

## Does financial development promote export diversification in Sub-Saharan Africa?

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### **Abstract**

This paper examines the effect of financial sector development on export diversification of 41 sub-Saharan Africa countries using data for the period 1995–2013. The empirical results using dynamic panel system generalized methods of moments (System-GMM) estimation technique show that high financial development promotes export diversification in sub-Saharan Africa. The finding underscores the importance of financial sector development policies in sub-Saharan Africa to stimulate export diversification. Specifically, it is necessary to increase the roll out of financial infrastructure across sub-Saharan Africa to widen the extent of financial access. Government should also ensure macroeconomic stability to support financial sector development in the various sub-Saharan Africa countries.

*Keywords:* Financial development; export diversification; trade receipts; sub-Saharan Africa

*JEL Classification:* F13, F14, G2, O33

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# 1 Introduction

The importance of finance for international trade has long been documented by several trade economists including Kletzer and Bardhan (1987), Baldwin (1989), Demirgüç-Kunt and Maksimovic (1998), Beck (2002), Ju and Wei (2005), Manova (2013) among others. With regards to scope, the literature in the field is limited and has focused largely on examining the influence of financial development on export volume; export share; trade balance; and number of bilateral trade flows (see Beck, 2002; Berman and Hericourt, 2010; and Manova, 2013). Consequently, little is known about how finance may affect other little but equally important areas of trade including the effect of financial development on export diversification which is one of the most critical aspects of trade for developing countries. Generally, exporting is very important due to its ability to provide employment; induce foreign direct investment (FDI); and boost economic growth of nations (see Fakher, 2016; Sakyi *et al.*, 2017; and Santosa, 2018). Specifically, export diversification is vital because of its capability to reduce the aggregate risk level associated with a country's export basket which is necessary to increase trade receipts and propel economic growth and development (Presbish, 1950; Singer, 1950; Herzer and Nowak-Lehmann, 2006; and Hausmann *et al.*, 2007).

In this study, we examine the influence of financial development on export diversification from a developing country perspective. Specifically, the study investigates the effect of private credit on export diversification or concentration in sub-Saharan Africa. The paper focuses on sub-Saharan Africa because of the region's declining share in world trade compared to other developing regions like Asia, a phenomenon which has largely been attributed to overdependence on a few primary commodity exports (Abdon and Felipe, 2011; and Ndikumana, 2015). It is also vital to study this phenomenon in sub-Saharan Africa because relative to other developing regions, it is a region where financial access is most lacking (Menyah *et al.*, 2014), a predicament which may have diverted the economic activity of most economies in the region away from the world's average (Aghion *et al.*, 2005).

Exploring the link between financial development and export

diversification is crucial for two interconnected reasons. First, if we find that financial development has a significantly positive influence on export diversification, then it will underscore the importance of financial sector development for increased export diversification activity and thus increase international trade performance in developing countries. Second, in spite of the fact that the constraints facing export processing or manufacturing (which is at the heart of export diversification) in developing economies are hydra-headed, it is often argued that lack of financial access may also be one of the key banes (Demir and Dahi, 2011; and Ndikumana, 2015), a hypothesis which merits further empirical interrogation.

It has been observed that export diversification in sub-Saharan Africa requires access to substantial amounts of finance to thrive (Subramanian, 2008; Ndikumana, 2015). Such finance is needed to overcome the huge costs of research and development (R&D), private infrastructural upgrading for product processing or manufacturing, innovation, coordination and also to conquer new export destinations. Thus it is predicted that countries with more developed financial systems will export more diversified products from industries that depend on external finance for exports than their counterparts in poorly developed financial enclaves (Kletzer and Bardhan, 1987; and Beck, 2002). It is critical to also note that Ndulu et al. (2007) and Beck et al. (2011) blame lack of sustainable economic growth in Africa on the continent's low level of financial development and poor trade performance over the decades.

Three important interrelated benefits of export diversification have been pointed out in the literature. First, export diversification promotes sustainable economic growth through favourable terms of trade. According to Presbish (1950) and Singer (1950), the overdependence of many developing countries on primary commodities for exports may severely reduce their trade receipts and suppress their economic performance if the world market price of such commodities tumbles. The recent fall in the world market price of crude oil and other primary commodities, which has left the economies of many African countries like Nigeria, Angola, Zambia among others struggling is a classic example. In averting this adverse effect, it is imperative to note the critical role of high financial development in capacity building, which is vital in promoting export diversification for sustainable growth and development. Second, Ferreira and Harrison (2012) note that export diversification dampens the

risk associated with export volatility and foreign exchange swings and thus prevents the exporter's currency from depreciating. The authors argue that in a diversified export basket, a fall in the price of one commodity can be offset by a rise in the price of another, thus negating the adverse effects of erosion in foreign exchange receipts. To this end, the role of financial sector development cannot be questioned in acquiring new inputs, training facilitation, research and development (R&D) and other related activities which are essential in producing and exporting variety of goods. Third, the spill over effects of export diversification like advanced methods of production, labour training, marketing among others which go a long way to enhance aggregate output and economic growth (Herzer and Nowak-Lehmann, 2006) require better financial systems to thrive owing to the huge costs associated with realising them (Ndikumana, 2015).

This paper contributes to the literature by extending our knowledge on how financial development may drive export diversification in sub-Saharan Africa, an area which has hitherto been left unexplored. It achieves this objective by using a panel of 41 sub-Saharan Africa countries on which data is available over the period 1995-2013, using 'System GMM' estimation procedure.

The rest of the study is organised as follows: section 2 reviews the extant literature on how financial development may affect trade. Section 3 describes the data and methodology used in the study. Section 4 discusses the empirical results while section 5 concludes the study.

## 2 Related literature

### 2.1 Theoretical literature

This study derives its theoretical underpinning from Demir and Dahi's (2011) Ricardian trade model which advocates for high financial sector development as a strategy to gain comparative advantage in international trade. This theoretical framework basically shows that countries with better financial systems will have a comparative advantage in the export of processed or manufactured products, while their counterparts with poorer financial systems will rely on the export of primary goods since the

former requires higher external finance to thrive. The notion, however, can be traced to earlier theoretical endeavours in the field by Kletzer and Bardhan (1987), Beck (2002) and Beck (2003) who posit that owing to credit market imperfections, high financial development may be a source of comparative advantage to industries<sup>1</sup> that rely on external credit to flourish.

Building on the Heckscher-Ohlin-Samuelson (HOS) trade model, Kletzer and Bardhan (1987) were the first to study the savings and credit allocation function of the financial system and report that financial development is crucial for international trade specialisation patterns. Specifically, these researchers use a two-country two-sector open economy where the sectors (an intermediate goods sector and a finished goods sector) differ in their need for finance. They observe that the more financially developed economy exports more of the finished goods (which require more finance to produce) than its less financially developed counterpart.

Beck (2002) and Beck (2003) further build on the theoretical framework of Kletzer and Bardhan (1987), but assume that the sectors have a similar need for finance; however, the manufacturing sector provides increasing returns to scale while the other, the food sector delivers constant returns to scale. With this setup, financial development will shift the incentives of entrepreneurs towards the goods that deliver increasing returns to scale since shareholder value maximisation and the high profit motive of producers remain supreme in business. The authors therefore argue that, all else being equal, countries that have high financial development will have a comparative advantage in the production and export of manufactured products relative to their financially undeveloped counterparts.

Demir and Dahi (2011) build on the above theoretical works and show the association between financial development and overseas trade, using the simple two-country two-sector Ricardian trade model outlined above. The authors relate that as a result of credit market imperfections, lack of access to finance will affect the manufacturing sector more negatively than the primary sector. This is because the primary sector, which requires

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<sup>1</sup> Owing to their huge capital outlays, it has been observed that processing/manufacturing concerns are the main economic activities that depend more on external credit to function.

relatively less finance, can continue to produce with its existing technology, while the manufacturing sector needs access to constant substantial working capital to renew its technology in every period before it can produce. The authors therefore argue that high financial development may give rise to comparative advantage in financial access and a shift from the export of primary commodities to the export of processed or manufactured goods. An important implication of this is that, the production and export of processed or manufactured goods may lead to the production and export of variety of products or increased export diversification, an export strategy that most sub-Saharan Africa states currently need to stabilise their economies and or increase their trade receipts.

To sum up, the theoretical trade models by Kletzer and Bardhan (1987), Beck (2002), Beck (2003) and Demir and Dahi (2011) predict that economies that are more financially developed may have comparative advantage in industries (processing and manufacturing concerns) that require higher external finance to flourish. Export commodity diversification is a capital intensive activity and involves introducing new primary commodities and export processing along the value chain of production. Given the huge financial commitment, commodity export expansion activity just like the activities involved in the increasing returns to scale sector mentioned in Demir and Dahi (2011) may not blossom without access to finance. Based on this observation, this study argues that an economy that is more financially developed may have a comparative advantage in exporting more varied commodities to its trading partners than those from less developed financial systems.

## 2.2 Empirical literature

The empirical literature that examines the role of finance in international trade is vast and can be categorised from diverse perspectives. In this study, we group the literature in the field into the type or level of data that researchers have used in their work. Researchers have explored data at the firm, industry and country levels. We begin our review with firm-level studies which include: Du and Girma (2007); Muûls (2008); and Berman and Hericourt (2010). This is followed by industry-level papers including Beck (2003); Svaleryd and Vlachos (2005); and Manova

(2013). We conclude the section with country-level works including Beck (2002); Svaleryd and Vlachos (2002); and Demir and Dahi (2011).

At the firm level, researchers who study the role of finance in trade mostly focus on how financial access may help firms to overcome the huge sunk and fixed costs of foreign market entry. Indeed, most of these studies find that access to finance is vital in paying for the huge upfront costs of internationalisation and therefore advocate for higher financial development as a means to promoting foreign trade. For example, Du and Girma (2007) examine the relation between export intensity, foreign direct investment (FDI) and bank loans for over 28,000 manufacturing firms in China over the period 1992–2002 and report that bank credit was significant and positively related to export market orientations. The authors therefore note that financial development may enhance exports, at least in the case of China. Also, Muûls (2008) investigates the role of liquidity inadequacies in the exporting decisions and number of export destinations served by Belgian firms over the period 1999–2005 and observes that lower liquidity constraints promote higher export market activities. This finding further buttresses high financial system development for accelerated exporting activity. Contributing to the literature on how finance may influence exports, Berman and Héricourt (2010) examine the influence of financial factors on the probability to export and export share of 5,000 manufacturing firms over the period 1998–2004 in nine developing and emerging countries and find that financial access is essential for both the entry decision and export share, though it is more important for the former. These authors thus conclude that financial development is indeed paramount in enhancing firm-level exports as it enables firms to overcome the huge upfront costs of foreign market entry and working capital constraints of exporters.

At the industry level, Beck (2003) attempted to answer the empirical question of whether financial development offers a comparative advantage to industries that rely on external credit for exports. Using data for 36 industries from 56 countries, the author finds that financial development positively and significantly drives export shares and trade balances in sectors that depend on external finance. Similarly, Svaleryd and Vlachos (2005) investigate the association between the level of financial development and industrial specialisation of 32 manufacturing industries from 20 Organisation for Economic Cooperation and Development

(OECD) countries. The researchers note that causation runs from the level of financial development to industrial specialisation in a manner consistent with the Hecksher-Ohlin-Vanek model implying that increased financial development is vital for increased industrial specialisation and thus exports. Manova (2013) also examines the influence of financial development on international trade by establishing causality via exploring differences in financial development across countries and differences in financial susceptibility across sectors over the period 1985-1995 in 107 countries. The findings of the study show that high financial development is associated with high export levels in financially vulnerable sectors suggesting that high financial development may drive trade.

On countrywide level analysis, Beck (2002) examines the effect of financial development on exports of manufactured goods in a 30-year panel of 65 countries. After accounting for country-specific effects and potential reverse causality, the author relates that financial development has a significantly positive impact on exports share and trade balance of manufactured commodities. This finding suggests that financial development is vital for increased international trade of nations. However, in a related study, Svaleryd and Vlachos (2002) using panel data over 1966-1994 in more than 80 countries show that international trade and financial development both influence each other suggesting that financial development and liberal trade policies should both be given high attention by policy makers as they endeavour to draw policies for the economic performance of their countries. Contributing to the literature, Demir and Dahi (2011) investigate the influence of financial development on total and high-skill manufactured exports from a South-South and South-North standpoint in 28 developing countries over the period 1978-2005. The authors find that financial sector development has a significantly positive effect on total and high-skill manufactured exports in the South-South trade, but no such evidence was noted in the South-North trade. This finding underscores the importance of financial sector development for trade, at least from a South-South perspective.

In conclusion, the empirical literature that investigates the influence of finance on international trade is huge and can be categorised into firm, industry and macro level studies. Though few of these papers find a bidirectional relationship between finance and international trade, most of them note a unidirectional effect with causation positively and



significantly running from finance to trade. This implies that financial sector development is critical in promoting the international trade of nations and thus should be given priority on policy makers' agenda. It is also clear from the literature that in spite of the prevalence of the huge studies that investigate the role of finance in international trade, those that examine the influence of financial sector development on export diversification are rare.

### 3 Methodology

#### 3.1 Data

Data for the study are extracted from United Nations Conference on Trade and Development database (UNCTAD) and two<sup>2</sup> sub-databases of the World Bank over the period 1995–2013 on 41 sub-Saharan Africa countries<sup>3</sup>.

#### 3.2 Model specification

The empirical model is focused on examining the effect of financial development on commodity export diversification across countries and over time. We specify a dynamic log linear model which includes a lagged dependent variable as one of the regressors to account for the adjustment speed and path dependency of exports. The empirical model which is specified below follows the work of Demir and Dahi (2011) and Iwamoto and Nabeshima (2012).

$$\ln Exportcon_{it} = \alpha_1 \ln Exportcon_{it-1} + \alpha_2 \ln PrivateCredit_{it} + \alpha_3 \ln CV_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

<sup>2</sup> These include the Global Financial Development (2016) and World Development Indicators (2016) databases.

<sup>3</sup> Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Democratic Republic of Congo, Djibouti, Equatorial Guinea, Eritrea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Seychelles, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Uganda and Zimbabwe.

Where  $\ln\text{Exportcon}$  is log of export concentration and is an indicator of export diversification,  $\ln\text{Exportcon}_{t-1}$ , denotes a one-year lag of log of export concentration,  $\ln\text{PrivateCredit}$  is used to denote log of private credit and represents financial sector development,  $\ln\text{CV}$  is also used to represent a set of conditioning variables including log of GDP per capita, log of squared GDP per capita, log of gross fixed capital formation, log of trade openness, one year lag of log of trade openness and a year's lag of log of inflation.  $i = 1, \dots, 41$ , and  $t = 1995, \dots, 2013$  respectively refers to country and time period. Also,  $\mu$  and  $\lambda$  are country and time-specific effects respectively.  $\varepsilon$ , is the error term assumed to be independent and identically distributed. The definition and source of variables is provided in Table 1. Our choice of control variables is informed by standard trade literature.

Table 1. Definition and source of variables

Variable	Definition	Source
Export Concentration	This is Herfindahl-Hirschman Product Index (HHPI) which is a concentration index. The index assesses whether exports of a particular country are concentrated in a few product or otherwise. The index ranges from 0-1 with values towards 0 indicating less concentration or more diversification.	UNCTAD
Private Credit	Ratio of private credit from banks and non-bank financial institutions divided by Gross Domestic Product (GDP) x 100	GFD-World Bank
Liquid Liabilities	Ratio of current liabilities of banks and non-bank financial institutions divided by (GDP) x 100	GFD-World Bank
GDP per capita	GDP converted to international dollars at purchasing power parity divided by total population.	WDI-World Bank
Gross Capital Formation	Gross capital formation as a percentage of GDP.	WDI-World Bank
Trade Openness	Imports plus exports divided by GDP.	UNCTAD
Inflation	Nominal GDP divided by real GDP x 100.	WDI-World Bank

Export diversification is proxied by Herfindahl-Hirschman Product Index (HHPI), which is a concentration index. The index assesses whether the exports of a particular country are concentrated in a few products or otherwise. The number of products which is derived from Standard International Trade Classification (SITC Revision 3 at three-digit group level) must have export value higher than or equal to USD100, 000.00 to

be considered in the computation of the index. The index is normalised to rank between 0–1 with higher values indicating more concentration in fewer products or less diversification. Thus for developing countries that desire to boost economic performance through export diversification, it is imperative for them to work towards achieving a lower value of the index. In spite of its popular appeal in the literature, it is critical to note that a low HHPI index may not necessarily mean a country has a well-diversified export portfolio if the number of products is low. It may merely suggest that the country exports comparable values of each product (World Bank, 2014). The index is computed as:

$$H_j = \frac{\sqrt{\sum_{i=1}^n \left(\frac{x_{ij}}{X_j}\right)^2} - \sqrt{\frac{1}{n}}}{1 - \sqrt{\frac{1}{n}}} \quad (2)$$

Where,  $H_j$  = country index,  $x_{ij}$  = value of exports for country  $j$  and product  $i$ ,  $X_j = \sum_{i=1}^n x_{ij}$  and  $n$  = number of products

### 3.3 Theoretical Justification of the Variables in the model

Private credit is the most widely used measure of financial sector development in the literature since it sufficiently captures most of the mobilised savings that are channeled to the private sector. Liquid liabilities of banks and non-bank financial institutions is also often used as an alternative measure of financial development. It is vital to note that financial market imperfections and financial constraints adversely affect the activities and growth of firms. Several researchers including Fazzari et al. (1988); Kashyap et al. (1994); Sharpe (1994); and Bernanke et al. (1996) note that financial market insufficiencies are known to be responsible for a myriad of fluctuations at the firm level including investment, inventories, employment, sales and short-term borrowing. This suggests that firms need access to credit to efficiently avert these challenges and grow. According to Beck (2002) and Demir and Dahi (2011), high financial development increases access to external finance and thus encourages financially constrained firms to intensify their exporting activities. Specifically, commodity export diversification requires access to external

credit to meet investments in R&D, human resource development, infrastructural upgrading among others to flourish since internally generated earnings alone cannot offset these costs. Based on this, we expect a significantly negative relationship between private credit and export concentration in the study suggesting that high financial development may promote export diversification.

GDP per capita is included in the model as a control variable to proxy and account for the level of economic development or income levels. The seminal works of Imbs and Wacziarg (2003); Klinger and Lederman (2004) and Cadot et al. (2011) show that the relationship between income and export diversification is non-linear. The authors specifically argue that specialisation follows a U-shaped curve. At lower levels of income, countries tend to specialise, then diversify and re-specialise again at higher income levels. Simply put, as income levels go up, countries tend to diversify their export baskets till they mature up to a middle-income status and thereafter concentrate on the exportation of fewer products (per their comparative advantage) as income further improves. A plausible reason may be the inability of countries to innovate and expand quickly at initial levels of increased income, but are able to do so with time owing to increased economic development with its associated benefits and re-specialize according to their comparative advantages at higher levels of income. Contrary to the above finding, Hausmann et al. (2011) argue that high income countries tend to diversify more than their low income counterparts since they have more resources to do so and that the re-specialisation stage espoused in Imbs and Wacziarg (2003) and Cadot et al. (2011) does not exist. According to Bahar (2016), the nature of the relationship between income and export diversification may be influenced by the type of export data and countries used in the analysis. He argues that when highly disaggregated export data and non-rich resource countries are used, the non-linearity of the relationship is less pronounced than otherwise. Consequently, we include the squared log of GDP per capita in the model to capture any possible U-shaped effect. Based on the above discussion and the nature of our sample which is mainly low and middle-income countries, we expect the non-linearity of the relationship between export concentration and income to be less pronounced in this study. Specifically, we expect a significantly negative relationship between GDP per capita and export concentration implying that increase income

levels will lead to more export diversification in sub-Saharan Africa.

Gross capital formation is included in the model to control for investment effect. Habiyaremye and Ziesemer (2006) and Demir and Dahi (2011) argue that investment in infrastructure including modern technology is critical to significantly drive export activity. On this premise, we expect a significantly negative relationship between gross capital formation and export concentration in the study implying that an increase in investment in infrastructure may propel export diversification activity in sub-Saharan Africa.

Trade openness is used to control for the effect of trade reforms on exports in the economies. Such reforms may affect export diversification in diverse ways. According to Baily and Gersbach (1995); and Miller and Upadhyay (2000), trade reforms promote export diversification since they enable local firms to gain access to quality inputs, cheaper and superior technology, and advanced managerial skills which are critical to the success of any export diversification activity. The view of these authors suggest that current trade openness may enhance export diversification. Similarly, Shepherd and Wilson (2009); and Portugal-Perez and Wilson (2012) suggest that trade liberalisation policies may have a lagging effect. This is because when trade policies are implemented, firms need some time lag to actually build up capacity in order to fully take advantage of the policies. Specifically, in infrastructure deficient primary commodity export-dependent economies, trade liberalisation policies may not instantaneously promote export diversification owing to the substantial preparation involved between the implementation of such reforms and actual export diversification activity. In these countries, trade reforms may initially trigger an increase in the imports of machinery and other foreign inputs necessary to scale up capacity before any export diversification activity can take place, as sound infrastructural presence is critical in promoting exports (Shepherd and Wilson, 2009; Portugal-Perez and Wilson, 2012). An important implication of this assertion is that while trade openness is vital for the export diversification process, it requires some time lag for its effect to be fully realised. Consequently, we include one-year lag of trade openness in the model to capture any such effect. Based on this, we expect a significantly positive relationship between the current value of trade openness and export concentration but a significantly negative association between one-year lag of trade openness

and export concentration in this study implying that given a reasonable time lag (one-year in this case), trade openness will stimulate export diversification.

Finally, a one-year lag of log of inflation is used in the model to control for the lagging effect of macroeconomic instability which may distort economic activity in the economies.

### 3.4 Estimation technique and identification issues

The dynamic model specification, where a lagged dependent variable is included in the model as an additional regressor raises endogeneity concerns and thus makes it impossible to use the fixed effect estimator precisely in estimating the model since such an attempt introduces 'Nickell bias' into the parameter estimates (Nickell, 1981). Furthermore, while employing the standard 2SLS including the Anderson-Hsiao estimator to deal with the problem produces consistent results, it fails to account for all potential orthogonality conditions, thereby estimating the model imprecisely (Arellano and Bond, 1991).

In fixing the problem above, we employ a superior estimator called 'System GMM'<sup>4</sup> which combines a system of equations in differences and levels to estimate the model. This estimator uses lags of the variables themselves as instruments to correct any potential endogeneity issue. Prior researchers including Demir and Dahi (2011) note that 'System GMM' is capable of efficiently dealing with any endogeneity problem emanating from the presence of unobserved country-specific effects, reverse causality and simultaneity bias. The estimator is developed by Arellano and Bover (1995) but popularized by Blundell and Bond (1998) and Roodman (2009) who show that the estimator yields superior results relative to the 'Difference GMM' estimator developed earlier by Arellano and Bond (1991).

We estimate the model with a full set of time-fixed effects in order to control for any country-specific time-fixed effects (Arellano and Bover, 1995). Since some of the first-differenced instruments that are used for the variables in levels may be correlated with the country-unobserved effects, we employ the instruments only in the differenced equation (Roodman,

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<sup>4</sup> Specifically, the study employs the `xtabond2` estimator in Stata.

2006). We presume that our independent variables are at least weakly exogenous since we used lagged variables as instrument. Also, the study use the closest three lags in instrumenting our GMM-style variable (log of export concentration), while including the other regressors as IV-style variables. According to Roodman (2009), deeper lags of GMM-style variables are not likely to contain much additional information and thus may not be helpful, especially when the number of groups is small. In estimating the model, we employ the two-step robust estimation procedure with Windmeijer's (2005) finite-sample correction method that yields asymptotically robust standard errors.

Finally, it is critical to note that the consistency of the 'System GMM' estimator depends on three important conditions. First, the error term should not exhibit any serial correlation (Arellano and Bond, 1991). Second, the instruments should be jointly valid (Arellano and Bond, 1991). Third, it is advisable to keep the number of instruments less than or equal to the number of groups (Roodman, 2009). In this study, the test of serial correlation, which is applied to the differenced residuals and has the null hypothesis of 'no autocorrelation', is upheld since the test is unable to reject the null hypothesis. Furthermore, the Sargan and Hansen tests of overidentifying restriction are also unable to reject the null hypothesis of 'the instruments as a group are exogenous', which suggests that our instruments are jointly valid. Third, the number of instruments we employ in the estimation is equal to the number of groups, indicating that our Sargan test is not weak. All the test results in Table 4 suggest that our findings are consistent and efficient.

## 4 Empirical results

### 4.1 Descriptive statistics

Table 2 presents the descriptive statistics of our dependent and independent variables.

Table 2. Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Export concentration	779	0.4717	0.2199	0.0886	0.9659
Private credit	779	17.5878	22.0160	0.4128	150.2097
GDP per capita	779	3794.303	6118.811	269.6376	48710.7
Gross capital formation	779	21.4972	17.4659	-2.4244	219.0694
Trade openness	779	58.2869	31.7964	7.6152	236.5595
Inflation	779	25.8678	228.8687	-31.5659	5399.507

Table 2 shows a considerable variation in export concentration ranging from a low of 0.089 to a high of 0.966 with a mean of 0.472 suggesting a wide variation in the export basket of sub-Saharan Africa economies. Private credit also shows a significant variation across countries, with a low of 0.413% to a high of 150.2% and a mean of 17.59%.

#### 4.2 Correlation

The correlation matrix shown in Table 3 indicates that there is a negative and highly significant correlation between private credit and export concentration. This shows a possible relationship between financial sector development and export diversification. The table also suggests that multi-collinearity may not be a problem in the model.

Table 3. Correlation matrix

Variable	Export concentration	Private credit	GDP per capita	Gross capital formation	Trade openness	Inflation
Export concentration	1					
Private credit	-0.5087 (0.0000)	1				
GDP per capita	0.0120 (0.7388)	0.4119 (0.0000)	1			
Gross capital formation	-0.0165 (0.6456)	0.1994 (0.0000)	0.3858 (0.0000)	1		
Trade openness	0.0763 (0.0333)	0.1499 (0.0000)	0.5849 (0.0000)	0.4041 (0.0000)	1	
Inflation	0.1682 (0.0000)	-0.2653 (0.0000)	-0.0196 (0.6112)	-0.0854 (0.0269)	0.0739 (0.055)	1

P-values are reported in parentheses



### 4.3 Statistic Results

We show the regression results for the influence of private sector credit on export concentration in Table 4. To begin with, it is important to note that our lagged dependent variable enters the regression significantly positive with its current value or the dependent variable suggesting that export concentration is indeed dynamic which confirms the rationale behind our empirical framework.

Table 4. Effect of private sector credit on export concentration

Export concentration	Model 1 Private Credit	Model 2 Liquid Liabilities
Export concentration_lag1	0.5293** (0.019)	0.5657** (0.014)
Private credit	-0.1545** (0.024)	
Liquid liabilities		-0.1609** (0.038)
GDP per capita	0.0109 (0.975)	-0.1011 (0.778)
Squared GDP per capita	0.0033 (0.876)	0.0090 (0.673)
Gross capital formation	-0.0064 (0.845)	-0.0102 (0.749)
Trade openness	0.1186* (0.068)	0.1488** (0.048)
Trade openness_lag1	-0.1058* (0.094)	-0.1229* (0.059)
Inflation_lag1	-0.0095 (0.343)	-0.0009 (0.926)
Constant	-0.3330 (0.805)	0.2990 (0.829)
Number of observation	671	671
No.'s of groups	41	41
No.'s of instruments	41	41
AR1 test (P-value)	0.035	0.031
AR2 test (P-value)	0.309	0.289
Hansen test of OIR	0.531	0.538
Sargan test of OIR	0.155	0.186

Notes: \*\*\*, \*\* and \* show 1, 5% and 10% significance levels respectively. P-values in parenthesis are based on Windmeijer's (2005) corrected standard errors. We estimated the model with a full set of time-fixed effects, which are not reported. All variables are in logs. 'OIR' is overidentifying restriction.

Source: Author's computation based on the various databases used: World Bank & UNCTAD

The results in Table 4 indicate that private sector credit has a significantly negative association with export concentration suggesting that countries with high levels of financial development have more diversified export baskets in sub-Saharan Africa. Also, current trade openness enters the regression significantly positive with export concentration; while its one-year lag enters significantly negative implying that trade liberalization policy in sub-Saharan Africa does not instantaneously promote export diversification, but its lag effect does. These results are confirmed in our alternative model. The next section discusses these results.

#### 4.4 Discussion

It is vital to note that access to credit is imperative to enable firms to diversify into the production and export of wide variety of products. The product variety in this case may be an extension in a country's existing primary products to cover non-traditional export commodities or export processing or manufacturing, which simultaneously generates new products and adds value. Particularly, financial access is essential to embark upon R&D into the viability of non-traditional exports, infrastructural upgrading, acquisition of new machinery and other related costs that are incurred in the commodity export diversification process. The finding of this present study confirms our *a priori* expectation and the theory of high financial sector development as a comparative advantage in shifting from exports of primary commodities to the export of processed or manufactured goods as espoused in Demir and Dahi (2011) Ricardian trade model. It is important to note that better financial systems make credit more available to enable a country or firm to build the necessary capacity required to transform from the export of primary goods to the production and export of processed or manufactured goods, since the latter requires a higher financial commitment. The finding also supports prior empirical works including Beck (2002) and Demir and Dahi (2011) who argue that high financial sector development is critical for the production and export of wide-range products.

Trade openness enters the regression significantly positive with export concentration while its one-year lag enters significantly negative. These findings confirm our *a priori* expectations and the views of Shepherd and

Wilson (2009) and Portugal-Perez and Wilson (2012) that although current trade openness may initially repress export diversification activities, it enables local firms to scale up their capacity and experience which are critical in eventually driving up export diversification. It is vital to note that in sub-Saharan Africa, most countries are natural resource rich nations but lack the necessary infrastructure to diversify their export baskets. Consequently, it is expected that any trade reforms in these nations should rather immediately trigger an increase in the importation of machinery and other foreign inputs like technology, skills among others which are important in building capacity towards any subsequent export diversification activity. The findings however contradict the work of Baily and Gersbach (1995); and Miller and Upadhyay (2000) who suggest that trade reforms may impact export diversification activities instantaneously.

#### 4.5 Robustness Test

The study uses liquid liabilities as an alternative indicator of financial sector development. The results which are presented in Model 2 of Table 4 confirm our finding that financial development promotes export diversification in sub-Saharan Africa.

## 5 Conclusion

Within a dynamic framework, this study examined the effect of financial development on the commodity export diversification of 41 sub-Saharan Africa countries in a 19-year panel using 'System GMM'. The results revealed that financial sector development appears to be significant in diversifying a country's export basket. This finding is consistent with our alternative measure of financial sector development. The findings therefore underscore the importance of financial sector development in sub-Saharan Africa. Specifically, it is necessary to increase the roll out of financial infrastructure across sub-Saharan Africa to broaden the extent of financial access. Finally, government of the various countries in the region should also ensure macroeconomic stability to support financial sector development.

This study is however not without limitation. For example, due to data unavailability, the study was unable to control for some equally important factors that may also affect export concentration. Some of these factors include the level of natural resource endowment of the countries, foreign direct investment (FDI) intensity, human capital development, R&D intensity and labour supply. Future research should therefore consider these dynamics when data becomes available.

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