **-4.87***** | **-4.92***** | n.a | n.a | | -1.83** | -2.92*** | n.a | n.a | -0.73 | -0.67 | **-5.09***** | **-3.29***** |
| | Finopex | **-1.90**** | **-2.46***** | n.a | n.a | **-3.40***** | **-4.26***** | n.a | n.a | C | -1.72** | -3.10*** | n.a | n.a | -0.91 | -0.88 | **-5.62***** | **-4.40***** |
| U | lgdp | **-1.55*** | **-2.34***** | n.a | n.a | **-2.24**** | **-1.60*** | n.a | n.a | E | -1.36* | -1.87** | n.a | n.a | -0.60 | -0.83 | **-3.94***** | **-4.35***** |
| E | Xgdp | **-2.42***** | **-3.03***** | n.a | n.a | **-1.57*** | **-1.42*** | n.a | n.a | M | -0.32 | 0.86 | **-4.06***** | **-3.71***** | 0.09 | 0.17 | **-4.38***** | **-3.26***** |
| M | Tropex | 2.05 | 1.53 | **-9.47***** | **-6.67***** | 0.96 | 1.74 | **-7.03***** | **-5.67***** | A | 3.18 | 4.31 | **-1.43*** | -1.19 | 1.17 | 2.31 | **-2.31**** | **-1.42*** |
| O | Globex | -1.100 | -0.720 | -9.72*** | -8.91*** | **-1.90**** | **-1.40*** | n.a | n.a | C | -1.98** | -3.32*** | n.a | n.a | -0.78 | -1.35* | **-5.99***** | **-4.66***** |
| A | GDPg | **-8.52***** | **-6.84***** | n.a | n.a | **-7.20***** | **-6.18***** | n.a | n.a | | **-3.52***** | **-1.82**** | n.a | n.a | **-3.66***** | **-2.16**** | n.a | n.a |
| | GDPpcg | **-6.70***** | **-6.89***** | n.a | n.a | **-6.94***** | **-6.12***** | n.a | n.a | | **-3.45***** | **-1.77**** | n.a | n.a | **-3.61***** | **-2.05**** | n.a | n.a |
| | bcbd | **-5.76***** | **-6.22***** | n.a | n.a | **-6.49***** | **-4.67***** | n.a | n.a | | **-1.37*** | 3.37 | n.a | n.a | **-1.46*** | -0.82 | n.a | n.a |
| | prdcfsd | **-2.02**** | 0.18 | n.a | n.a | -0.55 | 0.63 | n.a | n.a | | **-3.25***** | **-5.63***** | n.a | n.a | **-2.37***** | **-4.79***** | n.a | n.a |
| | FDIgdp | -1.04 | **-2.90**** | 21.58 | -4.38*** | **-2.97***** | **-4.10***** | n.a | n.a | | -1.58* | -1.58* | n.a | n.a | -1.40* | -0.77 | **-4.43***** | **-3.12***** |
| | PCFgdp | **-1.87**** | **-3.54***** | n.a | n.a | **-3.15***** | **-4.60***** | n.a | n.a | | -1.54* | -2.16** | n.a | n.a | -1.11 | -0.93 | **-5.14***** | **-3.85***** |
| C | Finopex | **-1.41*** | **-3.18***** | n.a | n.a | **-3.04***** | **-3.97***** | n.a | n.a | | **-1.63*** | **-2.53***** | n.a | n.a | **-4.46***** | **-3.08***** | n.a | n.a |
| O | lgdp | -1.09 | **-3.04***** | -12.0*** | -9.78*** | **-1.32*** | **-2.92***** | n.a | n.a | | 2.05 | 0.06 | **-4.17***** | **-2.90***** | 2.13 | 0.19 | **-4.45***** | **-3.61***** |
| M | Xgdp | **-2.03**** | **-3.52***** | n.a | n.a | **-3.14***** | **-3.45***** | n.a | n.a | E | -0.12 | -0.55 | **-5.13***** | **-5.17***** | -0.66 | -1.55* | **-5.38***** | **-4.95***** |
| E | Tropex | -0.79 | **-5.29***** | -9.16*** | -4.91*** | **-2.59***** | **-4.96***** | n.a | n.a | A | 2.45 | -0.30 | **-4.32***** | **-2.64***** | 2.06 | -0.95 | **-5.06***** | **-4.37***** |
| S | Globex | 2.21 | 8.66 | 27.08 | -6.45*** | **-1.89**** | **-4.33***** | n.a | n.a | C | -1.02 | -1.58* | **-3.05***** | **-2.39***** | -0.59 | -1.45* | **-3.48***** | **-2.09**** |
| A | GDPg | **-9.62***** | **-8.63***** | n.a | n.a | **-9.17***** | **-9.30***** | n.a | n.a | | **-1.61*** | **-1.71**** | n.a | n.a | **-1.45*** | **-2.57***** | n.a | n.a |
| | GDPpcg | **-8.61***** | **-6.25***** | n.a | n.a | **-8.98***** | **-9.40***** | n.a | n.a | | **-1.49*** | **-4.49***** | n.a | n.a | -1.25 | **-3.95***** | -7.09*** | -5.48*** |
| | bcbd | **-8.48***** | **-6.05***** | n.a | n.a | **-8.98***** | **-9.36***** | n.a | n.a | | **-2.58***** | -0.10 | n.a | n.a | **-2.18**** | 1.85 | n.a | n.a |
| | prdcfsd | **-2.88***** | 4.76 | n.a | n.a | **-2.61***** | -0.90 | n.a | n.a | | **-3.17***** | **-1.75**** | n.a | n.a | **-2.51***** | 0.15 | n.a | n.a |

*, **, *** denote significance at 10%, 5% and 1% respectively. Optimal lag selection is governed by AIC and H&Q for IPS and LLC tests respectively. Maximum lags applied are based on time series length: with 3 for 'UEMOA and COMESA' and 2 for 'CEMAC, ECCAS and EAC'. 7 lags are applied on ' prdcfsd' for COMESA . 'c' and 'ct': 'constant' and 'constant and trend' ;respectively. n.a: not applicable. Stationary series are in bold and decision rule depends on both tests but priority is given the IPS in case of conflict of interest. LLC; Levin, Lin and Chu (2002). IPS: Im, Pesaran and Shin (2003). First diff: First difference. Vbles: variables.

| Regions / Estimated Parameters | UEMOA Main Models (Banking System Efficiency) | | | | UEMOA Robustness tests (Financial System Efficiency) | | | | CEMAC Main Models (Banking System Efficiency) | | | | CEMAC Robustness tests (Financial System Efficiency) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model1* | Model2* | Model3* | Model4* | Model 1 | Model 2 | Model 3 | Model 4 | Model1* | Model2* | Model3* | Model4* |
| Constant | 0.945*** (3.947) | 1.106*** (4.508) | 1.52*** (25.01) | 1.23*** (22.73) | 0.632*** (4.328) | 0.544*** (4.100) | 1.51*** (30.40) | 1.36*** (29.41) | 0.90*** (16.09) | 0.90*** (17.08) | 0.93*** (17.84) | 0.78*** (20.37) | 1.01*** (14.57) | 1.02*** (14.21) | 1.03*** (14.98) | 0.86*** (17.90) |
| FDIgdp | --- | -0.025 (-0.559) | --- | --- | --- | 0.009 (0.298) | --- | --- | --- | 0.011 (1.324) | --- | --- | --- | 0.006 (0.801) | --- | --- |
| a FDIgdp | --- | 0.025 (0.385) | --- | --- | --- | 0.023 (0.580) | --- | --- | --- | -0.023** (-2.528) | --- | --- | --- | -0.015* (-1.759) | --- | --- |
| PCFgdp | -0.029 (-0.698) | --- | --- | --- | -0.008 (-0.242) | --- | --- | --- | 0.017* (1.990) | --- | --- | --- | 0.011 (1.420) | --- | --- | --- |
| aPCFgdp | 0.059 (1.036) | --- | --- | --- | 0.042 (1.046) | --- | --- | --- | -0,02*** (-2.732) | --- | --- | --- | -0.022** (-2.489) | --- | --- | --- |
| Finop | --- | --- | -0.041 (-0.895) | --- | --- | --- | 0.009 (0.216) | --- | --- | --- | 0.079* (1.945) | --- | --- | --- | 0.035 (0.894) | --- |
| aFinop | --- | --- | 0.093 (1.483) | --- | --- | --- | 0.049 (0.939) | --- | --- | --- | -0.15*** (-3.338) | --- | --- | --- | -0.113** (-2.412) | --- |
| Igdp | 0.020*** (2.83) | --- | --- | --- | 0.029*** (6.350) | --- | --- | --- | -0.006 (-0.888) | --- | --- | --- | -0.012* (-1.823) | --- | --- | --- |
| aIgdp | -0.02*** (-8.41) | --- | --- | --- | -0.02*** (-11.85) | --- | --- | --- | -0.004* -1.748 | --- | --- | --- | -0.006** (-2.380) | --- | --- | --- |
| Xgdp | --- | 0.021* (1.943) | --- | --- | --- | 0.040** (7.380) | --- | --- | --- | -0.009 (-1.263) | --- | --- | --- | 0.001 (0.187) | --- | --- |
| aXgdp | --- | -0.02*** (-6.557) | --- | --- | --- | -0.03*** (-13.69) | --- | --- | --- | -0.001* (-1.802) | --- | --- | --- | -0.004** (-2.456) | --- | --- |
| Tropex | --- | --- | 0.003 (0.764) | --- | --- | --- | 0.006* (1.855) | --- | --- | --- | -0.014** (-2.359) | --- | --- | --- | -0.01* (-1.699) | --- |
| aTropex | --- | --- | -0.01*** (-8.040) | --- | --- | --- | -0.01*** (-9.37) | --- | --- | --- | -0.002*** (-3.542) | --- | --- | --- | -0.003*** (-3.125) | --- |
| Globex | --- | --- | --- | -0.147 (-1.504) | --- | --- | --- | 0.18** (2.244) | --- | --- | --- | 0.089 (1.093) | --- | --- | --- | -0.000 (-0.008) |
| aGlobex | --- | --- | --- | 0.027 (-0.032) | --- | --- | --- | -0.27*** (-3.034) | --- | --- | --- | -0.164** (-2.438) | --- | --- | --- | -0.096 (-1.230) |
| GDPg | --- | --- | --- | --- | -0.02*** (-3.081) | -0.016** (-2.528) | -0.017** (-1.983) | -0.013 (-1.202) | --- | --- | --- | --- | -0.037** (-2.532) | -0.042** (-2.716) | -0.040*** (-2,749) | -0.022 (-1.567) |
| aGDPg | --- | --- | --- | --- | 0.032** (2.599) | 0.018* (1.664) | 0.020 (1.503) | -0.05*** (-3.24) | --- | --- | --- | --- | 0.013 (0.678) | 0.015 (0.762) | 0.014 (0.719) | --- |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDPpcg | -0.03*** | -0.027** | -0.021* | -0.05*** | --- | --- | --- | --- | -0.019 | -0.021 | -0.021 | -0.028* | --- | --- | --- | --- |
| | (-2.75) | (-2.36) | (-1.893) | (-3.97) | | | | | (-1.261) | (-1.439) | (-1.471) | (-1.714) | | | | |
| aGDPpcg | 0.034 | 0.014 | 0.021 | 0.027 | --- | --- | --- | --- | -0.016 | -0.016 | -0.015 | -0.009 | --- | --- | --- | --- |
| | (1.49) | (0,592) | (0.980) | (0.960) | | | | | (-0.738) | (-0.783) | (-0.763) | (-0.414) | | | | |
| R² ajust. | 0.51 | 0.45 | 0.47 | 0.19 | 0.77 | 0.80 | 0.69 | 0.45 | 0.26 | 0.29 | 0.37 | 0.15 | 0.33 | 0.28 | 0.34 | 0.14 |
| F-Stats | 14.87*** | 12.08*** | 12.72*** | 5.11*** | 39.63*** | 48.01**** | 27.13*** | 13.29*** | 2.96** | 3.25*** | 4.21*** | 2.32* | 3.55*** | 3.01** | 3.68*** | 2.17* |

\*, \*\*, \*\*\* denote respectively, 10%, 5% and 1% significance levels. Estimated parameters with '**a**' represent after policy implications to banking and financial system efficiencies.
UEMOA: West African Economic and Monetary Union.  CEMAC: Central African Economic and Monetary Community.

**Appendix 8: Regression results for COMESA and EAC (Economic regions)**

| Regions | COMESA | | | | | | | | EAC | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Estimated Parameters | Main Models(Banking System Efficiency) | | | | Robustness tests (Financial System Efficiency) | | | | Main Models(Banking System Efficiency) | | | | Robustness tests(Financial System Efficiency) | | | |
| | Model 1 | Model 2 | Model 3 | Model 4 | Model1* | Model2* | Model3* | Model4* | Model 1 | Model 2 | Model 3 | Model 4 | Model1* | Model2* | Model3* | Model4* |
| Constant | 0.89*** | 0.85*** | 0.84*** | 0.70*** | 1.02*** | 0.94*** | 0.93*** | 0.76*** | 0.59*** | 0.59*** | 0.55*** | 0.58*** | 0.68*** | 0.68*** | 0.61*** | 0.67*** |
| | (12.45) | (12.95) | (10.80) | (49.61) | (15.30) | (15.02) | (12.68) | (41.88) | (24.68) | (24.29) | (24.88) | (25.50) | (14.13) | (13.78) | (14.31) | (14.54) |
| FDIgdp | --- | -0.015 | --- | --- | --- | -0.015 | --- | --- | --- | -0.007 | --- | --- | --- | -0.003 | --- | --- |
| | | (-1.049) | | | | (-1.094) | | | | (-0.430) | | | | (-0.20) | | |
| a FDIgdp | --- | 0.013 | --- | --- | --- | 0.021 | --- | --- | --- | -0.023 | --- | --- | --- | -0.006 | --- | --- |
| | | (0.865) | | | | (1.378) | | | | (-0.912) | | | | (-0.193) | | |
| PCFgdp | -0.026** | --- | --- | --- | -0.027** | --- | --- | --- | -0.004 | --- | --- | --- | -0.000 | --- | --- | --- |
| | (-2.00) | | | | (-2.232) | | | | (-0.245) | | | | (-0.008) | | | |
| aPCFgdp | 0.028* | --- | --- | --- | 0.035** | --- | --- | --- | -0.018 | --- | --- | --- | -0.009 | --- | --- | --- |
| | (1.909) | | | | (2.57) | | | | (-0.756) | | | | (-0.318) | | | |
| Finop | --- | --- | -0.05*** | --- | --- | --- | -0.05*** | --- | --- | --- | -0.08*** | --- | --- | --- | -0.08*** | --- |
| | | | (-2.684) | | | | (-3.101) | | | | (-4,189) | | | | (-4.438) | |
| aFinop | --- | --- | 0.064*** | --- | --- | --- | 0.08*** | --- | --- | --- | 0.047 | --- | --- | -- | 0.056 | --- |
| | | | (2.868) | | | | (3.925) | | | | (1.325) | | | | (1.510) | |
| Igdp | -0.003* | --- | --- | --- | -0.005*** | --- | --- | --- | 0.006 | --- | --- | --- | 0.006 | --- | --- | --- |
| | (-1.759) | | | | (-2.716) | | | | (1.152) | | | | (1.251) | | | |
| aIgdp | -0.001** | --- | --- | --- | -0.002*** | --- | --- | --- | -0.000 | --- | --- | --- | -0.001 | --- | --- | --- |
| | (-2.586) | | | | (-2.837) | | | | (-0.255) | | | | (-0.412) | | | |
| Xgdp | --- | -0.004* | --- | --- | --- | -0.005** | --- | --- | --- | 0.001 | --- | --- | --- | 0.005 | --- | --- |
| | | (-1.703) | | | | (-2.048) | | | | (0.248) | | | | (0.796) | | |
| aXgdp | --- | -0.001 | --- | --- | --- | -0.000 | --- | --- | --- | 0.000 | --- | --- | --- | -0.000 | --- | --- |

|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  | (-1.012) |  |  |  | (-0.544) |  |  |  | (0.094) |  |  |  | (-0.176) |  |
| *Tropex* | --- | --- | -0.001 | --- | --- | --- | **-0.002**\*\* | --- | --- | --- | -0.000 | --- | --- | --- | 0.000 | --- |
|  |  |  | (-1.619) |  |  |  | **(-2.056)** |  |  |  | (-0.279) |  |  |  | (0.203) |  |
| **α***Tropex* | --- | --- | -0.000 | --- | --- | --- | -0.000 | --- | --- | --- | -0.000 | --- | --- | --- | -0.000 | --- |
|  |  |  | (-1.565) |  |  |  | (-1.164) |  |  |  | (-0.226) |  |  |  | (-0.384) |  |
| *Globex* | --- | --- | --- | **-0.08**\*\*\* | --- | --- | --- | **-0.08**\*\*\* | --- | --- | --- | 0.003 | --- | --- | --- | -0.002 |
|  |  |  |  | **(-3.319)** |  |  |  | **(-3.608)** |  |  |  | (0.108) |  |  |  | (-0.064) |
| **α***Globex* | --- | --- | ---- | **0.06**\*\*\* | --- | --- | --- | **0.10**\*\*\* | --- | --- | --- | 1.544 | --- | --- | --- | 0.011 |
|  |  |  |  | **(2.773)** |  |  |  | **(4.239)** |  |  |  | (0.000) |  |  |  | (0.357) |
| *GDPg* | --- | --- | --- | --- | -0.006 | -0.003 | -0.004 | 8,10 | --- | --- | --- | --- | **-0.018**\* | -0.017 | -0.007 | -0.017 |
|  |  |  |  |  | (-1.642) | (-0.874) | (-1.082) | (0.021) |  |  |  |  | **(-1.751)** | (-1.613) | (-0.769) | (-1.679) |
| **α***GDPg* | --- | --- | --- | --- | 0.002 | -0.006 | -0.001 | **-0.008**\* | --- | --- | --- | --- | 0.005 | 0.000 | 0.005 | -0.003 |
|  |  |  |  |  | (0.416) | (-1.186) | (-0.304) | **(-1.809)** |  |  |  |  | (0.207) | (0.021) | (0.271) | (-0.508) |
| *GDPpcg* | **-0.01**\*\*\* | **-0.01**\*\*\* | **-0.01**\*\*\* | **-0.008**\* | --- | --- | --- | --- | -0.014 | -0.016 | -0.001 | -0.013 | --- | --- | --- | --- |
|  | **(-2.805)** | **(-2.735)** | **(-2.601)** | **(-1.917)** |  |  |  |  | (-1.386) | (-1.526) | (-0.113) | (-1.278) |  |  |  |  |
| **α***GDPpcg* | **0.01**\*\*\* | **0.012**\*\* | **0.012**\*\* | 0.008 | --- | --- | --- | --- | 0.017 | 0.021 | 0.010 | 0.003 | --- | --- | --- | --- |
|  | **(2.602)** | **(2.104)** | **(2.255)** | (1.451) |  |  |  |  | (0.643) | (0.789) | (0.470) | (0.267) |  |  |  |  |
| R² ajust. | 0.46 | 0.44 | 0.45 | 0.44 | 0.64 | 0.63 | 0.62 | 0.61 | 0.50 | 0.49 | 0.62 | 0.48 | 0.56 | 0.54 | 0.68 | 0.54 |
| F-Stats | **15.70**\*\*\* | **14.28**\*\*\* | **15.31**\*\*\* | **16.86**\*\*\* | **31.24**\*\*\* | **25.72**\*\*\* | **27.60**\*\*\* | **31.10**\*\*\* | **7.41**\*\* | **7.03**\*\* | **11.56**\*\* | **8.86**\*\*\* | **9.03**\*\*\* | **8.62**\*\*\* | **14.68**\*\*\* | **11.36**\*\*\* |

*, **, *** denote respectively, 10%, 5% and 1% significance levels. Estimated parameters with '**α**' represent after policy implications to banking and financial system efficiencies. COMESA: Common Markets for Eastern and Southern Africa. EAC: East African Community.

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