

# Exports from WAEMU\* under Raw Materials Curse

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**Abstract** : This analysis seeks to understand how far natural resources curse work in WAEMU's foreign trade. With an augmented gravity model, I show that reinforcing the control of corruption is in favor of expanding foreign trade both intra and total exports from WAEMU. But, improving public services effectiveness works against expanding total exports. So does reinforcing democracy. It slows down intra exports in WAEMU. Among raw materials curse's symptoms, only these aspects of institution quality doesn't work against expanding exports. It is not necessary to improve this situation because exports in WAEMU is matter of raw materials mainly.

JEL classification : F 15, F 18, C 23, R 11.

Keywords : Exports, Gravity model, Institution quality, Raw materials curse.

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\*WAEMU stand for West African Economic and Monetary Union. It is a customs union with huit members : Bénin, Burkina Faso, Côte d'Ivoire, Guinée Bissau, Mali, Niger, Senegal and Togo.

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## Introduction

The impact of trade openness on economic development and social specific dimensions in Africa such poverty might be well known through a better knowledge of institutions (Dollar and Kraay, 2003). Indeed, the consequences of institutions on foreign trade would remove ambiguity in understanding the level and dynamic of Sub Saharan Africa's (S S A) trade. It is estimated that the gap between effective results and results expected and the failure of trade openness policies could be explained by the malfunctions of national, sub regional and regional institutions (Harrison and Tang, 2005). Also, the poor performance of sub-Saharan economies is due to inadequate economic infrastructure quality, poor management of economic policies and renewed instabilities, the existence of cross-border trade in fraudulent through social and economic variables (Coulibaly, 2007 ; Agbodji, 2007, 2008) but also to the abundance of natural resources (Carbonnier, 2007).

Building on these studies, I analyze the role of institutional environment and structure of products traded in foreign trade of WAEMU. Thus, this Working first attempt to assess the impact of factors such as control of corruption, effectiveness of public services and the rule of law. These aspects are important in African countries context in general and those of the WAEMU especially because the institutional environment determines the inflow of Foreign Direct Investments (Elbadawi, 1997), an important vector of economic growth and poverty reduction for the continent. Indeed, if trade between African countries is important, then the problems of outlets and conditions of access to the internal market summarize the strengthening of the motivations for locating Africa. However, this raises another question about what is the structure of products traded ? In fact, the exploitation of natural resources and raw materials may have negative impact on the economy : *the natural resources curse*. In addition, it is obvious that if trade deals on an homogenous range of products, consistent level of exchanges will not be the same if not.

The interest of this study is twofold. First, regardless of that, this study takes into account variables of structure and institutional quality in explaining WAEMU's exports. The scientific contribution of this paper is more methodological. In Indeed, I dissociate the decision to export and this export value determination. The estimate of a Type II Tobit model, allows us to highlight these two aspects which for us is not always dependent on the same variables and this has not been highlighted in previous studies. Indeed, decide to export may depend primarily on institution quality variables while determining the value of exports depends more on economic

variables. Second, orientation of the analysis seeks to understand how far natural resources curse works in WAEMU's foreign trade. Does the preponderance of raw materials part reinforce inequalities, weaken public services and lack of democracy, as well as encourage corruption and slow down economic growth? These are contribution of this work in understanding the low level of WAEMU's foreign trade. It appears from analysis that improving the efficiency of public services and strengthening the rule of law penalize exports from WAEMU. In addition, the strong divergence of products exported by WAEMU towards the rest of the world constitutes a potential obstacle to expanding foreign trade. Unsurprisingly, the level of development remains an major handicap to the growth of foreign trade in the WAEMU.

The following article attempts to understand this result by analyzing potential factors limiting the expansion of WAEMU's exports despite the implementation of the first trade agreement. Section 1 describes WAEMU's foreign trade and analyzes the structure of traded goods and the evolution of the institutional environment between 1996 and 2006. Section 2 describes the methodology used in this study. In Section 3, data and variables are presented. Section 4 gives the main results before concluding.

## **1 Foreign trade, traded goods structure and institution quality in WAEMU**

### **1.1 Foreign trade and traded goods structure**

International trade is not a recent phenomenon in the world. Indeed, since 19th century, it has increased with a faster rate than the world production. This trend has become more marked after world war II, so that between 1980 and 2000 world trade value is multiplied by 3.3 while the world production is by 1.6 (Mucchielli and Mayer, 2005 ; Krugman and Obstfeld, 2006). In this view, international trade is seen as an engine of growth. The main source of such increases is the decrease in transportation costs, thanks to development of transportation more efficient and faster (the railway, aircraft) and the improvement of maritime transport ; there is also the reduction of transaction costs with communication infrastructures development.

The meteoric rise of international trade has been accompanied by changes in its structure, according to the nature of products traded in the geographical distribution of such exchanges. So, during the two last century, the share of manufactured products in the global trade doesn't

stop rising at the expense of agricultural products and extractive industry products. Moreover, the share of services in international trade has increased considerably and they now take a key place in exchange. During the past forty years, share of primary products in the exports of developing countries has declined relatively even if they remain their main source of foreign exchange. Developing countries are thus forced to adapt the structure of their international trade to the global trade new context. Because this change may influence potential gains of trade openness in a context of globalization. The current trend in international trade gives pride to manufactured goods and other products except agricultural products and extractive industry products (Mucchielli and Mayer, 2005 ; Krugman and Obstfeld, 2006). Correspondingly to the change of trade structure, international trade was required to concentrate geographically around three areas constituting the so-called Triad (North America, European Union and Asia) or even within each of these areas (intra-area). This dynamic has marginalized parts of the world (Eg Africa, Central-Eastern Europe, Middle East, Latin America). Has WAEMU's trade structure experienced similar changes since its creation ? Is WAEMU's trade structure close to the rest of the world ?

## **1.2 Foreign trade and institutional environment**

There is two lines of research on the link between institutions quality and foreign trade in Economic literature. The first line consider the impact of national institution quality on bilateral trade. Here, the consequences of the similarity of institutions on international trade are analyzed. Indeed, this similarity may improve the ability of exporters and importers adapt to its partner institutions. Thus, Disdier and Mayer (2005) argue that the similarity of institutional frames partly explains why some older exchange settlements "abnormally too much" with their former colonizer, but also why two countries with the same colonizer share more with each other.

The second line examines the impact of national institutions quality on bilateral trade dynamic. It is recognized that good quality of institutions in partner countries increases bilateral trade to the extent that it reduces transaction costs and risks inherent in international trade. Anderson and Marcouiller (2002) show that the poor quality of national institutions is an obstacle to developing bilateral trade because it increases risks and uncertainties arising from international transactions that are including breach of contract, theft and corruption. Their model of import demand in an uncertain environment is demonstrated that the insecurity of trade increases the price of exchange goods manner equivalent to a hidden tax or a customs duties and therefore

reduces the volume of bilateral imports. And they show that the amount of the fees is even higher than the national institutions are in bad institutions quality environment. This negative impact is even greater for international transactions because they involve systematically sunk costs and that alternatives are rare their research and expensive for breach of contract (De Sousa and Disdier, 2006). Many empirical studies have confirmed this negative impact of poor or bad institutions quality on trade (Babestskaia-Kukharchuk et Maurel, 2004 ; Méon et Sekkat, 2004 ; Lavallée, 2006).

However, Lavallée (2006) also concluded that this impact is asymmetric. She shows that a country exports more than its institutions are good, but the quality of institutions of the importing country only affects exports from developed countries. Talking about the dynamics of trade, Groot and al (2003) argue that institutional factors are important in explaining the level of transaction costs and other distortions. The state institutions in fact (Rodrik, 2002 ; Treisman, 2000 ; Hisamatsu, 2003<sup>1</sup>) directly influences the behavior of exporters or affects economic variables which could produce a reduction of propensity to import of agents.

For example, the lack of transparency in administrative procedures appears to be an additional charge for risk neutral agents (Anderson and Young, 2000). Previous studies on the dynamics of trade in Sub Saharan Africa do not address the role of these institutions particularly in explaining trade dynamics. What is the role of institutional quality in WAEMU's exports ? Does the abundance of natural resources is a handicap to the expansion of its foreign trade ?

## 2 Methodology

This section present the specification of the gravity model, the estimation method and the expected signs for the variables of interest.

### 2.1 Gravity model specification

I use the formulation of gravity equation proposed by Anderson and Van Wincoop (2003) :

$$X_{ij,t} = \frac{Y_{i,t} * Y_{j,t}}{Y_{w,t}} \left( \frac{T_{ij,t}}{\Pi_{i,t} P_{j,t}} \right)^{1-\sigma} \quad (1)$$

where  $X_{ij,t}$  is exports of country  $i$  toward country  $j$  at time  $t$ ,  $Y_{i,t}$  and  $Y_{j,t}$  are their GDP,  $Y_{w,t}$  is the world GDP,  $T_{ij,t}$  represents the exchange costs. At last,  $\Pi_{i,t}$  and  $P_{j,t}$  account for multilateral

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1. cited by Lavallee, 2006

resistance of countries  $i$  and  $j$  respectively. Its summarize the mean trade-resistance of a country from its whole trade partners In others words,  $P_{j,t}$  catches the impact of openness on country  $i$  facing all imports from the rest of the world and  $\Pi_{i,t}$  the openness of the rest of the world facing country  $i$  exports. If transaction costs are symmetric, i.e.  $T_{ij,t} = T_{ji,t}$ , then  $\Pi_{i,t} = P_{i,t}$ . So, gravity equation becomes :

$$X_{ij,t} = \frac{Y_{i,t} * Y_{j,t}}{Y_{w,t}} \left( \frac{T_{ij,t}}{P_{i,t}P_{j,t}} \right)^{1-\sigma} \quad (2)$$

Finally, bilateral exports value  $X_{ij,t}$  depends on country size, but also transaction costs ( $T_{ij}$ ) between partners and multilateral trade-resistance of partners ( $P_{i,t}$  and  $P_{j,t}$ ). According to Anderson and Marcouiller (2002) and Lavallée (2006), I specify a transaction cost function in which good institution quality leads to reduce trade barriers so that it increases trade (3) :

$$T_{ij,t} = D_{ij}^{\alpha_0} * e^{[\alpha_1 * A_{ij,t} + \alpha_2 * B_{ij,t}]} * Inst_{i,t}^{\alpha_3} * Inst_{j,t}^{\alpha_4} \quad (3)$$

where,  $D_{ij}$  is the distance between country  $i$  and country  $j$ ,  $A_{ij,t}$  and  $B_{ij,t}$  are set of dummy variables used traditionally in a gravity model specification. Institution quality are modeled through indicators  $Inst_{i,t}$  and  $Inst_{j,t}$ , respectively for country  $i$  and  $j$  at time  $t$ . Then I substitute (3) in and I transform with the log. Gravity equation becomes :

$$\begin{aligned} \ln X_{ij,t} = & \beta_0 + \beta_1 * \ln Y_{i,t} + \beta_2 * \ln Y_{j,t} + \beta_3 * Sim_{ij,t} + \beta_4 * \ln D_{ij} + \\ & \beta_5 * A_{ij,t} + \beta_6 * B_{ij,t} + \beta_7 * \ln Inst_{i,t} + \beta_8 * \ln Inst_{j,t} + \mu_{ij,t} \end{aligned} \quad (4)$$

with  $\mu_{ij,t}$  the error term. The test for the existence of specific effects of the panel leads to the rejection of the null hypothesis that is why in the theoretical formulation of the gravity equation (4), there is no terms

## 2.2 Equation to estimate

I consider all WAEMU's trade partners in the world even if there are null values between 1996 and 2006. Indeed, this null values are important in the analysis because I get information on exporting countries behavior with them. When the global income decreases substantially over time and the partner is too far away from WAEMU member country, rationality suggest that It is optimal to trade more with neighbors and nearest countries. So, low values and zero trade are important information about WAEMU exports with partners. However, using the log will be impossible because of zero value. That is why I turn to a semi-log specification considering the dependant variable as a truncated variable and I add +1 on the lowest value in order to get

positive values for the dependant variable. Finally the equation to estimate is :

$$\begin{aligned}
EX_{ij,t} = & \beta_0 + \beta_1^1 * \ln PIB_{i,t} + \beta_1^2 * \ln PIBT_{i,t} \\
& + \beta_2^1 * \ln PIB_{j,t} + \beta_2^2 * \ln PIBT_{j,t} + \beta_3 * Sim_{ij,t} + \beta_4 * \ln Distance_{ij} \\
& + \beta_5 * Frontiere_{ij} + \beta_6 * Maritime_{ij} + \beta_7 * Creation_{ij,t} + \\
& \beta_8 * \ln Institution_{i,t}^k + \beta_9 * \ln Institution_{j,t}^k \\
& + \beta_{10} * \ln Concent_{i,t} + \beta_{11} * \ln Diversif_{i,t} + \mu_{ij,t}
\end{aligned} \tag{5}$$

with,  $EX_{ij,t}$  defined as follows :

$$EX_{ij,t} = \begin{cases} EX_{ij,t}^* = \ln(1 + Exportation_{ij,t}) & \text{if } X_{ij,t} > 0 \\ 0 & \text{if } X_{ij,t} = 0 \end{cases}$$

where  $Exportation_{ij,t}$  is exports value between countries at time  $t$  and the transformation  $\ln(1 + Exportation_{ij,t})$  in order to manage with positive values of exports only after transforming in log. After that, I suppose a sequential behavior in exporting from WAEMU with two steps. First of all, each country decide to export or not. This decision is modeled as follows based on a criterium refereed by a latent variable  $Z_{ij}^*$  :

$$Z_{ij,t}^* = \begin{cases} 1 & \text{si } X_{ij,t}^* > 0 \\ 0 & \text{si } X_{ij,t}^* = 0 \end{cases}$$

Then, the second step refers to choose the value of exports after decided to export. If I write  $EX_{ij,t}$ , the effective value of country  $i$  exports towards country  $j$ , this is defined by :

$$EX_{ij,t} = \begin{cases} EX_{ij,t}^* & \text{si } X_{ij,t}^* > 0 \\ 0 & \text{si } X_{ij,t}^* = 0 \end{cases}$$

One of the advantages of this approach is that, it allows us to point out the relationship between the two main decisions in this behavior : 1, the decision to export and 2 the determination of the effective value of exports. It is a type II Tobit model because, only the sign of  $X_{ij,t}^*$  through  $Z_{ij,t}^*$  is useful and  $EX_{ij,t}$  is truncated as I said before. What method will I perform to estimate this equation? Generally speaking, Tobit model parameters are estimated by Maximum Likelihood (ML) method However, It will be useful to perform others methods in order to determine initial conditions in numeric optimization algorithms of ML method. Among theses, there is Heckman (1976), two steps estimation method. I use this approach in order to catch the impact of unobservable variables on the dependant variable. On the first step, I estimate the following Probit

model :

$$Z_{ij,t}^* = \begin{cases} 1 & \text{si } X_{ij,t}^* > 0 \\ 0 & \text{si } X_{ij,t}^* = 0 \end{cases} \quad (6)$$

It is the decision of exporting or not for each country member which depends on : economic conditions in both countries, the quality of economic infrastructures (communication and roads), the institutions quality, and some transaction costs, etc.  $X_{ij,t}^*$  follows  $N(x_{1,ijt}, \sigma_1^2)$ . The probit model estimated at this level is :

$$Prob(Z_{ij,t}^* = 1) = Prob(X_{ij,t}^* > 0) = \phi(x_{1,ijt}, \theta_1) \quad (7)$$

Suppose that  $\hat{\theta}_1$  is a convergent estimator of  $\theta_1$  in the Probit model. With  $\hat{\theta}_1$ , I calculate Mills ratio  $\lambda(x_{1,ijt}, \hat{\theta}_1)$  for each observation. Then suppose also that  $\hat{\lambda}(x_{1,ijt}, \hat{\theta}_1)$ , is the estimator calculated. What about the second step ?

On the second step, I regress by Ordinary Least Square on positive values of  $EX_{ij,t}$  introducing Mills ration as an explanatory variable. The equation to estimated is as follows :

$$EX_{ij,t} = x_{2,ijt}\beta_{2,ij} + \frac{\sigma_{12}}{\sigma_1}\hat{\lambda}(x_{1,ijt}, \hat{\theta}_1) + \tilde{\mu}_{2,ijt} \quad (8)$$

This model estimates exports value of each country which depends on a set of explanatory variables  $x_{2,ijt}$ . Because of heteroscedasticity, I use General Least Squares Method to estimate 8. AS far as it concerns institution quality indicators and traded goods structure, I expect two results. First, raw materials and extractive industry products are the main goods exported by WAEMU, and this situation is not profitable for expanding exports from this area according to improve institution quality for better results. Then, a high level of corruption, the weakness of publics services efficiency and lack of democracy in WAEMU work in favor of expanding exports as typical *symptoms of raw materials curse*. Do all theses symptoms appear in explaining WAEMU's exports ?

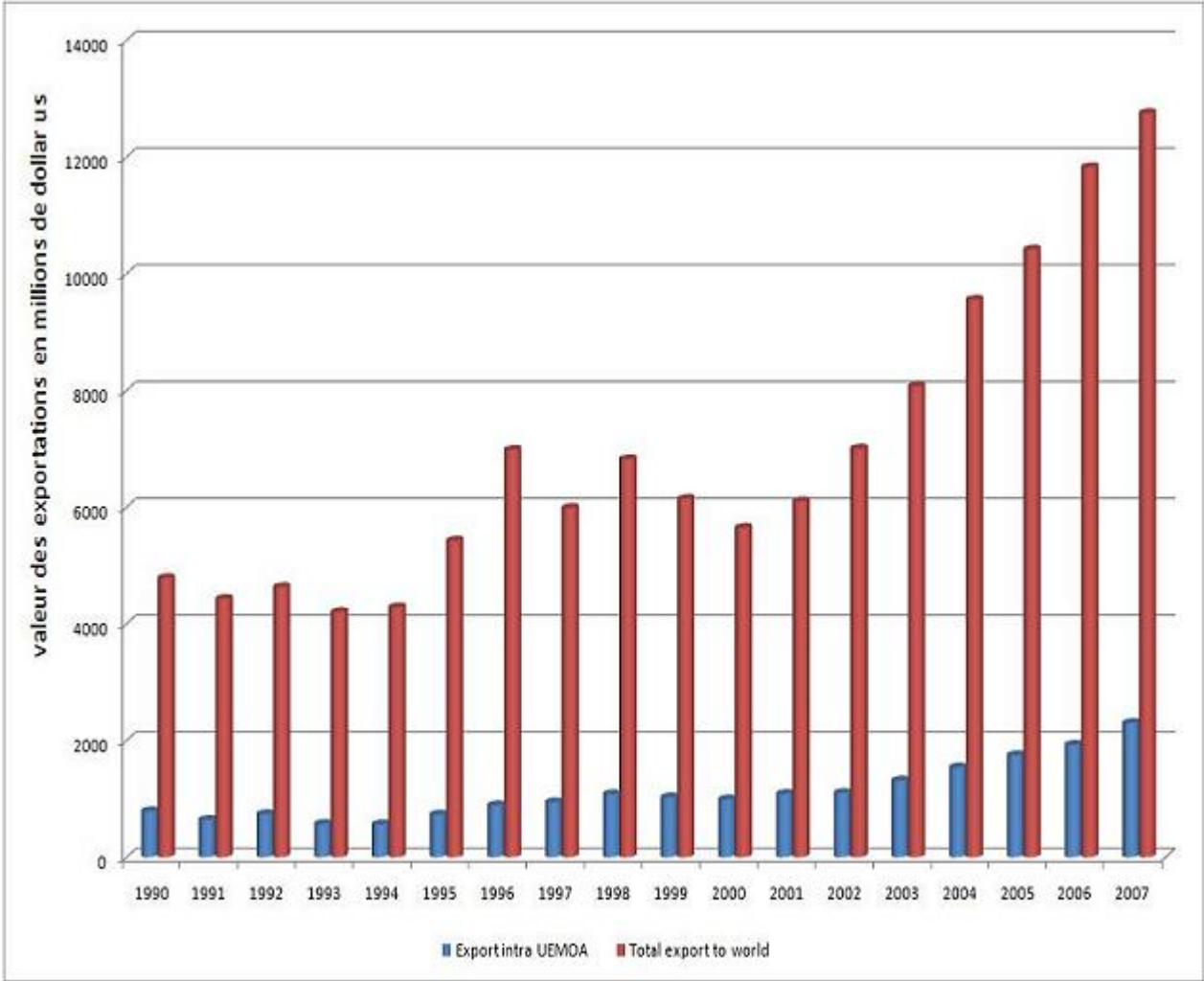
### 3 Data

For exports data, I use the FOB value, in millions of US dollar, of exports flows of all WAEMU member country from 1996 to 2006, from International Monetary Fund (IMF) database, Data On Trade Statistics (DOTS), 2008. I call this variable *Exportations*. Note that, exports earnings



in WAEMU doesn't cover imports expenditures. Its represent around 75% of imports. However in this area, foreign trade share in economic activities is about 40%. But, the share of regional exports in global world trade is very small. Indeed, according to UNCTAD statistics book, 2008, is about 0.12% in 2005. It is 0.13% for imports the same year. And as we can see on this graph (graph 1), intra exports are lower than export toward the rest of the world. GDP data come from

FIGURE 1 – WAEMU’s Exports toward WAEMU and the rest of the world.



Source : IMF data, DOTS 2008.

World Bank database, WDI, 2009. I use GDP in current price, in millions of US dollar, and GDP per capita. Data on Distance, are from CEPII database. I use distance between the main city of each partner. I consider frontier a dummy equals to 1 if countries share a same frontier and 0 otherwise. There is also direct access to the sea, equals to 1 if one of countries in the pair has direct access to the sea and 0 otherwise. Analyzing the global export, I introduce also Creation an other dichotomous variable which is equal to 1 if both countries are WAEMU member country

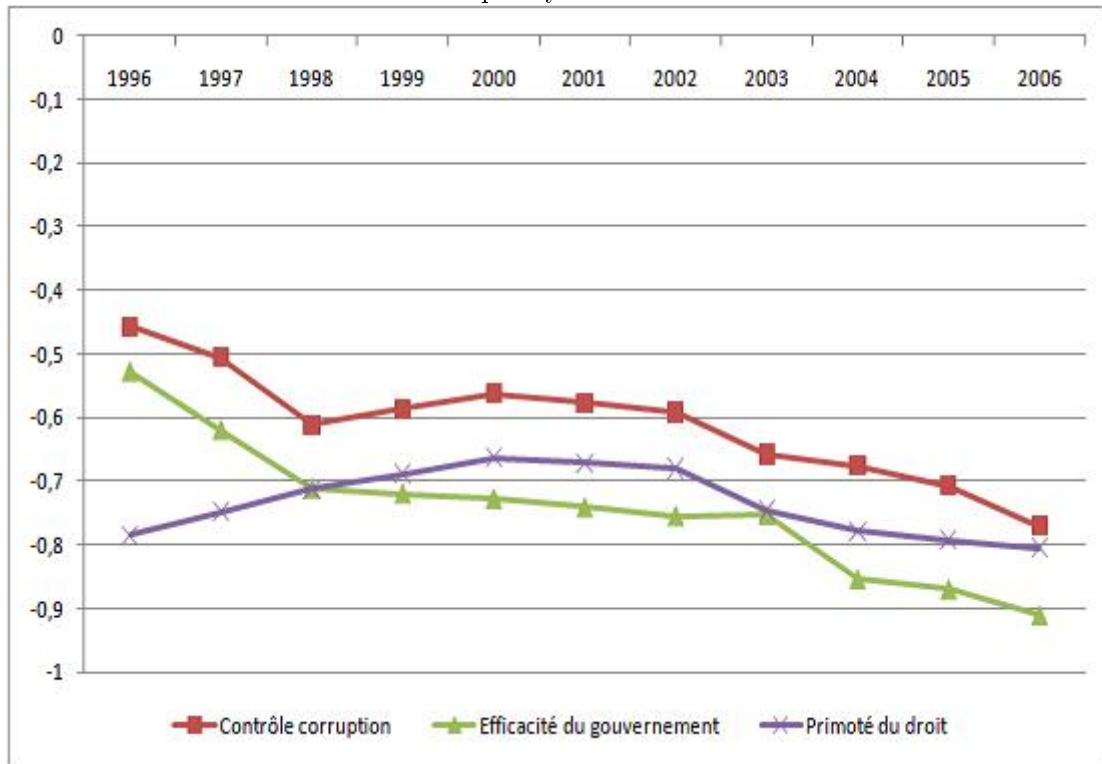
and 0 otherwise. This allow us to catch the impact of WAEMU on expanding exports. Similarite is another variable in the specification of the gravity equation. According to (Agbodji, 2008) if countries are so similar in the same area, this can slow down trade dynamic. I keep Egger (2000) formulation to build this indicator :

$$Sim_{ij} = \ln \left[ 1 - \left( \frac{PIB_{it}}{PIB_{it} + PIB_{jt}} \right)^2 - \left( \frac{PIB_{jt}}{PIB_{it} + PIB_{jt}} \right)^2 \right] \quad (9)$$

It is an index which range between 0 (absolute divergence in partner size) and 0.5 (partners have the same size). The sign of the coefficient of this indicator is undetermined because of contradictories effects which can appear analyzing the value. Indeed, country with the same living standard conditions can have intra industrial trade given that they share a large brand of goods (Linder hypothesis). However, if differences in incomes are highly correlated with factors endowments, trade within industries must be lower between countries which have similar income level. I consider also in the gravity equation, percentage of road paved and the number of telephone line per 1000 inhabitants over the period. Such variables catch the impact of economic infrastructure on exports in WAEMU. These information are from world bank database, WDI (2008).

As far as it concerns institutions quality indicators, I use control of corruption , public services efficiency and rule of law (Jansen and Nordas (2004)) from World Bank database, World Governance Indicators (WGI), 2008. Control of corruption indicator reflects the extent to which public power is exercised for private purposes, including large and small forms of corruption and state capture by elites and private interests. As for public services effectiveness, the indicator captures the perception of service quality, the qualities of public service and the degree of its independence from political pressures, the quality of policy formulation and implementation and also the credibility of the government's commitment towards these policies. As far as it concerns rule of law indicator, it shows the perception of the extent to which agents have confidence and respect the rules of society and particularly the quality of contract enforcement, property rights, police, courts and the perception of crime and violence. Theses indicators are scores centered around 0 and the range of variation is from  $-2,5$  to  $2,5$ . A negative score means a worse situation while a positive value indicates a better situation. These variables were selected because they increase the uncertainty of economic activity if they are not controlled. Consequently they increase transaction costs and thus slow down foreign trade expanding. Linear interpolation help us to replace missing value. Graph 2 shows the evolution of these indicators from 1996 to 2006. As we can see, on this graph, all indicators have negative values and they decrease over the period.

FIGURE 2 – Institutions quality in WAEMU from 1996 to 2006



Source : WGI data, 2008.

This means that, institutions are bad in WAEMU and this situation becomes worse and worse over time. So this situation would have negative impact on WAEMU exports as I describe before. Analyzing the correlation between exports (respectively within member country and with the rest of the world) and these indicators, I get the following results (tables 1 and 2). The correlation coefficient between Intra exports and rule of law is negative and significant at 5% level (-0,21). So the lack of democracy seems not to be an obstacle to expanding exports within WAEMU.

TABLE 1 – Correlation coefficient between intra exports and institution quality indicators in WAEMU

	Exports	Control of corruption	Public services effectiveness	Rule of law
Exports	1,00			
Control of corruption	-0,0418 (0,3004)	1,000		
Public services effectiveness	-0,0139 (0,73)	0,7040* (0,000)	1,000	
Rule of law	-0,2120* (0,000)	0,6872* (0,000)	0,7035* (0,000)	1,000

Source : IMF data (DOTS) and World Bank data (WGI), author's calculations (\* significant at 5% level, (P-value))

TABLE 2 – Correlation coefficients between total exports and institution quality in WAEMU

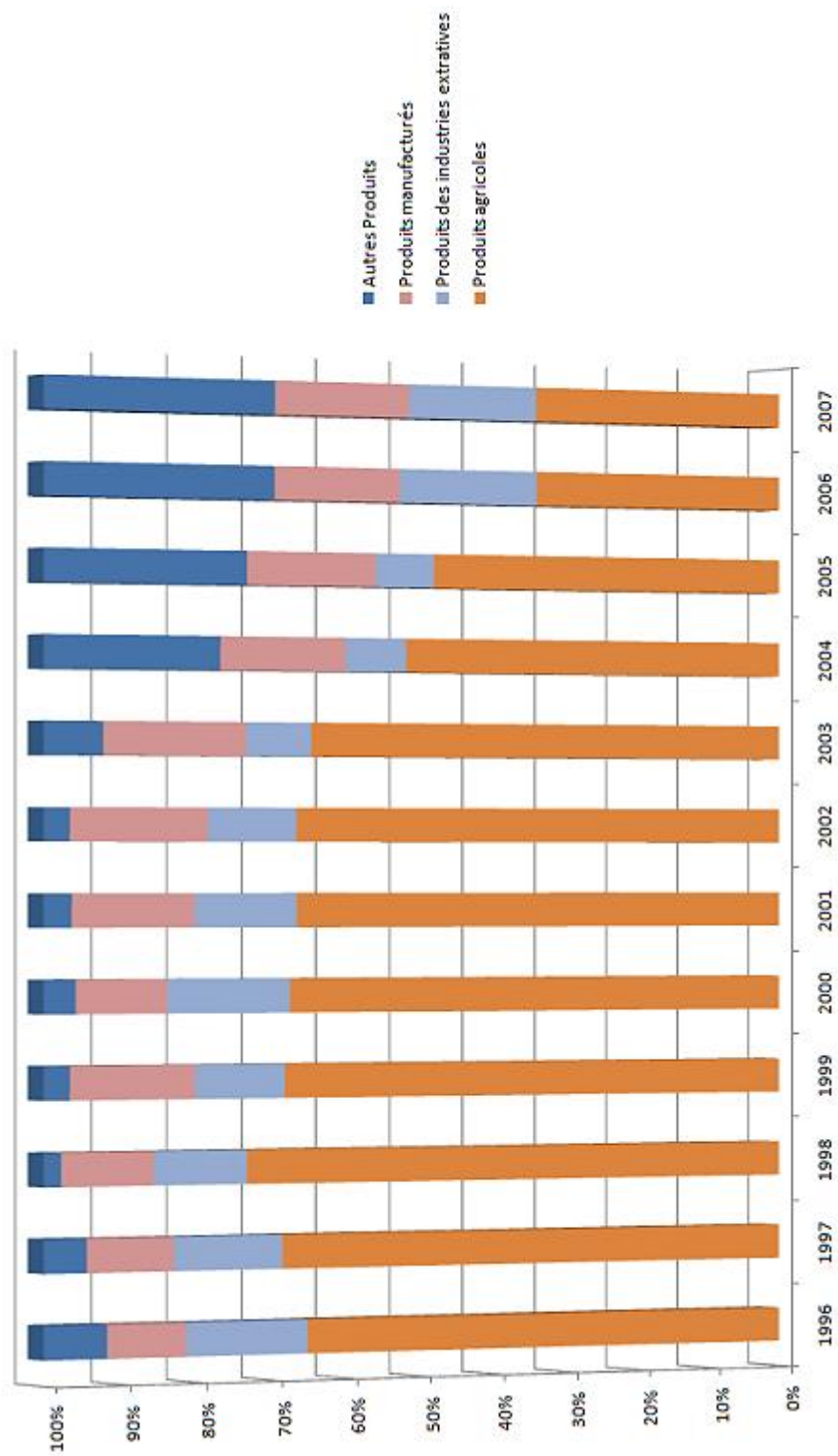
	Exports	Rule of law	Control of corruption	Public service effectiveness
Exports	1,00			
Rule of law	-0,1357* (0,000)	1,00		
Control of corruption	-0,0463* (0,000)	0,6810* (0,000)	1,00	
Public services effectiveness	-0,0257 (0,0566)	0,7040* (0,000)	0,6991* (0,000)	1,00

Source : IMF data (DOTS) and World Bank data (WGI), author's calculations (\* significant at 5% level, (P-value))

On total exports side, (table 2), lack of democracy and more and more corruption work along with expanding global exports from WAEMU to the rest of the world. The correlation coefficient is negative and significant respectively around  $-0,14$  and  $-0,05$ . Such institutional environment is expected to discourage exports because it leads to higher transaction costs. And instead it boosts exports. There would indeed be symptoms of natural resources and raw materials curse in explaining WAEMU's country foreign trade. But is this relationship significant? And at what level such institutions work in favor of expanding exports in WAEMU? Before it is interesting to know what kind of goods WAEMU exports mainly?

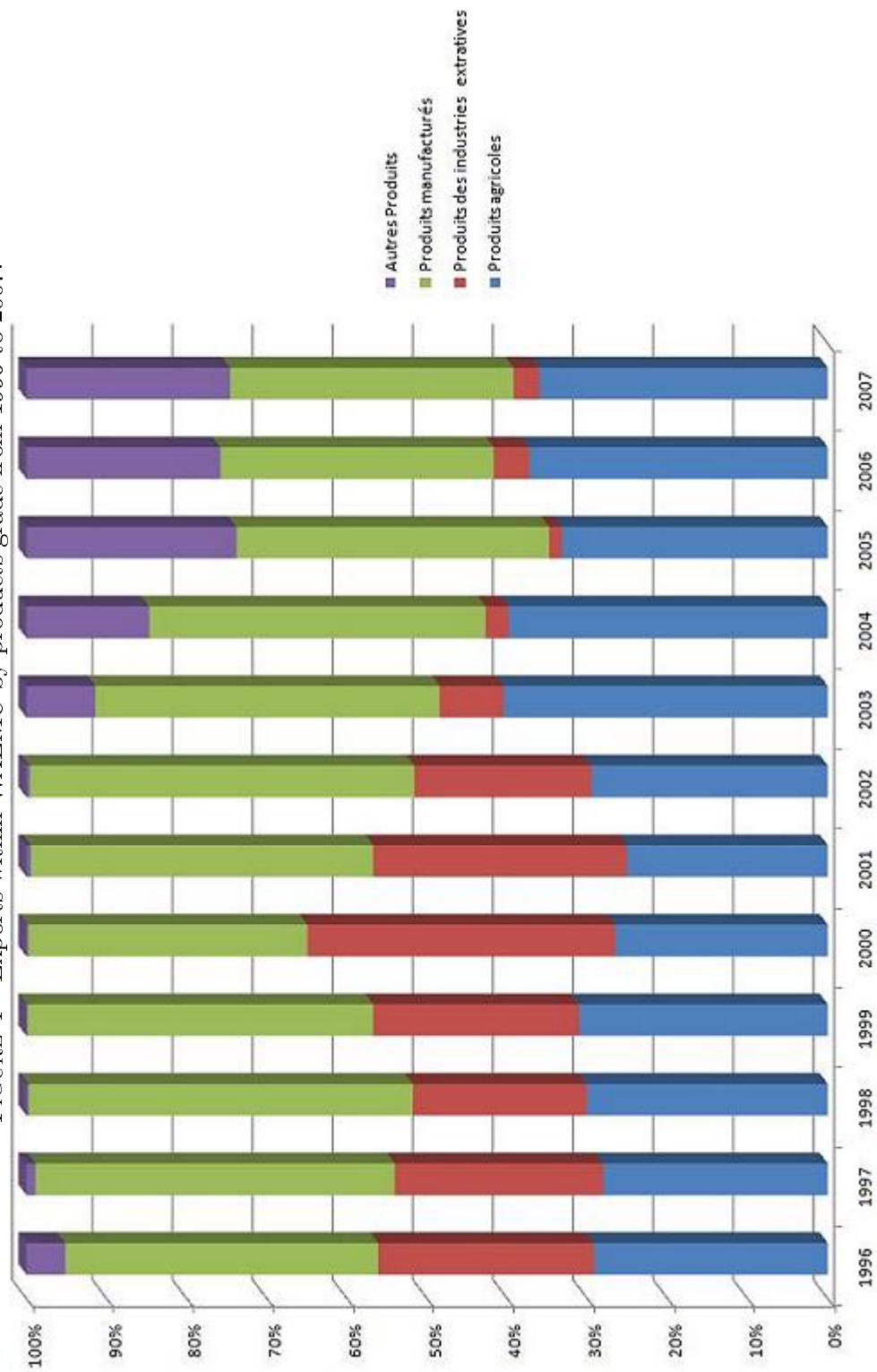
As for WAEMU exports goods structure, I analyze it on two steps. First, I consider all kind of product per category exported by WAEMU both intra exports and total export including the rest of the world given by WAEMU economic commission data (2008). For exports within WAEMU so do exports towards the rest of the world, as we can see on the two following graph (graph 3 and graph 3), agricultural products and extractive industry products, both respectively raw materials and natural resources, are the main exported goods in WAEMU. Does it cover a large brand of products? Is it really different from goods exported from the rest of the world? Let us analyze diversification and concentration indexes for answering to these questions?

FIGURE 3 – WAEMU's total exports by products grade from 1996 to 2007.



Source : WAEMU's economic commission data, 2008.

FIGURE 4 – Exports within WAEMU by products grade from 1996 to 2007.



Source : WAEMU's economic commission data, 2008.



So in the second, I look these two indicators, concentration and diversification indexes given by UNCTAD statistics book (2008). These indicators will be used in the gravity equation in order to assess the impact of changes in exports structure on WAEMU's exports. Concentration index changes between 0 and 1. It indicates that exports are matter of an homogenous brand of products. Over the period, WAEMU's concentration index moves from 0.09 to 0.36. I notice that WAEMU's exports are slightly concentrated. In others words, these exports consist of an homogenous brand of raw materials and extractive industry products. Looking at diversification index, it moves between 0 and 1 also. In WAEMU, it fluctuates between 0,43 to 0,64. Thus, WAEMU's exports diverge strongly from ones of the rest of the world. Is there any significant relationship between these indexes and total exports and intra exports? From table 3, we learn that there is a positive and significant relationship with concentration index although this relationship is negative considering the diversification index as far as it concerns total exports. For intra exports, only a negative and significant relationship with diversification index is pointed out (table 4). Does this structure have an influence on exports in WAEMU?

TABLE 3 – Correlation coefficient : total exports and structure index

	Exports	Concentration index	Diversification index
Exports	1,00		
Concentration index	0,0406* (0,0026)	1,00	
Diversification index	-0,1564* (0,000)	0,4525* (0,000)	1,00

Source : IMF data, DOTS, author's calculations (\* significant at 5% level,(P-value))

TABLE 4 – Correlation coefficient : exports within WAEMU and structure index

	Exports	Concentration index	Diversification index
Exports	1,00		
Concentration index	0,0727 (0,0716)	1,00	
Diversification index	-0,3737* (0,000)	0,4505* (0,000)	1,00

Source : IMF data, DOTS, author's calculations (\* significant at 5% level,(P-value))

## 4 Results

Table 5 gives estimation results. Note that both models either for total exports or exports within WAEMU are significant and well specified looking at Wald statistic p-value after estimation. Indeed, this probability equal to 0 for each model. Then, Mills ratio ( $\lambda$ ) coefficients are significant and positive. That means there are unobservable variables which have positive influence on exports in WAEMU. The analysis shows the following : Country economic size and development level, have a direct access to the sea and sharing a same frontier, exports structure and institution quality either for WAEMU country member and their partner, have significant influence on exports.

As far as it concerns, country economic size and development level, I show that when the first increases about 1% in WAEMU, this leads to increase exports from WAEMU by 1.57% for total exports and 2.07% for intra exports. But such increase in economic size for trade partner contribute to reduce total exports about 0.64%. This is only 0.06% for intra exports. Economic growth in WAEMU is in favor of expanding exports although an increase in GDP in trade partner economy reduces exports from WAEMU. The same result has been highlighted by Agbodgi (2008). So this GDP growth in WAEMU allows country member to export more than before and for the trade partner this growth can lead to reduce their imports from WAEMU. That is why the coefficient of trade partner GDP is negative. In addition when these partners become more developed, they do so and it is the same situation considering WAEMU country member. Indeed an increase about 1% in GDP per capita respectively for WAEMU's member countries and their trade partner considered in this work, leads to a reduction about respectively 1,11% and 0,15% for total exports. For intra exports the reduction is only notice after an increase in WAEMU's countries GDP per capita (2.71%). But this increase of 1% in GDP per capita for partners in WAEMU leads to increase for 1.15% WAEMU's intra exports. The decrease is higher in the case of WAEMU's member countries than it is for their trade partner. Exports intensification respond positively with GDP growth in WAEMU and negatively with the growth rate GDP per capita.

Distance and having a common frontier have respectively negative and positive significant coefficient. These variables have the expected sign according to the literature on gravity model(Fontagné et al, 2002 ; Carrère, 2004 ; Coulibaly, 2007 ; Agbodji, 2007). For a common frontier,

TABLE 5 – Estimation results

Variables	Total Exports	Exports within WAEMU
GDP (E)	1.57*** (21.10) [0.000]	2.07*** (10.35) [0.000]
GDP (I)	0.64*** (26.95) [0.000]	0.06 (0.44) [0.066]
GDP per capita (E)	-1.11*** (-6.28) [0.000]	-2.71*** (-5.25) [0.000]
GDP per capita (I)	-0.15*** (-5.27) [0.000]	1.15*** (2.90) [0.004]
Direct access to the sea	1.03*** (10.94) [0.000]	1.83*** (8.53) [0.000]
Common frontier	0.38*** (5.34) [0.000]	0.31*** (2.99) [0.003]
Creation	0.41*** (6.86) [0.000]	– – –
Distance	-1.38*** (-29.42) [0.000]	-0.67*** (-7.44) [0.000]
Similarité	-0.30*** (-13.70) [0.000]	0.24*** (2.22) [0.026]
Road paved (%) (E)	-0.28*** (-5.24) [0.000]	0.21* (1.77) [0.077]
Road paved (%) (I)	-0.02 (-0.57) [0.569]	-0.018 (-0.18) [0.859]
Number of telephone for 1000 people (E)	0.50*** (7.39) [0.000]	0.62*** (3.88) [0.000]
Number of telephone for 1000 people (I)	-0.12*** (-4.07) [0.000]	-0.51*** (-3.43) [0.001]
Concentration index	0.09 (0.99) [0.320]	0.25 (1.33) [0.185]
Diversification index	-1.69*** (-4.66) [0.000]	-4.014*** (-5.22) [0.000]

Note : E= Exporting countries, I= Importing countries, t student and P-value respectively into () and [] with \*, \*\* and \*\*\* indicate significant at 10%, 5% and 1% level

Variables	Total exports	Exports within WAEMU
Control of corruption (E)	1.26*** (5.08) [0.000]	0.86* (1.73) [0.083]
Control of corruption (I)	-1.86*** (-8.48) [0.000]	0.92* (1.94) [0.053]
Rule of law (E)	-0.41 (-1.29) [0.197]	-2.78*** (-4.45) [0.000]
Rule of law (I)	0.80*** (3.09) [0.002]	-0.05 (-0.09) [0.929]
Public services effectiveness (E)	-1.52*** (-5.38) [0.000]	-0.91 (-1.56) [0.118]
Public services effectiveness (I)	-0.80*** (-3.28) [0.001]	-1.45*** (-2.93) [0.003]
Regulation quality (E)	1.64*** (5.94) [0.000]	-1.59*** (-3) [0.003]
Regulation quality (I)	1.43*** (8.69) [0.000]	0.9* (1.69) [0.092]
Stability (E)	-0.53*** (-3.46) [0.001]	0.63** (2.03) [0.042]
Stability (I)	0.77*** (7.43) [0.000]	0.49* (1.83) [0.067]
Lambda (Mills ratio)	3.22*** (22.79) [0.000]	0.823*** (3.08) [0.002]
Constant	-33.10*** (-32.71) [0.000]	-32.045*** (-9.55) [0.000]
Number of observations	3839	541
Log-likelihood	-5525.45	-614.328
Wald $\chi^2_{(.)}$	3917.43	1836.60
Prob> $\chi^2_{(.)}$	0.000	0.000

Note : E= Exporting countries, I= Importing countries, t student and P-value respectively into ( ) and [ ] with \*, \*\* and \*\*\* indicate significant at 10%, 5% and 1% level

I show that partners which have a common frontier in the sample, trade 1.46 more than others for total exports and This is about 1.36<sup>2</sup> more for intra exports. In addition being so far from a partner work as an obstacle to expanding trade. It reduces exports about 1.38% for 1% of increase in distance for total exports and 0.67% for exports within WAEMU's countries. Trade creation is significant. WAEMU country member exports each another 1.5 more than with another country outside. WAEMU's member countries which have a direct access to the sea export 2.8 more than those whose have not. This situation leads to about 6.23<sup>3</sup> for exports within WAEMU.

Diversification index has a negative impact on exports. A change about 1 point of this index leads to reduce total exports about 1.69 points and intra exports about 4.01 points. This index impact is higher within WAEMU's countries than the whole partner together. As I showed before, WAEMU's export is very different from the rest of the rest of the world exports. Thus this situation works against expanding total exports and intra exports also. It is important to diversify products exported with more industrials goods. Concentration index has a positive and significant impact on exports from WAEMU. Its impact is higher for exports within WAEMU than total exports for an increase about 1 point of this index respectively 0.25 and 0.09.

Economic infrastructures-telephone- have positive impact on total exports and intra exports. An increase about 1 point, improving the number of telephone line per 1000 inhabitants in WAEMU, will increase total exports and intra exports respectively about 0.5% and 0.62%. For the percentage of road paved, an improving about 1% work as an obstacle for total exports (0.28%) although it contributes to increase intra WAEMU exports for 0.21% (Longo et Sekkat 2004, Coulibaly (2007) and Agbodji (2007,2008)).

Improving control of corruption in WAEMU leads to expanding total exports and intra exports. An increase about 1% unit of standard deviation of control of corruption scores, increases total exports 0,47% (Lavallée, 2006) about and intra exports about 0,32%. But improving democracy about 1% in the standard deviation of this score, works as an obstacle for expanding exports form WAEMU only for intra WAEMU exports about 1.19%. It has not impact any on total exports. It is the same situation for public services effectiveness. So improving public services effectiveness for 1% of the standard deviation of this score leads to reduce total exports about 0,67%. It has no significant impact on intra exports.

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2. 1,36 =  $exp(0,31)$

3. 6,23 =  $exp(1,83)$

En somme, la qualité des institutions (les variables de gouvernance) a (ont) un impact significatif sur les exportations totales en provenance de la zone. Un bon contrôle de la corruption et une bonne gestion de la politique économique restent en faveur de l'expansion des exportations de l'UEMOA. Mais l'amélioration de l'efficacité de l'administration et la stabilité politique pénalisent les exportations en provenance de cette espace d'intégration économique et monétaire.

En définitive, les résultats montrent que le contrôle du niveau de corruption et la stabilité politique sont favorables à l'expansion des exportations intra-UEMOA. Mais la recherche d'une meilleure qualité dans la régulation publique et le renforcement de l'Etat de droit pénalisent les exportations intra-UEMOA.

## Conclusion

This analysis seeks to understand how far the natural resources curse works in WAEMU's foreign trade. Does the preponderance of raw materials part reinforce inequalities, weaken public services and lack of democracy, as well as encourage corruption and slow economic growth? It appears that improving the efficiency of public services and strengthening the rule of law penalize exports from WAEMU. In addition, the strong divergence of products exported by WAEMU towards the rest of the world constitutes a potential obstacle to expanding foreign trade. Unsurprisingly, the level of development remains a major handicap to the growth of foreign trade in the WAEMU. Nevertheless, trade creation is significant in WAEMU and economic size is in favor of expanding WAEMU's foreign trade. Even if the low level of economic development limit also the intensity of foreign trade. Finally, raw materials and natural resources curse work on WAEMU's exports by public services effectiveness and encourage democracy. It is necessary to move up foreign trade by changing exports structure. As WAEMU exports more raw materials and natural resources, fight against institution deficiency might be worse in expanding foreign trade.

## Références

- [1] Acemoglu J. and al. (2005), "*Institutions as a fundamental cause of long-run growth*", Handbook of economic and growth, ch 6, volume 1.A. edited by Philippe Aghion and Steven N. Durlauf.
- [2] Agbodji A. E. (2007), "*Intégration et échanges commerciaux intra sous régionaux : le cas de l'UEMOA*", Revue Africaine de l'Intégration, Vol. 1, N°1, Janvier 2007.
- [3] Agbodji A. E. (2008), "*The impact of subregional integration on bilateral trade : the cas of UEMOA*", AERC Research Paper, 186, December 2008.
- [4] Anderson J.E. and Marcouiller D. (2002), "*Insecurity and the Pattern of Trade : An Empirical Investigation*", The Review of Economics and Statistics 84 (2), 342-52.
- [5] Anderson, J.E., van Wincoop, E., (2003), "*Gravity with gravitas : A solution to the border puzzle*", American Economic Review 93 (1), 170-92.
- [6] Anderson J. E. and Young L. (2000), "*Trade and Contract Enforcement*" presented to the NBER Summer Institute, August, 1999 and the Econometric Society, January 2000.
- [7] Avom D. (2005), "*Les déterminants des échanges dans la CEMAC : une évaluation empirique*", Economie appliquée, T. LVIII, n°2, pp. 127-153.
- [8] Babestskaia-Kukharchuk, O. and Maurel M. (2004), "*Russia's Accession to the WTO : The Potential for Trade Increase*", Journal of Comparative Economics 32 (4), 680-699.
- [9] Baier S. L. and Bergstrand J. H. (2005), "*Do Free Trade Agreements Actually INcrease Members's International Trade ?*", Federal Reserve Bank of Atlanta, Working Paper 2005-3, February 2005.
- [10] Baltagi B. H. (2005), "*Econometric Analysis of panel data*", John Wiley and Sons, Ltd, Third Edition.
- [11] Berechid M. (2005), "*Création et détournement de commerce sous l'accord de libre échange entre le Chili et le Canada*", Rapport de recherche, Université de Montréal, Décembre 2005.
- [12] Bourdet Y., (2005), "*Limites et défis de l'intégration régionale en Afrique de l'Ouest*", Asdi, Country Economic Report 2005 :6.
- [13] Carbonnier G., (2007), "*Comment conjurer la malédiction des ressources naturelles ?*", Annuaire suisse de politique de développement[en ligne], vol ; 26, n°2, 2007.
- [14] Carrière C. (2004), "*African Regional Agreements : Impact on Trade With or Without Currency Unions*", Journal of African Economies, Vol. 13 (2), pp. 199-239.

- [15] Cheng H. I. and Wall J. H. (2003), "*Controlling for heterogeneity in gravity models of trade and integration*", The federal reserve bank of Saint-louis, Working Papers series, 1999-010 D.
- [16] Coe D. T. and Hoffmaister A. W. (1999) , "*North-South trade : is Africa unusual ?*", Journal of African Economies, Vol. 8, N° 2, pp. 228-256.
- [17] Coulibaly S.,(2007), "*Evaluating the Trade Effect of Developing Regional Trade Agreements : A Semi-parametric Approach*",World Bank Policy Research Working Paper, N°4220, May 2007.
- [18] Deardorff A. (1998), "*Determinants of bilateral trade : does gravity models work in a neo-classical world ?*", in J.A. Frankel, ed, the regionalization of the world Economy, Chicago : the University of Chicago Press.
- [19] De Groot, H., Linders, G-J., Rietveld, P., Subramanian, U., (2005), "*The Institutional Determinants of Bilateral Trade Patterns*", *Kyklos* 57 (1), 103-123.
- [20] De Sousa, J., Disdier, A.-C., (2006), "*La Qualité du Cadre Juridique Constitue-t-elle une Barrière au Commerce ? Application aux Economies en Transition*", *Revue économique* 57 (1), 135-151.
- [21] Disdier, A.-C., Mayer, T., (2005), "*Je t'aime, Moi Non Plus : Bilateral Opinion and International Trade*", CEPR Discussion Paper 4928.
- [22] Dollar, D., Kraay, A., (2001), "*Trade, growth and poverty*", The World Bank Development Research Group Working Paper Series 2615.
- [23] Dollar D. and Kraay A. (2003), "*Institutions, trade, and growth*", *Journal of Monetary Economics*, Volume 50, Issue 1, January 2003, Pages 133-162.
- [24] Egger P. and Pfaffermayer M. (2002), "*The Pure Effects of European Intergartion on Intra-EU Core and Periphery Trade*", Australian Institute of Economic Research, January 2002.
- [25] Elbadawi I. (2002), "*Real Exchange Rate Policy and Non-Traditional Exports in Developing Countries*", dans Helleiner, G.K. (éd.), *Non-Traditional Export Promotion in Africa : Experiences and Issues*, Palgrave, New York.
- [26] Fontagné L., Pajot M. et Pasteels J.M. (2002), "*Potentiels de commerce entre les économies hétérogènes : un petit modes d'emploi des modèles de gravité*", *Economie et Prévision*, 2002.
- [27] Foroutan F. and Pritchett L. (1993), "*Intra-sub-Saharan African trade : is it too little ?*", *Journal of African Economies*, Vol. 2, N° 1, May 1993.



- [28] Frankel J. A. and Romer D. (1999), "*Does Trade Cause Growth ?*", The American Economic Review, Vol 89, n°3, June 1999, pp 379-399.
- [29] Geda A. and Kebret H. (2007), "*Regional Economic Integration in Africa : a review of problems and prospects with a case study of COMESA*", Journal of African Economies, Advance access published online on November 2, 2007.
- [30] Gbetnkom D. et Avom D. (2005), "*Intégration par le Marché : le Cas de l'UEMOA*", Région et Développement, N°22-2005.
- [31] Gert-Jan M. L. and al. (2005), "*Cultural and Institutional Determinants of Bilateral Trade Flows*", Tinbergen Institute Discussion Paper, TI 2005-074/3, 2005.
- [32] Gould D. M. (1998), "*Has NAFTA Changed North American Trade ?*", Federal Reserve Bank of Dallas, Economic Review, First Quarter, 1998.
- [33] Groot H. L.F. and al (2003), "*The Institutional Determinants of Bilateral Trade Patters*", Tinbergen Institute Discussion Paper, Ti : 2003-044/3.
- [34] Hanink D.M. and Owusu J. H. (1998), "*Has ECOWAS Promoted Trade Among Its Members ?*", Journal of African Economies, Vol. 7, N°3, pp. 363-383.
- [35] Hapsari I. M. and Mangunsong C. (2006), "*Determinants of AFTA Members's Trade Flows and Potential for Trade Diversion*", Asia-Pacific Research and Training Network on Trade, Working Paper Series, N°21, November 2006.
- [36] Harrison, A., Tang, H., (2005), "*Liberalization of Trade : Why so much Controversy ?*", dans Roberto Zaghera, N. (éd.), Economic Growth in the 1990s : Learning from a Decade of Reform, World Bank, Washington, D.C.
- [37] Jansen M. and Nordas H. K. (2004), "*Institutions, Trade Policy and Trade Flows*", Papers-SSRN CEPR, 2004.
- [38] Kandogan Y. (2004), "*The Role of International Blocs on Trade*" University of Michigan Flint, School of Management, Working Paper Series, N°2004-01.
- [39] Krugman P. (1991) "*The Move Toward Free Trade Zones*", Policy Implications of Trade and Currency Zones, Federal Reserve Bank of Kansas City.
- [40] Krugman P. et Obstfeld M.(2006), "*Economie Internationale*", Nouveaux Horizons, 7ème Edition, 2006.
- [41] Longo R. and Sekkat K. (2004), "*Economic obstacles to expanding intra-african trade*", World Development, Vol. 32, N°8, pp. 1309-1321.

- [42] Lucian C. (2001), *"Assessing regional trade arrangements : are south-south regional trade agreement more trade diverting ?"*, United Nation publication sales N° E.01.II.D, ISBN 92-1, ISSN 1607-8291, ISSN 1607-8291, United Nations Conference on Trade and Development, Policy Issues in International Trade and Commodities, Study series N°16.
- [43] Matyas L. (1997), *"Proper Econometric spécification of teh gravity model"*, World Economy, 20(3) : 363-368.
- [44] Matyas L. (1998), *"The gravity model : some econometric considerations"*, World Economy, 21(3) : 397-401.
- [45] Martinez-Zarzoso I and Nowak-Lehmann F. (2003) *"Augmented gravity model : an empirical application to MERCOSUR-EURPEAN UNION trade flows"*, Journal of Applied Economics, Vol. VI, N°.2 (Nov 2003), 291-316.
- [46] Méon P-G an Sekkat K. (2004), *"Does the quality of institutions limit the MENA's integration in the world economy ?"*, in the World Economy, Global Trade Policy, pp 155 à 159.
- [47] Méon P-G an Sekkat K. (2005), *"Does corruption grease or sand the wheels of growth ?"*, Public choice 122 (1-2), 69-97.
- [48] Mucchielli J-L. et Mayer T. (2005), *"Economie Internationale"*, Editions Dalloz, 2005.
- [49] Musila J. W. (2005), *"The intensity of trade creation and trade diversion in COMESA, ECCAS and ECOWAS : a comparative analysis"*, Journal of African Economies, Vol. 14 (1), pp. 117-141.
- [50] Nicet-Chenal D. (2006), *"Analyse des échanges intra et inter blocs des pays du MERCOSUR vis à vis de l'ALENA, du pacte ANDIN et de l'UE 15 : une analyse en terme de création/détournement de trafic"*, Cahiers du GRES, N°2006-25, Novemebre 2006.
- [51] Njinkeu D. and al (2008), *"Expanding trade within Africa : the impact of trade facilitation"*, The World bank, Developement Research Group, Working Paper, N°4790, Trade team, December 2008.
- [52] Odularu G. O. (2009), *"Export diversification as a promotion strategy for intra-ECOWAS trade expansion"*, African Journal of Business Management, Vol. 3(2), pp. 032-038, February 2009.
- [53] Park J. H. (1995), *"The new regionalism and third world development"*, Journal of Developing Societies, XI (1), 21-35.

- [54] Rault C and al (2008), "*Modeling international trade flows between CEEC and OECD countries*", Applied Economics Letters, 99999 :1,
- [55] Roelofsen H. and Srivastava S. (1993), "*Promoting intraregional trade : a strategic approach for developing countries*", International Trade Forum, 3 : 7-12.
- [56] Schiff M. (1997), "*Small is beautiful : preferential trade agreements and the impact of country size, market share and smuggling*", Journal of Economic Integration, 12 : 359-87.
- [57] Serlenga L. and Shin Y. (2004), "*Gravity Models of the intra-EU trade : Application of the Hausman-Taylor Estimation in heterogeneous panels with common time-specific factors*", Mimeo, 2004.
- [58] Stiglitz J.E. et Walsh C.(2004), "*Principes d'économie moderne*", Editions De Boeck, 3ème Edition, 2004.
- [59] Subramanian A. and Tamirisa N. (2001), "*Africa's Trade Revisited*", IMF Working Paper, 01/33, March 2001.
- [60] Trotignon J. (2008), "*L'impact des accords de libre-commerce entre pays latino-américains : les enseignements d'un modèle de gravité en données de panel*", Economie appliquée, Tome LXI, N°2 (2008), pp.95-120.
- [61] United Nations Conference on Trade and Development (UNCTAD) (1996), *handbook of Economic Integration and Cooperation Groupings of Developing Countries*, Vol.1, New York and Geneva, Uited Nations.
- [62] Warner D. and Kreinin E. M. (1983), "*Determinants of international trade flows*", the review of Economics and Statistics, Vol. 65, N°1 (Feb. 1983), pp. 96-104.
- [63] World Bank (2000), "*Trade Blocs*", New York : Oxford University Press.
- [64] Yeats A. (1998), "*What can be expected from African regional trade arrangements ? Some empircial evidence*", World Bank, Mimeo.

# Annexes

## Annexe 1A

FIGURE 5 – Homoscedasticité test results : total exports model

Source	SS	df	MS			
Model	57053.2441	26	2194.35554	Number of obs =	3839	
Residual	5202.83584	3812	1.36485725	F( 26, 3812) =	1607.75	
				Prob > F =	0.0000	
				R-squared =	0.9164	
				Adj R-squared =	0.9159	
				Root MSE =	1.1683	
Total	62256.0799	3838	16.2209692			

residus2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
PIB1	6.003719	.0852204	70.45	0.000	5.836637	6.170801
PIB2	2.77257	.0270382	102.54	0.000	2.719559	2.825581
PIBT1	-3.258862	.2022321	-16.11	0.000	-3.655356	-2.862369
PIBT2	-.6894963	.0316539	-21.78	0.000	-.7515565	-.6274361
maritime	2.875475	.107893	26.65	0.000	2.663942	3.087009
frontiere	1.227707	.0809414	15.17	0.000	1.069014	1.386399
creation	.9507995	.0677575	14.03	0.000	.817955	1.083644
Distance	-6.265142	.0538005	-116.45	0.000	-6.370622	-6.159661
Sim	-1.150012	.0247663	-46.43	0.000	-1.198569	-1.101456
RouteExpor~s	-1.362075	.0609241	-22.36	0.000	-1.481522	-1.242628
RouteImpor~s	-.6714623	.0369663	-18.16	0.000	-.7439379	-.5989867
TelephoneE~s	2.855902	.0780037	36.61	0.000	2.702969	3.008835
TelephoneI~s	-.2032168	.0347221	-5.85	0.000	-.2712926	-.135141
IndexC	.5038123	.1079393	4.67	0.000	.292188	.7154365
IndexD	-5.859405	.4152607	-14.11	0.000	-6.67356	-5.045251
ControlCor..	3.461426	.2850156	12.14	0.000	2.902628	4.020223
ControlCor..	-5.626175	.2512586	-22.39	0.000	-6.11879	-5.133561
PrimDroitE~s	-.7264322	.3635991	-2.00	0.046	-1.4393	-.0135648
PrimDroitI~s	1.069816	.2951332	3.62	0.000	.4911819	1.64845
EffGouvExp~s	-7.443456	.3228774	-23.05	0.000	-8.076485	-6.810427
EffGouvImp~s	-4.290301	.2797969	-15.33	0.000	-4.838867	-3.741735
RegQualExp~s	7.37077	.317405	23.22	0.000	6.74847	7.993069
RegQualImp~s	6.456537	.1893693	34.09	0.000	6.085262	6.827811
StabPolExp~s	-2.647965	.1749327	-15.14	0.000	-2.990936	-2.304995
StabPolImp~s	4.362081	.1182763	36.88	0.000	4.13019	4.593972
Lambda1	16.38051	.1617208	101.29	0.000	16.06344	16.69757
_cons	-130.0021	1.158479	-112.22	0.000	-132.2734	-127.7308

Source : Calculs de l'auteur.

Annexe 1B

FIGURE 6 – Homoscedasticité test results : exports within WAEMU model

Source	SS	df	MS			
Model	17871.38	25	714.8552		Number of obs =	541
Residual	1566.72415	515	3.04218281		F( 25, 515) =	234.98
Total	19438.1042	540	35.9964892		Prob > F =	0.0000
					R-squared =	0.9194
					Adj R-squared =	0.9155
					Root MSE =	1.7442

residusint2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
PIB1	7.235655	.4645397	15.58	0.000	6.323029	8.14828
PIB2	.4190089	.3224014	1.30	0.194	-.2143746	1.052393
PIBT1	-8.162567	1.195226	-6.83	0.000	-10.51069	-5.814449
PIBT2	2.575037	.9180001	2.81	0.005	.7715512	4.378522
maritime	6.802229	.4960436	13.71	0.000	5.827711	7.776747
frontiere	1.099726	.2369794	4.64	0.000	.6341606	1.565291
Distance	-2.272121	.2097715	-10.83	0.000	-2.684234	-1.860008
Sim	1.584648	.2536538	6.25	0.000	1.086324	2.082971
RouteExpors	-1.152371	.2712857	-4.25	0.000	-1.685334	-.6194082
RouteImpors	-.5711623	.2346743	-2.43	0.015	-1.032199	-.1101256
TelephoneEs	1.483596	.3705406	4.00	0.000	.7556386	2.211553
TelephoneIs	-1.009095	.3475054	-2.90	0.004	-1.691797	-.3263924
IndexC	1.867854	.438511	4.26	0.000	1.006364	2.729345
IndexD	-21.86496	1.782449	-12.27	0.000	-25.36672	-18.36319
ControlCor..	-.4755505	1.149654	-0.41	0.679	-2.734139	1.783038
ControlCor..	3.411145	1.099637	3.10	0.002	1.250818	5.571471
PrimDroitEs	-10.35608	1.449827	-7.14	0.000	-13.20438	-7.507774
PrimDroitIs	-.9083958	1.35009	-0.67	0.501	-3.560756	1.743965
EffGouvExpors	-6.475977	1.343156	-4.82	0.000	-9.114716	-3.837238
EffGouvImpors	-3.898534	1.151039	-3.39	0.001	-6.159843	-1.637225
RegQualExpors	-4.929475	1.23292	-4.00	0.000	-7.351647	-2.507303
RegQualImpors	2.164805	1.23704	1.75	0.081	-.2654605	4.595071
StabPolExpors	.2673397	.7191114	0.37	0.710	-1.145413	1.680092
StabPolImpors	1.66967	.6285534	2.66	0.008	.4348262	2.904514
Lambda2	4.87968	.6194196	7.88	0.000	3.66278	6.09658
_cons	-103.3091	7.768412	-13.30	0.000	-118.5708	-88.04743

Source : Calculs de l'auteur.