

A G D I Working Paper

WP/16/033

Extending the Determinants of Dollarization in Sub-Saharan Africa: The Role of Easy Access to Foreign Exchange Earnings

Ibrahim D. Raheem

School of Economics, University of Kent, Canterbury, UK

E-mail: idr5@kent.ac.uk

Simplice A. Asongu

African Governance and Development Institute,

P.O. Box 8413, Yaoundé, Cameroon

E-mail: asongusimplice@yahoo.com / asongus@afridev.org

AGDI Working Paper

Research Department

Extending the Determinants of Dollarization in Sub-Saharan Africa: The Role of Easy Access to Foreign Exchange Earnings**Ibrahim D. Raheem & Simplicie A. Asongu**

September 2016

Abstract

This study argues that the ease at which economic agents have access to foreign earnings would influence/increase the level of dollarization in the economy. The three sources of foreign currency earnings are financial integration, trade openness and natural resource rent. As such, we extend the determinants of dollarization to capture these variables. A dataset of 26 countries in sub-Saharan Africa (SSA) for the period 2001 – 2012 was built. Based on Tobit regression, we found that all the proxies of foreign currency earning, with the exception of natural resource rent, are significant contributors to the increasing rate of dollarization. Specifically, it was found that trade openness and financial liberalization are positive determinants of dollarization, while natural resource rent serves as drag to the dollarization process. These results remain valid to three robustness tests. Policy implications and suggestions for future research were proposed.

Keywords: Dollarization; Openness; Resources; Tobit regression; SSA

JEL Classifications: E31; E41; C21

1. Introduction

The ensuing effects of globalization on the one hand, and the negative consequences of macroeconomic instability on the other hand, had made policymakers and scholars beam their searchlight on Financial Dollarization (FD)¹. In the case of the former and

¹ Financial Dollarization and Currency Substitution (CS) are sometimes used interchangeably in the literature. Even though both phenomenon address the same issue, they are however, conceptually different. The difference lies on government policy interventions in adopting foreign currency as means

as a result of international trade and investment, there are incentives for multinational corporations to hold varieties of foreign currencies. In the case of the latter, among the suggested solutions to macroeconomic instability is the adoption of FD. In addition to the above scenarios, it could be argued that asset diversification is also an important determinant of FD (Murray and Powell, 2003; Sharma et al., 2005; and Levy-Yeyati, 2006)².

Regions, such as Latin America and Eastern Europe, which are characterized by macroeconomic instability, have been the focal point of earlier studies between 1980s and early 2000. For instance, Argentina experienced a high degree of FD during the period 1980-1984, while Mexico's case was recorded during the period 1977-1980. The resultant effect of financial liberalization in countries such as Bolivia, Peru, and Uruguay is the high degree of substitutability between the local and foreign currencies (Ramirez-Rojas, 1985; Calvo and Vegh, 1992). Asia has received some attention in the literature. Sharma et al. (2005) state that only two countries in the region, Japan and South Korea, have empirical studies to their credit. The policy coordination in Europe, which led to the adoption of Euro as the legal tender among selected European countries, accounts for the reason why studies are lacking in the region.

Investigations on the effects of FD in African economies are rather burgeoning. Prior to these studies, it would have been misleading to assume that the subject matter is not an African phenomenon. The implementation of the Structural Adjustment Programme (SAP) in most African countries in the late 1980s, which led to financial liberalization and the removal of restrictions on the use of foreign currencies, had led to the increase in the demand/use for/of foreign currencies alongside with local currencies (Yinusa, 2009). For instance, within a year of liberalizing its financial sector, Tanzania recorded 15% of foreign currency deposit in total monetary deposit (Kessy, 2011). The average rate of FD in Liberia and the Congo Republic is estimated to be in the region of about 80%. This is closely

of legal tender, which is the case of CS. Even though both concepts are different in their respective rights, they are however used interchangeably in this study. This is premised on the fact that no country in sub-Saharan Africa has adopted a foreign currency as legal tender, although Zimbabwe has been using the USD alongside her local currency as legal tender.

² However, caution must be exercised when interpreting asset diversification as a fall-out of FD. This is based on the findings of Gosh et al. (1998) that countries with high portfolio denominated in foreign currencies seem to have low inflationary pressure, more stable exchange rate movements than countries with relatively low levels of FD.

followed by Angola and Sao Tomé and Príncipe with 70% and 60%, respectively. The average level of FD for SSA for the period 2001 to 2012 stood at 30% (IMF, 2015). Hence, Africa is considered to be in the league of the “dollarizing” economies in the world³.

Giovanni and Turtelboom (1994) argued that the theoretical foundation for FD is based on the theory of demand for money. They laid emphasis on cash-in-advance model and transaction cost models. In the first model, the return differential (proxied by inflation) between domestic currency and foreign currencies serves as the basis for demand of either of the two sets of currencies. In essence, the decision on which currency to demand for is purely business/economic induced. This is consistent with the three types of FD De Nicolé et al. (2003) identified⁴. The IMF (2015) has developed a broad model to account for some perceived important determinants of FD, among which are market failure, institutions, portfolio and access to foreign exchange. The IMF further argued that these determinants have been neglected by earlier studies.

This study takes a cue from the ease of access to foreign exchange (FOREX). The ease at which economic agents, households, firms and the government have access to FOREX would to a large extent determine the level of demand for and use of foreign currencies. The three fundamental motives for the demand for money are unit of account, store of value and medium of exchange. In a liberalized economy with no restrictions on the use of foreign currencies, the flexibility of the substitution between foreign and local currencies would be high. Hence, economic agents would be faced with the option of either demanding for money in domestic currency or in a basket of foreign currencies. For instance, in countries with unstable macroeconomic policies, firms and individuals are likely to hedge against potential loss by denominating their assets in foreign currency(ies). This satisfies the store of value function of the demand for money.

It is common knowledge that countries with high levels and perhaps hyperinflation would transact and pay for goods and services in foreign currencies. Kessy (2011) and IMF (2015) document that United States Dollars (USD) are used to

³ A country is considered to be highly “dollarized” if the ratio of the measure of FD exceeds 30% (Balino, Bennett and Boreinztsein; 1999; IMF, 2015). However, Sepulveda’s (2000) classification is in the following form: below 20% (low dollarization); between 21-70% (mild dollarization) and above 70% (high dollarization). This study adopts the first classification due to its relative simplistic range as compared with the latter classification.

⁴Financial, payment and real dollarization.

pay for services- such as accommodation rents and purchases, schools fees, among other high value consumer durables- in Tanzania, the Democratic Republic of Congo and Zimbabwe. Multinational Corporations pay their expatriate staffs' wages and allowances in foreign currency. In essence, the argument this study seeks to make is that easy access to FOREX fuels FD. This is a gap that has not been "adequately" investigated.

The objective of this study is to examine the extent to which access to FOREX magnifies/dampens the level of FD in SSA countries. Based on the foregoing, three major sources of FOREX are considered. They are (i) natural resource rent; (ii) total export; and (iii) International capital inflow (proxied with financial integration)⁵. Based on data constraints, the scope of this study is limited to 26 countries in SSA for the period 2001-2012⁶.

The contribution of this inquiry to existing literature is twofold, notably, in terms of scope and hypothesized role of FOREX. First, on the dimension of scope, studies on FD focusing on Africa are very few. To the best of our knowledge, only two studies (Yinusa, 2009 and IMF, 2015) are based on panel data while the remaining are country-specific studies⁷. Hence, this study adds to the scarce African literature on FD. The second innovation is based on the hypothesized role of FOREX. To date, Kessy (2011) and IMF (2015) are closest to this study. However, the point of departure (considering IMF's paper) lies on the proxies for the sources of FOREX. As an analogy, the three IMF proposed sources of FOREX (exports, oil export and sum of Bank for International Settlements (BIS) deposit and loan (all expressed as a ratio of GDP)) can be questioned on the following grounds. (i) Not all African countries are oil-endowed. Countries like South Africa, Liberia, Kenya, and Togo among others, have no oil export. As an improvement to this measure, natural resource rent is proposed⁸. This is considered as a more generic source of FOREX. (ii) While

⁵ Financial integration is a difficult concept to measure. It should be noted that there are different measures or indices of financial integration, however, the index provided by Lane and Milesi-Ferretti (2006) has been adjudged to be a better measurement.

⁶ See the Appendix for a list of selected countries.

⁷ See Yinusa and Akinlo (2008a), Imam (2009), Erasmus et al. (2009), Kessy (2011), for more narratives.

⁸ The World Bank classifies natural resources into four groups: Oil, forest, mineral, and natural gas. Due to lack of data, resources such as diamond were not captured in the computation of mineral sub-components. Hence, countries like Botswana with huge deposits of diamonds would have a low level of mineral rent because their bulk of endowments were not considered. To the best of our knowledge, the World Bank's classification has the most comprehensive dataset. In the context of this study, total natural rent, defined as the summation of these classifications, is used.

acknowledging that the BIS's deposit and loan serve as proxies for the source of FOREX, there would be a problem of multicollinearity in the baseline equation. This is premised on the fact that whatever the measure of the FD adopted, it would be highly correlated with BIS loans and deposits. (iii) There could also be multicollinearity between exports and oil export. Unlike Kessy (2011) who ignored the growing importance of remittances in his computation of foreign capital flows, we considered a holistic approach to measuring this variable- through the adoption of Lane and Milesi-Ferretti (2006) database.

This study is significant to SSA because of the following reasons: (i) an in-depth understanding of the nature of FD would be unraveled; (ii) even though it is widely acclaimed that the region is macro-economically unstable, this study would shed light on whether the increasing level of FD is being driven by this instability and (iii) policy prescriptions would be derived from the empirical results.

Following this introductory section, the rest of this study is structured as follows. Section two sheds light on some important conceptual issues and presents some stylized facts about the evolution of FD on global, regional and country-specific bases. Section three engages the extant literature. Methodological related issues are presented in Section four. The empirical results are discussed in Section five, while Section Six concludes with policy recommendations and suggestions for future research.

2. Background to the study

This section aims to dwell on the presentation of some stylized facts about the evolution of both FD and access to sources of FOREX in SSA. This is to help gather some background information of the region using these variables. Based on the foregoing, discussion in this section would be bifurcated into two phases. In the first phase, statistics of FD would be presented based on global, regional and country-specific cases. The second phase would give an overview of the three identified sources of FOREX.

Table 1 below shows the level of FD from a global perspective. Based on a 30% threshold, it could be established that the world is dollarized (see Footnote 3). It is equally observed that across the regions, with the exception of SSA, loan FD has a lower magnitude as compared with the deposit magnitude. The reason adduced for this cannot be unrelated to the fact that the region is considered to be capital starved,

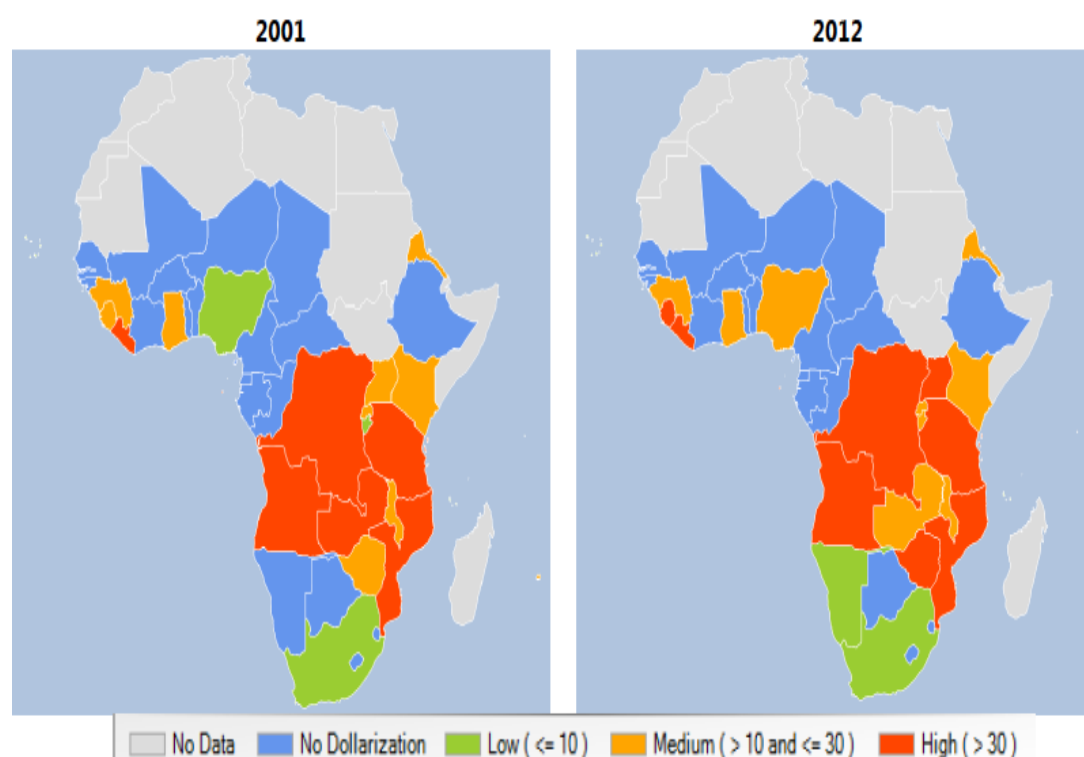
hence the need to rely on external financial inflow, which is usually financed via foreign currency. It is also correct to state that the region is the most dollarized in the world. Next on the ladder is Latin America and the Caribbean. The high level of FD could be explained by the fact that some Latin American countries such as Argentina, Bolivia, El-Salvador, Ecuador, and Peru have given-up their national currencies for the adoption of the USD. Coincidentally, this region was the first to have considered dollarization as a solution to its macroeconomic fundamentals. The foreign direct investment drive in India and China is a contributory factor for mild level of FD in the region.

Table 1: Global trends of Financial Dollarization

Region	Deposit FX	Loan FX
SSA	29.6	30.5
Latin America and Caribbean	28.2	25.1
East & South Asia and the Pacific	19.5	18.95
Middle East and North Africa	15.6	12.3
Average	29.1	27

Authors' computation with underlying data from IFS and IMF (2015)

Figure 1: Pictorial Analysis of Dollarization in SSA



Source: IMF (2015)

Figure 1 above shows the pictorial overview of dollarization in SSA, Table 2 presents the trend of FD in the selected SSA countries. It could be inferred from the table that

the top-three dollarized economies in SSA are the Democratic Republic of Congo (DRC), Liberia and Angola. Going by the threshold of IMF (2015), other countries that can equally be classified as highly dollarized economies are Sierra Leone, Tanzania, Mozambique, Zambia and Ghana. The moderately dollarized economies are Uganda, Eritrea, Kenya and Malawi. The remaining countries are classified as low dollarized economies. It is also interesting to point out that for the period 2009-2012, with the exceptions of the DRC, Djibouti, Kenya and Sierra Leone, SSA as a region recorded a decline in the use of foreign currency (ies) domestically. The attendant effect of the global financial crisis in 2007/2008 might account for the dwindling use of the foreign currency.

The literature has identified that among the chief causes of dollarization is misalignment in macroeconomic fundamentals. Among the macroeconomic fundamentals are inflation, high exchange rate volatility, and interest rate, among others. Starting with the top three dollarized economies, statistics have shown that there is relative high inflation rate in these economies. For instance, the average inflation rates (2001-2012) for Angola, and Congo, are 43% and 42%, respectively. As regards volatility of exchange rate, Angola and the DRC, recorded 21% and 247%, respectively. Extending our investigation into low dollarized economies, we can state that the SSA dataset validates the argument in the literature as regards the importance of macroeconomic stability in the dollarization discourse. However, it is surprising to infer that these causes of macroeconomic instability are not valid using the Liberian dataset. Hence, there must be some specific factors behind this incidence.

Table 2: Country-Specific Background of Financial Dollarization in SSA

Country	2001-04	2005-08	2009-12	2001-2012
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	1	1.41
Congo, DR	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	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	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

Source: Authors' Computation

An attempt is being made to extend the literature to capture some perceived important determinants such as the proxy for financial integration. Data obtained from the wealth of nations (see Lanes and Milesi-Ferreti, 2006) show that liberalized financial sectors account for the seemingly high dollarization. Specifically, considering the period of investigation (i.e 2001 - 2012), Angola recorded about \$700 million worth of financial transactions, the DRC (\$180 million); Tanzania (\$208 million); Zambia (\$218 million) and Ghana (\$214 million), although some low dollarized economies still recorded high capital mobility. A likely justification for countries such as South Africa, Nigeria to have high capital mobility might be: (i) their large market sizes and (ii) resource rent they generate.

Theory is not explicit on the relationship between dollarization and foreign reserves. However, historical data has suggested that there is a positive relationship between these variables. Hence, when reserve is high, dollarization might also be high. Drawing inferences from the Nigerian experience (especially around mid 2015 to early 2016), with the dwindling reserves, financial institutions are barred from accepting foreign currencies as deposits from their customers. Based on the scope of this study, data has also revealed that there is a positive relationship between international reserves and the dollarization index. See Table 3 for more details.

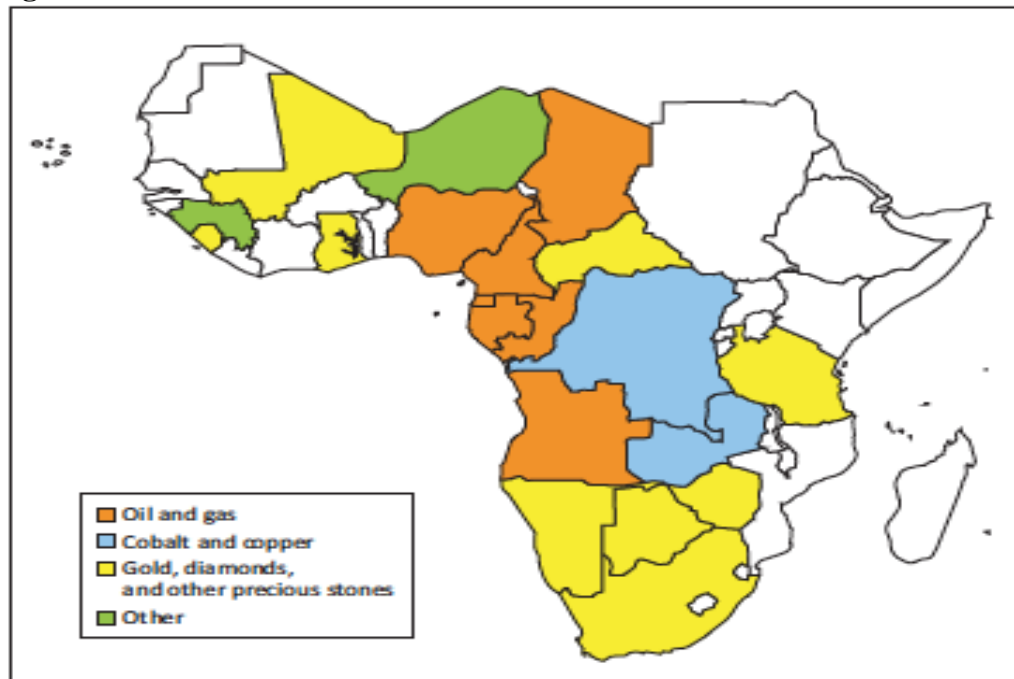
Table 3: Financial Dollarization and selected macroeconomic variables

Country	Fin Dol	Inflation	ExrVola	Reserves	Fin Int
Angola	64.5	43.01	21.58	11.6	700.99
Botswana	22.3	8.47	0.92	7.35	188.68
Burundi	11.4	10.03	161.01	0.18	21.10
Cape Verde	6.43	2.63	14.07	0.25	26.38
Comoros	1.4	3.43	67.26	0.17	5.96
Congo, DR	83.3	42.65	247.65	0.52	179.97
Djibouti	56.7	3.78	2.88	0.15	22.01
Eritrea	17.8		1.29	0.06	19.76
Ghana	29.6	15.68	0.34	2.54	214.54
Guinea	24.8	15.52	1823.67	0.11	62.37
Kenya	16.2	10.54	5.98	2.81	218.66
Liberia	80.8	10.29	7.63	0.19	79.30
Malawi	17.9	12.43	47.16	0.18	36.97
Mauritius	16.8	5.72	1.58	1.78	3,494.7
Mozambique	42.1	9.98	3.68	1.53	160.13
Namibia	1.2	6.20	1.17	0.95	148.36
Nigeria	10.75	12.67	15.07	31.51	1,808.13
Rwanda	24.5	7.34	48.71	0.54	33.18
Sao Tome	55.1	15.76	3843.71	0.04	5.73
Seychelles	15.8	7.93	3.54	0.13	33.79
Sierra Leone	30.7	12.61	798.60	0.34	26.30
South Africa	1.25	5.90	1.68	24.45	4,920.21
Tanzania	37.8	8.09	222.45	2.68	208.66
Uganda	27.8	8.13	288.7	1.98	135.413
Zambia	43.0	14.02	0.558	1.18	213.08

Source: Authors' Computation. Note Fin Dol is financial dollarization, ExrVola is exchange rate volatility, and Fin Int is a proxy for financial integration.

There is no denying the fact that SSA is endowed with diverse natural resources and these resources account for a considerable share of GDP. A country is considered to be resource-rich if: (i) export of natural resources accounts for one-fourth of the total export and (ii) if natural resource rent accounts for more than 30% of its GDP (Lundgren et al., 2013). Also, the second condition above is likened to natural resource dependence.

Figure 2: Natural Resource Distribution in SSA

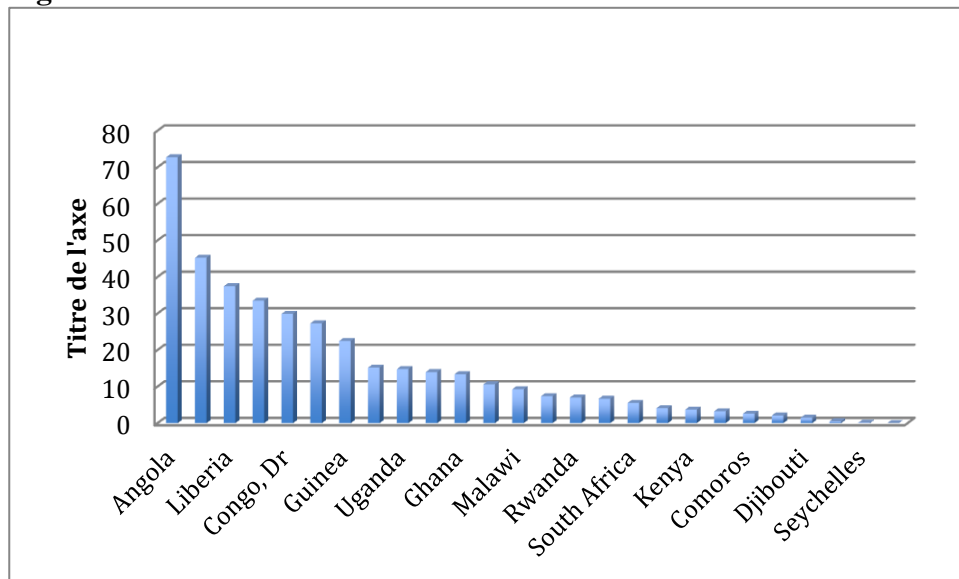


Source: Lundgren et al. (2013).

Figure 2 shows the distribution of non-renewable natural resources in SSA. The figure depicts that the major natural resources of the region are: oil, gas, gold and diamond. Figure 3 shows the intensity of natural resource dependence within the region.

The identified resource-rich countries are Angola, Liberia, Nigeria and Burundi. There is the need to extend the threshold set by Lundgren et al. (2013) to account for mild/moderately-dollarized economies. As such, countries with resource rents of between 21-29% of GDP are classified as moderately resource-rich, while those with below 20% are low resource-rich countries. The point to note here is that moderate- and high resource-rich countries coincidentally have high degrees of FD. Hence this serves as the first pointer to the fact that access to FOREX fuels FD.

Figure 3: Natural Resource Rent as a Ratio of GDP



Source: Authors' Computation.

Table 4 shows the remaining proxies for sources of FOREX. Panel A shows financial inflows into SSA, while Panel B shows export earnings of the selected countries. It is acknowledged that there could be a problem of multicollinearity between export and natural resource rent. This is premised on the fact that most countries in SSA are import-dependent and only export primary raw materials. Hence, natural resources, including but not limited to agricultural product, would form the principal component of their exports. The inclusion of exports is to serve as robustness checks to the empirical results. The following points could be drawn from Table 4.

- The financially liberalized economies include South Africa, Mauritania, Nigeria, Angola, Tanzania, Mozambique, Zambia and the DRC.
- These countries, excluding South Africa have high degrees of FD.
- Countries such as Tanzania, Zambia, the DRC, Ghana, Angola have high degrees of trade liberalization, going by their export proceeds. Also, these countries have high degrees of FD.

Table 4: Other sources of FOREX

Country	PANEL A				PANEL B			
	Financial Integration				Export			
	2001-04	2005-08	2009-12	2001-2012	2001-04	2005-08	2009-12	2001-2012
Angola	89083.59	108,907	165,029	363,020	38778.53	157522.71	232816.65	232,816.65
Botswana	13278.91	14,857	20,506	48,642	16225.30	20509.14	26238.11	26,238.11
Burundi	5229.77	6,365	4,599	16,194	192.01	431.37	762.27	762.27
Cape Verde	3595.72	6,123	9,813	19,532	913.04	2125.77	2779.37	2,779.37
Comoros	1150.33	1,394	1,322	3,866	201.26	262.84	352.09	352.09
Congo, DR	50147.16	56,399	48,640	155,186	6001.04	19858.26	32812.14	32,812.14
Djibouti	1689.26	3,477	6,735	11,901	945.22	1266.74	1697.39	1697.39
Eritrea	3930.47	5,456	14,190	23,577	642.02	678.45	678.45	678.45
Ghana	38897.49	41,274	86,479	166,650	11568.20	22092.84	48506.13	48,506.13
Guinea	13924.21	16,290	21,779	51,993	3186.79	4722.28	6252.29	6252.29
Kenya	32164.53	41,576	57,920	131,660	14119.53	26641.35	37300.13	37,300.13
Liberia	24956.12	28,498	22,707	76,161	1268.73	2137.58	3391.56	3391.56
Malawi	13892.76	8,432	8,662	30,987	2135.15	3296.00	5592.80	5592.80
Mauritius	9305.68	31,199	1,202,673	1,243,178	12427.13	17127.47	21017.09	21,017.09
Mozambique	29537.55	38,514	54,341	122,393	5232.08	10933.76	14506.43	14,506.43
Namibia	15188.01	21,426	33,502	70,116	6743.73	12870.72	19213.58	19,213.58
Nigeria	244913.47	290,689	428,708	964,311	103333.55	271703.29	337203.51	337,203.51
Rwanda	7076.52	4,780	8,380	20,236	621.82	1561.13	3147.90	3,147.90
Sao Tome	1421.53	1,394	1,622	4,437	57.30	63.70	103.03	103.03
Seychelles	5939.91	11,508	10,157	27,606	2305.12	3639.47	3570.25	3,570.25
Sierra Leone	6598.31	6,103	8,213	20,915	571.69	1235.29	2689.03	2689.03
South Africa	423294.30	885,784	1,357,626	2,666,704	177915.41	334776.60	420840.13	420,840.13
Tanzania	43078.86	45,962	71,697	160,738	8450.28	16097.20	27465.39	27,465.39
Uganda	23265.03	25,728	44,981	93,974	3353.31	8629.76	16011.53	16,011.53
Zambia	45590.40	42,772	62,847	151,209	5487.12	16737.07	31200.36	31,200.36

Source: Authors' Computation with underlining data from WDI, UNCTAD and Milesi-Ferreti (2006)

3.0 Literature Review

Unlike other issues in macroeconomics, studies on FD have revealed two distinctive and interesting features. The first relates to the geography of coverage. As earlier stated in the introductory section, the concept of FD first gained prominence in Latin America. This was essentially because of the increasing rate at which studies directed attention towards understanding the nature, causes and effects of financial crises in countries of the region.

The second interesting feature is due to the fact the core objective has been to determine the factors that influence FD. In essence, studies have focused mainly on

estimating a money demand equation. This is in sharp contrast with other topics in macroeconomics, as each topic has got different policy objectives and thus has refrained from estimating one “broad” type of baseline equation.

An overview of the FD literature has shown that studies have towed four main lines of scientific enquiry.

- Price movement and its effect on store of value
- Relative rate of return on portfolio
- Institutions and policy credibility
- The consequences of FD on financial deepening

3.1 Price movement and its effect in store of value

The main focus of this argument is how inflation and exchange rate affect the dynamics of FD in an economy. Mundell (1963) was the first to assert that demand for money (denominated in either local/foreign currencies) is a function of exchange rate, interest rate and income. The case where an environment is characterized by unstable macroeconomic policies (such as inflation and volatility of exchange rate, among other) serves as incentives for economic agents to want to edge against any potential risk, hence diversify their portfolio to capture the presence/utilization of foreign currencies.

Studies prior to Arango and Nadiri (1989) have focused on modeling the demand for money by ignoring the influence of international/foreign monetary developments⁹. Arango and Nadiri’s paper is considered as one of the first sets of studies to account for the role of foreign market interventions. Relying on a simplified portfolio model and focusing on Canada, United Kingdom, the United States and Germany, their results, among other findings, show that changes in foreign interest rate and exchange rate expectations play a vital role in the decision of substitution between domestic and foreign assets. Bordo and Choudhiri (1982) following the argument of the above study focused on Canada and found that the most important determinant of demand for foreign currency is ‘expected exchange rate depreciation’.

Using Thailand as a case study, Bahmani-Oskooee and Techaratanachai (2001) found that exchange rate depreciation is the cause of currency substitution. This is due to the fact that as currency depreciates, broad money supply in circulation

⁹ See Goldfeld (1973) for a survey of traditional demand for money.

reduces. Similarly, Kaplan et al. (2008), applying the Johansen and Juselius co-integration method using Turkish dataset, found the existence of a long-run co-integrating relationship among variables in the model. It was concluded that the positive coefficient on exchange rate implies currency substitution. However, Akinlo (2003) whose study centers on determining the consequences of exchange rate depreciation on FD, found that depreciation of the local currency does not cause FD, rather the holders of foreign currencies see depreciation in terms of increasing wealth. Ize and Levy-Yeyati (2003 and 2005) highlight the importance of exchange rate and inflation volatility. In their results, it was established that dollarization is likely to persist as long as inflation volatility remains high in relation to real exchange rate volatility. This stance is also obtainable in low inflationary pressure environments.

Arteta (2002) focused on developing and transition economies to examine the effect of exchange rate regime on the level of financial dollarization. It is widely argued that flexible exchange rate regimes encourage banks to match dollar-denominated liabilities with a corresponding amount of dollar-denominated assets, ameliorating currency mismatches. The results have it that flexible regime exacerbate currency mismatch and also encourages deposit dollarization more than credit dollarization. Levy-Yeyati and Sturzenegger (2005) estimated that a fixed exchange rate regime fuels deposit dollarization. Arteta (2003) and Weymouth (2011) through their results, found that flexible exchange rate increases the level of deposit dollarization. These results were however conditioned upon the existence of a relative stable exchange rate. Contrary to these views, Honig (2009) and Berkmen and Cavallo (2010) in their respective papers have empirically invalidated the claim that an exchange rate regime has deterministic power on the level of dollarization.

3.2 Relative Rate of Return

The decision to switch between local and foreign currencies is purely a business decision and is predicated on the interest rate differential between two economies. Essentially, if the foreign currency has a higher interest rate, there would be an increase in the demand for that currency which does leads to depreciation of the domestic currency. Thus, both interest rate spread and exchange rate volatility are inter-related, which supports the view of uncovered interest rate parity.

Sahay and Vegh (1996) stated that FD positively responds to the real interest rate differentials between domestic and foreign denominated assets. It was also

further suggested that inflation has an indirect effect on FD. Specifically, it was hypothesized that a fall in inflation would only affect FD only if inflation first has an effect on real interest rate. Savastano (1996) focused on the pattern of dollarization in five Latin American countries for the period 1970-1993. He posits that FD is attributed to an incidence of macroeconomic instability, institutional quality as well as a high interest rate spread between domestic and foreign economies. Chief of the three factors is the role of the wide interest rate spread for the region. Basso et al. (2011) suggest that wider interest rate differentials on loans have a positive impact on loan dollarization, while the inverse is the case for deposit dollarization.

Licandro and Licandro (2003) state that the interest rate ceiling is unable to fizzle out the inflationary pressure and the absence of inflation index asset would force domestic residents to resort to convert the composition of their assets to foreign-denominated. Results of Kessy (2011) suggest that a percentage point increase in the expected rate of return would, in the long run, lead to about 6percent increase in the dollar deposit.

Even though Sahay and Vegh (1996) were among the first set of studies to have identified the importance of the interest rate spread, they however concluded that the variable is more pronounced in Eastern Europe than in Latin America. Balino et al. (1999) held a similar view. Several rejoinders have been made to the claim above. For instance, Arteta (2002) concluded that the explanatory power of interest rate spread is poor. Civcir (2003) proclaims that there are exceptions to the positive linkage between high real rate of return and the composition of assets. Also, Catao and Terrones (2000) argue that interest rate plays a dual role. In the first role for low or semi-dollarized economies, increase in the external interest rate would induce local economic agents to switch allegiance to the use of foreign portfolios. On the other hand, decline in the foreign interest rate would serve as attraction for financial intermediaries to seek for cheap sources of credit abroad and in turn; advance foreign denominated credit to their local clients, in a bid to hedge against any potential devaluation. Hence, the exact effect of interest rate is mixed.

3.3 Institutional Factors and Credible Policy Stance

In the dollarization process, there are ample reasons to assume that institutions have some fundamental roles to play. Among early proponents of this debacle include Savastano (1992) who showed that the quality of institutions has strong influences on

the variables that lead to the dollarization process. The main argument here lies on the credibility of government policies. A weak institutional level would send signals to economic agents about unreliability of government policies Levy-Yeyati (2006). It has also been realized that enforcement of contract might be problematic due to poor form of governance. The reckless behavior of the executive arm of governance who in a bid to finance deficit and create short-term output growth, resort to printing of new currencies, which thus exert inflationary pressure on the economy and hence, leads to dollarization (Honig, 2005; Aizenman et al., 2005 and Doblaz-Madrid, 2009). Also, Calvo and Mishkin (2003) state that loss of banks' balance sheet, courtesy of poor supervisory role of the monetary authorities, makes it costly for monetary authorities to curtail inflation by increasing interest rate. The collapse of monetary regime could also be a driving force for dollarization (Ize and Parrado, 2002). In the eventual case of banking crisis, investors would be weary of the commitment of government to bail out the debtors in the event of devaluation and further compounds to the mispricing associated with government guarantees (DeNicolo et al., 2003).

Honig (2009) used a dataset of 66 selected countries to argue that even in the face of low inflationary pressure and controlled exchange rate volatility, lack of trust in government about her ability to adopt policies that would ensure long-term stability and credibility of the currency would lead to dollarization. Weymouth (2011) proxied institutions with *veto player*, a check on the policymakers' decision on property right. Based on the underpinning argument about *veto players*¹⁰, the larger the number of players in the settings, the lower would be the rate of dollarization in such an economy. De Nicolo et al. (2005) suggest that shifting from a highly restrictive to a completely unrestricted or liberal political system increases uncertainty and risk, and induces shifts in agent portfolios in favor of foreign assets. Jeanne (2003) and Calvo and Guidotti (1989) analyzed how lack of monetary credibility increases the rate of growth of FD.

In an interesting article, Neanidis and Savva (2013) claimed that there are two direct linkages between institutions and dollarization in the accession of Europe: confidence instilled in economic agents and the high rate of convergence of exchange rates to the euro due to the adoption of common currency. Unlike extant literature that

¹⁰ It is assumed that veto players consist of representatives of diverse group and stakeholders in a country. To reach a decision, the interests of these diverse groups must have been accounted for. Hence, opportunistic decision by certain groups would be rejected.

has listed the direct causes of FD to (i) inflation and exchange rate/ exchange rate regime; (ii) interest rate spread; (iii) institutions; and (iv) minimum variance portfolio, Neanidis and Savva (2013) showed that institutions are indirectly related to the four identified causes above. It was concluded that institutions have significant coefficients for both deposit and credit dollarization.

Despite the general agreement about the importance of institutions in explaining FD, the major weakness of this strand of literature is its inability to be explicit about what part of institutions and why is it important. Rather, studies are more concerned with the correlation coefficients (Weymouth, 2011).

3.4 Financial Development

The concept dollarization was changed to financial dollarization when it was noticed that the financial sectors have a great share in the cause of dollarization. There are several ways in which the financial sector is linked to dollarization. Among the debate include the misallocation effect: a situation in which the banks would want to hedge against risk and thus match their liabilities with assets. This being the case the bulk of the risk is now transferred to the holders of their assets. If a significant share of deposit and credit is foreign currency-denominated, this might pose a risk for the stability of the sector. Hence, it is accentuated that among the causes of financial instability is the increasing level of dollarization. In a similar view, the level of development of the financial sector has a lot to say about the ability of the sector to withstand exogenous shocks created by the increasing activities of foreign currency (De Nicolo et al., 2003; Levy-Yeyati, 2006).

In an interesting study by Honohan and Shi (2002), it was revealed that a high level of dollarization enhances further deepening of the financial sector. Though the results are only obtainable in inflationary economies, De Nicolo et al. (2003) reached a similar conclusion to that of Honohan and Shi (2002). In addition to that, it was stated that the cause of financial instability could equally be attributed to dollarization. Asel (2010) argued that there is a positive correlation between loan dollarization and private credit. It was further enunciated that the lower the level of financial development, the higher would be the rate of dollarization. Levy-Yeyati (2006) used the balance sheet effect of banks to contribute to the debate. Barajas and Morales (2003) towed the argument of Levy-Yeyati (2006) to establish that liability dollarization of banks causes financial and/or banking crisis through the exposures of

private and public balance sheets to exchange rate volatility. They further argued that the three major causes of FD are financial development, macro-related and banking-related explanations. Presence of foreign banks could enhance the degree of currency and asset substitutability. IMF (2005) confirmed this position using Ukrainian data.

Despite the dichotomy in the strands identified in the finance-FD nexus, two common conclusions are reached: first, there is a positive correlation between FD and proxies of financial development. Second, the exact effect of the relationship between these variables is dependent upon inflation.

4.0 Model Specification, Methodology and Data

In this section, discussion would center on three basic forms of argument. In the first form, emphasis would be laid on specifying an estimable equation, drawing inferences from previous studies. Next to this would be methodological related issues. In this case, an elaborate explanation on the choice of our estimation technique would be presented. The last sub-section would attempt to explicit on the scope of the study as well as the data sources.

4.1 Model Specification

Dollarization literature is huge and growing. As earlier indicated above, the literature can be decomposed into four levels. Hence, it might seem impossible to formulate a model that would completely capture issues surrounding dollarization. Taking a cue from Levy-Yeyati (2006), Ize (2013), Kessy (2011), IMF (2015), and since the aim of this study is to expand on the perceived important determinants of dollarization; the model is specified in the form below:

$$FD_{it} = \alpha RETURNS_{it} + \beta ACCESS_{it} + \delta CONTROLS_{it} + \theta_t + \rho_i + \varepsilon_{it} , (1)$$

where, FD is a proxy for dollarization (foreign currency deposit as a ratio of broad money supply). RETURNS is a vector that captures differences between the rate of returns of both domestic and foreign currencies. This focuses specifically on the portfolio approach to dollarization. The proxies used are interest rate differentials between domestic and foreign currencies (INT), exchange rate volatility (SEXR), inflation (INF), and exchange rate depreciation (DEP). ACCESS is the main variable of interest for this study. It is a vector that captures the relative ease to which foreign

currencies are domestically available. The proxies include resource rent (NAT), trade openness, (TRA) and degree of financial integration (FINT). CONTROLS are some perceived variables that have been validated to be good determinants of dollarization. In this study, they include a measure of institutions (INST)¹¹, financial development (FIN) and GDP per capita growth (GDP), international reserves (RES). θ and ρ capture time and country-specific effects, respectively, while ε is the independently and identically distributed (iid) error term component¹².

4.2 Methodology

Econometrics provides numerous empirical tools in testing the relationship among economic variables. Each tool has its merits and demerits. This is to say that no “one cap fits all”. The early literature and elementary econometrics have adjudged Ordinary Least Squares (OLS) as the best estimator based on its “BLUE” properties. This is in addition to its simplistic form of usage. Despite the accolades, among others, OLS has been criticized based on its inability to account for endogeneity related issues such as reverse causality, measurement error and omitted variable bias. Another problem of OLS relates to its nature to break down when censored data is used¹³. A censored variable is said to occur when the range of the value of the dependent variable is limited for some reasons such as: (i) due to the way the data is constructed (using dollarization as an illustration, the limit of the variable is any value less than 100¹⁴); (ii) it could also be a case in which such a variable cannot be captured by dummies; (iii) when a significant proportion of the observation of the data is exactly the value of the limit and (iv) if there is a possibility of having a

¹¹The proxy used is collected from World Governance Indicators of Kauffmann et al. (1999). Essentially, they provided six indicators, which are Control of Corruption, Rule of Law, Voice and Accountability, Government Effectiveness, Regulatory Quality and Political Stability. The variation among these indices would be very minimal; this is just as there is high correlation among the indices. The solution to these problems would be to drop some series, which would lead to loss of information. A better solution is to aggregate the indices into an index using principal component analysis. (Asongu and Nwachukwu, 2016a and b; and Ajide and Raheem, 2016).

¹²See Appendix for variable definition, measurement and a priori expectations.

¹³This problem is more peculiar in a situation in which the dependent variable is censored. As such, it is less severe for independent variables.

¹⁴This is due to the fact that 100 FD index implies full dollarization, implying that such a country is adopting a foreign currency as its official currency. In such a situation, this type of scientific enquiries would be void. Rather, the objective of such an enquiry would be to determine the factors affecting money supply in the economy.

negative value for the dependent variable (Long, 1997; Green, 2002; Kennedy 2003 and Wooldridge, 2003).

To this end, effort has been channeled to solving this problem. The first attempt was by Tobin (1958) who came up with Tobit regression. Essentially, 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, 2016) is as follows in Eq. (2):

$$y_{i,t}^* = \alpha_0 + \beta X_{i,t} + \varepsilon_{i,t} \quad (2)$$

where $y_{i,t}^*$ is a latent response variable, $X_{i,t}$ is an observed $1 \times k$ vector of explanatory variables and $\varepsilon_{i,t} \approx \text{i.i.d. } N(0, \sigma^2)$ and is independent variable of $X_{i,t}$. Instead of observing $y_{i,t}^*$, we observe $y_{i,t}$ in Eq. (3):

$$y_{i,t} = \begin{cases} y_{i,t}^*, & \text{if } y_{i,t}^* > \gamma \\ 0, & \text{if } y_{i,t}^* \leq \gamma, \end{cases} \quad (3)$$

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 .

We address the concern of endogeneity by controlling for both simultaneity using instrumented variables¹⁵.

4.3 Data

The central focus of this study is limited to 26 countries in SSA. The time frame is between 2001 and 2012. The choice of this scope is limited to data availability. The main data sources are International Financial Statistics of the International Monetary

¹⁵Literature offers two types of instrument: internal and external. Due to the complexity of finding external instruments, we decided to use the former, which entails the usage of lagged differences and lagged levels of the explanatory variables.

Fund, World Governance Indicators (WGI), Lane and Milesi-Ferretti (2006), updated in 2013 and Reinhart and Rogoff (2004).

5.0 Empirical Results

Table 5 presents the descriptive statistics of the variables in the model. The most volatile series, judging by the values of the standard deviation, is exchange rate depreciation. As regards the main variable of interest, trade openness has a mean value of 77%, which is distantly followed by natural resource abundance and the proxy for financial integration. It is important to emphasize that our measure of institutions has a negative mean value. This is due to the way the series is constructed and also based on the fact that the region has poor institutional development level.

Table 5: Descriptive Statistics

Categories	Variable(s)	Mean	StdDev	MIN	MAX
RETURNS	INF	12.205	24.510	-2.404	359.936
	SEXR	2.846	2.604	-1.069	8.256
	DEP	72.202	287.284	-950.998	2290.15
	INT	7.263	6.130	-2.254	47.862
ACCESS	TRA	77.073	37.061	20.964	225.015
	NAT	13.785	20.142	0.004	166.189
	FINT	8.962	1.706	5.811	13.651
CONTROLS	RES	20.125	2.093	11.635	24.693
	GDP	7.428	3.891	4.947	25.881
	FIN	24.448	28.997	0.198	160.129
	INST	-0.069	0.750	-1.599	1.790
DEPENDENT	FINDEX	29.606	23.439	1.03	90.123

Source: Authors' Computation

The results of Equation 1 are presented in Table 6. This section starts by interpreting the key variables of interest (ACCESS) of this study. Financial integration has been an important source of dollarization in SSA. One percent increase in FINT would increase FD by about 2.3%, a coefficient that is significant at the 5% level. This confirms historical data on the post-adoption of SAP (financial liberalization policy) in 1986, an initiative of the IMF, which had led to increase in the level of foreign currency circulation in the domestic economy. It has also been established that trade openness and dollarization are positively related. Essentially, an increase in trade openness by one percent would lead to about 0.13% increase in the level of dollarization in Africa. This conforms to the theoretical dictates. Similarly, IMF (2015) established that a percentage point increase in export earnings would increase

dollarization by 0.10%. A higher coefficient (0.63) was obtained when oil export was used. This implies that economic agents that receive earnings in foreign currency in SSA have a tendency to keep part of their proceeds in foreign currency rather than converting into domestic currency.

Table 6: Main Results
Dependent Variable: Deposit Dollarization

	Variable	1	2	3	4	5	6	7	8
RETURNS	INF	0.347* (0.078)	0.144 (0.031)	0.251* (0.074)	0.091* (0.026)	0.350* (0.075)	0.127* (0.035)	0.329* (0.074)	0.136** (0.061)
	SEXR	0.007** (0.003)	0.054* (0.016)	0.007* (0.003)	0.054* (0.017)	0.006** (0.003)	0.047** (0.021)	0.008** (0.003)	0.062* (0.021)
	DEP	0.000 (0.002)	0.007 (0.004)	-0.001 (0.002)	-0.002 (0.003)	0.0002 (0.002)	0.004 (0.004)	-0.0001 (0.002)	-0.0001 (0.0038)
	INT	0.040 (0.108)	0.012 (0.034)	0.033 (0.104)	0.008 (0.027)	0.042 (0.108)	0.011 (0.029)	0.001 (0.108)	0.0003 (0.035)
CONTROLS	GDP	-1.170* (0.302)	-0.452* (0.135)	-0.700 (0.918)	-0.209 (0.300)	-0.845 (1.017)	-0.266 (0.367)	-1.204 (0.880)	-0.487 (0.513)
	INST	-4.323** (1.881)	-0.030 (0.025)	-5.626* (1.640)	-0.185 (0.015)	-5.221* (1.842)	-0.033 (0.032)	-3.690** (1.860)	-0.036 (0.054)
	FIN	-0.101** (0.046)	- 0.152*** (0.092)	-0.102** (0.048)	-0.126 (0.080)	-0.118** (0.049)	- 0.154*** (0.087)	-0.228* (0.077)	-0.493 (0.806)
	RES	1.639* (0.531)	1.530* (0.509)	1.408* (0.452)	1.093* (0.378)	1.753* (0.523)	1.414** (0.601)	1.228** (0.542)	1.248 (0.948)
ACCESS	TRA			0.125* (0.028)	0.368* (0.098)				
	NAT					-0.023 (0.068)	-0.015 (0.032)		
	FINT							2.293** (0.949)	1.068 (0.963)
DIAGNOSTICS									
	Sigma_u	17.912* (4.015)		18.481* (4.250)		18.756* (4.589)		16.234* (3.927)	
	Sigma_e	4.637* (0.311)		4.396* (0.298)		4.603* (0.314)		4.564* (0.309)	
	Rho	0.937 (0.027)				0.943 (0.028)		0.927 (0.034)	
Left censored	28			38		38			
Uncensored	125			125		125			
Right censored	118			118		118			

Source: Authors' Computation

Note: Values in parenthesis are the standard error statistics. “*”, “**” and “***” imply levels of statistical significance of 1%, 5%, and 10% respectively.

INF is inflation rate, SEXR is exchange rate volatility; DEP is exchange rate depreciation, INT is interest rate differentials between domestic and foreign currency. NAT is resource rent; TRA is trade openness, and FINT is the degree of financial integration. INST measures institutions; FIN is financial development and GDP per capita growth (GDP) and international reserves (RES)

However, the third proxy of access to foreign currency (natural resource rent) seems to have a negative effect, though significant, on dollarization. This is in clear contradiction of this study's hypothesis. Figure four depicts that SSA is endowed with oil, gas, gold and other precious metals. The exploring companies of these resources are foreign-based. Once these resources are explored and exported, the proceeds appear to be remitted to their headquarters. The royalty being paid to the government, in most cases, is usually made through the central banks of the resource-endowed countries. Hence, it can be seen that the proceeds from natural resource rents do not pass through the domestic financial system. Thus, necessitating resource rent not being an important determinant of dollarization.

It is established that inflation is a positive and significant determinant of dollarization in SSA. The coefficients range from 0.091 to 0.350. This result is similar to those in De-Nicole (2005), Yinusa (2009), Vieri et al. (2012) and Ize and Levy-Yeyati (2003). This can be justified using the intuition that high inflationary rate reduces the values of money. It also indicates that higher levels of inflation lead to reallocations in the portfolio of agents. Such agents will tend to sell domestic assets and buy assets denominated in foreign currency. In another related argument, Canzoneri and Diba (1992) concluded that dollarization should be a stabilizing tool in a high inflationary period. Another important determinant of dollarization is exchange rate volatility. The higher the frequency of changes in exchange rate, the higher would be unlikely changes of holding the domestic currency. Across all our regressions, it was found that this variable is positive and significant, whose coefficient ranges between 0.007 and 0.062. Arango and Nadiri (1981) estimated similar coefficients.

In all the models, economic growth is estimated to have a negative coefficient. The interesting part is that models without the inclusion of proxies for ACCESS yield significant results. Higher GDP per capita growth reduces dollarization pressure. These results are analogous to Yinusa (2009) and IMF (2015). Yinusa (2009) stated that a growing and active economy tends to have a strong productive base to support the local currency, hence, put in policies to curtail episodes of dollarization. The obtained results support the notion that good and improved institutional/governance infrastructure serves as a conduit for reducing incidence of FD. The channel through

which governance affects dollarization is through credibility of government policies, enforcement of contract, supervisory role of the monetary authorities among other channels. The list of studies whose results are quite similar includes, but not limited to Ize and Parrado (2002), De Nicolo, et al. (2005), Honig (2005 and 2009), Aizenman et al. (2005), Levy-Yeyati (2006) and Doblas-Madrid (2009).

Furtherance to the above, Tobit estimates confirm the position that improved financial development serves as a good deterrent tool to combat unwanted financial dollarization. Across the estimated models, negative and significant coefficients were obtained. This is in sharp contrast to theoretical expectation. Also, this study's results seem to invalidate existing empirical studies such as Honohan and Shi (2002), De Nicolo et al. (2003) and Asel (2010) among others. A plausible reason for these counter-intuitive results might be due to the poor level of financial development of most countries in our sample. It is a known fact that SSA has a low level of financial development compared to other developing and emerging countries¹⁶. Hence, the channel through which financial development is expected to react on dollarization would be the other way round. However, our result confirms the argument of IMF (2015) who also estimated a negative coefficient and justified the result on the ground that innovations in financial sector products and services would enhance domestic currency savings to be invested within the economy. A positive correlation between international reserves and dollarization was obtained. Hence, during high periods of dollarization, it is safe to assume that the level of international reserves would also be high. These results are consistent with those of Yotopolous (1997).

Three sets of robustness tests were conducted. The first relates to estimating a semi-elasticity of the models. These results are presented in Columns 2, 4, 6 and 8 of Table 6. The second test takes account of endogeneity related issues and thus estimated an IVTOBIT regression. The result of this exercise is presented in Table 7. The third robustness test entails identifying the outliers in the model and thus, eliminating them from the sample. The countries eliminated are Liberia, the DRC, South Africa, Comoros and Namibia. Table 8 presents the results of the smaller sample countries. It can be summarily stated that these results are not too significantly different from the results in Table 6. Hence, our result is robust to different estimation techniques, smaller sample size and semi-elasticity based coefficient measurement.

¹⁶Though, there are few exceptions to this claim. Data sourced from WDI shows that notable examples include, Nigeria, South Africa, Botswana and Egypt

Table 7 Robustness Test with IVTOBIT
Dependent Variable: Deposit Dollarization

	Variable	1	2	3	4
RETURNS	INF	0.332*** (0.189)	0.152 (0.169)	0.281 (0.184)	0.151 (0.175)
	SEXR	0.005** (0.003)	0.006* (0.001)	0.006** (0.003)	0.008* (0.002)
	DEP	0.004 (0.005)	0.005 (0.006)	0.004 (0.005)	0.004 (0.004)
	INT	0.293 (0.341)	-0.270 (0.294)	0.251 (0.392)	0.627** (0.281)
CONTROLS	GDP	-1.558* (0.391)	-1.51* (0.369)	-1.574* (0.502)	-2.232* (0.360)
	INST	-1.048 (1.624)	0.432 (1.840)	0.109 (2.153)	-7.420* (1.820)
	FIN	-0.377* (0.056)	-0.512* (0.070)	-0.359* (0.065)	-0.382* (0.049)
	RES	3.717** (1.597)	-0.847 (2.989)	3.487 (2.423)	6.327* (1.403)
ACCESS	FINT		6.769** (2.640)		0.125* (0.028)
	NAT			0.137 (0.107)	
	TRA				0.253* (0.039)
DIAGNOSTICS					
	Alpha	-1.454 (1.884)	0.378 (3.341)	-1.557 (2.796)	-1.830 (1.525)
	WALD	0.440	0.983	0.577	0.230
	CHI2 (PROB)	0.000	0.000	0.000	0.000
Left cens.	30				
Uncensored	103				
Right cens.	100				

Source: Authors' Computation

Note: Values in parenthesis are the standard error statistics. “*”, “**” and “***” imply levels of statistical significance of 1%, 5%, and 10% respectively.

INF is inflation rate, SEXR is exchange rate volatility; DEP is exchange rate depreciation, INT is interest rate differentials between domestic and foreign currency. NAT is resource rent; TRA is trade openness, and FINT is the degree of financial integration. INST measures institutions; FIN is financial development and GDP per capita growth (GDP) and international reserves (RES)

Table 8: Robustness Test Accounting for Outliers Sub-sample
Dependent Variable: Deposit Dollarization

	Variable	1	2	3	4
RETURNS	INF	0.340* (0.075)	0.255* (0.075)	0.344* (0.075)	0.323* (0.074)
	SEXR	0.005*** (0.003)	0.005** (0.003)	0.005*** (0.003)	0.005*** (0.003)
	DEP	0.0001 (0.002)	0.000006 (0.00203)	0.0002 (0.002)	-0.001 (0.002)
	INT	0.042 (0.109)	0.039 (0.104)	0.046 (0.109)	0.014 (0.107)
CONTROLS	GDP	-1.042*** (0.575)	-1.095** (0.559)	-1.024*** (0.579)	-1.239** (0.563)
	INST	-4.657* (1.653)	-5.603* (1.615)	-4.835* (1.690)	-3.642** (1.696)
	FIN	-0.070 (0.064)	-0.082 (0.061)	-0.074 (0.073)	-0.148** (0.072)
	RES	1.751* (0.504)	1.636* (0.497)	1.790* (0.511)	1.318** (0.539)
ACCESS	TRA		0.116* (0.032)		0.125* (0.028)
	NAT			-0.035 (0.068)	
	TRA				1.738** (0.860)
DIAGNOSTICS					
	Sigma_u	10.293* (2.294)	9.923* (2.276)	10.346* (2.328)	10.007* (2.207)
	Sigma_e	4.630* (0.312)	4.422* (0.200)	4.618* (0.312)	4.561* (0.307)
	Rho	0.831 (0.639)	0.834 (0.065)	0.834 (0.064)	0.828 (0.307)
	CHI2 (PROB)	0.000	0.000	0.000	0.000
Left cens.	2				
Uncensored	125				
Right cens.	94				

Source: Authors' Computation

Note: Values in parenthesis are the standard error statistics. “*”, “**” and “***” imply levels of statistical significance of 1%, 5%, and 10% respectively.

INF is inflation rate, SEXR is exchange rate volatility; DEP is exchange rate depreciation, INT is interest rate differentials between domestic and foreign currency. NAT is resource rent; TRA is trade openness, and FINT is the degree of financial integration. INST measures institutions; FIN is financial development and GDP per capita growth (GDP) and international reserves (RES).

6.0 Conclusions, Policy Implications and Suggestions for Future Research

This study has explored and extended the determinants of dollarization. Although the literature has a long list of some perceived important determinants of dollarization,

this study was able to identify some important determinants that are not too popular in the literature. Basically, these hypothesized important determinants are natural resource rent, financial liberalization and trade openness. These three variables are tagged “ACCESS”. This is premised on the fact that the more people have access to foreign currency, the more economic agents use foreign currency for transactionary purposes. The focus of this study was limited to 26 SSA countries for the period 2001 – 2012. The choice of this scope was due to data availability and limited number of studies on dollarization in Africa. The value addition of this study to the literature is based on (i) the scope of the study and (ii) the expansion of the model to account for ACCESS.

Our results show that both trade openness and financial integration are positive and significant determinants of dollarization in SSA, while the direct opposite is the case of natural resource rent. The inability of natural resource rent was justified by the notion that the proceeds from the export of the resources are not channeled through the domestic financial system. Other important determinants include inflation, exchange rate volatility, institutions and financial development. These results are robust to different specifications.

Even though this study was unable to determine that dollarization is a bad omen for a country, emphasis should be placed on reducing the incidence of dollarization¹⁷. This might be due, at least using the Latin America experiences, to the fact that dollarization is usually caused/induced by macroeconomic instability and policy credibility of the government, which are orchestrated by weak domestic macroeconomic imbalance, epically though inflation and exchange rate volatility. The most effective tool to reduce dollarization is through the adoption of policies that would seek to restore the strained confidence in the domestic currency, in particular and macroeconomic stability, in general.

Among the mechanisms that can help achieve this laudable policy stance is the design of policies that would seek to improve the level of governance/institutions, financial development and economic growth. In the same line of reasoning, SSA countries should be open to the rest of the world in terms of financial and trade services. In continuance, inflation and exchange rate volatility should be reduced, as

¹⁷ On the one hand, this is due to the fact that this (an enquiry into the net effect of dollarization) does not fall within the objective of the study. On the other hand, no study, we are aware of, has been able to categorically find the net effect of dollarization. Studies that have concluded that the net effect of dollarization is difficult to estimate include Eichengreen (2000 and 2001) and Karras (2002).

excessive levels of inflation increase and encourage the use of foreign currency within the domestic economy.

It is erroneous to assume that inflation, at all levels is bad for the economy. Some level (low) of inflation might still be consistent and help in achieving the aim of some macroeconomic and monetary policies, among which is the reduction of dollarization. Hence, future studies should try to obtain the optimal level of inflation, which would be consistent with the aim of reducing dollarization, among others. This study was unable to examine the effect of exchange regime on dollarization. The importance of exchange rate regime on the dollarization process cannot be underestimated. As such, future studies should channel efforts to unraveling this important factor.

References

- Aizenman, J., K. Kletzer, and Pinto, B., (2005). Sargent-Wallace Meets Krugman-Flood Garber, or: Why Sovereign Debt Swaps do not Avert Macroeconomic Crises, *The Economic Journal*, 115(2), 343-367.
- Ajide, K, and Raheem, I.D (2016). Institutions-FDI Nexus in ECOWAS Countries, *Journal of African Business*, 17(3), 319-341.
- Akinlo, A. E. (2003). Exchange Rate Depreciation and Currency Substitution in Nigeria, *African Review of Money, Finance and Banking*, 16(1), 139-143.
- Arango, S. and Nadiri, M., (1981)' Demand for Money in Open Economies. *Journal of Monetary Economics*, 7(1), 69-83.
- Arteta, C. (2002). Exchange Rate Regimes and Financial Dollarization: Does Flexibility Reduce Bank Currency Mismatches?, International Financial Discussion Paper, No.738, Board of Governors of the Federal Reserve System. Washington.
- Arteta, C., (2003). Are Financially Dollarized Countries More Prone to Costly Crises? International Finance Discussion Papers 763. Board of Governors of the Federal Reserve System. Washington.
- Asel, I. (2010). Financial Sector Development and Dollarization in the Economies of Central Asia, Final Report for Grant No. PPC IX-69. Global Development Network Regional Research, Global Development Network, Washington.
- Asongu, S. A., and Le Roux S. (2016) Enhancing ICT for Inclusive Human Development in Sub-Saharan Africa, *African Governance and Development Institute Working Paper* No. 16/029, Yaoundé.
- Asongu, S. A., and Nwachukwu, J. C., (2016a). Revolution empirics: Predicting the Arab Spring, *Empirical Economics*, 51(2), 439-482.
- Asongu, S. A., and Nwachukwu, J. C., (2016b). Mobile phones in the diffusion of knowledge for institutional quality in Sub-Saharan Africa, *World Development*, 86(October), 133-147.
- Balino, T., Bennett A., and Borensztein E. (1999). Monetary Policy in Dollarized Economies, IMF Occasional Paper, No. 171, Washington.
- Basso, H. S., Calvo-Gonzalez, O. and Jurgilas, M. (2011). Financial Dollarization: The Role of Foreign-Owned Banks and Interest Rates, *Journal of Banking and Finance*, 35(4), 794-806.
- Berkmen, P., Cavallo, E., (2010). Exchange rate policy and liability dollarization: what do the data reveal about causality? *Review of International Economics*, 1 (5), 781-795.
- Bordo, M. and Choudhri, E. (1982). Currency Substitution and Demand for Money: Some Evidence from Canada, *Journal of Money, Credit and Banking*, 14(1), 48-57.

- Calvo, G. A. and Guidotti, P., (1989), “Credibility and Nominal Debt: Exploring the Role of Maturity in Managing Inflation,” IMF Working Paper 89/73 (Washington: International Monetary Fund).
- Calvo, G.A. and Vegh, C.A. (1992). Currency Substitution in Developing Countries. *Revista de Analisis Economica*, 7, 3-27.
- Calvo, G., and Mishkin, F., (2003). The mirage of exchange rate regimes for emerging market countries. *Journal of Economic Perspectives*, 17 (4), 98–120.
- Canzoneri, M., and Diba, B. (1992). The inflation discipline of currency substitution. *European Economic Review*, 36(4), 827–845.
- Carson, R. T. and Sun, Y. (2007) The Tobit model with a non-zero threshold”, *Econometrics Journal*, 10(3), 488-502.
- Catao, L. and M. Terrones (2000). Determinants of Dollarization: The Banking Side, IMF Working Paper, No.146, Washington.
- Civcir, I (2003). Money demand, financial liberalization and currency substitution in Turkey, *Journal of Economic Studies*, 30(5), 514-534.
- De Nicolò, Gianni, Honohan, P. and Ize. A. (2003), “Dollarization of the Banking System: Good or Bad?” *IMF Working Paper* 03/146, International Monetary Fund, Washington.
- De Nicoló, G., Honohan, P., and Ize, A., (2005). Dollarization of bank deposits: causes and consequences. *Journal of Banking and Finance*, 29(7), 1697–1727.
- Doblas-Madrid, A., (2009). Fiscal Trends and Self-Fulfilling Crises, *Review of International Economics*, 17,(1), 187–204.
- Eichengreen, B (2000). When to Dollarize. University of California, Berkeley, working paper, February 2000.
- Eichengreen, B (2001). What Problems can Dollarization Solve? *Journal of Policy Modeling*, 23(3), 267-277.
- Erasmus, L., Leichter, J., and Menkulasi, J. (2009). Dedollarization in Liberia—Lessons from Cross-country Experience, IMF Working Paper Series No: WP/09/37, Washington.
- Giovannini, A, and Turtelboom. B. (1994). Currency Substitution, In *The Handbook of International Macroeconomics*, edited by F. Van der Ploeg. Cambridge: Blackwell: 390–436.
- Goldfeld, S. M., (1973). The Demand for Money Revisited, *Brookings Papers on Economic Activity*, 4(3), 577-646
- Greene, W. (2003). *Econometric Analysis*. New Jersey: Prentice Hall.

- Honig, A., (2005). Fear of floating and domestic liability dollarization. *Emerging Markets Review*, 6(3), 289–307.
- Honig, A., (2009). Dollarization, Exchange Rate Regimes, and Government Quality, *Journal of International Money and Finance*, 28(2), 198–214.
- Honohan, P., and Shi, A., (2002). Deposit Dollarization and the Financial Sector in Emerging Economies, World Bank Policy Research Working Paper, No. 2748, Washington.
- Imam, P. (2009). Introducing the Euro as Legal Tender-Benefits and Costs of Eurorization for Cape Verde, IMF Working Paper Series No: WP/09/146, Washington.
- IMF (2005). Dollarization in Sub-Saharan Africa Experience and Lessons, African Department Working Paper series, IMF Staff Papers, 39, 318-44, Washington.
- IMF (2015). Dollarization in Sub-Saharan Africa: Experience and Lessons. IMF Working Paper Series, Washington.
- Ize, A. (2013). Financial Dollarization. *The Evidence and Impact of Financial Globalization*, Chapter 32, 463-479.
- Ize, A. and Levy-Yeyati, E. (2003). Financial Dollarization, *Journal of International Economics*, 59(2003), 323–347.
- Ize, A. and Levy-Yeyati, E. (2005). Financial De-dollarization: Is it for Real? IMF Working Paper 05/187, Washington.
- Ize, A. and E. Parrado, 2002, “Dollarization, Monetary Policy, and the Pass through,” IMF Working Paper 02/188, Washington.
- Jeanne, O., (2003). Why Emerging Markets Borrow in Foreign Currency, IMF working paper number No. 03/177, Washington.
- Kaplan, M., Kalyoncu, H. and Yucel, F. (2008). Currency Substitution: Evidence from Turkey. *International Research Journal of Finance and Economics*, No. 2, 158–162.
- Karras, G. (2002). Costs and Benefits of Dollarization: Evidence from North, Central, and South America, *Journal of Economic Integration*, 17(3), 502-516.
- Kessy, P. (2011). Dollarization in Tanzania: empirical evidence and cross-country experience, International Growth Centre Working Paper 11/0251, International Monetary Fund, Washington.
- Kennedy, P. (2003) Guide to Econometrics 5th edn., Blackwell, Malden, MA.
- Lane, P. R., and Milesi-Ferretti, G.M (2006). The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970–2004, IMF Working Paper Series Number WP/06/69.

- Levy-Yeyati, E., (2006). Financial dollarization: evaluating the consequences. *Economic Policy*, 21(45), 61–118.
- Levy-Yeyati, E., and Sturzenegger, F., (2005). Classifying exchange rate regimes: deeds vs. words. *European Economic Review*, 49(6), 1603–1635.
- Licandro, G. and Licandro, J.A., (2003). Building the Dedollarization Agenda: Lessons from the Uruguayan Case. Mimeo, Central Bank of Uruguay.
- Long, J. S. (1997). Regression Models for Categorical and Limited Dependent Variables. Thousand Oaks, CA: Sage.
- Lundgren, C.J, Thomas, A.J and York, R.C (2013). Boom, bust, or prosperity?: managing Sub-Saharan Africa's natural resource wealth, IMF Working Paper Series, Washington.
- Mundell, R.A., (1963). Capital mobility and stabilization policy under fixed and flexible exchange rates. *Canadian Journal Economic and Political Science*, 29(November), 475–485.
- Murray, J., and Powell, J. (2003). Dollarization in Canada: where does the buck stop?, *Economics and Finance* 14(2), 145–172.
- Neanidis, K. C., and Savva, C. S., (2013). Institutions and financial dollarization: Indirect effects based on a policy experiment, *Economics Letters*, 121(3), 405–410.
- Ramirez-Rojas, C.L. (1985). Currency Substitution in Argentina, Mexico and Uruguay. Staff Papers, International Monetary Fund, Vol. 32(4), 629-667.
- Reinhart, C., Rogoff, K., (2004). The modern history of exchange rate arrangements: a reinterpretation? *Quarterly Journal of Economics*, 119(1), 1–48.
- Sahay, R. and Vegh, C.A.(1996), “Dollarization in Transition Economies: Evidence and Policy Implications,” in *The Macroeconomics of International Currencies: Theory, Policy, and Evidence*, ed. by Mizen and Pentecost (UK: Cheltenham).
- Savastano, M., (1996), “Dollarization in Latin America: Recent Evidence and Some Policy Issues,” IMF Working Paper 96/4 (Washington: International Monetary Fund).
- Savastano, M.A., (1992). The pattern of currency substitution in Latin America: an overview. *Revista de Analisis Economico*, 71(1), 29–72.
- Sharma, S. C., Kandil, M., and Chaisrisawatsuk, S. (2005), Currency substitution in Asian countries, *Journal of Asian Economics*, 16(3), 489–532.
- Tobin, J. (1958). Estimation of relationships for limited dependent variables. *Econometrica* 26 (1): 24–36.

- Vieira, F.A.C., Holland, M., and Resende, M. F., (2012). Financial dollarization and systemic risks: new empirical evidence. *Journal of International Money and Finance*, 31(6), 1695–1714.
- Wooldridge, J. (2002). *Econometric Analysis of Cross Section and Panel Data*. Cambridge: MIT Press.
- Weymouth, S., (2011). Political institutions and property rights: veto players and foreign exchange commitments in 127 countries, *Comparative Political Studies*, 44(2), 211–240.
- Yinusa, D.O. and Akinlo, A.E. (2008a). Exchange Rate Volatility and the Extent of Currency Substitution in Nigeria, *Indian Economic Review*, 43(2), 161-181.
- Yinusa, D.O. and A.E. Akinlo (2008b) “Exchange Rate Volatility, Currency Substitution and Monetary Policy in Nigeria”, *Botswana Journal of Economics*, 5(9), 61-83.
- Yinusa, D.O. (2009). Macroeconomic Fluctuations and Deposit Dollarization in Sub-Saharan Africa: Evidence from Panel Data, MPRA Paper No. 16259, Munich.
- Yotopoulos, P.A. (1997). Financial Crises and the Benefits of Mildly Repressed Exchange Rates. Stockholm School of Economics Working Paper Series in Economics and Finance, No. 202 (October).