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Abstract

This study contributes to the dollarization literature by expanding its determinants to account for different dimensions of globalization, using the widely employed KOF index of globalization. Specifically, globalization is "unbundled" into three different layers namely: economic, social and political dimensions. The study focuses on 25 sub-Saharan African (SSA) countries for the period 2001-2012.Using the Tobit regression approach, the following findings are established. First, from both economic and statistical relevance, the social and political dimensions of globalization constitute the key dollarization amplifiers, while the explanatory power of the economic component is weaker on dollarization. Second, consistent with the theoretical underpinnings, macroeconomic instabilities (such as inflation and exchange rate volatilities) have the positive expected signs. Third, the positive association between the accumulation of international reserves and dollarization is also apparent. Policy implications are discussed.

Keywords: Dollarization; Globalization; sub-Saharan Africa; Tobit regression
JEL Classifications: E41; F41; C21

1.0 Introduction

The issue centering on financial dollarization (FD)[2] has dominated and still continues to dominate discussion spaces, mostly among policymakers, researchers as well as other stakeholders. This is particularly so because the phenomenon has assumed a threatening dimension to the financial-cum-monetary sovereignty of most emerging and transitional economies. The concern is considered imperative given the fact that some countries within the African continent, particularly those in the sub-Saharan African (SSA)[3] region have been perpetually enmeshed in the web of '***flight to quality***'[4] syndrome with the aim of hedging against continuous fall in the value of their domestic against foreign currencies. In fact, the wield phenomenon has engulfed the region to the extent that it has trailed after other regions like Latin America[5] and East Asia and the Pacific, where large amounts of financial transactions have been denominated in foreign currencies. The foreseeable implications[6] thereon have come under close scrutiny thus, warranting researchers to seek answers to questions like: what constitutes the key drivers of FD? Why are some countries, regions and continents experiencing more FD than others? What constitutes the way out of the economic quagmire? Unarguably, a large chunk of researches has been investigating important aspects and practical details of the subject in the literature. Broadly speaking, in a recent survey, De Nicolo et al. (2003) and Levy-Yeyati (2006) have summarized the main drivers of FD captured by the deposit dollarization measure to include: past rate of inflation which aligns with the currency substitution view (e.g., Savastano 1996; Sahay and Vegh 1996), the minimum variance portfolio (MVP) dollarization share which expresses unalloyed support for a portfolio argument standpoint (e.g., Ize and Levy-Yeyati 2003), a financial development view (Honohan and Shi, 2002; De Nicolo et al. 2003; and Asel, 2010), the quality of institutions and exchange rate pegs also neatly fitting into the institutional perspective (e.g., De Nicolo et al. 2003; Rennhack and Nozaki 2006). While many of these factors have been

[2]Dollarization and financial dollarization (FD) are used interchangeably in this paper.

[3]Dollarization has remained significant and persistent at 30 percent rates for both bank loans and deposits in SSA though found not to have increased significantly since 2001. However its reduction still lags behind those of other regions (Corrales et al. 2016; Raheem and Asongu, 2018)

[4] It is a phenomenon that is concerned with the action of investors moving their capital away from riskier investments to the safest investment vehicles. This is usually created by uncertainty in the financial or international markets. Examples include countries like Ecuador and El-Salvador which have abandoned their national currencies for the American dollar.

[5] Belonging to this category are such countries like Argentina, Bolivia, Peru and Uruguay. These countries are being referred to as highly dollarized economies since their ratios of foreign currency deposits to broad money are in excess of 50 percent.

[6] For instance, it has been alleged as capable of constituting a potential source of balance of payment and financial crises in the face of large exchange rate fluctuations as well as posing a serious threat to both macroeconomic and financial stability.

well documented in the literature, what is still less clear and probably under-researched is that aspect which borders on FD main transmission channels[7].

Arguably, globalization is one of the formidable candidates capable of transmitting the FD phenomenon since it involves cross-border movements of goods and services which are financial and non-financial. The heightened concern however, hinges on its various dimensions of impacts, which have been classified to include economic, political and social[8] dimensions (Dreher, 2006; Asongu et al., 2018). Notably, of the dimensions, economic globalization has often times, been considered as being synonymous to the real concept of globalization thus making other dimensional impacts to be inadvertently underrated. Just like economic globalization, the need to bother on other dimensions is of immense concern as they equally entail movements of foreign currencies from one country, region or continent to another. For instance, the social dimension aspect of globalization, characterized by the spread of ideas, information and images, has been found to cause substantial movements in foreign currencies. A case in point can be related to include the activities of the entertainment industry, which have gained widespread acceptance among many African countries. The elite and government official in high positions of authority are usually seen engaging in clandestine multi-million deals with their host foreign counterparts. The underlying transactions are, more often than not, involving substantial currency transfers. This aside, the prevalence of internet services and other allied information and communication activities are reckoned areas worthy of mentioning. Further, the political dimension of globalization (which habours activities like diffusion of government policies involving embassies, high commissions and other foreign missions) often deal in foreign currencies, thus suggesting that it is never completely immune to FD syndrome. Viewing from these focal lenses, the study's concern therefore is to explore primarily, the impactful roles of various dimensions of globalization on dollarization. This research exercise is considered important as conjectures devoid of formal empirical authentication seem to be baseless or at best unfounded.

In light of the foregoing, the study unravels the supposed relationship between the unbundled globalization indices and FD for developing countries like those in the SSA region for the following reasons: (i) The most notable has been compactly captured under

[7]With the exception of few studies (like Moreno-Villalaz, 2005; Arellano and Heathcote, 2010; Kessy, 2011; Brown et al.,2015; Raheem and Asongu, 2018; Asongu et al., 2018) that have concentrated on examining the impact of financial integration on dollarization under different geographical contexts.

[8] Economic globalization has been characterized as long-distance flows of goods, capital and services as well as information and perceptions that accompany market exchanges; political globalization is characterized by a diffusion of government policies; and social globalization has been expressed as the spread of ideas, information, images and people.

"(un)blessed trinity" argument in the literature. This term has been enunciated as constituting those economies that are characterized by three sterling qualities namely: (weak) strong international currency, (in) flexible exchange rate regime, and (poor) sound contractual and regulatory environment. While the developed countries undoubtedly are characterized by good quality features at one end, the other categories, which are duly represented by ill-quality features, are typical of countries within the developing African region at the other end. This notwithstanding, other auxiliary reasons that are considered germane include: (ii) widespread of globalization waves across countries in the region; the average level of loan dollarization is found to be modestly increased for SSA while the same remains stable or falling in other regions like Latin America and the Caribbean, East Asia and Pacific as well as Europe and Central Asia. For instance, in 2001, 26 percent of total bank credit in the region (which later shot-up to 34 percent in 2012) was denominated in foreign currencies. Moreover, the region has also been found to have lagged behind other regions in the de-dollarization[9] phenomenon; (iii)The symptomatic feature of macroeconomic volatility typical of all known dollarized economies is also a common feature in SSA (Corrales et al., 2016), among other factors.

Against this background, the study's contributions are pinned down on providing fresh evidence on the stock of FD literature but paying a particular attention to the strand that specifically features globalization and its various dimensions in the globalization-dollarization nexus. Moreover, the study probes into causal linkages between the duo using an instrumental estimation strategy that has some bite on endogeneity because it accounts for simultaneity issues.

The rest of the study is structured as follows. Section 2 covers some stylized background information on globalization and dollarization. The review of the literature is undertaken in Section 3 by delving into both the theoretical and empirical issues. Section 4 presents the methodology, model specification as well as data issues. Specifically, this section first justifies the use of Tobit regression before delving into the reason for the adoption of 25 SSA countries. The empirical results emanating from the estimated model are presented in Section 5, in which three main results are established: (i) validation of the minimum variance portfolio theory; (ii) social and political dimensions of globalization are found to be positive and significant determinants of dollarization, while(iii) the economic component of

[9] The deposits in foreign currency in Latin America and the Caribbean region stood at 36.3% in 2003 and later fell to 25.6% in 2012. A similar story can be told of East Asia and Pacific whose deposits dollarization dropped to 17 % in 2012 from 25% in 2003. Europe and Central Asia also managed to reduce same by 10 percentage points between 2001 and 2012 (Corrales et al., 2016).

globalization is established to reflect a weak explanatory power. Concluding implications and future research directions are provided in Section 6.

2.0 Some salient stylized Information

Table 1 below depicts the extent as well as the magnitude of dimensions of globalization impacts across countries within the SSA region. Generally speaking, a cursory visual inspection of the table points to the fact that the region is faring poorly in the globalization index. This notwithstanding, a country-by-country analysis rates Angola and Mauritius (with the scales of 68.47 and 68.25 respectively), as leaders in relation to economic globalization. Burundi is found operating lowest in the ladder. On the scorecard of social globalization, Mauritius and Seychelles having scales ranging between 63.65 and 55.13 appear to be topping the chart, with the Democratic Republic of Congo (DRC) and Angola lying on the lower bound, particularly within the precincts of 13.94 and 18.47, respectively. On the political front of globalization, Nigeria, South Africa and Ghana seem to be spearheading the race with scales ranging in the order of 89.12, 84.18 and 83.98 while the positions of Sao Tome & Principe and Eritrea are found ebbing away with the value ranges of 29.75 and 29.05.

Taking together, the scorecard finally rates Mauritius (60.75) and Namibia (56.06) as the first and second runners-up while South Africa with the scale of 65.76 assumes the lead position, at least for the region.

Regionally speaking, in Table 2, Southern Africa appears to be the most globalized African region except in the political sphere where North Africa takes the lead position. The Central African region remains a laggard in all dimensions of globalization with the exception of economic spheres where it overruns both the East and West African regions by percentage points of 0.99 and 1.85 respectively. Comparing each regional average with the African average, the Southern African (East African) region stands as the best (worst) performer. It is also worth noting that the average of SSA is marginally lower than the African average.

Table 1: Average of Globalization Dimensions in Sub-Saharan Africa Region (2001-12)

Countries	Economic Globalization	Social Globalization	Political Globalization	Average of the Aggregate
Angola	68.47	18.47	46.09	44.34
Botswana	64.01	40.22	44.96	49.73
Burundi	25.08	19.86	47.20	30.71
Cape Verde	52.17	38.36	36.26	42.26
Comoros	-	27.08	31.47	29.28
DRC	37.33	13.94	53.95	35.07
Djibouti	-	36.79	57.48	47.13
Eritrea	-	21.91	29.05	25.48
Ghana	48.89	32.25	83.98	55.04
Guinea	36.30	23.49	72.91	44.23
Kenya	38.79	27.64	82.70	49.71
Liberia	-	21.41	43.92	32.66
Malawi	42.29	26.90	58.81	42.67
Mauritius	68.25	63.65	50.35	60.75
Mozambique	53.46	27.61	63.74	48.27
Namibia	62.69	42.67	62.83	56.06
Nigeria	55.54	22.27	89.12	55.65
Rwanda	32.23	24.06	56.32	37.54
Sao Tome& Principe	-	33.96	29.75	31.85
Seychelles	-	55.13	35.36	45.25
Sierra Leone	39.75	19.40	56.32	38.49
South Africa	66.14	46.95	84.18	65.76
Tanzania	41.39	19.64	56.41	39.14
Uganda	46.70	22.96	64.34	44.67
Zambia	59.49	28.95	74.74	54.40

DRC: the Democratic Republic of Congo.
Source: Authors' computation from KOF index

Table: 2 Average Globalization Indices for Africa Regions (2001-12)

Africa Regions	Economic Globalization	Social Globalization	Political Globalization	Overall Globalization Index
Central Africa (CA)	45.59	23.37	48.74	36.78
East Africa (EA)	44.60	25.54	55.04	40.15
West Africa (WA)	43.74	26.29	65.35	42.80
North Africa(NA)	46.71	37.92	75.21	51.22
Southern Africa (SA)	63.82	39.81	52.96	51.90
Sub-Saharan Africa (SSA)	46.18	26.97	58.14	41.97
Total Average (All African countries)	47.09	28.91	59.17	43.16

Source: Authors' computation from KOF index

Financial dollarization has been found to wax stronger in virtually all economies of the world. Of the countries however, the SSA region appears to dominate both in terms of deposit and loan dollarization. The Table 3 below presents the global trends of financial dollarization.

Table 3: Global Trends of Financial Globalization

Regions	Deposit Dollarization	Loan Dollarization
SSA	29.6	30.5
Latin America and Caribbean	28.2	25.1
East & South Africa and Pacific	19.5	18.95
Middle East and North Africa	15.6	12.3
Average	29.1	27.0

SSA: sub-Saharan Africa.
Source: Raheem and Asongu (2018).

From the table, the dollarization indices rank SSA as the most dollarized, with loan dollarization surpassing the threshold value of 30[10]. This is not surprising because the region is capitally-deficient. Hence it resorts to external financing as means of sustaining growth and development. It has been documented that the region is fundamentally financed through foreign currency (Raheem and Asongu, 2018). Also, the Latin America and Caribbean region assumes the second position in terms of the two measures of FD. This is particularly so because some countries within the region like Argentina, Peru, Bolivia, El-Salvador, Ecuador and Peru have given-up their national currencies for US dollars.

Further, financial dollarization has been found to be more prevalent among the three

[10] A country is said to be highly dollarized if the ratio of the measure of FD exceeds 30% (see Balino, Bennett a nd Boreinztein, 1999; Corrales et al. 2016 for further details).

countries in SSA, namely: Angola, the DRC and Liberia. Apart from these three countries, others like Djibouti, Ghana, Mozambique, Sao Tome & Principe, Sierra Leone, Tanzania and Zambia can equally be referred to as highly dollarized nations if the 30% threshold is anything to go by. It is equally worth mentioning that majority of the countries within the region can be regarded as low dollarization countries. These include: Cape Verde, Comoros, Namibia and South Africa whose values of FD are in single digit over the period of review. Table 4 presents dollarization episodes of the selected SSA countries.

Table 4: Financial Dollarization in Sub-Saharan Africa Region

Countries	**2001-04**	**2005-08**	**2009-12**	**2001-12**
Angola	76.67	66	55.5	66.06
Botswana	23.15	17.14	25.92	22.07
Burundi	7.5	12.63	14.56	11.56
Cape verde	6.2	6.74	6.43	6.46
Comoros	2.23	1.00	1.00	1.41
DRC	80.23	84.73	85.27	83.41
Djibouti	58.45	54.73	57.13	56.77
Eritrea	18.38	18.98	15.99	17.78
Ghana	30.58	29.26	28.5	29.45
Guinea	25.17	30.22	21.45	25.61
Kenya	15.87	15.03	16.24	15.71
Liberia	76.8	83.03	82.6	80.81
Malawi	19.52	17.88	16.52	17.97
Mauritius	14.98	19.92	15.34	16.75
Mozambique	49.5	42.25	34.75	42.17
Namibia	1.73	1.21	0.84	1.26
Nigeria	8.94	10.32	13.83	11.03
Rwanda	30.01	24.03	22.13	25.39
Sao Tome & Principe	48.66	60.42	56.5	55.19
Seychelles	4.34	15.73	27.76	15.94
Sierra Leone	27.35	30.01	34.87	30.74
South Africa	1.45	1.25	1.00	1.23
Tanzania	40.5	38.25	34.51	37.75
Uganda	30.87	26.18	26.45	27.83
Zambia	49.37	41.26	38.25	42.96

DRC: the Democratic Republic of Congo.
Source: Raheem and Asongu (2018).

In light of the aforementioned developments, a pertinent question remains: how does the degree of globalization affect dollarization? Quite interestingly, some insightful pictures can be discerned from the duo relationships as depicted in Tables 1 and 4.First, for the highly

dollarized nations like Angola, globalization is seen to favour the economic sphere more than the other two dimensions (like social and political) while the DRC and Liberia are seen to be operating at higher levels of political spheres. Second, the least dollarized nations do not seem to herald less globalization as Cape Verde enjoys more economic globalization, and same argument is seen to hold for Namibia and South Africa. Lastly, a direct relationship seems to be entrenched for Comoros whose dollarization regimes are (un)coincidentally in tandem with globalization episodes. It is therefore apparent that visual observations alone may not offer objective evaluations without making recourse to empirical estimates.

3.0 Literature Review

This section aims at x-raying both the theoretical arguments underpinning FD on the one hand and on the other hand, the empirical verifications of these underlined FD theories and corresponding channels of transmission. Thus, achieving the twin objectives are pursued in what follows.

The concept of dollarization largely connotes the use of foreign as against domestic currencies in socio-economic and political transactions. Its development has been attributed to two major phenomena in the literature namely: currency and asset substitution arguments. The former has been argued as occasioning FD owing to the prevalence of problems emanating from both inflation and exchange rates. To the extent that the FD reigns, the effectiveness of monetary policy is presumptively believed to be rendered impotent. These situations seem to be so as perceived risks of changes in the value of the domestic currency are greater where floating exchange rates predominate (Miles, 1978; Arturo and Schadler 1980; Girton and Roper, 1981; Ortiz, 1983). This notwithstanding, the decline in the rates of inflation in the 1990s amid high dollarized episodes, has stirred torrent of attacks bordering on the underlying causes of currency view from the critics. The ensued attacks have later hatched the emergence of the latter group (asset substitution view) challenging the initial status quo. For instance, Edwards and Magendzo (2003) submitted that inflation has been significantly lower in dollarized countries than in their non-dollarized counterparts. By and large, this latter argument has been analyzed from four main perspectives in the literature, which include: portfolio, market development, financial development and institutional views.

The portfolio argument to dollarization has been viewed mainly from the standpoint of optimal portfolio choice. Accordingly, it is viewed in the sense that if domestic deposit yields higher returns than a corresponding dollar deposit, deposit dollarization should be lower and vice versa. Market development also sees dollarization as the sub-optimal response

to market imperfections. The financial development strand argued that the misallocation effects of the financial institutions has an important effect on the dollarization process while the institutional view conceives dollarization phenomenon as emanating from both institutional and policy failures. The need to hedge against it, could amplify the use of more foreign as against domestic currencies.

It is also worthy of note that, while a burgeoning literature exists on the empirical studies on FD, the focus has specifically aimed at either validating or refuting the above claims. Several macroeconomic variables have been identified as drivers of FD as earlier espoused in the theoretical literature. Topping the list are inflation and exchange rates. The twin variables have been charged as being the primary drivers of the FD phenomenon and these have consequently been confirmed for several countries and regions (Bahmani-Oskooee and Techaratanachai,2001; Arteta, 2002; Ize and Levy-Yeyati, 2003 and 2005; Levy-Yeyati and Sturzenegger, 2005; Kaplan et al.,2008). In spite of the empirical regularity between each of these variables and FD, contrary results have been established by another strand of authors (like Honig 2009 and Berkmen and Cavallo, 2010) thus, invalidating a direct connection between exchange rate regimes and FD.

Apart from the core variables for which the debates about currency view were initially generated, some other variables like real interest rate differentials have equally been alleged as probable culpable. Researchers like Sahay and Vegh (1996), Savastano (1996), Basso et al. (2011) and Kessy (2011) have established a positive influence of interest rate differentials on financial dollarization. Just like with the case of inflation and exchange rates, some researchers' conclusions also had somewhat conflicting postures. For instance, Arteta (2002) confirmed the explanatory power of interest rate spread to be poor in driving FD. Further, some additional variables were extolled as playing a prominent role in FD promotion. More importantly, institutional factors and credibility policy stance were stressed. The examples of studies in this category include: Calvo and Guidotti (1989); Savastano (1992); Ize and Parrado (2002); Jeanne (2003); Levy-Yeyati (2006); Honig (2009) and Neanidis and Savva (2013). Other than the foregoing variables, the importance of financial sector indicators was equally accorded greater weights. Studies like Honohan and Shi (2002); De Nicolo et al. (2003) and Asel (2010) and Corrales et al. (2016) also submitted the existence of the impactful and positive roles of financial variables on FD in the countries, regions or continents of case studies.

Similar in spirits to the present enquiry are studies like Moreno-Villalaz (2005), Arellano and Heathcote (2010), Kessy (2011), Brown et al. (2015), and Raheem and Asongu

(2018) who have examined causal linkages between dollarization and integration using different study areas and analytical tools.

To begin with, Arellano and Heathcote (2010) specifically analyzed the interaction between the choice of exchange rate regime and integration into international financial markets. In providing solutions to this salient issue, they built a small open economy model, in which they argued that dollarization, perhaps attractive as monetary instrument elimination could help strengthen incentives to repay debts, thereby increasing access to international credit. Thus, when the model was applied to El-Salvadorian data, it was predicted that eliminating the monetary instrument could allow the country to borrow more while the converse was held for a comparator country like Mexico. Given the similar character of Arellano and Heathcote (2010) with Moreno-Villalaz's (2005), attempt was made to differentiate them on the following grounds: (i) the latter was conducted on Panama, and (ii) unlike other highly dollarized economies, Panama has effective institutional structures that enabled her market to function properly and as such help enhanced macroeconomic efficiency.

Brown et al. (2015) examined the relationship between the perceived stability of the domestic currency and FD using variation in the quarterly series on consumer price inflation, across 71 Russian regions, over the period Q2 2005 to Q2 2014. They were able to establish that a one standard deviation increase in regional year-on-year inflation was associated with 0.10 standard deviation increase in deposit dollarization in the next quarter and a 0.11 standard deviation decrease in the dollarization of loans to non-tradable firms. In addition, the impact of inflation on credit dollarization appeared to be weaker in regions where the banking sector was less integrated.

Kessy (2011) conducted a study on the dollarization process in Tanzania. The study further provided a comparative analysis of dollarization between Tanzania and other East African countries. Among the explanatory variables in the model was gross capital inflow, which could be argued to be classified as economic globalization. The proxies for capital inflows are foreign direct investment (FDI) and foreign aid. The importance of these variables amplifying the level of dollarization cannot be questioned. Raheem and Asongu (2018) made a rebuttal to the claim of Kessy (2011) by arguing that the study ignored the important role of remittances in the developing countries. As such, they provided a better proxy for capital inflows by relying on a more encompassing data. Specifically, financial integration dataset provided by Lanes and Milessi-Ferrati (2006) was used. Their results show that financial integration is a positive determinant of dollarization in the selected countries.

Given the brief empirical survey on the main drivers of dollarization in the previous literature, it is therefore apparent that a missing gap remains the socio-economic-political environment upon which the entire activities are transacted, perhaps inadvertently undermined or at best, yet to be given due consideration. Thus, filling this void remains the primary goal of the present enquiry. Plainly, the study contributes to the stock of knowledge at least in one major respect: unlike the tri-referenced studies which focus on one aspect of globalization, viz economic, our study makes a clear distinction by focusing on the three components of globalization as well as the aggregate index.

4.0 Methodology, Model Specification and Data

At the end of this section, there would be a clear understanding of two fundamental aspects that are considered to be germane in studying the relationship between dollarization and elements of globalization. The first issue relates to methodology, while the second item concerns model specification, data sources and measurements.

4.1 Methodology

Due to the construction of the two main variables of interest (i.e. dollarization and globalization), in this study we are constrained to use a methodology that is considered to be best suited for this type of data[11]. Hence, the censored nature of the data invalidates the use of Ordinary Least Squares (OLS) estimates. As such, Tobin (1958) designed a methodology that works with censored variables and coined it "Tobit regression". In simple terms, the model entails the simultaneous use of maximum likelihood estimation and probit model.

The standard Tobit model (Tobin, 1958; Carsun and Sun, 2007; Asongu and le Roux, 2017; Boateng et al., 2018) is as follows:

$$y_{i,t}^{*} = \alpha_0 + \beta X_{i,t} + \varepsilon_{i,t} , \qquad (1)$$

where $y_{i,t}^{*}$ is a latent response variable, $X_{i,t}$ is an observed $1 \times k$ vector of explanatory variables and $\varepsilon_{i,t} \approx$ i.i.d. N(0, σ^2) and is independent variable of $X_{i,t}$. Instead of observing $y_{i,t}^{*}$, we observe $y_{i,t}$:

[11] Dollarization and globalization are constructed in such a way that there is an upper limit bound. In essence, there is a threshold of 100%, which cannot be exceeded. In the case of dollarization any country with dollarization index of 100% is considered to be fully dollarized. Classical common examples in the literature are Ecuador, El-Salvador and Panama, to name a few. The same logic applies to globalization. Accordingly, both dollarization and globalization indices are considered to be censored variables.

$$y_{i,t} = \begin{cases} y^*_{i,t,} \; if \; y^*_{i,t} > \gamma \\ 0, \; if \; y^*_{i,t} \leq \gamma, \end{cases} \quad (2)$$

where γ is a non stochastic constant. In other words, the value of $y^*_{i,t}$ is missing when it is less than or equal to γ.

Endogeneity is a statistical problem that if not accounted for could lead to conjured results and hence the formulation of wrong policies. The main causes of endogeneity are reverse causality, measurement error and omitted variable bias. Of these three causes, there are high chances that the model would suffer from reverse causality and measurement error. In order to correct for the simultaneity dimension of endogeneity, the study adopted a Tobit Instrumental variable regression[12].

4.2 Model Specification

Compared to other topics in international macroeconomics, dollarization is a relatively new concept, which has triggered a renewed interest in the last decade of the nineteenth century[13]. As argued earlier, there are very few studies that are related to ours. Hence, we follow the models of these studies (Kessy, 2011; Raheem and Asongu, 2018). However, these models are modified to account for the inclusion of globalization indices. Thus, the equation to be estimated is presented in what follows:

$$FD_{it} = \propto + RETURN_{it} + GLOBAL_{it} + CONTROLS_{it} + \rho_i + \tau_t + \varepsilon_{it}, \quad (3)$$

where, FD is a proxy for dollarization (foreign currency deposit as a ratio of broad money supply). RETURN is a vector that captures differences between the rate of returns of both domestic and foreign currencies. Essentially, this vector variable includes interest rate differentials between domestic and foreign currencies (INT), exchange rate volatility (SEXR), inflation (INF), and exchange rate depreciation (EXDEP). GLOBAL is the globalization indices, which are decomposed into economic, political and social dimensions[14]. We also use

[12]The literature offers two types of instruments: internal and external. Due to the complexity of finding external instruments, we decided to use the former, which entails the use of lagged differences and lagged levels of the explanatory variables.

[13] It does not mean this issue has not existed before. Running down the memory lane, it can be argued that dollarization is as aged as World Wars I and II. Following the abandonment of gold standard and the Bretton Woods system as fallout of the outbreak of World Wars I and II respectively, some countries have sought for exchange rate regimes to enhance their economic stability and growth. Among the exchange rate regimes being sought for is "currency substitution" otherwise known as dollarization, currency board, among others.

[14]KOF index perceives globalization in three dimensions: economic, political and social. These dimensions where further aggregated using principal component analysis. More information on this index could be sourced

the aggregated index of these three indices which is obtained using principal component analysis. CONTROLS variables in this study are institutions (INST)[15], financial development (FIN) and GDP per capita growth (GDP), international reserves (RES),$\tau$and ρ capture time and country-specific effects, respectively.$\varepsilon_{it}$is the independently and identically distributed (iid) error term component, while i and t are country and time dimensions, respectively.

A dataset for 25 SSA countries for the period 2001 and 2012 was built. These countries and time frame were selected strictly based on data availability. Our main data sources are the World Development Indicators, International Financial Statistics of the IMF and the KOF index of globalization. The appendix contains list of countries under investigations, data description, measurement and sources of variables.

5.0 Empirical Results

The descriptive statistics of the model is presented in Table 5 below. It is estimated that the average ratio of dollarization in the selected countries is about 30%, which is the threshold level of a dollarized economy. In terms of variability, it could be said that the variable is fairly stable. This satisfies the argument of a strand in the literature about the persistent nature of dollarization. The decomposition of the globalization shows that the political component has the highest mean value of 56.588, which is followed by the economic and social components. These indices are quite stable judging by the values of standard deviations. The exchange rate related variables are understandably the most volatile series in the model. On the average, the region has an inflationary rate of about 12%.

from https://www.kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html

[15]The World Governance Indicators of Kauffmann et al. (1999) consist of six indices of governance, which are: control of corruption, rule of law, voice and accountability, government effectiveness, regulatory quality and political stability. There is a very minimal variation among these indices just as they are highly correlated. (Ajide and Raheem, 2016a, 2016b; Asongu and Nwachukwu, 2016a, 2016b). Hence, we solved these problems through the use of principal component analysis in order to aggregate these indices.

Table 5: Descriptive Statistics

Categories	Variables	Mean	StdDev	Min	Max
Dependent Var	DOL	29.606	23.439	1	90
RETURNS	INF	12.204	24.510	-2.404	359.936
	EXDEP	72.202	281.2884	-950.998	2290.15
	SEXCH	305.238	217.280	0.343	3853.18
	INT	7.263	6.130	-2.254	47.861
CONTROLS	GDP	7.428	3.891	4.947	25.882
	INST	-0.069	0.750	-1.599	1.790
	FIN	24.448	28.997	0.198	160.124
	RESV	20.125	2.093	11.635	24.699
GLOBAL	ECO	49.420	13.009	21.792	84.685
	SOC	30.229	11.995	10.951	64.751
	POL	56.488	18.483	25.374	90.945
	AGG	42.940	13.940	21.940	70.930

Source: authors' computation

NOTE: DOL= Dollarization Index; INF = Inflation EXDEP= Exchange rate Depreciation SEXCH: Volatility of nominal exchange rate INT= interest rate spread; GDP = GDP per capita INST= average of institutions FIN = financial development RESV = foreign reserves ECO = Economic globalization SOC = social globalization and POL = political globalization, AGG is the aggregate of ECO, SOC and POL.Dependent Var: Dependent Variable. StdDev: Standard Deviation. Min: Minimum. Max: Maximum.

The results of the baseline estimates are presented in Table 6. Starting with GLOBAL variables, economic globalization (denoted by ECO), though positive, does not significantly wield any appreciable influence on the level of dollarization in the region. This is startling given the mean value of economic globalization on the descriptive statistics table. This can be plausibly attributed in part to the process by which foreign currencies and other foreign denominated assets are handled within the region. The level of dollarization may tend to reduce if emanating transactions from ECO are properly channeled through domestic financial systems. This result contradicts that of Raheem and Asongu (2018) whose variable of financial integration was positively significant across the estimated models. The emanated difference may be said to be due in part, to the indicator used to capture ECO by the authors. For instance, previous studies like Kessy (2011), Raheem and Asongu (2018) and Lanes and Milesi- Ferratti (2006) have used foreign capital inflow, financial aid and financial integration index, respectively to surrogate for economic globalization. It is however, interesting to note that both the social and political globalization variables represented by SOC and POL constitute the main dollarization amplifiers with the effects of the former featuring more prominently than the latter. At least the three "S's" (i.e. significance, sign and size) on the regression estimates are dully satisfied. Apart from being statistically different from zero, these indices have the right signs, which support the hypothesis of this study. Moreover, they

also have relatively non-zero coefficients. A similar argument equally holds for the aggregate index of globalization[16]. It is important to mention that the emanating intuition from Table 6 regarding globalization indices is that the foreign currencies obtainable from both the social and political dimensions of globalization are largely unregulated or at best inadvertently undermined as constituting formidable threats to socio-economic stability.

More importantly, with respect to RETURNS, inflation and exchange rate volatility constitute the key predictors of dollarization episodes in SSA. For instance, the coefficients of inflation ranged between 0.052 and 0.347. These results support the argument of Minimum Variance Portfolio (MVP) postulated by Ize and Levy-Yeyati (2003) that volatility of exchange rate and inflation are the prominent determinants of dollarization. On the empirical front, studies such as De-Nicole (2005), Yinusa (2009), Vieri et al. (2012) and Raheem and Asongu (2018) also obtained similar results. Interest rate spread is a positive determinant but rather insignificant. Again, devaluation of exchange rate (i.e. depreciation) increases the incidence of dollarization in SSA, which is in tandem with theoretical expositions. However, this variable suffers from loss of statistical significance.

Further, across the models estimated, economic growth serves as a driving "dedollarization" force in SSA. The implication is that higher GDP per capita growth tends to lower the penchant for holding foreign as against domestic currencies. This is more likely to be so as a growing economy tends to have a strong productive base to support its local currency. This result aligns with Yinusa (2009) and IMF (2015). The improved institutional infrastructure among in SSA could also help in reducing the dollarization trend in the region. This mostly works through channels like credibility in government policies, enforcement of contract, supervisory role of the monetary authorities, among others. This seems plausible as deficiency in these more often than not create room for the substitution of domestic for foreign currencies. Honig (2005, 2009), Aizenman et al. (2005), Levy-Yeyati (2006) and Doblas-Madrid (2009) are among the previous studies that had earlier obtained similar results. With respect to financial sector development, the financial product innovations as well as better service delivery can equally help in reducing the use of foreign currencies in the region. This contradicts the theoretical argument underlying studies of Honohan and Shi (2002), Asel (2010), to name a very few. The coefficients on the variable of international reserves duly conform to theoretical prior as dollarization episode tends to be high as reserves soar. This is

[16] In Table 6, we chose not to present the result of the aggregated globalization index so as not to crowd the table. The result of the aggregated index is similar to that obtained in the case of SOC. However, the result of the aggregated index can be made available upon request.

also confirmed by Yotopolous (1997).

On the endogeneity issue, in order to ensure that the previously presented results are valid to the control for endogeneity, the use instrumental variable Tobit regression was embraced. The results are presented in Table 7. Among the important noticeable differences in these results and those presented in Table 6 is the significance of the economic globalization at 10 % significance level which is supported by higher magnitude coefficients. Also, attempt is made to present the semi-elasticity of the models (with special reference to Table 6 only). These results are reported in Columns 2, 4, 6 and 8 in Table 6. The last robustness check we performed was to test for an outlier effect. In principle, the eliminated countries are Namibia, Liberia, the DRC, South Africa and Comoros. The results of these tests are presented in Table 8.

Table 6: TOBIT Results

Categories		1	2	3	4	5	6	7	8
RETURNS	INF	0.347***	0.052**	0.158***	0.052**	0.274***	0.065**	0.247***	0.080***
		[0.076]	[0.025]	[0.082]	[0.024]	[0.074]	[0.021]	[0.078]	[0.027]
	EXDEP	0.0003	-0.002	-0.001	-0.002	-0.002	-0.001	-0.002	-0.004
		(0.002)	[0.004]	[0.002]	[0.003]	[0.003]	[0.003]	[0.003]	[0.006]
	SEXCH	0.007**	0.179**	0.004	0.179**	0.005*	0.004**	0.007*	0.046**
		[0.003]	[0.054]	[0.009]	[0.054]	[0.003]	[0.001]	[0.004]	[0.019]
	INT	0.040	0.029	0.121	0.029	0.081	0.047	0.099	0.022
		[0.108]	[0.021]	[0.091]	[0.021]	[0.100]	[0.036]	[0.105]	[0.024]
CONTROLS	GDP	-1.170***	-	-1.250***	-	-1.720***	-0.459	-1.743***	-
		[0.302]	0.314***	[0.264]	0.314***	[0.211]	[0.146]	[0.554]	0.498***
			[0.081]		[0.081]				[0.137]
	INST	-4.323**	0.002	0.248***	0.001***	-7.013***	-0.497	-4.565*	-0.117
		[1.881]	[0.002]	[0.001]	[0.000]	[1.736]	[0.211]	[2.559]	[0.107]
	FIN	-0.1009**	-0.029	-0.036	-0.029	-0.205***	-	-0.114**	-0.114**
		[0.046]	[0.035]	[0.043]	[0.035]	[0.046]	0.133***	[0.060]	[0.058]
							[0.021]		
	RESV	1.639***	0.552**	0.924**	0.552**	1.876***	0.562***	1.768***	1.211***
		[0.531]	[0.279]	[0.450]	[0.279]	[0.476]	[0.168]	[0.653]	[0.395]
GLOBAL	ECO			0.006	0.008				
				[0.059]	[0.021]				
	SOC					0.697***	0.016***		
						[0.110]	[0.001]		
	POL							0.159**	0.303**
								[0.071]	[0.126]

DIAGNOSTICS

	Sigma_u	17.912***	24.498***	19.233***	22.248***
	Sigma_e	4.637***	3.164***	3.667***	3.841***
	Rho	0.937	0.983	0.965	0.971
DIAGNOSTICS					
	Left censored	38	24	38	38
	Uncensored	125	69	74	74
	Right censored	118	128	169	169

Source: Authors' Computation

Note: Values in parenthesis are the standard errors, while "*", "**", "***" represents 10, 5 and 1% level of statistical significance, respectively.

NOTE: DOL= Dollarization Index; INF = Inflation EXDEP= Exchange rate Depreciation SEXCH: Volatility of nominal exchange rate INT= interest rate spread; GDP = GDP per capita INST= average of institutions FIN =

financial development RESV = foreign reserves ECO = economic globalization SOC = social globalization and POL = political globalization AGG is the aggregate of ECO, SOC and POL.

Table 7: Robustness Test with IVTOBIT Results

Categories	Variables	1	2	3	4	5
RETURNS	INF	0.306**	0.217**	0.150***	0.586***	0.368**
		[0.105]	[0.056]	[0.031]	[0.309]	(0.118)
	EXDEP	-0.002	-0.001	0.001	0.001	0.002
		[0.006]	[0.002]	[0.006]	[0.006]	(0.002)
	SEXCH	0.006***	0.005**	0.002***	0.005**	0.003***
		[0.002]	[0.002]	[0.000]	[0.003]	(0.000)
	INT	1.088***	0.864***	0.761***	0.910***	0.793**
		[0.299]	[0.261]	[0.213]	[0.312]	(0.276)
CONTROLS	GDP	-1.846***	-1.348***	-1.275***	-2.232***	-2.048***
		[0.263]	[0.206]	[0.170]	[0.356]	(0.267)
	INST	-4.972***	-2.449	-6.291***	2.201***	-1.938***
		[1.693]	[1.718]	[1.715]	[0.454]	(0.445)
	FIN	-0.334***	-0.309**	-0.461***	-0.642***	-0.293**
		[0.049]	[0.120]	[0.065]	{0.090}	(0.122)
	RESV	4.548***	3.049***	3.466***	3.675**	3.904**
		[0.757]	[0.684]	[0.657]	[1.131]	(1.252)
GLOBAL	ECO		0.298*			
			[0.173]			
	SOC			0.845**		
				[0.325]		
	POL				0.123***	
					[0.004]	
	AGG					0.493**
						(0.133)
	DIAGNOSTICS					
	Alpha	-0.648	-0.162	0.253	-1.166***	-2.380***
		[0.157]	[0.047]	[0.182]	[0.3760]	[0.364]
	WALD	0.361	0.773	0.365	0.265	0.428
DIAGNOSTICS	CHI2 (PROB)	0.045	0.056	0.015	0.002	0.032
	Left censored	34	22	22	34	34
	Uncensored	68	63	63	68	68
	Right censored	155	117	117	155	155

Source: Authors' Computation

Note: Values in parenthesis are the standard errors, while "*", "**", "***" represents 10, 5 and 1% level of statistical significance, respectively.

NOTE: DOL= Dollarization Index; INF = Inflation EXDEP= Exchange rate Depreciation SEXCH: Volatility of nominal exchange rate INT= interest rate spread; GDP = GDP per capita INST= average of institutions FIN = financial development RESV = foreign reserves ECO = Economic Integration SOC = social Integration and POL = political integration AGG is the aggregate of ECO, SOC and POL.

Table 8: Robustness Test for Outlier Sub-sample

Categories	Variables	1	2	3	4	5
RETURNS	INF	0.254**	0.227**	0.323*	0.375*	0.2118
		[0.098]	[0.102]	[0.153]	[0.187]	[0.054]
	EXDEP	-0.004	-0.003	-0.002	-0.003	0.004
		[0.006]	[0.003]	[0.005]	[0.005]	[0.005]
	SEXCH	0.007**	0.104**	0.175**	0.211***	0.313***
		[0.0023	[0.051]	[0.055]	[0.003]	[0.000]
	INT	2.000***	1.294**	1.459**	1.459***	0.949**
		[0.354]	[0.430]	[0.656]	[0.321]	[0.]
CONTROLS	GDP	-0.655**	-0.854***	-1.043**	-1.144***	-1.987**
		[0.222]	[0.103]	[0.456]	[0.333]	[0.590]
	INST	-1.938***	-2.293***	-3.904**	-1.994***	-2.049**
		[0.028]	[0.094]	[1.148]	[0.087]	[0.974]
	FIN	-0.294**	-0.639***	-0.392***	-0.403***	-0.193**
		[0.087]	[0.103]	[0.069]	{0.052}	(0.048)
	RESV	1.237***	2.934***	3.048***	3.048**	2.894**
		[0.187]	[0.720]	[0.938]	[0.903]	(0.830)
GLOBAL	ECO		0.200*			
			[0.102]			
	SOC			0.673**		
				[0.193]		
	POL				0.382***	
					[0.092]	
	AGG					0.666**
						(0.293)
	DIAGNOSTICS					
DIAGNOSTICS	Alpha	-0.538**	-0.404***	0.222	-1.188***	-1.392***
		[0.157]	[0.047]	[0.329]	[0.367]	[0.283]
	WALD	0.638	0.393	0.230	0.495	0.526
	CHI2 (PROB)	0.033	0.043	0.028	0.028	0.044
	Left censored	34	22	22	34	34
	Uncensored	68	63	63	68	68
	Right censored	155	117	117	155	155

Source: Authors' Computation

Note: Values in parenthesis are the standard errors, while "*", "**", "***" represents 10, 5 and 1% level of statistical significance, respectively.
NOTE: DOL= Dollarization Index; INF = Inflation EXDEP= Exchange rate Depreciation SEXCH: Volatility of nominal exchange rate INT= interest rate spread; GDP = GDP per capita INST= average of institutions FIN = financial development RESV = foreign reserves ECO = Economic globalization , SOC = social globalization and POL = political globalization AGG is the aggregate of ECO, SOC and POL.

6.0 Concluding implications and future research directions

This study contributes to the dollarization literature by expanding its determinants to account for different dimensions of globalization. Thus, three measures of globalization (economic, political and social) are introduced into a financial dollarization model. Abundant empirics from previous studies have mainly focused on the economic component using other measures such as FDI, foreign aid and a financial integration index as key surrogate variables (Corrales et al. 2016; Kessy, 2011). The spatial and temporal scopes are limited respectively to 25sub-

Saharan African (SSA) countries and the period 2001 through 2012.

Using instrumental variable Tobit regression, the following results have been established. (i) With respect to globalization factors, both the social and political dimensions of globalization affect dollarization, while the influence of the economic component is weak. (ii)Macroeconomic instabilities involving inflation and exchange rate volatility variables have also been lent credence. Furthermore, the theoretical conjecture underlying minimum variance portfolio argument has been dully upheld for the duo. (iii) The deleterious impacts of international reserves have equally been noticed. (iv) The results are robust to semi-elasticity estimation, outlier tests and the control for simultaneity.

In the light of the above outcomes, the following are some implications for policy. First, special attention should henceforth be accorded to every dimension of globalization, particularly its social and political components. This becomes imperative as illicit foreign currencies and other foreign related transactions as well as other sharp practices have been observed to have gained unnoticed influence into the region. This can be curtailed henceforth provided appropriate sanctions are meted out to defaulters. Second, the macroeconomic environment should be constantly maintained, mostly with respect to inflation and exchange rate volatilities. Third, the interest rate spread should be kept within the range of bounds such that whenever the threshold is exceeded, inbuilt mechanisms should work to restore it back to normalcy. Lastly, deeper financial systems supported by quality institutional frameworks should be further strengthened in the region.

Future studies can investigate if the established findings withstand empirical scrutiny within country-specific settings in order to derive more targeted policy implications. Moreover, accounting for heterogeneities that are exogenous to financial dollarization is worthwhile.

Appendix

A: List of Countries

Angola, Botswana, Burundi, Cape Verde, Comoros, Democratic Republic of Congo, Djibouti, Eritrea, Ghana, Guinea, Kenya, Liberia, Malawi, Mauritius, Mozambique, Namibia, Nigeria, Rwanda, Sao Tome and Principle, Seychelles, Sierra Leone, South Africa, Tanzania, Uganda and Zambia.

B: Data Description

Variable	Definition	Measurement	Source
Dollarization	Foreign currency deposit as a ratio of broad money supply	%	International Monetary Fund (IMF)
Interest Rate Differentials	Interest rate differentials between domestic and foreign economies[17]	%	World Development Indicator (WDI)
Inflation	Logarithm of Consumer Price Index	%	WDI
Exchange Rate Volatility	Standard deviation of the exchange rate. Exchange rate is defined as the number of units of local currency that could exchange for one unit of American Dollar, based on official (forex) rate.	Level	WDI
Exchange rate depreciation	The depreciation of the local currency against the American dollar, on a yearly basis.	Level	Authors′ calculation with underlining data from WDI
Globalization indices	See footnote 13	Level	KOF index
Institutional/governance index	See footnote 14	Level	World Governance Index
Financial Development	Credit provided to the Private Sector	% of GDP	WDI
GDP per capita growth	Growth rate of the GDP per capital	%	WDI
International Reserve	The ratio of the level of international reserves to GDP	%	WDI

[17]Interest rate of the United States of America is used as a proxy for foreign economies, which is in line with the extant literature.

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