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Original Paper

Analysis of the Determinants of Export Diversification in the Franc Zone: A Comparative Study in WAEMU and CAEMU Countries

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Abstract

The objective of this study is to analyze the determinants of export diversification in the 14 countries of the Franc Zone and compare them between WAEMU and CAEMU zones. Export diversification leads to sustainable economic growth, a satisfactory balance of payments, job creation and income redistribution. To this end, the study uses Bruno (2005a, b) LSDVC econometric estimation methods over the period 1990-2015 to identify factors that may or may not improve export diversification in these countries. The main lesson of this study is that more factors favor diversification in WAEMU countries compared to those in the CAEMU zone. In addition, we note a U-inverse relationship between per capita income and diversification in the WAEMU zone while a U-shaped relationship is observed in the second zone. Moreover, the results on the Franc Zone as a whole show that the most relevant explicative factors of export diversification are: human capital, economic development, financial liberalization, degree of trade openness, public investment and the index of democracy.

Keywords

Export diversification, Franc zone, WAEMU, CAEMU, LSDVC

JEL: C23, F15, F41, O11, O57

1. Introduction

The establishment of a competitive and prosperous economy remains an imperative for States in a global context of economic liberalism characterized by the deregulation of international transactions and the opening of national, regional and international markets. This international competition requires States to have a developed productive system that favors exports. Thus, a low level of exports is unfavorable to

economic growth. According to the World Bank (1999), over the last thirty years, Africa has lost market share in world trade or in traditional commodities such as cotton, coffee, pineapple, and this despite the trade preferences they have been granted. This weakness in economic development, and hence the development of trade, is reflected in the imbalance between the productive apparatus and exports that are subject to international competition. Therefore, the productive system must focus more on specializations in more diversified industrial activities and not only on raw materials that mobilize productive resources with low added value. Exports, on the other hand, should, first, reflect the comparative advantages of the Ricardian type where "each country has an interest in specializing in the production for which it is relatively the most favored or the least disadvantaged". Second, of the type of factor endowments in a Heckscher-Ohlin Samuelson (HOS) pure competition where "each country has an interest in specializing in the production and export of goods that require abundant production factors at home and therefore inexpensive". Third, of the type of the new theory of international trade with heterogeneous firms developed by Melitz (2003).

Addressing this problem of mismatch between the productive system and the structure of exports requires diversification and sophistication of exports. The importance of these two indicators in international trade is crucial, especially for the least developed countries (LDCs), including the Franc Zone countries, whose production and export capacities are low to allow them to integrate successfully in world trade. For example, according to the Economic Report on Africa of the Economic Commission for Africa and the Commission of the African Union (2013)", intra-African trade would represent about 12% of Africa's total trade or even 20% if informal cross-border trade is included. This is compared to the proportion of intra-regional trade in Europe's total trade which is 60 % and 40% in North America". Also, according to the UNCTAD report (2013), the composition of Africa's official exports for the period 2010-2012 can be summarized in Table 1 which shows the low level of diversification of inter and extra-African exports.

Table 1. Composition of Official African Exports, 2010-2012

Products concerned	African exports to the rest of the world (%)	African exports to Africa (%)
All commodities food	7	17
Agricultural raw materials	2	2
Ores and metals	10	5
Fuels	63	32
Pearls, precious stones		
And non-monetary gold	4	4
Manufactured items	12	40
Not assigned elsewhere	2	0
Total	100	100

Source: UNCTAD (2013). Adaptation of the authors.

Thus, this present study, which focuses specifically on the Franc Zone, instead of simultaneously processing the development of the two terms diversification and sophistication of exports, only addresses the diversification exports given the density of the two subjects and their importance for the development of small sub-Saharan economies, the second term being the focus of a further study. In fact, these two indicators in the field of international trade are of crucial importance when, fundamentally, they explain to a large extent the problem of economic development faced by the LDCs, including the countries of the Franc Zone in terms of reducing unemployment and employment of youth and graduates, GDP growth, etc. Thus, this study focuses mainly on diversification. At a time when many of the countries in the region continue to suffer the effects of the collapse of commodity prices, diversification, especially of export products, appears to be an important means of strengthen growth and increase the resilience of the economy. The Food and Agriculture Organization of the United Nations (FAO) (2004) maintains that, in the absence of export diversification in developing countries, the decline and fluctuations in export earnings have had a negative impact on income, investment and employment. Through diversification, investment risks are spread across a broader portfolio of economic sectors, resulting in higher revenues (Acemoglu & Zilibotti, 1997). According to Romer (1990), diversification can be considered as a factor that helps to improve the efficiency of others production factors. In addition, diversification helps countries to protect themselves against the deterioration of the terms of trade by stabilizing export earnings. Economic growth and structural changes depend on the types of products that are traded (Hausmann & Klinger, 2006; Hausmann et al., 2007). Hence, because of the diversification of its exports, an economy can progress towards the production and export of more elaborate products, which can contribute strongly to its economic development. Moreover, the diversification of exports makes it possible to achieve at national level certain macroeconomic objectives, namely sustainable economic growth, a balance of satisfactory payments, job creation and income redistribution.

To our best knowledge, very few studies have been devoted to this study on the Franc Zone. Our study therefore addresses the analysis of the determinants of export diversification in the Franc Zone through its measurement and comparative impact on WAEMU and CAEMU over the period 1995-2015 using panel data. Another reason for choosing this zone is that Easterly and Reshef (2010) have shown in the case of several African countries that a low degree of export diversification does not necessarily imply a lack of diversification dynamics. The exporting bases of countries, even the poorest, are renewed and sometimes enriched by new goods.

The Franc Zone includes 14 sub-Saharan African countries, including 8 countries for WAEMU and 6 for CAEMU. WAEMU includes Benin, Burkina Faso, Ivory Coast, Guinea Bissau, Mali, Niger, Senegal and Togo. CAEMU groups Cameroon, Central African Republic, Republic of Congo, Gabon, Equatorial Guinea and Chad. The two unions “aim at achieving the economic and monetary integration of the Member States by strengthening the competitiveness of economic activities in the framework of an open and competitive market and a harmonized and rationalized legal environment objectives”. Reforms have allowed governments in these countries to make choices for the diversification of their economies with

the intention of increasing their exports and gradually reducing their vulnerability to external shocks. At the monetary level, it is for these countries to lead a regional policy that incorporates the fixed exchange rate constraints between the CFA Franc and the French Franc (and the EURO since 2002), in order to impact their economic performance (Ghosh et al., 2010). However, it raises the question of whether, in achieving this integration, the two unions, and more particularly the countries, behave the same way in the presence of the determinants of export diversification, even though in theory and in principle the two unions conduct the same monetary policy, fiscal policies remain different.

The rest of the work is as follows: Section 2 analyzes the structure of exports in the Franc Zone by presenting some descriptive data of exports over the period of our study. Section 3 discusses the literature review. Section 4 examines the methodology through the specification of the models used and whose results and analysis are shown in Section 5. The last section, while concluding the work, suggests the necessary recommendations for a proper integration of the Franc Zone countries and in general the LDCs into world trade.

2. Analysis of the Export Structure in the Franc Zone

According to an IMF study on the regional economic prospects in Sub-Saharan Africa, dating from April 2016, exports from Sub-Saharan African countries have evolved considerably over the past 30 years, unlike other developing regions such as Latin America and Asia. Net commodity exports rose for the region as a whole from 2 percent of GDP in the 1980s to 6 percent in the period 2010-2014, due to the expansion of exports of petroleum products and metals. Over the same period, these commodity exports from the region accounted for almost half of all exports, while they accounted for less than a quarter of the 1980s, equalizing North Africa and the Middle East. This gradual increase in commodities in sub-Saharan Africa is due to increased exports of mining products, which today cover 20 countries compared with 14 in the 1990s. According to the same study, it is in the exporting countries that commodities are more important, accounting for between 45% and 85% of GDP in the countries such as Angola, Republic of Congo, Gabon and Equatorial Guinea, well above the average observed in energy exporting countries outside the region.

The negative correlation (-0.1210) between export diversification in WAEMU and that of CAEMU zone is shown in Figure1, in which diversification of exports is represented by the concentration index of Theil. Figure 1 shows that diversification in the CAEMU zone has an upward trend, although the level remains low compared to that of the WAEMU zone which shows a downward trend. This result can be explained by the fact that the countries of the CAEMU zone are strongly concentrated around the oil, mining and agriculture sectors (Kamgna, 2007), which explains the dynamics of the diversification of the zone. However, these countries have more export products (crude oil, cocoa, coffee, cotton, wood, bananas, diamonds, coffee, tobacco, sugar, cattle, etc.) compared to those of the WAEMU zone, which is left with some products (cocoa, coffee, cotton, uranium, etc.). This analysis of diversification based on a synthetic index of diversification has several disadvantages (Berthélemy, 2005). In fact, data on international trade

in general, and on exports in particular, cover only a part of the activity, since services are by definition excluded. Moreover, rather than identifying total production, only the international aspect of resulting trade is evaluated, limiting the study of diversification to its component related to the analysis of international specialization. Finally, this analysis, of a macroeconomic nature, masks the evolutions at the micro and meso-economic levels, and therefore, does not allow appreciating the efforts of vertical diversification (intra-branches). In addition to the challenges of diversification, the search for explanatory factors of the dynamics of the countries of the Franc Zone will bring out relevant lessons for the development of adequate diversification strategies for the countries of this zone.

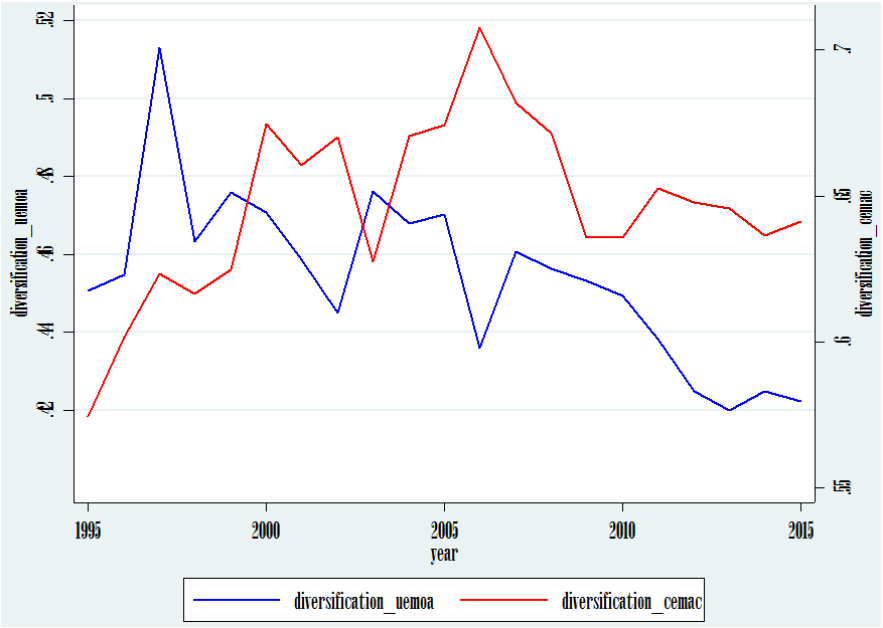

Figure 1. **Evolution of the Diversification Index in the Franc Zone**

Source: WDI (2015), Freedom House (2015) and UNTACD (2015).

Figure 2 shows the relationship between GDP per capita and diversification in both zones. Thus, Figure 2a shows that GDP per capita is negatively correlated (-0.6865) with export diversification in the WAEMU countries. While export diversification continued to decline (as the Theil index shows), economic growth was steady throughout the study period. Conversely, Figure 2b shows a positive correlation (0.3393) between diversification and GDP per capita in the CAEMU zone, although this link strength remains weak. However, after the fall in commodity prices, the countries in the CAEMU zone seem to be plunging into a deep economic recession.

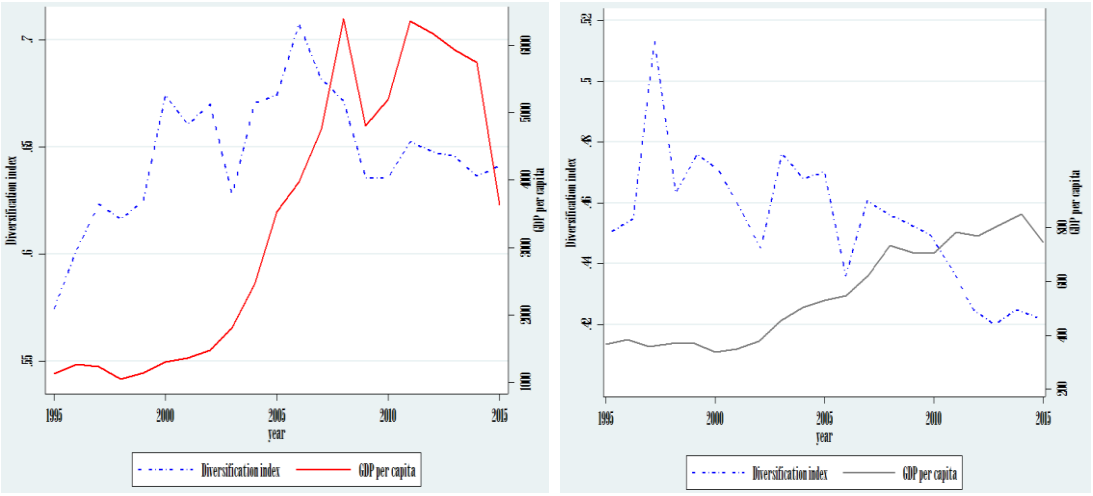

Figure 2. **Evolution of Export Diversification and Real GDP Per Capita in the WAEMU and CEMAC Zones**

Source: WDI (2015), Freedom House (2015) and UNTACD (2015).

3. Literature Review

Diversification consists in progressively widening the range of products manufactured without necessarily modifying production levels (Berthélemy & Chauvin, 2000). By changing the share of different products in the exported range, or by including new products, a given country will have diversified its exports. Thus, greater export diversification can increase economic growth.

Several studies examine the determinants of export diversification and highlight groups of variables such as international openness, structural factors, macroeconomic variables, institutional variables, and hysteresis. More specifically, the report on diversification in Africa of the United Nations Economic Commission for Africa (2006) distinguishes five categories of variables affecting the process of export diversification, namely: (1) physical factors (investment, growth and human capital); (2) political choices (impact of trade and industrial policies); (3) Macroeconomic variables (exchange rate, inflation and major macroeconomic imbalances); (4) institutional variables (governance, investment environment and security situation); and (5) access to markets (degree of openness to trade in goods, services and capital through the elimination of tariff and non-tariff barriers, access to bank or market financing).

From an empirical point of view, various literatures are devoted to the analysis of export diversification. However, our study examines the most recent ones that show the diversification of exports across these key variables.

The work of Imbs and Wacziarg (2003) indicates an inverse U-relationship between diversification and per capita income. In other words, poor countries are trying to diversify with the increase in per capita income to a high level around $9000US (1985 value of the US dollar). This positive relationship between export diversification and per capita income will decline after specialization becomes the dominant force. This U-inverse relationship is confirmed by the work of Cadot et al. (2011). In fact, these authors show

that the positive relationship between diversification and per capita income is due primarily to the extensive margin effect where new products and new markets are discovered. And then, when the turning point is reached at a threshold of $25,000 US, the concentration process is also due to an extensive margin effect where more developed countries begin to close out the operating lines that are no longer active. Agosin and Bravo-Ortega (2009) analyze the main determinants of export diversification across the world over the period 1962-2000 to show that trade openness implies greater specialization that does not favor diversification. The variables financial development, human capital, and terms of trade help countries to diversify their exports while real exchange rate volatility has a negative effect. Aditya and Acharyya (2012) examine the differences between economic growth in Asia and Latin America, and more particularly the role of trade and institutions over the period 1975-2005. The results obtained from a GMM estimator show that the two regions have in common determinants of economic growth such as exports, investment, public debt and human capital. Trade policy remains almost similar. Diversification and the composition of exports in general have a significant impact on economic growth. Industrial exports are significant for both regions. However, the diversification of exports within the same industrial sector is only significant for Asia. Regional economic integration institutions have asymmetrical effects on Asia and Latin America, but are more favorable for the latter. Dogruel and Tekce (2011) study the main sources of export diversification in 8 countries in the Middles East and North region Africa (MENA) for the period 1991-2009. The results show that countries that are not dependent on oil exports (Morocco, Egypt, Jordan and Tunisia) increase the diversification of their exports unlike other oil-rich countries (Algeria, Saudi Arabia, Kuwait and Oman). As for the interaction between export diversification and economic growth, the results indicate an inverse relationship between the two variables. The results concerning trade liberalization on export diversification remain mixed. Similarly, Ben Hammouda et al. (2006) analyze the determinants of diversification in North Africa over the period 1996-2002 and find that industrial policies, public and private investment and external balance have positive impacts on export diversification. Veiga et al. (2010) study the economic and political factors that determine the diversification of exports in 48 countries of sub-Saharan Africa over the period 1960-2005. The results show that the level of development and the size of the economy are positively correlated with export diversification. The results also suggest that improvements in institutional, political and educational services play an important role in promoting export diversification. Elhiraika and Mbate (2014) explore the long-term relationship of the determinants of export diversification for 53 African countries over the period 1995-2011. The results obtained from the GMM system estimator indicate that the key determinants of export diversification on the continent are per capita income, public investment, human capital, infrastructure, institutions and economic policies. More specifically, industrialization policies further facilitate horizontal and vertical diversification. Horizontal diversification occurs when the number of export products in the same sector increases and vertical diversification occurs when there is a transformation of primary products to secondary or tertiary products, thus creating externalities in knowledge and technology.

In total, most of these various studies identify several variables that explain the diversification of exports. However, of these multitudes works, none to our knowledge has been devoted specifically to the Franc Zone in terms of comparison. Thus, our study fills this void by analyzing the factors that influence the export diversification at WAEMU and CAEMU levels while comparing these two unions. These two zones present peculiarities in relation to their export process and commodity endowments likely to influence the choice of diversification as shown by the stylized facts (Figures 1 and 2).

4. Methodology

4.1 Specification of the Model

The United Nations Economic Commission for Africa - North Africa- Office (ECA- AN, February 2013) developed a model for NAPs to highlight the determinants of export diversification through a panel data approach. The model explains the level of diversification of exports at period *t* by the level of diversification of exports at period *t-1*, trade openness, FDI, structural factors (education spending, GDP / capita, trade facilitation), institutional factors (industrial, public and private investment, state aids, governance) and macroeconomic variables (the terms of trade and the exchange rate).

Our model is in the same wake of research. However, given the unavailability of information, we do not consider the variables trade facilitation and states aids. In addition, we use gross fixed capital formation (GFCF) as a proxy for public and private investment. Finally, our study considers as a measure of governance the variables index of democracy, quality of democratic institutions and index of political rights. In fact, Kormendi and Meguire (1985) and Savvides (1995) show that African countries that enjoy greater political freedom, a guarantee of good governance, enjoy greater economic growth. Rivera-Baltiz (2002) indicates that strong democratic institutions are closely linked to high quality governance and that democracy is a major determinant of economic growth.

In order to interpret our factors in terms of elasticity and improve the variability of our variables we apply the neperian logarithm function (*ln*) to all our variables with the exception of inflation which is expressed as a percentage (%) and governance variables.

The equation of our model which explains the evolution of the level of diversification of exports results in:

$$\boldsymbol{lndiv_{it} = \gamma lndiv_{i,t-1} + \beta_1 lngdp_{it} + \beta_2 lngfcf_{it} + \beta_3 lncpriv_{it} + \beta_4 lntouv_{it} + \beta_5 lntot_{it} + \beta_6 lneduc_{it} + \beta_7 lnfdi_{it} + \beta_8 infl_{it} + \beta_9 democ_{it} + \beta_0 + \lambda_i + \xi_{it}} \quad (1)$$

With $|\gamma| < 1$. This condition allows ensuring convergence and the existence of a solution.

In this model, div_{it} is the dependent variable that measures the level of diversification of exports through the Theil index whose calculation method is presented in appendix 4. The lower the Theil index of exports, the greater the diversification of export products. The variable div_{it-1} is the lagged variable of the level of export diversification (hysteresis phenomenon) to account for the slow pace of diversification processes and their dependence on past conditions. The variable *touv*, the degree of trade openness, measures the share of trade in a country's GDP. The *fdi* variable refers to foreign direct investment. The

educ variable measures expenditures on education that cover the expenditures of schools, universities and other public and private institutions involved in providing or supporting educational services. They can promote economic growth, improve productivity, support the personal and social development of citizens and help reduce social inequalities. The *gdp* variable, which expresses *GDP* per *capita*, reflects the evolution of a country's level of economic development and reflects the country's economic performance and ability to finance domestic and foreign investment needs. Gross fixed capital formation g*fcf* measures the investment of the various resident economic agents in fixed assets, ie tangible or intangible assets. It is used as a proxy for public and private investment. Macroeconomic variables are the terms of trade, *tot*, and the *cpriv* financial opening measured by credit to the private sector as a percentage of GDP which, according to ECA-NA, would improve diversification. The *infl* variable, which measures the change in consumer price indices, will capture the price effect on export diversification. The variable *demo* refers to the Democracy Index of the Freedom House Policy 4 database. It ranges from (-10) for the least democratic regimes to (+10) for the most democratic regimes. It makes it possible to take into account the main importance of political factors in democracy. According to the Freedom House, a high index reflects a high political risk, which is likely to not favor democracy, hence good governance.

The parameters $\gamma, \beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8 \; and \; \beta_9$ represent the coefficients to be estimated for each group of countries in the Franc Zone (WAEMU; CAEMU). The term $\boldsymbol{\lambda_i}$ indicates the unobservable effects that characterize individual country specificities. The error term is designated by ξ_{it}. The indices *i* and *t* represent respectively the individual or spatial dimension (country index) and the temporal dimension.

From a macroeconomic point of view, with the exception of $\beta_{8,}$ which can be positively or negatively signed, all the other coefficients (β_2, β_3, β_4, β_5, β_6, β_7 and $\beta_{9)}$ are negative (Melitz, 2003; Ben Hammouda et al., 2006; Herzer & Nowak-Lehmann, 2006; Kamgna, 2007; Manova, 2008; CEA, 2013, Poncet et al., 2013). Given that a high level of the Theil index reflects low levels of export diversification, a negative sign in the regression indicates that the factor in question is associated with better diversification.

Data on the variables come from the World Bank (WDI) database and the United Nations Conference on Trade and Development (UNTACD). Governance variables come from Freedom House (Policy IV).

The period of the study, 1995-2015, is justified by the fact that the years 1995 mark the beginning of the period of the devaluation of 1994 and the experience of democracy for the countries of the Franc Zone. In addition, the presence of governance variables motivates this choice. The end of the period 2015 is expressed by the chosen period of our study.

4.2 Estimation Method

Our study uses regression in panel data. The double dimension offered by panel data is a decisive advantage over other types of data, time series and cross-sections. This double dimension makes it possible to simultaneously account for behavioral dynamics and their possible heterogeneity (Sevestre, 2002). Another characteristic, partly stemming from this double dimension, is that the number of

observations is high. The advantage of having a large sample size is that it makes it possible to obtain estimators whose asymptotic properties can be assimilated to the asymptotic properties of the methods used (possible convergence, asymptotic law). More precisely, this means that they converge to true values and that the limit of the variance-covariance matrix of the estimated coefficients tends to zero, when N and T tend to infinity. From the double dimension, it is possible to reduce the risks of multi-collinearity, and to manage the individual and temporal specificities and thus to control the effects of the omitted and unobserved variables on the properties of the estimators (Pirotte, 2011).

Economists most often use two economic model categories that deal with panel data such as the linear model and the dynamic model. The latter is characterized by the presence of delayed endogenous variables. These delayed variables are in fact time-shifted forms of the dependent variable in the explanatory variables. The estimation of such a model can be done by several methods because of the size of the panel (N large and T small, N small and T large, N and T large).

Nickell (1981) has shown that the estimation of a dynamic model on panel data by OLS (Ordinary Least Squares) and LSDV (Least Squares Dummy Variable) estimates is biased when N tends to infinity and T fixed because the endogenous variable is correlated with the error term. As Bond and Windmeijer (2002) point out, the estimate of the β_1 coefficient is biased upward for the OLS estimate and downward for the LSDV estimator.

The econometric literature has developed many consistent estimators that use instrumental variable methods and generalized moments (Anderson & Hsiao, 1982; Blundel & Bond, 1998). The estimator of instrumental variables proposed by Anderson and Hsiao (1982) consists in estimating the model (1) in first difference using the explained variable delayed by two periods as an instrument. This estimator is effective when N tends to infinity and T fixed. However, as Lai et al. (2008) point out, the asymptotic properties of the estimator are no longer valid for many sample configurations, which implies strong differences between the asymptotic performance of the estimator and its finite sample performance. This is particularly the case when the instruments used are weak or too numerous. An instrument is said to be weak when the constraint on the moments it implies provides little information relative to the sample size (Lai et al., 2008). This problem of weak instruments is very important even with a sample with very large numbers of individuals. The estimator of Anderson and Hsiao (1982) provides very unreliable results when the instruments are weak.

Other estimators are based on the generalized moment's method. Similar to the Anderson and Hsiao (1982) estimator, these estimators have good properties when N tends to infinity and T fixed, provided that the instruments used are not weak. There are two types of GMM estimators for dynamic models on panel data, namely the first difference estimator and the system estimator. In GMM methods in differences or systems, the choice of number and quality of instruments affects the results. Hence, the conditions of identification require that it be at least as many instruments as endogenous suspected variables. However, when the instruments themselves are weakly exogenous or too large in number, the estimates could be strongly biased (Tauchen, 1986; Ziliak, 1997). While the GMM method in system

seems theoretically more efficient than the GMM method in differences, it uses more instruments than the latter, which makes it particularly inappropriate when the individual dimension is small (Bowsher, 2002).

An alternative way to provide an efficient estimate of dynamic models on panel data is to correct the bias of the LSDV estimator (Nickell, 1981; Kiviet, 1995; Bun & Kiviet, 2003). The advantage of this method is twofold since, on the one hand, the LSDV estimator often has a lower variance than the other estimators and, on the other hand, a bias correction of the LSDV estimator provides a consistent estimate for all panel dimensions. In the presence of a panel whose T is large and N fixed, this estimator is more efficient than the other estimators (Nickell, 1981; Kiviet, 1995), which is the case in our study. Moreover, the Monte-Carlo simulations carried out by Kiviet (1995), Bun and Kiviet (1999, 2003) and Bruno (2005a) show the superiority of the corrected LSDV estimator (LSDVC) compared to the IV and GMM estimators, that in terms of bias and RMSE (Root Mean Squared Error). Similarly, these authors also show that a corrected LSDV estimator (LSDVC) is more efficient than the GMM estimator when N is low. Bruno (2005b) extends the formulation of Bun and Kiviet (2003) for the case of a non-cylindrical dynamic panel.

In our case, we have low values of N (8 for the WAEMU zone and 6 for the CAEMU zone) and 21 periods (T) for each of the two zones. The use of a GMM estimator in system or difference is therefore not too suitable and will lead to biased estimators.

Thus, the originality of our work consists in using the LSDVC method developed by Bruno (2005a, b) for a small sample to estimate the determinants of export diversification in each monetary zone of the Franc Zone and also in the zone as a whole.

4.3 Using the Corrected LSDV Estimator (LSDVC)

Nickell (1981) examines the bias of an LSDV estimator for N tending to infinity. However, an additional bias given by $\hat{B} = E\left(\hat{\beta}_{LSDV} - \beta\right)$ plays an important role in the case where N and T are finite (Bun & Kiviet, 1999, 2003, 2006; Bun & Carree, 2005, 2006). Bun and Kiviet (2003) defined three types of bias:

$$B_1 = c_1(T^{-1}),$$
$$B_2 = B_1 + c_1(NT^{-1}),$$
$$B_3 = B_2 + c_1(T^{-1}). \quad (2)$$

where the values of $c_i, i = \{1, 2, 3\}$ depend on the unknown parameters of equation (2) (β) and the variance of the error term. For more details on the values of c_i, see Bun and Kiviet, 2003, Bruno 2005a. The LSDVC estimator is obtained by subtracting the estimated value B_i $(\hat{B}_i)$ from the Within (LSDV) estimator. For the estimation of B_i, Bruno (2005b) uses as initial values the estimated values of $\hat{\beta}$ of the estimation methods Anderson and Hsiao (AH), Arellano and Bond (AB) or Blundel and Bond (BB). The LSDVC estimator is as follows:

$LSDVC_i = LSDV - \hat{B}_i,\ i = 1, 2\ and\ 3$

5. Results and Discussions

This section presents the results of the different econometric simulations in the two zones according to the LSDVC approach proposed by Bun and Kiviet (2003) and subsequently improved by Bruno (2005a, 2005b). The regressions selected are those with the lowest value for RMSE (Root Mean Squared Error) and the results differ from one zone to another. In addition, the study also paid particular attention to the verification of the U-inverted relationship between economic development and diversification in each of the zones as found by Imbs and Wacziarg (2003), Klinger and Lederman (2004), Cadot et al. (2011), Agosin et al. (2012). Finally, the study also looked at the determinants of export diversification by considering the Franc Zone as a single block instead of distinguishing the WAEMU and the CAEMU zones as presented in the comparative analysis. Given that a high level of the Theil index reflects low levels of export diversification, a negative sign in the regression indicates that the factor in question is associated with better diversification.

5.1 Export Diversification and Economic Growth

Regarding the determinants of diversification, Table 2 shows a positive and significant relationship between export diversification and economic growth in the WAEMU zone, which corresponds to negative parameters, thus confirming what the empirical literature predicts (de Piñeres & Ferrantino, 1997; Balaguer & Cantavella-Jordá, 2004; Ben Hammouda et al., 2006; CEA-AN, 2013; Elhiraika & Mbate, 2014; IMF, 2016). We note that a 1% increase in per capita income strengthens the diversification of nearly 0.04% in the WAEMU countries. In other words, an increase in per capita income induces an improvement in diversification.

On the other hand, this control variable (*lngdp*) does not seem to be significant for the countries of the CAEMU zone. Given that these countries have particularities in the Franc Zone because of their potential for natural export resources (crude oil, cocoa, coffee, cotton, wood, banana, diamonds, coffee, tobacco, sugar, livestock, etc.), it may be necessary to achieve a per capita income level before observing the sensitivity of diversification following a change in wealth per capita in this group of countries.

5.2 Export Diversification and Trade Openness

Table 2 shows the positive effects of trade openness on diversification in WAEMU and CAEMU zones, which corresponds to a negative parameter since the explained variable is the index of concentration of Theil. Thus, greater trade openness encourages a deepening of export diversification regardless of the zone. However, the impact seems quite similar in both zones. Hence, an increase of 1% in trade openness leads respectively to a 0.016% increase in diversification for the WAEMU zone compared to 0.020% for the CAEMU zone. Thus, greater trade openness also increases the number of potential trading partners and the demand for exports. These results corroborate those obtained by Agosin and Bravo-Ortega (2009); CEA-AN (2013); Elhiraika and Mbate (2014); Kazandjian et al. (2016). For example, according to Agosin and Bravo-Ortega (2009), a positive interaction between trade openness and diversification indicates that greater specialization promotes diversification. In addition, greater trade openness can also increase the potential number of trading partners and the demand for exports (Kazandjian et al., 2016).

5.3 Export Diversification, Financial Openness and FDI

The results as shown in Table 2 reveal that financial openness (credit to the private sector as a percentage of GDP) leads to greater diversification only in CAEMU countries. In other words, a 1% increase in credit to the private sector in this zone will lead to an increase in export diversification of around 0.02%. These results confirm those obtained by Melitz (2003); Manova (2008); CEA-AN (2013); Elhiraika and Mbate (2014); Kazandjian et al. (2016). However, improved foreign direct investment (FDI) has no impact on diversification strategies in each of the two zones.

5.4 Diversification of Exports and Economic Levers (Human Capital, Democracy, Inflation)

Human capital and the existence of stronger democratic institutions and a low level of inflation are associated with greater diversification of the export base in all countries of the WAEMU zone with the exception of those in the CAEMU zone. However, it should be noted that the effect is more pronounced for human capital than the other variables. Education and research policies must therefore be strengthened in order to accelerate the diversification of economies, especially towards innovative products. These results highlight the need to continue working to improve these relatively slow-moving factors over the medium and long term. This tends to confirm the results of the existing literature (Agosin & Bravo-Ortega, 2009; CEA, 2013; Elhiraika & Mbate, 2014; Kazandjian et al., 2016).

5.5 Export Diversification and Macroeconomic Variables (Terms of Trade Index, Gross Fixed Capital Formation)

The results highlight that an improvement in public investment in WAEMU countries helps to improve diversification. In other words, an increase in public investment of 1% will lead to a deeper diversification of nearly 0.04%. In addition, public investment tends to enhance trade diversification, suggesting that investments are allocated both in existing and new industries (ECA-AN, 2013). These results confirm those obtained by Agosin and Bravo-Ortega (2009); Ben Hammouda et al. (2006); CEA-AN (2013); Elhiraika and Mbate **(**2014).

Table 2. Results of the LSDVC Estimates in the WAEMU and CAEMU Zones

	(1)	(2)	(3)	(4)	(5)	(6)
	WAEMU	WAEMU	WAEMU	CAEMU	CAEMU	CAEMU
Ln div	0.872 ***	0.886 ***	0.851 ***	0.635 ***	0.621 ***	0.612 ***
	(0000)	(0000)	(0000)	(0000)	(0000)	(0000)
Ln gdp	-0.0377	-0.0388 ***	-0.0377 ***	0.0039	0.0018	0.0012
	(0651)	(0000)	(0000)	(0596)	(0826)	(0884)
Ln cpriv	0. 0023	-0.0121	-0.0124	-0.0238 **	-0.0229 **	-0.0220 *
	(0998)	(0285)	(0281)	(0036)	(0044)	(0060)
Ln touv	- 0.0205 * *	0.0120	- 0.015 8 **	- 0.0213 ***	- 0.0193 **	- 0.0207 **
	(0.028)	(0210)	(0.09 5)	(0009)	(0020)	(0015)

Ln tot	0.0295	0.0290 ***	0.0283 ***	0.00751	0.0106	0.0114
	(0840)	(0000)	(0000)	(0588)	(0454)	(0420)
Lneduc	0.0883	- 0.0805 ***	- 0.0804 ***	0.00214	0.0030	0.0049
	(0866)	(0000)	(0000)	(0886)	(0843)	(0753)
Infl	- 0.0022 **	0.0013	- 0.0011 *	-0.0008	-0.0007	-0,0007
	(0.003)	(0,965)	(0.000)	(0,201)	(0,256)	(0,285)
Democ	- 0,0054 **	- 0,0052 **	- 0,0049 **	0,0052 *	0,0056	0,0057
	(0,007)	(0.010)	(0.017)	(0.063)	(0,049)	(0,048)
Lngfcf		- 0,0435 ***	- 0,0456 ***		-0,0055	-0.0051
		(0.000)	(0,001)		(0,494)	(0,532)
Lnfdi			-0,0189			-0.00381
			(0.524)			(0,597)
NOT	160	160	160	120	120	120

p- values in parentheses

** p <0,1, ** p <0,05, *** p <0,01*

Source: WDI (2015), Freedom House (2015) and UNTACD (2015).

5.6 The Hysteresis of Export Diversification

Hysteresis is also very significant and positive in both zones, suggesting that diversification phenomena are extremely slow processes and therefore very dependent on past values. A policy aimed at more diversification is therefore a long-term policy.

5.7 U-reversed Relationship between Export Diversification and Economic Growth

Since the work of Imbs and Wacziarg (2003), the relationship between economic developments has generated much controversy in recent empirical literature. Some authors have developed a non-monotonic relationship, a U-inverted relationship (Klinger & Lederman, 2004; Cadot et al., 2011; Agosin et al., 2012). Second, others have suggested a U-shaped relationship (Dabla-Norris et al., 2013) that countries initially diversify until they reach a certain level of development and then begin to concentrate their exports. Indeed, the results of Appendix 5 indicate a U-inverse relationship in the WAEMU countries confirming the results of the authors Imbs and Wacziarg (2003); Klinger and Lederman (2004); Cadot et al. (2011); Agosin et al. (2012). Thus, up to a relatively high income level, the relationship between diversification and GDP per capita is positive. Then beyond this level, this relationship is reversed. However, the results rather show a U-shaped relationship in the CAEMU zone countries, thus joining the conclusions of Dabla-Norris et al. (2013).

5.8 Results in the Franc Zone as a Single Block

The results for the Aggregated Franc Zone (Appendix 3) show that the explanatory factors for export diversification, the most relevant are: human capital, economic development, financial liberalization, the degree of trade openness, public investment, the index of democracy. Therefore, all these factors

contribute to the strengthening of export diversification in the Franc Zone. A conclusion that tends to corroborate and clarify recent findings on the analysis of diversification. However, the impact of human capital seems more pronounced than the other variables, which seems interesting to emphasize. An increase in human capital generally promotes the accumulation of human capital and subsequently allows countries to shift their specialization towards more elaborated products. Hysteresis is also very significant and positive while remaining relatively lower than the value previously obtained in each of the two zones (Table 2). Finally, we note a U-shaped relationship between GDP per capita and diversification in the zone. This confirms the conclusion of Dabla-Norris et al. (2013), which indicates that countries initially diversify until they reach a certain level of development and then begin to concentrate their exports.

6. Conclusions and Recommendations

The objective of this study was to assess the determinants of export diversification in the 14 countries of the Franc Zone. To do this, the study used Bruno (2005a, b) LSDVC estimation methods to identify these factors that may or may not improve diversification in these countries. The main teaching of this study is that more factors favor diversification in WAEMU countries compared to those in the CAEMU zone. In addition, we note a U-inverse relationship between per capita income and diversification in the WAEMU zone while a U-shaped relationship is observed in the second zone. Moreover, the results for the Aggregated Franc Zone (Appendix 3) show that the factors that explain diversification and the most relevant are: human capital, economic development, financial liberalization, degree of trade openness, public investment, and the index of democracy. However, the countries of the Franc Zone are characterized by a low diversification of the productive base and exports. In particular, the performance of those in the CAEMU zone is thus dependent on the activities of vulnerable sectors, and in general on one or a few raw materials. On the other hand, the observation of the dynamics of exports over the period of study revealed cases of abandonment of production or the extraction of certain goods in the countries of the zone.

In terms of implications, our results indicate that the structural transformation and composition of the production of a country must be part of any development strategy. Ben Hammouda et al. (2006) concluded that African countries should seek to increase their levels of investment particularly in education, transport infrastructure, improve governance, eliminate conflict, adopt non-conservative fiscal policies and ensure macroeconomic stability, in addition to implement industrial and trade policies that stimulate economic diversification. The creation of new activities with high added value requires an improvement of training, education and research policies. As a result, a long-term strategy should be put in place to ensure that the potential in terms of skilled and productive workforce is effective to feed new industrial strategies and to cope with growth in the labor force.

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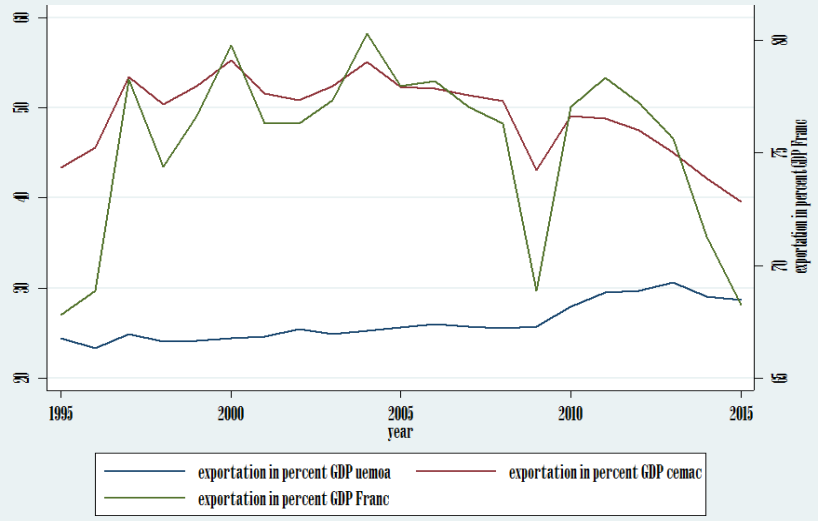
Appendix

Appendix 1. Evolution of Exports in Both Zones



Source: WDI (20 15); Freedom House (2 015); UNTACD (2015).

Appendix 2. Descriptive Data Analyses

Variables	Obs.	Mean	Std. Dev.	Low	Max
lndiv	294	0,294	0.16	0.000	0,581
lngdp	294	6.169	1,486	0.000	10.025
lngfcf	294	2,855	0,689	0.000	5.384
lncpriv	294	2.3	0,635	0.000	3,645
lntouv	294	3,476	0.956	0.000	6.219
lntot	294	4.493	0,569	0.000	0,5377
lneduc	294	1.104	0,371	0.000	2.156
lnfdi	294	2,535	0,451	0.000	5.144
infl	294	3,857	6,339	-8,975	50.734
democ	294	2.81	2,853	0.000	8,000

Source: WDI (2015); Freedom House (2015); UNTACD (2015).

Appendix 3. Estimation Results on the Franc Zone

	(1)	(2)	(3)
	FRANC ZONE	FRANC ZONE	FRANC ZONE
lndiv	0.442 ***	0.474 ***	0 0,460 ***
	(0.000)	(0.000)	(0.000)
lngdp	-0,0266 ***	-0,0266 ***	-0,0269 ***
	(0.000)	(0.000)	(0.000)
lncpriv	-0,0126	-0,0171 *	-0,0166 *
	(0,180)	(0,065)	(0,069)
lntouv	- 0,0232 ***	- 0,0231 ***	- 0,0212 ***
	(0.000)	(0.000)	(0,001)
lntot	0,00791	0,00641	0,00740
	(0.193)	(0,324)	(0,262)
lneduc	- 0,0425 ***	- 0,0424 ***	- 0,0417 ***
	(0.000)	(0.000)	(0.000)
infl	0.000356	0.000214	0.000152
	(0,533)	(0,711)	(0,793)
democ	- 0,00345 **	- 0,00297 *	- 0,00294 *
	(0,038)	(0.064)	(0.064)
lngfcf		- 0,0160 **	- 0,0142 **
		(0.015)	(0,033)
lnfdi			0,00351
			(0,555)
NOT	280	280	280

p- values in parentheses

* p <0,1, ** p <0,05, *** p <0,01

Source: WDI (2015); Freedom House (2015); UNTACD (2015).

Appendix 4. Calculation of the Diversification Index of THEIL

For a given country and for a given year the Theil index of export diversification is given by:

$$T = \frac{1}{n}\sum_{k=1}^{n}\frac{x_k}{\mu}\ln(\frac{x_k}{\mu}) \qquad \text{where} \qquad \mu = \frac{1}{n}\sum_{k=1}^{n} x_k$$

n is the total number of products exported (for example the 256 products registered in the UNTACD

database in the Standard Classification for commerce (SITC), Revision 3 for the most detailed level). x_k means the exports of the product *k*.

Appendix 5. Verification of the Bump-shaped Relationship (Inverted U-Curve) Between Economic Development and Export Diversification

	WAEMU	CAEMU	FRANC ZONE
ln gdp	0.0890 *	-0.0819 *	-0.0998 ***
	(0.076)	(0.059)	(0.001)
ln gdp2	-0,0123 **	0.008 2 ***	0.0102 ***
	(0016)	(0009)	(0000)
constant	0,135	0.527 ***	0.498 ***
	(0.278)	(0000)	(0000)
NOT	168	126	294

p- valeurs in parentheses * p <0.10, ** p <0.05, *** p <0.01

Source: WDI (2015); Freedom House (2015); UNTACD (2015).

Appendix 6. Results of Estimation of the GMM Method in System

	(1)	(2)	(3)	(4)	(5)	(6)
	WAEMU	WAEMU	CAEMU	CAEMU	FRANC ZONE	FRANC ZONE
Lndiv	0.653 ***	0.654 ***	0.599 ***	0.595 ***	0.629 ***	0.628 ***
	(0000)	(0000)	(0000)	(0000)	(0000)	(0000)
Lngdp	-0.0015	-0.0013	0.0003	0.0004	0.0005	0.0004
	(0815)	(0846)	(0.965)	(0.955)	(0914)	(0923)
Lngfcf	0.0232	0.0232	0.0067	0.0060	0.0147 *	0.0146 *
	(0.152)	(0.154)	(0410)	(0.456)	(0090)	(0093)
lncpriv	-0.0397 ***	-0.0389 ***	-0.0270 **	-0.0272 **	-0.0374 ***	-0.0377 ***
	(0.005)	(0.006)	(0.018)	(0019)	(0000)	(0000)
lntouv	-0.0112	-0.0106	0.0167 *	0.0171 *	-0,007 3	-0.0073
	(0.359)	(0409)	(0.070)	(0.069)	(0411)	(0409)
Lntot	0.00128	0.0016	0.0143	0.0143	0.0065	0.0065
	(0.912)	(0890)	(0.342)	(0.346)	(0522)	(0.520)
lneduc	0.0197	0.0194	-0.0023	-0.0025	0.0017	0.0016
	(0424)	(0.434)	(0899)	(0890)	(0910)	(0.915)
Infl	-0.0018 **	-0.0018 **	-0.0019 **	-0.0019 **	-0.0016 **	-0.0016 **
	(0.045)	(0.050)	(0017)	(0017)	(0016)	(0016)
democ	-0.0003	-0.0003	- 0.0112 ***	- 0.0115 ***	0.0026	0.0026
	(0913)	(0.908)	(0003)	(0002)	(0.233)	(0.227)
Lnfdi		-0.0105		0.0005		0.0019
		(0.740)		(0952)		(0858)
Constant	0.137 *	0.156	0.0544	.0547	0.144 **	0.140 **
	(0.086)	(0.111)	(0.381)	(0.397)	(0.013)	(0.026)
NOT	160	160	120	120	280	280
Test de Sargan	0,018	0,020	0.747	0.744	0.277	0,278

p- values in parentheses

* *p* <0.1, ** *p* <0.05, *** *p* <0.01

Source: WDI (2015); Freedom House (2015); UNTACD (2015).