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The Determinants of Trade Facilitation in Central African Economic and Monetary Union: An Analysis by the Gravity Model

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Abstract:
This study aims at identifying, by using the gravity model, the determinants of trade facilitation, likely to boost economic development in CEMAC zone. The data used cover the period 2004-2014 and come from five different sources namely COMTRADE of World Integrated Service (WITS), Center for Prospective Studies and International Information (CEPII), UNCTAD, Doing Business and Heritage Foundation Index of Economic Freedom from the Heritage Foundation. The results show that the distance between CEMAC countries and their partners significantly and negatively influences exports; sharing a common language is a proxy for cultural rapprochement that can foster trade. Therefore, our analysis shows that to reduce export and import delays, it is therefore important to strengthen cross-border administrations. In order to reduce transactions cost, it should be urgent to computerize the administrative system, reduce the digital divide and create an institutional framework of law enforcement and trade facilitation.

1- Introduction

Since the Singapore Conference in 1996, trade facilitation (TF) has been at the heart of debates and a major concern for developing countries. However, most of these countries signed a Trade Facilitation Agreement concluded in December 2013 in Bali within the framework of the World Trade Organization. The main purpose of the agreement was to reduce trade costs and consequently contain the provisions relating to the acceleration of circulation, the free hand and the clearance of goods in transit. Based on the fact that trade facilitation is the core of a country's development (Banomyong, 2012), the United Nations Conference for Trade Development (2006) shows that there is a strong link between the ability to implement trade facilitation measures and the initial level of a country's development. Moreover, according to the World Trade Organization (2015), commerce (predominantly in less developed countries (LDCs)) would see a 35% increase in their exports through Trade Facilitation Agreement if it were fully implemented. The United Nations Economic Commission for Africa (2013) using simulations showed that the establishment of a continental free trade zone coupled with trade facilitation would double the share of intra-African trade in the continent's total trade. Beyond accelerating trade flows, trade facilitation has a direct impact on the budget, through the effective collection of custom duties and taxes

on foreign trade[1] operations on which developing countries depend. In the face of these advantages, the need to modernize and harmonize trade procedures in CEMAC countries is necessary through the appropriation and implementation of the concept of trade facilitation. This is all the more necessary because despite its crossroads, the diversity of natural resources and a very favourable ecosystem, the Central African zone remains one of the least integrated on the African continent, in terms of trade flows between states (CEA, 2015). According to the African Development Bank (2015), CEMAC countries have not yet benefited from the advantages of regional integration, despite the importance of trade facilitation in creating opportunities to lift the burdens that weight down the fluidity of intra-CEMAC trade. Therefore, this study aims to identify the factors of trade facilitation, which could stimulate the economic development of the countries of the CEMAC zone, through the use of a gravity model.

[1]One of the main sources of funding Budgets developing countries.

Even if the literature on the analysis of the impact of Trade Facilitation, on commercial exchange is abundant, little studies are oriented or focused on identifying the determinants of trade facilitation in the CEMAC using a gravity model. By identifying the factors that facilitate trade, which could have spillover effects on economic growth, this study provides an opportunity to understand the levers of action of CEMAC countries to maximize the benefits of the trade facilitation agreement.

The rest of the article is organized as follows: Section 2 is devoted to the literature review, section 3 deals with modeling. Section 4 discusses the results, while Section 5 concludes in terms of recommendations.

2-Literature review

The Facilitation of Trade has its foundations in free trade or *permit* economic liberalism, which is a doctrine born in the 18th century and advocates the freedom of international trade between nations as well as the removal of all barriers to such trade. International trade theory explains the trade and economic effects of trade facilitation using two types of models: theoretical models based on the specialization of nations and models of the new theory of international trade. According to these theories, the facilitation of trade increases the possibilities of specialization and exchange between nations on the one hand; and improves the real income of workers on the other hand.

2.1-Classical theories of international trade

The theory of comparative advantages emerged as a result of the work of Adam Smith (1776). Indeed, the author showed that each country has an interest in specializing in the production of the property for which it has an absolute advantage in terms of production costs. By absolute advantage, the author means an advantage obtained in international trade by a nation when it produces and sells a good at an absolutely lower cost than that of all other countries. Free trade therefore allows each country to export goods for which the cost is lower than that of all other countries and to import goods for which the cost is higher than that of all other countries. However, the main criticism addressed to Adam Smith's theory of absolute benefits *(op. City*) is difficult to explain the configuration in which a country has no absolute advantage but must necessarily participate in international trade. Thus, the thesis of comparative advantage developed by David Ricardo (1817) then provides an answer to this concern. According to the author, exchanges exist even in situations where there are no

absolute advantages. The author relies on the notion of comparative advantages in terms of production costs to explain international trade between nations even in the absence of absolute benefits. By relative advantage, the author means an advantage obtained in international trade by a nation when, compared to others, her advantage in terms of production costs is greater and its disadvantage in terms of production cost is weaker. In the latter case, the cost of production is less than that of the most competitive country. Therefore, by opening up to international trade, the country can specialize in the production and export of goods for which it has a relative productive advantage and import the goods it produces with relatively lower productivity.

While the comparative advantage theory provides an analytical framework to better explain the effects of facilitating international trade through specialization, it nevertheless presents two main limitations. These are; the collective costs generated (training costs and loss of skills) by the internal mobility of production factors, as in the case of work, and indeed the only factor of production used in the Ricardian model; inequality in the distribution of earnings between trading nations and lack of precision in specialization. Indeed, if a country specializes in the production of low-value-added goods, it clearly loses out because it has to buy high value-added products abroad, which can lead to a trade deficit. Ricardo *(op. cited)* does not specify, in his thesis, the type of production that a country which participates in international exchange should specialize on. Thus, the Heckscher-Ohlin-Samuelson (HOS) theory explains why a country specializes in a given type of production. Thus, according to this theory, a developing country should export goods incorporating more labour since it has this factor in abundance and import capital-intensive goods.

On the contrary, a developed country would export goods that incorporate more technical capital and import labor-intensive goods. It is therefore in a nation's interest to specialize in the production of goods for which the combination of factors of production at its disposal provides it with a maximum advantage or a minimal disadvantage. Moreover, international specialization and international exchange leads to an international equalization of the remuneration of the factors of production of the participating nations. Indeed, specialization makes the intensively used factor less abundant and therefore its remuneration increases, as it becomes increasingly rare and expensive. From this perspective, trade facilitation can improve the real income of workers in a country with a large labour force.

It is inadmissible to point out that the HOS theory suffers from a number of ineligible limitations. First, HOS's theory predicts the convergence on the compensation of production

factor, which is not empirically verified. Second, international trade is not due to factorial differences but rather to differences in productivity. Finally, HOS's theory does not take into account economies of scale, which may also explain the link between costs and the level of production; and likewise to justify the adoption of trade facilitation measures.

2.2-New theories of international trade

In the 1980s, the dominant approach was supplanted by "a new theory of international trade" in which the most widely known author was Paul Krugman (1980). The author's work is distinguished by taking into account the role of increasing yields and imperfect competition in international trade theory. This theory provides an analytical framework for exchanges between countries with identical initial resource allocations. It also explains the development of intra-branch trade. Since, according to this theory, high trade costs limit trade and lead to the concentration of manufacturing output in developed countries; less developed countries that do not wish to be dependent on agriculture and natural resources have an interest in undertaking trade facilitation reforms such that lower trade costs increase demand for manufactured goods from developing countries and therefore reduce the concentration of manufacturing output in developed countries.

Moreover, the new trade theory attempts to explain specialization by the role of the heterogeneity of companies to the size of the market. This theory equally explains the reason why large productive enterprises are present in the export market, while small firms operate only in the domestic market, shows that trade facilitation reduces both variable costs, fixed costs and the costs associated with learning a nation's business procedures. This cost reduction also benefits large companies already present in the export market as well as small companies that are now able to enter the export market.

2.3-Some empirical findings

Moïsé and Sorescu (2013) analyzed the costs of bilateral trade between low- and middle-income countries. According to the authors, barriers to trade in sub-Saharan Africa (SSA) are formalities - automation, formalities - documents and the availability of information (estimated reduction potential at 2.9%, 2.7% and 1.9%) respectively. Moreover, using the various components of the Logistics Performance Index (LPI), the authors show that agricultural exports from developing countries are more sensitive to the quality of transport and trade-related infrastructure. They point out that an improvement in the quality of this

infrastructure by 10 percentage points increases the potential of agricultural exports in that country by about 30 percentage points for the countries in their sample. In the same vein, Seck (2014), for its part, shows that trade reforms for physical infrastructure (ports and airports) in Africa, improve the commercial performance of the region.

According to the author, the improvement in the quality of these infrastructures by one point (on the scale of 0 to 7) on the exporting side increases overall exports by 2%. This increase is 1.7% if the similar improvement were made in the partner country. Strengthening the quality of these infrastructures in the importing country increases the value of intra-African trade by 5.1% and 2.3% if this reinforcement came from the importing partner. In addition, Hummels and Schaur (2013), using import and export time as indicators of trade facilitation, conclude that an additional day for products to be exported constitutes a trade cost ranging from 0.6% to 1.2% in terms of tariff equivalency. Djankov et al. (2010) also highlight this negative effect of trade delay by showing in their study that a 10% increase in export time results in a reduction in the volume of exports by about 3 to 4%. Their work also reveals that perishable agricultural products were more sensitive to time. The latter result appears in Liapis's (2011) analysis, which shows that a 10% reduction in export time is associated with a 9.6% increase in agricultural trade.

Martinez-Zarzoso and Marquez-Ramos (2008) for their part claim that, in addition to export time, which has a higher contribution in reducing trade in agricultural products, the import time also negatively affects it.

Feenstra and Ma (2014) showed in their study that the improvement in port efficiency (trade facilitation indicator) by 1%, allows an increase in the number of varieties exported by about 0.22%. Export intensity, on the other hand, only increased by about 0.065%. Dennis and Shepherd's (2011) results are consistent with Feenstra and Ma (2014) when they conclude that a 10% reduction in export costs is associated with a 3% increase in export diversification.

In addition, Bernard et al. (2006) using data from U.S. manufacturing firms, show that a one-unit decrease in the standard deviation in trade costs leads to a 3% improvement in firm productivity growth. The authors go on to say that such a decline reduces the survival of less competitive firms by 1.3 percentage points. Similarly, Persson (2013) by using the number of days needed to export a commodity as a proxy for export costs, shows that a 10% reduction in this number of days increases the number of homogeneous and differentiated products exported by 3% and 6% respectively.

Using a computable general equilibrium model, the United Nations Conference for the Development of Commerce (UNCTAD, 2001) shows that a 1% reduction in the cost of maritime and air transport could increase Asia's gross domestic product by $3.3 billion. In addition, a 1% increase in productivity for the entire transportation sector would lead to an increase of $3.6 billion. Similarly, Economic Cooperation for Asia-Pacific, APEC (1999), using a computable general equilibrium model, results in the effect that the effects of the EF-derived business transaction cost reduction vary among APEC member countries.

Portual-Perez and Wilson (2012) analyze the effects of physical infrastructure (hard infrastructure) and institutional infrastructure (soft infrastructure) on the export performance of 101 countries over the period 2004 to 2007 using an increased gravity model. These authors used different estimation approaches including, Heckman in two steps and PPML. Among their findings, the authors found that if the business environment in Chad increases by one point, exports will increase by 22.6% and if Cameroon's environment also increases by one point, exports can grow by 16.8%.

3-Methodology

This third section seeks to determine the trade facilitation factors in CEMAC based on the gravity model whose theoretical and empirical models are presented in the following subsections.

3.1- Theoretical model

Under the Armington hypothesis (1969) and the identical and homogeneous preferences of the Cobb-Douglas type, consider a number C of countries i, j (i, d from 1 to C) and a number M of varieties of distinct goods □, □=1 to M. Note also $y_{□}^{i}$ the amount of production of the country i in variety □. Moreover, assuming the assumption that there are no costs to trade (tariffs and transportation costs are zero), prices [2] of goods can be standardized individually from one country to another. This makes them $y_{□}^{i}$ will measure the value of the production variety □ in the country i.

Where $Y^{i} = \sum_{□=1}^{M} y_{□}^{i}$ (1)

[2]Products differ in origin

If we assume global GDP equal to the sum of the GDP of all countries, we can write: Y

$$Y = \sum_{i=1}^{M} Y^i \qquad (2)$$

Let's assume $\square^j$ the share of the country's spending on the world expenditure. By formulating the assumption that total production equals total expenditure, we can write the following relationship:

$$\square^j = \frac{Y^j}{Y}$$

To maximize their profit at market opening, all countries produce different varieties of goods and under the additional assumption that demand is identical and homothetic between countries, exports of the variety of goods □ from the country i to the country j are given by the following expression:

$$X_{\square}^{ij} = \square y_{\square}^{i} \qquad (3)$$

Taking all products into account, you can write:

$$X^{ij} = \sum_{\square=1}^{M} X_{\square}^{ij} = \square^j \sum_{\square=1}^{M} y_{\square}^{i} = \square Y^i = \frac{Y^j Y^i}{Y} = \square\square Y = X^{ji} \qquad (4)$$

Let us now assume that there are costs to trade and that prices in countries are different. Therefore, we are faced with a "border effects" or *"border effects" model.*In this case, we will specify a utility function with constant substitution elasticity (CES).

Let's say that $C_{\square}^{ij}$ are the exports of the variety of goods □ of the country i to the country j, with the assumption that each country produces varieties of unique good, it can be said that exports of the variety □ of good from countries i to the country j will be equal to the total consumption of that good in the country j. Hence the total consumption $C_{\square}^{ij}$ of the country j in variety of goods □.

- The elasticity of substitution between goods which is also equal to the elasticity of demand when the number of goods M is large and always assuming the number of countries equal to C, with each country producing a number M^i of varieties of property unique, the usefulness of the country j is given by:

$$U^j = \sum_{i=1}^{C} \sum_{\square=1}^{M^i} \left(C_{\square}^{ij}\right)^{\frac{\square-1}{\square}} \qquad (5)$$

Prices are different between the exporting and importing countries, so we will have:

$$P^{ij} = t^{ij} P^{i} \quad (6)$$

With P^{i} the price of the property imported into the country i; P^{ij} the price of the goods exported from i to j and t^{ij} a multiplier explaining all the effects of factors limiting trade between i and j.

Assuming now price P^{ij} equality and assuming that all varieties of i exported goods □ constitute the total consumption of j $\left(C_{□}^{ij} = C^{ij}\right)$, the utility function of the importing country j can be summed up as:

$$U^{j} = \sum_{i=1}^{C} M^{i} \left(M^{ij}\right)^{\frac{o-1}{□}} \quad (7)$$

At present, C^{ij} is considered the consumption in the country j of any product from i, the representative consumer in the country i maximize its usefulness under the following constraint:

$$Y^{j} = \sum_{i=1}^{C} M^{i} P^{ij} C^{ij} \quad (8)$$

Y^{j} represents the aggregate expenditure corresponding to income in the country j (under the assumption of balanced budgets of the country j)

By maximizing consumer uility (7) under its budgetary constraint (8), the expression derived from demand for each country i, j equal to;

$$C^{ij} = \left(\frac{P^{ij}}{P^{j}}\right)^{-□} \left(\frac{Y^{j}}{P^{j}}\right) \quad (9)$$

P^{j} represents for the country j, all the implied factors indexed to the price that is defined by the expression:

$$P^{j} = \left[\sum_{i=1}^{C} M_{i} \, P_{ij}^{\,□-1}\right]^{\frac{1}{1-(}} \quad (10)$$

By replacing the latter expression (10) with that of (9), the total value of the country's exports to the country j is given by the following expression:

$$X^{ij} = M^{i} Y^{j} \left(\frac{P^{ij}}{P^{j}}\right)^{1-□} \quad (11)$$

Under the zero-profit hypothesis, there is a fixed production of firms. ϒ

The country's GDP i is equal to:

$$Y^{i} = M^{i} P^{i} \overline{Y} \quad (12)$$

By replacing (12) in the phrase (11), we get:

$$X^{ij} = \frac{Y^{i} Y^{j}}{P^{i} Y} \left(\frac{P^{ij}}{P^{j}} \right)^{1-\square} \quad (13)$$

Let's replace it with its expression above in the equation (13), we will have the following form: P^{j}

$$X^{ij} = \frac{Y^{i} Y^{j}}{P^{i} \square Y} \left(\frac{t^{ij}}{P^{j}} \right)^{1-\square}$$

Hence the gravity model of Anderson and Wincoop (2003) with theoretical basis.

$$X_{ij} = \frac{Y_i Y_j}{Y} \left(\frac{t_{ij}}{P_i P_j} \right)^{1-\square} \quad (14)$$

Log-linearization allows you to have an equation with coefficients to be estimated and easily interpretable

$$\ln X_{ij} = a_o + a_1 \ln Y_i + a_2 \ln Y_j + a_3 \ln t_{ij} + a_4 \ln P_i + a_5 \ln P_j + \square_{ij} \quad (15)$$

Where a_0 is a constant, $a_0 = 1 - \square$ and a term of error.
$\square$ j

t_{ij} represents the cost of trade and represent multilateral resistance to trade by countries $P_i P_j$ *I* and *j* respectively. They reflect the average resistance to trade between a country and all its partners. Thus, measures the opening of the world to the exports of the country $P_i I$ and the opening of the country $P_j j$ to imports from the world.

The terms and are not directly observable and their omission is the cause of significant estimation bias (Anderson and van Wincoop, 2003). Two approaches have been suggested to model multilateral resistance. These are the non-linear estimation of and (Anderson and van Wincoop, 2003) and the introduction of specific effects to each importing and exporting country (Feenstra, 2004; Kepaptsoglou P_i $P_j P_i P_j$ et al., 2010). This method is more appropriate for instant-cutting data but insufficient for panel data because it amounts to considering only the invariant part in time of the terms of multilateral resistance. This is why,

in addition to specific bilateral effects, fixed temporal effects to control the terms of multilateral resistance are added (Baldwin and Taglioni, 2006).

In the gravity model, it is generally assumed that commercial costs take the following form:

$$t_{ij} = d_{ij}^{\beta_1}.\exp(\beta_2 cont_{ij} + \beta_3 lang_{ij} + \beta_4 ccol_{ij} + \beta_5 col_{ij} + \beta_6 landlock_{ij} + \beta_7 RTA_{ij}) \quad (16)$$

d_{ij} is the bilateral distance, $cont_{ij}$ $lang_{ij}$, , $ccol_{ij}$, col_{ij} and are the $landlock_{ij}$ mute variables that enter the model as control variables. These variables mean whether the two countries have a common border, the common language, common colonizer, one was a colony of the other at some point in time, whether one of the two is a landlocked country and if the countries are members of a trade agreement.

3.2-Empirical model

Considering the variables of interest (soft and hard infrastructure) and making small changes to equation 16, the empirical model is written:

$$logX_{ijt} = Q_0 + Q_1 logPIB_{it} + Q_2 logPIB_{jt} + Q_3 logPOP_{it} + Q_4 logPOP_{jt} + Q_5 logdiswces_{ij} + Q_6 logSH_{it} + Q_7 lang_{ij} + Q_8 ccol_{ij} + Q_9 APE_{ij} + a_{ij} + a_t + \varsigma_{ijt} \quad \textbf{(17)}$$

With:

$logX_{ijt}$: logarithm of total exports in the t period;

$loePIB_{it}$: logarithm of the country's gross domestic product i at the t period;

$loePIB_{jt}$: logarithm of the country's gross domestic product during the t-period;

$logPOP_{it}$ Logarithm of the country's total population i at the t period;

$loePOP_{jt}$ Logarithm of the country's total population at the t-period;

$logdistwces_{ij}$: logarithm of the distance between the country i and j;

$logSH_{it}$: logarithm of the vector of soft variables and hard infrastructure at the t period. This vector consists of: cost of exporting the container (ccx), export time of the container (delx), export document (docx), mobile phone (telmobile), property right (dprt), roads (road), even rail (rails), air transport (freight) and internet (int).

α_{ij} , α_t : refers respectively to the bilateral individual effects between country i and j and fixed temporal effects at the t period;

$þ_0$Constant.

APE_{ij}: dummy variable to designate whether between the country i and j there is an economic partnership agreement i - 1,. 6

The model estimate (17) poses three (3) problems, including the direct non-observability of the terms of multilateral resistance, the problems of zero flow and heteroscedasticity.

To solve the problem of multilateral resistance, we use the fixed effects exporting and importing countries. The latter approach, because of its flexibility, is widely used in literature (Baldwin and Taglioni, 2006; Fontagné et al., 2008; Ferro et al., 2015). With regard to problems of zero trade and heteroscedasticity, we adopt the method of estimating maximum pseudo-likelihood from a Fish Law (PPML) with the introduction of specific bilateral effects and fixed temporal effects(Santos-Silva and Tenreyro (2006). (However, we compare the results with estimates using MCO and pseudo-maximum likelihood estimators as part of a Gamma (Gamma pseudo-maximum likelihood or GPML) model. If all three estimates produce similar results, then the model is well specified and it is possible to rely on the results of the estimates by MCO. If MCO estimates produce different results of PPML and GPML, then the heteroscedasticity problem is present and the results of the MCO estimates should not be relied upon. If the coefficients of the estimates by MCO and GPML are similar, but higher in absolute terms than the coefficients estimated by PPML, then there are two possible solutions. If the sample is small and the average quadratic error is wide, then the PPML may be the reference estimator. Finally, if the sample is large enough, then trade-related costs may have a non-constant elasticity.

3.3- variables and data sources

The variables used in this study are:

Bilateral exports (Xij): they represent the model-dependent variable and capture the total exports (in USD) of CEMAC countries to their main partners.

Table 1 below provides information on the types of export products of the various CEMAC countries specializing in commodity trade for the 2012 and 2013periods.

Distance (distwcesij): it plays negatively on bilateral trade because the further away partner countries are from each other, the smaller their bilateral trade. Generally, there are three kinds of distance: the bird's-eye distance, the actual distance and the adjusted actual distance. We thereby retain the adjusted real variable called "distwces" in the CEPII database, which measures the sum of distances between the major cities of each country weighted by their relative size.

Gross domestic product **(PIBi and PIBj):** it is expressed in current dollars and used to represent the production levels of each country i and j at the t-period.

Common language (langij): trade seems all the easier as trading partners speak the same language and as a result the level of connectivity increases. By common language, we mean the official or national language common to the country couple (i and j).

Export cost of the container (ccxi): the export cost of the container, expressed in dollars, is the cost collected for a 20-foot container. All costs related to the export procedures for goods are taken into account, including document costs, customs and inspection administrative costs, customs broker fees, port-related and land transportation costs.

Property rights (dprti): property rights are an instrument for measuring and accurately measuring the quality variable of the legal framework. It includes on the one hand, the level of protection provided by the law and, on the other hand, the degree of enforcement of contracts.

Export time (delxi): the deadlines for the export of the containers are expressed in calendar days. The waiting time between procedures (for example, during the unloading of the cargo) is included in the calculation.

Number of export documents (docxi): it represents the number of papers requested at the border in the event of export of goods.

Variable related to telecommunications (interneti): it is captured by the percentage of people who have access to the Internet (per 100 inhabitants).

Rail and road infrastructure (railsi and roadsi): the islands are assessed by the kilometer of the railway tracks. As for road infrastructure, it is the kilometer of paved roads that is used as a proxy. Road freight remains the dominant mode of transport in trade corridors for

virtually all landlocked developing countries and, more specifically, for landlocked countries in the CEMAC zone.

Variable related to a trade agreement (APEij):APEij the existence of a regional agreement such as EPAs is likely to bring the signatory countries closer together and should therefore stimulate trade by reducing tariff barriers and transaction costs.. Thus, the APEij variable is a dummy variable that takes the value: 1 if one of the CEMAC countries has signed a partnership agreement and 0 if not.

The data from 2004 to 2014 used in this study comes from different sources,[3] namely the COMTRADE database of World Integrated Service *(WITS)*, the Center for Forward-Looking Studies and International Information (CEPII),UNCTAD, UNCTAD, *Doing Business (2016),*, the International Telecommunications Union (ITU),, the World Bank and heritage Foundation Index of Economic Freedom of the *Heritage Foundation.*

4- Results and discussion

Table 2 below presents the results of econometric estimation by the ppml method. The gamma and MCO estimation approach is added to discuss the validity of the results with PPML.

Head and Mayer (2014) recommend, in order to validate the results of the Fish estimator, to compare them to two main estimators: the estimator of the smallest ordinary squares and the Estimator Gamma. The Fish estimator and the Gamma estimator result in consistent estimators, in the presence of zeros and a strong dispersion of the dependent variable. Indeed, the Zero-Inflated Negative Binominal Model (ZINBPML) and the Zero-Inflated Fish Model (ZIPPML) are also consistent in cases of high dispersion of the dependent variable (De Benedictis and Taglioni, 2011). Finally, to account for the nature of the dependent variable (which can be censored or truncated), we use the Censored Fish Regression Model (CPRM) and the Truncated Fish Regression Model (TPRM) (Grogger and Carson [1991], Long [1997], Winkelmann (2008), Raciborski (2011), Cameron and Trivedi (2005, 2013).

Tableau 2 : résultats d'estimation économétrique

[3] See Appendix

	Equation 1	Equation 2	Equation 3
Variables	**Ppml**	**Gamma**	**MCO**
ldistwcesij	-0.238**	-0.207**	-0.251*
	(0.110)	(0.0954)	(0.150)
lpopj	0.352***	0.266***	0.00398
	(0.101)	(0.0634)	(0.106)
lpopi	2.999	-17.99**	20.68
	(3.481)	(8.236)	(12.71)
lpibi	1.058*	6.761**	1.965
	(2.731)	(3.377)	(5.182)
lpibj	0.0816*	0.245***	0.119
	(0.0691)	(0.0677)	(0.0856)
ldelxi	-15.50**	-28.00**	-28.69**
	(6.291)	(11.25)	(17.39)
ldocxi	-8.550	-31.45*	-37.98
	(8.800)	(17.47)	(26.99)
linterneti	7.876**	19.84**	26.59*
	(3.236)	(9.638)	(14.99)
ldprti	-29.31*	-98.56**	-116.1
	(21.75)	(45.73)	(70.71)
lrailsi	36.92	250.1**	305.4
	(47.10)	(124.3)	(192.0)
lroadsi	27.20	85.80**	99.65
	(18.18)	(39.33)	(60.82)
lfreighti	-0.193	-0.667*	-0.688
	(0.188)	(0.374)	(0.577)
ccolij	0.721	1.058**	1.439**
	(0.449)	(0.506)	(0.681)
langij	0.441*	0.733	0.229
	(0.440)	(0.487)	(0.800)
lccxi	-0.690	2.304	2.821
	(1.082)	(1.682)	(2.584)
Apeij	-0.662*	-1.010***	-0.789*
	(0.352)	(0.379)	(0.445)

Constant	-239.4	-1,698**	-2.085
	(325.7)	(845.8)	(1.306)
Observations	540	403	409
R-squared	0.150	-	0.043
Effet pair	Oui	non	non
Effet temporel	Oui	non	non

Standard errors inside the brackets

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

Source: *author's estimate*

The coefficient associated with distance is negative and significant at 5%. Distance is thus a barrier to exchange. The distance between CEMAC countries and their partners has a negative and significant impact on exports. This result may confirm the idea that the greater the distance, the lower exports and imports will be as transportation costs are high (Baldwin and Taglioni, 2006).

However, it is important to remember that estimates of the effect of distance in a gravitational model appear very high to explain only the transportation costs of trade (Grossman, 1998), it is the phenomenon of *"puzzle distance"*. Presumably there would be other implicit factors that this estimated effect of distance captures. For example, natural barriers that sometimes require long detours between nearby cities. The export time is negative and significant at 5%. If the transit time increases by one day, exports are down by 15.50%. This is due to the remoteness of CEMAC countries from their partners (geographic location). For example, transporting a 40-foot container between Asia and Central Africa costs $6,000 for a journey period of one and a half to two months. The result is consistent with the work of the authors[4](Djankov, 2008; Nordas, 2006; Hummels and Schauer, 2013) who have shown that increasing the time limit on trade negatively influences countries' supply. Freud and Rocha (2010) corroborated the previous result by showing that in Africa, a one-day increase in transit reduces exports by 7%.

The coefficient of the interneti variable is positive and significant at 5%. This result confirms the work of Ramli and Ishmael (2014) which shows that the number of Internet subscribers per hundred inhabitants is considered an indicator of demand for e-commerce. If the

[4] Studies on business opportunities in Central Africa (2008)

percentage of people using the Internet increases by 1%, this affects exports by 7.87%. There is a rapprochement between exporters and importers through the use of the Internet and in particular through e-commerce. It is for this reason that Cairncoss (2001) referred to *the "death of distance"* to talk about reducing transport costs with technological revolutions.

Trade agreements (EPAs) have a negative and significant impact on CEMAC's trade. As a result, EPAs decreased by 0.516 (times CEMAC's exports. As a result, the EPA has led to the ouster of some local producers and a decline in intra-community trade. There is a diversion of trade.$e^{-0.662}$)

The institutional framework has a negative and significant effect at 1% on CEMAC's exports. If the legal framework score deteriorates by 1%, exports fall by -29.31 per cent. This result is consistent with the work of Anderson and Marcouiller (2002), which shows that the low quality of national institutions reduces bilateral trade by increasing the risks and uncertainty associated with trade transactions. In recent years, the CEMAC zone has been disrupted by the insecurity created by the *Boko Haram* sect and the conflicts in the Central African Republic. This is due to the fact that CEMAC countries have archaic and jurisdictional institutions that do not offer all guarantees to foreign partners, which increases country risk and affects trade in the zone. Yet having an efficient legal system and the availability of laws protecting intellectual property, and in general private property, is likely to enhance the security of commercial transactions (Beugelsdijk et al., 2005). The adequacy of national regulations to that which is popular in other countries, the accession of a country to international conventions to protect private rights and trade transactions, also strengthens bilateral trade.

5- Conclusions and recommendations

In light of all these interpretations, it is important to strengthen cross-border administrations to reduce export delays. Computerization of the administrative system associated with the application of texts can reduce costs to transactions created by extending exports on time. Although there are uniform documents in the CEMAC, the authorities must ensure the application of customs procedures and then EU instruments to facilitate trade. Reducing the digital divide through the accessibility of the population to the Internet is a guarantee to develop electronic exchanges. More needs to be done to make it easier for people to use the Internet. Given that weak institutions are weighing on bilateral trade, it is imperative for the authorities of the sub-region to create an institutional framework where respect for laws and

freedom of trade prevail, the vectors of trade facilitation. It is important to stress that in relation to the violence caused by terrorists, States have found military cooperation as solution through the creation of a joint force.

Appendix: List of exporting and importing countries with their code

Code	Country
AGO	Angola
Are	United Arab Emirates
Aut	Australia
Beautiful	Belgium
Ben	Benin
Bfa	Burkina Faso
Bgr	Bulgaria
Cmr	Cameroon
Fca	Centrafrique
Chn	China
Civ	Ivory Coast
Cog	Congo, Rep.
Cpv	Cape Verde
Deu	Germany
Egy	Egypt
Esp	Sword
Eth	Ethiopia
End	Finland
Fra	France

Gab	Gabon
Gbr	Great Britain
Gha	Ghana
Gin	Guinea Conakry
Idn	Indonesia
Ind	India
Ita	Italy
Jpn	Japan
Ken	Kenya
Lbr	Liberia
LBY	Libya
Lux	Luxembourg
MDG	Madagascar
Pwm	Mali
Mrt	Mauritania
Mys	Malaysia
Nam	Namibia
Nga	Nigeria
Nld	Netherlands
Pak	Pakistan
Prt	Portugal
Rus	Russian Federation
Rwa	Rwanda

Sau	Saudi Arabia
Sen	Senegal
Sgp	Singapore
Sle	Sierra Leone
Stp	Sao Tome and Principle
Tcd	Chad
Tgo	Togo
Tha	Thailand
Tun	Tunisia
Tur	Turkey
TZA	Tanzania
Usa	United States
Zaf	South Africa
Zar	Congo, Dem. Rep.
ZMB	Zambia

Source: author's construction

Appendix: Estimation Approaches by Tobit and Heckman

	Tobit	**Heckman**
Ldistwcesij	0.233	0.174
	(0.147)	(6.621)

Lpopj	-0.0101	0.0356
	(0.103)	(4.591)
Lpopi	-21.23*	-20.65
	(12.30)	(537.8)
Lpibi	6.576	5.968
	(5.012)	(219.2)
Lpibj	0.114	0.153
	(0.0838)	(3.741)
Ldelxi	-29.34*	-28.67
	(16.82)	(735.7)
Ldocxi	-38.65	-38.06
	(26.11)	-1,142
Linterneti	26.58*	26.57
	(14.49)	(633.8)
Ldprti	118.4*	116.2
	(68.40)	-2,991
Lrailsi	310.4*	305.8
	(185.7)	-8,12
Lroadsi	101.7*	99.77
	(58.82)	(2.573)
Lfreighti	-0.709	-0.689
	(0.558)	(24.41)
Ccolij	1.226	52.06

	(0.796)	(1,023)
Langij	0.169	-60.93
	(0.772)	(1,231)
Lccx	2.906	2.826
	(2.498)	(109.3)
Apeij	0.219	0.116
	(0.430)	(18.85)
Constant	3.301***	2.39
	(0.118)	(55.603)
lambda (mills ratio)		0.443
		(0.0391)
Comments	409	1.257

Variables	Description	Sources
Xij	Exports from the country i to the Country j, in current dollars	COMTRADE database available at: http://wits.worldbank.org/
Pibi (d)	domestic product of the country i or j current dollars	UNCTADSTAT Database UNCTAD available at http://www.unctad.org.
popi (d)	Population of the country i or j	UNCTADSTAT Database UNCTAD available at http://www.unctad.org.
langi (d)	Mute variable equal to 1 if two countries share a language common, and 0 if not.	"Distance" database CEPII, available at http://www. www.cepii.fr.
ccolij	Mute variable equal to 1 if two countries have a common colonizer and 0 if not.	"Distance" database CEPII, available at http://www. www.cepii.fr.
distwcesij	Distance between kilometres major cities in the i and J countries weighted by their relative size.	"Distance" database CEPII, available at http://www. www.cepii.fr.
freighti	air freight valued in million tons	Bank database World
roadsi	Kilometer of paved road for 100 inhabitants	Bad

docxi	Number of documents requested for export	Doing Business Database www.doingbusiness.org
railsi	Kilometre of railway tracks in kilometres	World Bank database
Delxi	export deadline of the country i	Doing Business Database www.doingbusiness.org
dprti	country property rights i	Heritage foundation index database available at: http://www.heritage.org/index/
ccxi	Export cost of the country's container i	Doing Business Database www.doingbusiness.org
Internet	Percentage of people with access to the Internet (100 inhabitants)	Itu

Appendix: sources of different variables

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