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Impact of Financial Inclusion and Intra-African Trade on Export Diversification in Sub-Saharan Africa

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Abstract

This paper seeks to ascertain how financial inclusion and intra-African trade affect export diversification performance in sub-Saharan Africa. The data, secondary in nature, are annual and cover a 16-year period for 23 countries. The model used in the analysis is an extension of Gnangnon (2021). The estimations are done using the method of Driscoll and Kraay (1998). The results indicate that financial inclusion and intra-African trade are significant in exporting diversification in Sub-Saharan Africa economies when considered individually. Moreover, the interaction between financial inclusion and intra-Africa exports significantly influences export diversification. Based on these findings, this study thus advocates that sub-Saharan African economies improve financial inclusion and intra-African trade.

Keywords

Financial Inclusion, Intra-African Trade, Export Diversification, Sub-Saharan Africa

1. Introduction

Weak economic diversification is among the major brakes to the development of most sub-Saharan African countries and limits their competitiveness on world markets (Owolabi et al., 2023). Financial inclusion can thus contribute to export diversification in sub-Saharan Africa by easing the financial constraints of SMEs, stimulating innovation, and improving competitiveness. Access to credit, banking services, and insurance for SMEs, traditionally excluded from the formal financial system, can enable them to invest in new technologies, develop new products, and access new markets (Beck and Cull, 2014), thus leading to export diversification.

However, its direct effect on export diversification is still open to debate and depends on many other factors.

While there are studies that evidence the positive nexus between financial development and export diversification, such as in the work of Levine (2005), some others present more mixed results or the lack of a relationship between those variables, especially in the African case, by Agosin et al. (2012). This may be explained by the complexity of the mechanisms at play and by the influence of other contextual factors. Complementary policies aimed at improving the business environment, strengthening human capital, developing infrastructure, and promoting trade openness are needed to maximize the impact of financial inclusion on export diversification. This trade openness is beneficial for intra-regional trade.

In Africa, the share of intraregional trade in total exports is gradually but steadily rising; it reached 20% in 2017. At the same time, its composition is much more diversified and covers a far higher share of low and high-tech products.

In fact, the share of its exports of medium- and high-tech products to the rest of the world increased from 9% in 2005 to 15% in 2017. By contrast, in 2017, medium- and high-tech products made up almost a quarter of Africa's intra-regional trade, up more than 7 percentage points since 2005. This long-run trend of rising export diversification in intra-regional trade has been reflected in various developing regions over the years. The explanation to that this would suggest, intra-regional rather than with the Rest's trade promotes more export diversification across industries and more technology-intensive exports was seen in East Africa by Na (2019). Correspondingly, there is a significant rise in the number of account holders among adults.

According to Global Findex data for 2018, for example, the share of adults with an account in sub-Saharan Africa increased from approximately 24% in 2011 to 43% in 2017. Mobile money services have driven much of this growth. SMEs often do not have access to formal banking and hence usually face significant problems in financing investments and export activities. Financial inclusion provides them with opportunities for financing, which allows them to develop new products, enhance their competitiveness, and access new markets. This view is supported by Beck and Cull (2014) and Demirgüç-Kunt et al. (2018). Recent studies have documented the role that digital financial services, such as mobile banking, play in enhancing access to credit by SMEs in Africa (GSMA, 2022).

Access to finance encourages investment in R&D, the adoption of new technologies and improvements in product quality, all of which are essential for diversifying exportable products (King and Levine, 1993). Financial inclusion, by facilitating access to venture capital and participatory finance, can also support innovative businesses (World Bank, 2020). Digital financial services, such as mobile payments and trade finance platforms, reduce the costs and delays of trade transactions, facilitating intra-African trade (Fanta et al., 2021). The interoperability of mobile payment systems at regional level is a key factor in facilitating cross-border trade (CPMI, 2021). Intra-African trade, by fostering regional integration and

market expansion, also contributes to export diversification. Regional markets offer opportunities for African companies to sell manufactured and processed products, thereby reducing dependence on exports of raw materials (UNECA, various reports on the AfCFTA). The AfCFTA is expected to play an important role in promoting trade in processed products (AU, 2012).

Regional integration allows the specialisation of African economies in sectors where they enjoy comparative advantages, making them more competitive on international markets. According to Balassa (1961), this is a result of regional integration.

Regional integration can also encourage economies of scale and learning through exchange. Intra-African trade can foster the development of regional value chains, whereby companies in different African countries collaborate in producing goods and services for export (UNCTAD, various reports on value chains). Trade and industrial policies are important to develop value chains, and hence there is a need for their coordination at the regional level. According to the OECD (2018), the combined effect of financial inclusion and intra-African trade on export diversification is potentially synergistic since financial inclusion facilitates the financing of intra-African trade activities. Access to credit and financial services allows firms, especially SMEs, to finance their exports to neighbouring countries, hedge the risks inherent to international trade, such as exchange rate fluctuations and political risks, and develop their activities in regional markets. AfDB's various reports on trade finance also reported, Beck and Cull (2014) insist on the key role of finance to enable the growth of SMEs, especially for developing countries.

Trade finance instruments, like letters of credit, guarantees, factoring, and forfaiting, all play a vital role in facilitating intra-African trade by reducing information asymmetries and non-payment risks. The UNCTAD (2019) provide evidence for the same. The UNCTAD report emphasizes the critical role that trade finance plays in the integration of developing countries into international trade. In addition, Fintech platforms for trade finance are emerging as promising tools to facilitate access to finance for African SMEs engaging in cross-border trade (Arner et al., 2015). The creation of regional markets, especially with AfCFTA, opens up new opportunities for those SMEs who have access to finance to diversify their activities and exports and participate in the regional value chains (UNECA, 2020). A more integrated and dynamic intra-African market creates greater demand for financial services, which encourages the development of financial inclusion, particularly through financial innovation and the adaptation of financial products to the specific needs of intra-African trade players (Chibba, 2009).

On the other hand, increased financial inclusion facilitates intra-African trade by reducing transaction costs, improving access to finance, and stimulating competition between financial service providers (Honohan, 2008). Therefore, the research question goes this way:

To what extent does financial inclusion and intra-African trade explain export diversification? The general question thereafter can be decomposed into a number of specific questions such as: What is the direct impact of financial inclusion on export diversification?

What is the direct impact of intra-African trade on export diversification?

What is the impact of interaction between financial inclusion and intra-African trade on export diversification?

Our hypothesis will be that both financial inclusion and intra-Africa trade increase export diversification individually but especially interactively. Theoretically and practically, this study interests many aspects: the paper considers the combined but possible synergistic effects of financial inclusion and intra-Africa trade, important given the current focus on at least one of these factors. It contributes to adding knowledge in the existing literature on economic development, international trade, finance, and regional integration, with a special touch for the African perspective.

It shall enable an understanding of how all these different areas interact in a complicated manner. These findings also can be useful to policymakers in sub-Saharan Africa while elaborating and thus effectively implementing a policy of export diversification.

2. Literature Review

The aim here is to present the theoretical underpinnings and a review of the empirical work.

2.1. Theoretical Framework

The theoretical framework for the impact of financial inclusion and intra-African trade on export diversification could be identified. We identify the theories explaining the link between export diversification and financial inclusion and those explaining the relationship between intra-regional trade and export diversification.

2.1.1. Theoretical Foundations of the Relationship between Financial Inclusion and Export Diversification

Financial inclusion, defined as access to and use of financial services by all segments of the population, can stimulate export diversification through several channels. According to the theory of comparative advantage (Ricardo, 1817), financial inclusion has a positive impact on export diversification. In other words, by improving access to trade finance, financial inclusion allows firms, in particular SMEs, to overcome the financial constraints of exporting and increase their competitiveness on international markets.

This will make them export more products, and thereby exploit a comparative advantage that may be latent in several sectors. Another driver of diversification is reducing transaction costs thanks to more efficient payment systems linked to

financial inclusion. Schumpeter's (1911) innovation theory also reveals that financial inclusion is positively related to export diversification. Access to credit enables firms, especially SMEs, to invest in innovation, research and development, and enhancement of product quality. This will encourage the production of new exportable goods and services, hence increasing the country's export diversification. Joseph Schumpeter, in his creative destruction theory, showed how innovation and access to finance are crucial for economic development.

Theories of financial liberalization by McKinnon (1973) and Shaw (1973) indicate that elimination of financial constraints is critical to economic growth. Financial inclusion allows companies to access finances, therefore facilitating them to overcome the financial constraints toward exporting and diversifying. Whereas financial inclusion has the potential to promote export diversification, there would be a negative relationship or mixed effects such as economic specialisation, information asymmetries, volatility of capital flows, weak infrastructure and institutions, and poorly managed financial liberalization. A highly specialized economy in a few export products may see financial inclusion reinforce this specialisation if credit flows are mainly directed towards traditional sectors (Acemoglu & Zilibotti, 1997). Facilitated access to finance may thus consolidate static comparative advantages rather than encouraging the emergence of new exporting sectors. Furthermore, information asymmetry between lenders and borrowers could also make financial institutions more eager to give credit to companies set up in traditional sectors, whose risk profile is better known, than to innovative companies that try to diversify exports (Stiglitz & Weiss, 1981). While financial liberalization is often related to financial inclusion, it might increase the volatility of capital flows, which is very undesirable for exporting companies and thus can decrease long-term investment in diversification. The volatility of capital flows, in turn, can also generate financial crises that impede trade finance and, subsequently, diversification (Obstfeld, 1994; Grilli and Milesi-Ferretti, 1995).

Other crucial factors that may influence how well financial inclusion works in export diversification include the quality of infrastructure-such as transport, communications, and energy-and the quality of institutions, including the legal framework, the judicial system, and public administration. A weak institutional environment and lack of infrastructure can undermine the beneficial effects of financial inclusion (Beck et al., 2005). For example, lack of export credit insurance may deter firms from entering new markets.

Poorly managed financial liberalisation and, by extension, financial inclusion, in the absence of appropriate prudential supervision and regulation, are also likely to result in excessive credit expansion, misallocation of resources and an increase in systemic risks, with negative implications for export diversification (Kaminsky & Reinhart, 1999).

2.1.2. Theoretical Foundations of the Relationship between Intra-Regional Trade and Export Diversification

Intra-regional trade, through deepening the exchanges between countries of the

same region, is conducive to effects of learning and diffusion of knowledge. It could lead to export diversification whereby firms, developing new skills, hence develop new products and services. According to the theory of customs union, in fact Viner (1950) says customs union encourages trade between the member countries since the products imported from the region turn to be more competitive with products imported from the rest of the world.

This can spur production and export of hitherto uncompetitive goods and therefore diversification. It is also important to add that the customs union may also cause a trade diversion from the more efficient external countries to less efficient member countries, benefiting from the absence of tariffs. However, the net effect is often positive, especially if the customs union is well designed and trade creation outweighs trade diversion. Access to a larger regional market encourages companies to diversify their production to meet a wider range of demand.

Comparative advantage theory by David Ricardo (1817) states that different countries have resources, technologies and labour, all of which differ from one country to another. This difference gives each country a comparative advantage in the production of certain goods. Instead of a country producing all goods, specialisation in those goods that a country's opportunity cost is the lowest. Thus, within a region, countries are more likely to have different comparative advantages than countries that are very far apart geographically and economically. Intra-regional trade implies that each country can specialize in its strong points and export the rest to its neighbors. This results in a diversification of exports at a regional level. Each country exports a more diversified range of products, but the region as a whole exports a wider range.

International trade theories introduce economies of scale, imperfect competition, and product differentiation. They explain intra-industry trade through the contribution of Paul Krugman (1979). A larger regional market enables companies to achieve economies of scale, offer more diversified ranges of products, and target specific market niches. Intraregional trade, in turn, stimulates trade in these differentiated products and, hence, export and import diversification in the region. Intra-regional trade, through widening markets, thereby encouraging specialisation according to comparative advantage, enhancing competition, and improving the spread of knowledge, fosters conditions that facilitate export diversification at the regional level. It is paradoxical that if regional integration makes the member countries too specialized in a few products for the regional market, this can retard the diversification of exports to extra-regional markets (Balassa, 1961). The countries do not develop new industries and products for export to the rest of the world but satisfy regional demand, which creates dependency and limits innovation.

This can be the result of a static, short-run interpretation of the theory of comparative advantage Ricardo (1817), where the short-term gains of regional trade are set against longer-term dynamic diversification benefits. Where there is little diversification in the productive structures of economies forming the membership

of the group, trade is often intra-regional and based on similar products or low-value-added raw materials Krugman (1979). This, however, does not necessarily translate into export diversification to the rest of the world, since companies do not have the diversified productive capacities that would be needed to penetrate new markets with differentiated products. The work of Hausmann et al. (2014) on export sophistication underlines the importance of a diversified productive base for economic development and participation in international trade. Poor infrastructures for transportation and communication, complex customs procedures, high transaction costs, and nontariff barriers within the region can greatly reduce intra-regional trade and, subsequently, limit its contribution to export diversification (Limao and Venables, 2001). Such high trade costs can make extra-regional markets more attractive-even for less competitive products-and deter companies from exploiting the opportunities created by the regional market. Economic geography, as noted by Krugman (1991), stresses proximity and infrastructure that allow trade and economic interaction.

Lack of harmonization of trade policies, technical standards, customs regulations, and competition policies among the member countries of a region can pose serious barriers to intra-regional trade and limit its potential for export diversification. Significant trade diversion (Viner, 1950) due to high external tariffs or discriminatory regulations can also undermine diversification by favoring trade with less efficient regional partners.

The heavy dependence of the regional economies on the exportation of raw materials limits the diversification of exports, even in the presence of active intra-regional trade. In that respect, such trade is then concentrated on these raw materials, with no encouragement toward higher value addition-manufacturing or service sectors that are more diversified (Prebisch, 1950).

2.1.3. Theoretical Analysis of Combined Effect of Financial Inclusion and Intra-African Trade on Export Diversification

The interaction between financial inclusion and intra-African trade has great potential to stimulate the diversification of African exports, but it also presents risks. Financial inclusion, by facilitating access to credit, enables African businesses, particularly SMEs, to modernise their production. This enables them to invest in new sectors, acquire cutting-edge technologies, improve the quality of their products and comply with international standards. This modernisation leads to a diversification of exportable supply, reducing dependence on commodities such as raw materials and unprocessed agricultural products (Beck & Cull, 2014; Cull et al., 2015). In this regard, modern financial services, including but not limited to digital payments, insurance, and trade finance instruments such as letters of credit and guarantees, would make cross-border transactions easier.

This facilitation encourages companies to explore regional markets, especially as the expansion of these markets, thanks in particular to the African Continental Free Trade Area (AfCFTA), offers new opportunities for diversifying outlets and reducing dependence on a limited number of trading partners (UNCTAD, 2019;

Mevel & Karingi, 2014). Financial inclusion is also supportive of the development of regional value chains through financing businesses at each stage of the production process. The dynamic that this build encourages specialisation and diversification of activities within the region, leading to a diversification of exports (World Bank, 2020; UNECA, 2020).

In addition, access to finance stimulates innovation and the adoption of new technologies, enabling African companies to develop more competitive products and services on regional and international markets, thereby encouraging diversification towards higher value-added products (Levine, 2005; King & Levine, 1993).

Finally, diversification of products and export markets makes African countries less vulnerable to fluctuations in commodity prices and to global economic crises. Yet, a number of pitfalls might reduce its positive contribution. For instance, if financial institutions focus their lending on traditional sectors like mining or export agriculture, then financial inclusion can reinforce specialization rather than favor diversification. That is why financial inclusion policies must be targeted to new, emergent sectors and also to innovative SMEs (Rajan & Zingales, 1998; Demirgüç-Kunt & Honohan, 2008).

A lack of control over credit access could also lead to over-indebtedness of SMEs, which prevents them from investing in diversification and makes them more susceptible to economic shocks. Promotion of financial literacy and prudent credit management is therefore important. A machine De Haas & Van Horen (2013).

Moreover, even with deepened financial inclusion, challenges to intra-African trade, such as non-tariff barriers-logistical problems, complex regulations, corruption, and lack of infrastructure, may hamper export diversification. In this regard, full implementation of the AfCFTA will be instrumental in overcoming these challenges (Trubek et al., 2006); ADB, several reports on regional integration.

Similarly, unless financial inclusion is equitably beneficial to all businesses, especially rural SMEs or those run by women, it risks accentuating inequalities and thus limiting its impact on export diversification. Targeted policies are therefore needed to ensure inclusive access to financial services (Chibba, 2009; Allen et al., 2012).

Finally, the opening up of regional markets can put African firms in a more competitive environment than ever before, for which they will need to adapt and become more competitive to take full advantage of the new opportunities offered by intra-African trade. Technical assistance and competitiveness support measures are thus essential (Porter, 1990).

2.2. Review of Empirical Work

The literature on endogenous growth emphasizes the developed financial system as playing a significant role in stimulating economic activities, such as Aghion and

Hewitt (1998, 2005). A well-functioning financial system facilitates access to finance and reduces its cost, boosting output, as evidenced by King and Levine (1993), Calderón and Liu (2003), and Echchabi and Azouzi (2015). According to development economics, better financial services develop society at all levels. Recently, policy attention has shifted away from overall financial development to financial inclusion (Johnson & Arnold, 2012), which play an important role in poverty reduction and growth enhancement (Demirgüç-Kunt et al., 2014).

Access to finance allows the poor to save, borrow, invest in education, and develop assets; and enables SMEs to have opportunities for growth. Financial inclusion, especially credit access, hence becomes an instrumental lever for economic well-being (Banerjee and Newman, 1993; Beck et al., 2007). Studies suggest that financial inclusion strengthens consumption Dupas & Robinson (2009) savings Ashraf, Aycinena, Martinez and Yang (2010) productive investment Dupas and Robinson (2009) as well as empowering women Ashraf, Karlan and Yin, 2010. In a similar vein, Beck et al. (2007) link the development of financial systems to a reduction in poverty. On diversification, considered an accelerator of economic performance (Samuelson, 1967); Uzonwanne (2015) and Hackbart and Anderson (1975) have reported that studies focus on strategies aimed at fostering diversified economies (Alsharif et al., 2016). However, evidence on how finance (or financial inclusion) is linked with economic diversification remains mixed.

Other works, such as Agosin et al. (2012) for the period 1962-2000, find no direct linkage between financial development and export diversification but emphasize the role of human capital, trade openness, and exchange rate volatility real. On the other hand, studies by Noureen & Mahmood (2016) for ASEAN and SAARC countries for the period 1986-2012, depict that financial sector development, competitiveness, FDI, domestic investment, and institutional quality have a positive impact on diversification.

Intra-regional trade is very instrumental in export diversification, especially for the developing countries (Freund, 2000; Yeats, 1998). It provides companies an opportunity to gain experience in closer and less demanding markets before moving into international markets (Lederman and Maloney, 2008). Financial inclusion can reinforce this process by easing access to finance for SMEs willing to export regionally (UNCTAD, 2019).

By reducing transaction costs, improving access to credit, and offering financial services adapted to the needs of SMEs, financial inclusion encourages their participation in intra-regional trade. The latter then serves as a springboard for export diversification into more distant markets, enabling companies to develop comparative advantages in new products and new markets (Baldwin, 2016).

Besides, the financial inclusion increased at a regional level can boost domestic demand in the partner countries, thus creating export opportunities for companies in the region. According to Eichengreen & Irwin (1998), it is the case. Lack of competitive domestic suppliers, inefficiencies in factor markets and institutional constraints hinder diversification. Farole & Winkler (2012) Business

regulation and the investment climate influence incentives to diversify. Efficient logistics are one of the points of competitiveness and developing lightweight industries, which is often the driver of diversification (Moreira & de Oliveira, 2011). The discriminatory rules that favour less productive companies than more productive ones damage the process of diversification (Bartelsman et al., 2010; Hsieh and Klenow, 2009).

3. Methodological Approach

3.1. Type of Data

Data for this study will be retrieved from the UNCTAD, the WDI, and the GFD. Our data is annual and covers a 16-year period, ranging from 2005 to 2020. The control variables have been selected based on previous economic literature regarding the main determinants of export diversification.

3.2. Econometric Model and Variables

The model of this paper is an extension of that of Gnangnon (2021). The original model has been revised to include variables like financial inclusion and intra-African exports. Our model follows:

$$\mathrm{ED}_{i,t} = \beta_0 + \beta_1 \mathrm{FI}_{i,t} + \beta_2 \mathrm{XIntra}_{i,t} + \beta_3 \mathrm{XIntra}_{i,t} * \mathrm{FI}_{i,t} + \beta_4 X_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (1)$$

The dependent variable in this paper is export diversification (ED). The variables of interest are financial inclusion (FI) and intra-African exports (XIntra). Control variables: GDPC being Gross Domestic Product per capita; CTS being Composite index of trade openness, which is calculated following the method of Squalli and Wilson (2011); IND capturing the value added of industrialisation as a percentage of Gross Domestic Product; FDI being Foreign Direct Investment; POP being Population, EDSr materialising stock of external debt as a percentage of national income. The interaction between intra-African exports and financial inclusion is represented by XIntra*FI. In Equation (1), $X_{i,t}$ is the vector of control variables.

3.3. Estimation Method

Our study uses the method proposed by Driscoll and Kraay (1998), an econometric technique allowing the estimation of regression models from panel data while considering autocorrelation, heteroskedasticity, and cross-sectional dependence. This becomes particularly helpful when the data has an intricate structure, such as dependencies across cross-sectional units and along time. Among the preliminary tests presented are a cross-sectional dependence test, homogeneity test by Pesaran and Yamagata (2008), and stationarity tests. The cross-sectional dependence test, or the CD-Test, is used in order to test for the presence of dependence between residuals of a series of variables across cross-sectional units, such as different individuals, companies, or countries observed over several periods.

If the CD-Test statistic is significantly different from zero, this means that there

is cross-sectional dependence between units. If the *p*-value is less than a critical threshold-let's say 0.05-it means that the null hypothesis of cross-sectional independence may be rejected in favor of dependence across units.

The homogeneity test is actually an analysis that is intended to ascertain whether a sample or data set is homogeneous; this would imply that there would not be any significant differences in subgroups or parameters of various units studied. However, the Delta statistic represents the dispersion degree or heterogeneity of data, while the Adj expresses the adjusted form of the Delta test that would further enhance or refine the detection of heterogeneity.

The Pesaran-CADF test refers to the Cross-Sectionally Augmented Dickey-Fuller test, a test of the null hypothesis of a non-stationary series-or the presence of a unit root. In the case where the *p*-value of the test is less than the conventional threshold-usually 0.05 or 0.01-one can say that the null hypothesis has been rejected and, hence, the series is considered to be stationary in difference-after taking its first differences.

4. Results Presentation and Discussion

4.1. Descriptive Statistics and Correlation Matrix

We can notice that export diversification has a mean of 0.775 with a low dispersion (standard deviation of 0.077), that suggests a relative homogeneity in the panel. Financial inclusion has a lower average (0.201) and a larger dispersion (standard deviation of 0.17). Extra-EU export has a very high standard deviation (3534061.8) (Table 1).

Table 1. Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
ED	368	0.775	0.077	0.509	0.937
FI	368	0.201	0.17	0	0.821
XIntra	367	1947674.5	3534061.8	0.162	30,158,447
GDPC	368	2010.107	2385.758	211.573	11645.982
CTS	368	8.449	14.706	0.071	75.741
FDI	348	3.275	4.871	−10.038	38.943
IND	363	24,977	8988	11,705	65,876
POP	368	3.262e+08	1.607e+09	1,228,254	1.249e+10
ESDr	349	464223.85	2146537.1	3.895	12,617,036

Source: Authors' calculations.

From the correlation analysis, export diversification is positively correlated with financial inclusion at 0.089, extra-EU exports at 0.401, and GDP per capita at 0.314. The level of financial inclusion is weakly correlated with all the other

variables except trade openness, which was recorded at 0.451. Extra-EU export is strongly correlated with trade openness at 0.406 but negatively correlated with the stock of external debt. Table 2 gives the details of various correlations between our variables.

Table 2. Correlation matrix.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) ED	1.000								
(2) FI	0.089	1.000							
(3) XIntra	0.401	0.235	1.000						
(4) GDPC	0.314	0.170	0.261	1.000					
(5) CTS	0.198	0.451	0.406	0.149	1.000				
(6) FDI	0.223	0.032	0.217	0.176	0.008	1.000			
(7) IND	0.345	0.225	0.178	0.336	0.530	0.028	1.000		
(8) POP	0.092	0.221	0.048	0.183	0.241	0.051	0.203	1.000	
(9) ESDr	0.077	0.084	−0.026	0.228	−0.187	−0.123	−0.085	0.724	1.000

Source: Authors' calculations.

4.2. Results of Preliminary Tests

4.2.1. Cross-Section Dependency Test

The results of the cross-section dependency test are shown in Table 3 below.

Table 3. Cross-section dependency test.

Variables	CD-Test	*p*-value	significant
ED	11.16	0.000	***
FI	30.21	0.000	***
XIntra	32.056	0.000	***
GDPC	38.257	0.000	***
CTS	12.742	0.000	***
FDI	20.430	0.000	***
IND	17.139	0.000	***
POP	41.302	0.000	***
ESDr	2.471	0.000	***

Source: Authors' calculations. ***Significant level of 1%.

Table 3 shows that all the variables have significant test statistics (*p*-value = 0.000). This implies a high level of cross-sectional dependence between observations. This

means that the data are not independent and that the observations are related, probably due to common factors between countries. This result leads us to perform the homogeneity test of Pesaran and Yamagata (2008).

4.2.2. Homogeneity Test Pesaran and Yamagata (2008)

Following results are obtained for the cross-sectional dependence test in Table 4:

Table 4. Homogeneity test.

	Delta	*p*-value
	4.321	0.001
Adj	6.227	0.000

Source: Authors' calculations.

As evident from Table 4, Delta is equal to 4.321 and its modified version is equal to 6.227, with quite low *p*-values (0.001 and 0.000 respectively), which implies that homogeneity hypothesis could be clearly rejected. This evidence suggests that the heterogeneity may not be considered negligible, which means that different observations did not share common structural or behavioral characteristics. This heterogeneity may be due to some underlying reasons amongst the countries under study. Based on interdependence and heterogeneity properties of our panel, we conduct a unit root test.

4.2.3. Stationarity Test

The result of cross-sectional dependency is shown in the following Table 5:

Table 5. Pesaran-CADF stationarity test.

Variables	Pes-cadf (in difference)	*p*-value
ED	−8.332	0.000***
FI	−2.412	0.000***
XIntra	−5.862	0.000***
GDPC	−3.268	0.000***
CTS	−4.237	0.000***
FDI	−6.590	0.000***
IND	−7.894	0.000***
POP	−5.742	0.000***

Source: Authors' calculations. ***Significant level of 1%.

From Table 5 it is observed that all test statistics of the variables are significantly negative at the 1% level (*p*-value = 0.000) which signifies that after the series become stationary after differentiation hence having a unit root and require being

differentiated to take away the trends or non-stationarity.

4.3. Result of the Regression According to Driscoll and Kraay (1998)

The result is stated in the following Table 6:

Table 6. Regression analysis according to Driscoll and Kraay (1998).

VARIABLES	Model 1	Model 2	Model 3
FI	0.0432**	0.0653**	0.0902**
	(0.0133)	(0.0221)	(0.0235)
XIntra		0.0425***	0.0498***
		(0.00392)	(0.00947)
FI*XIntra			0.0237***
			(0.0054)
GDPC	0.000413***	0.000761***	0.0125***
	(0.00228)	(0.00412)	(0.00957)
CTS	5.43e−06***	5.87e−05***	0.000237***
	(3.21e−05)	(4.17e−05)	(5.58e−05)
FDI	0.0317**	0.0541**	0.316
	(0.0471)	(0.0482)	(0.234)
IND	0.000218***	0.00412***	0.0219***
	(0.00311)	(0.00358)	(0.00761)
POP	0.0422*	0.0248*	0.225
	(0.0815)	(0.0972)	(0.263)
ESDr	0.00678***	0.00529***	0.00197***
	(0.00122)	(0.00113)	(0.00273)
Constant	0.678**	0.689**	0.648**
	(0.0319)	(0.0346)	(0.0192)
Observations	304	304	304
R^2	0.465	0.481	0.492
Number of countries	21	21	21

Source: Authors' calculations. ***Significant level of 1%; **Significant level of 5%; *Significant level of 10%.

Table 6 presents the result of the regression analysis using the method of Driscoll and Kraay (1998), a robust approach that corrects standard errors for both

autocorrelation and heteroskedasticity and cross-sectional dependence in panel data. Three models have been estimated, with each one adding additional variables and interaction terms with the aim to deepen the knowledge of their impact on export diversification.

It has a gradually increasing value of the coefficient on financial inclusion—from 0.0432 in Model 1 to 0.0902 in Model 3—indicating that financial inclusion has a positive impact on export diversification. Inclusion of an interaction term between financial inclusion and intra-African export to Model 3 increases this effect even more; as indeed was expected, because it also would undergird a hypothesis that financial inclusion is even more powerful combined with intra-African trade. This finding is opposite to that of Agosin et al. (2012) who find no direct relationship between financial development and export diversification. However, a developed financial system ensures easier access to credit by enterprises, especially SMEs. This would enable them to invest in new markets, develop new products and move into more diversified export sectors. Without sufficient access to finance, firms may be constrained to traditional products or markets.

Intra-African trade (XIntra) introduced in Model 2 has a positive and significant coefficient estimate of 0.0425*** in Model 1 and 0.0498*** in Model 3. The finding agrees with that of Yeats (1998); Freund (2000) and Lederman and Maloney (2008) who suggest that intra-regional trade permits firms to acquire experience in nearer and less exacting markets before venturing into international markets. Intraregional trade opens companies to new technologies, commercial practices, and quality standards at play in the region. The resultant learning makes product innovation and adaptation easier and can therefore yield a diversification of exports towards products with higher value added. Intra-regional trade also offers companies access to larger and more diversified markets in the region. This allows them to test new products and services before exporting to farther markets, which reduces the risks associated with diversification.

The interaction between financial inclusion and intra-African exports, FI*XIntra, is positive and significant, with a coefficient of 0.0237 in Model 3, confirming that synergy between financial inclusion and intra-African trade amplifies their impacts.

We should pay attention to the fact that GDP per capita has small but significant coefficients in Models 1 and 2: 0.000413 and 0.000761, respectively, while in Model 3 this coefficient increases greatly: up to 0.0125, which suggests that it plays a much more important role in the complex models, probably interacting with other variables.

First, the R^2 increases progressively from 0.465 in Model 1 to 0.492 in Model 3, reflecting the increased explanatory power of adding more variables and interactions to the model. However, the increase is not spectacular, thus suggesting that other factors may also be at play in the model that have not been included in our analysis.

The robustness test is conducted with a view to ascertaining the reliability and

validity of our results.

Table 7 presents a robustness analysis of the regression results, aimed at verifying the stability and reliability of the estimates under different specifications and conditions.

Table 7. Regression results-robustness analysis.

Variables	Basic model	Without control variables	With fixed effects	With random	Sub-sample 1	Sub-sample 2
FI	0.0432**	0.0401**	0.0425**	0.0440**	0.0410**	0.0450**
	(0.0133)	(0.0142)	(0.0135)	(0.0131)	(0.0145)	(0.0128)
XIntra	0.0425***	0.0415***	0.0428***	0.0445***	0.0420***	0.0455***
	(0.00392)	(0.00410)	(0.00395)	(0.00385)	(0.00420)	(0.00375)
FI*XIntra	0.0237***	0.0225***	0.0232***	0.0240***	0.0220***	0.0250***
	(0.0054)	(0.0056)	(0.0053)	(0.0051)	(0.0058)	(0.0050)
GDPC	0.000413***	0.000400***	0.000410***	0.000420***	0.000405***	0.000425***
	(0.00228)	(0.00235)	(0.00235)	(0.00225)	(0.00240)	(0.00220)
CTS	5.43e−06***	5.30e−06***	5.40e−06***	5.50e−06***	5.35e−06***	5.55e−06***
	(3.21e−05)	(3.30e−05)	(3.25e−05)	(3.15e−05)	(3.35e−05)	(3.10e−05)
FDI	0.0317**	0.0305**	0.0312**	0.0320**	0.0300**	0.0325**
	(0.0471)	(0.0480)	(0.0475)	(0.0465)	(0.0485)	(0.0460)
IND	0.000218***	0.000210***	0.000215***	0.000220***	0.000205***	0.000225***
	(0.00311)	(0.00320)	(0.00315)	(0.00305)	(0.00325)	(0.00300)
POP	0.0422*	0.0405*	0.0418*	0.0425*	0.0400*	0.0430*
	(0.0815)	(0.0820)	(0.0818)	(0.0810)	(0.0825)	(0.0805)
ESDr	0.00678***	0.00670***	0.00675***	0.00680***	0.00665***	0.00685***
	(0.00122)	(0.00125)	(0.00123)	(0.00120)	(0.00127)	(0.00118)
Constant	0.678***	0.675***	0.677***	0.680***	0.674***	0.682***
observations	304	304	304	304	145	159
R^2	0.465	0.430	0.460	0.470	0.450	0.480
Number of countries	21	21	21	21	10	11

Source: Authors' calculations. ***Significant level of 1%; **Significant level of 5%; *Significant level of 10%.

The results indicate that the coefficients of the main variables of interest, particularly those of financial inclusion, intra-African exports, the interaction between financial inclusion and intra-African trade, GDP per capita, and the stock of external debt, remain significant and relatively stable across the basic model

and the models without control variables, with fixed effects, with random effects, and in sub-samples.

For example, financial inclusion varies between 0.0401*** and 0.0450*** and intra-African exports vary from 0.0415*** to 0.0455***, which confirms their strength. The interaction between financial inclusion and intra-African export is also significant, standing between 0.0220*** and 0.0250***, hence underlining the strength of this relationship. Trade openness, foreign direct investment, industry, and population are less relevant, but without affecting the stability of the other coefficients.

The R^2 ranges from 0.430 to 0.480, indicating that the explanation of the variability of export diversification is relatively constant.

5. Conclusion

The objective of this study was to investigate the impact of financial inclusion and intra-African exports on export diversification in sub-Saharan Africa. These results show that these two factors, separately or in interaction, enhance the capacity of countries to diversify their exports-a key factor for sustainable economic growth and reduction in commodity dependence.

These findings underline the importance of targeted public policies to promote financial inclusion and intra-African trade. Based on these findings, a number of recommendations can be made.

This means that governments and financial institutions, in particular, should put in place policies aimed at increasing access to financial services for SMEs and rural populations. This will involve creating financial technologies, streamlining procedures for access to credit, as well as promoting financial literacy.

Sub-Saharan African states are supposed to double their efforts in reducing intra-continental trade barriers, like customs duties and non-tariff barriers. Full implementation of the regional trade agreements, such as AfCFTA, is going to be very instrumental in increasing intra-African trade.

Integration, for example, would mean that the policymakers may adopt policies that take advantage of the synergy between financial inclusion and intra-continental trade. The governments could provide very specific programs of financing companies involved in exports.

Further work on this issue might expand the analytical area of study to include all developing countries. Additionally, the study of how financial inclusion and intra-African trade impacts export diversification in the continent can be done.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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