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WEIGHT OF OIL RENT ON LABOR MOBILITY AND DEMAND OF CAMEROONIAN FOOD PRODUCTS IN CEMAC ZONE: AN APPLICATION OF A GRAVITY MODEL

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Abstract

The objective of this article is to analyze the impacts of oil rent on labor mobility and the demand for Cameroonian food products. By specifically examining the impact of oil rent on the demand for Cameroonian food products and using panel data for the period 2010-2017, we use a gravity model and use the Fixed Effect Vector Decomposition estimator (FEVD) that identifies the effect of invariant explanatory factors over time and controls the unobserved heterogeneity through fixed effects. Our main results reveal that there is a strong correlation between the mobility of workers, the demand for Cameroonian food products and the oil rent. Income inequalities, linguistic and geographical proximity and the effects of income increase determine the mobility of workers and the high demand for Cameroonian food products. The immediate consequence is that Cameroonian food products are becoming luxury goods. As a result, trade between Cameroon and other CEMAC countries reduces the surplus of the Cameroonian consumer although they are considered as a catalyst for unity and regional integration. In terms of recommendations, we propose the strengthening of the diversification of economies and bilateral exchanges through a strong intra-country trade opening as essential levers on which the States must act to improve the competitiveness and the substantial well-being of the populations.

Keywords: Demand, economic integration, labor mobility, oil rent

JEL Codes: O13, P28, Q10.

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1. Introduction

The objective of this article is to analyze the impacts of oil rent on labor mobility and the demand for Cameroonian food products. Given that in the review of literature, petroleum rent and mobility of labor are two disputed problematics giving rise to two effects: the expenditure effect (Rybczynski, 1955), and that of movement of resources long developed by the classical in the framework of the mobility of factors (Adam Smith & David Ricardo) then by Corden and Neary (1982) in the case of the displacement of manpower towards a rent, very competitive within which remunerations progress. If it is true that this problematic is not new and remains current in the framework of CEMAC where economies suffer directly the weight of an unlikely economic crisis due to the absence of economic diversification, petroleum revenue annihilate sectors not involved in competition, then constrain these countries to the importation of agricultural products (FMI, 2017).

According to the United Nations report (2011), regional integration is the best means which will enable African governments to accelerate the transformation of their little fragmented economies, to enlarge their markets, to extend continental economic space, and to harvest their fruits of economies of scale to the benefits of production and trade, thereby increasing the wealth of their countries. We are therefore asked the question of how oil revenues and the mobility of workers can impact the development and intensification of trade between Cameroon and the other high income oil exporting countries. It being understood that until now the works present in the literature states a relationship between oil rent and trade (FMI, 2017 and Nkendah, 2013). The specificity of this research consists of forging a synergy around oil rent, labor mobility and demand for Cameroonian food products. In other words this research aims to propose the channels through which the conjunction between petroleum incomes and the mobility of workers in the intra-CEMAC constitutes a lever for free trade, development and economic growth.

Indeed the theory of free trade in the very distant past and even today constitutes the epicenter about the path that leads to economic growth and development. This is achieved through externalities in terms of, for example the dissemination of knowledge and technology. Thus if it turns out to be double in the theoretical and empirical plan, that the oil rent influences the movements of resources[1] as well as the demand for food products and this, in spite of the debates on the significance of this impact, one can continue to wonder about the nature and the intensity of the effects of rents on the dynamics of migration within the oil producing countries and its impacts on sub regional food markets in the lights of economic integration efforts. It would be relevant to analyze for all the CEMAC oil exporting countries, which are the subject of our study, the effects of oil rent on labor mobility and demand for Cameroonian food products, in order to question the nature and the intensity of the impacts of this rent on labor mobility and the demand Cameroonian food products.

To do this, this article is organized around two sections: Section (2.1) will address the review of the empirical literature relating to the relationship between oil rent, labor

[1] The ability of people to leave their country of origin to work in another country. Even if according to Smith, the man is still considered a reasonable decision maker and his movements are made according to a clear logic based on better remuneration of his work perceived in the form of wages: it is in fact the neoclassical theory relating to wage differential.

mobility and demand for food products. Section (2.2) is devoted to the methodological approach and then to the testing strategies and the data. The last section through the different estimation methods implemented (The ordinary least square estimator (OLS), Fixed Effect Vector Decomposition (FEVD) the Pseudo Maximum Likelihood Fish (PMLF)) relating to difficulties related to the implementation of the gravity model and of the possible continuation of convergence of results of the different models will confirm or invalidate the research hypothesis stated above. But before then, a brief review of literature will be done on the gravity model, and subsequently we will engage through the different methods of estimation but in place as mentioned above.

2. Empirical Review

CEMAC is recognized as one of the least commercially integrated sub regions in Africa. However, it is located on the borders of almost all the other regional economic communities (RECs) of the continent. Despite this strategic position, recent advances in the elimination of customs duties and the existence of a single currency, the results in terms of trade flows and export diversification are still very weak. Official studies and empirical studies confirm this reality (Carrère, 2013). This integration problem remains an arduous task for the CEMAC economies.

In the same vein, Avom and Mignamissi (2013) assessed the community commercial potential first on the basis of stylized facts and the results show that the CEMAC countries are weakly integrated commercially, extroverted and heterogeneous; the coefficient of the traditional variables of the gravity model are generally expected signs; the low level of income per capita and especially the low productivity diversification greatly reduce the commercial potential in the sub region; episodes of trade creation , albeit at a low level, appear, especially in Cameroon's bilateral flow with other member states.

Thus, for example, the share of intra-community trade remained relatively stable between 1980 and 2003, with trade estimated, on an average, at 1.5%, despite some episodes of slight increase observed in particular in 1990 (2.3%) and 1995 (2.1%). Recent estimates show that this trend does not seem to be reversing for the long term. By way of comparison, over the same period, the average of this indicator is 65.87% for the EU (European Union), 48.28% for NAFTA (North American Free Trade Agreement), 21.32% for ASEAN (Association of South East Asian Nations), 13.98% for MERCOSUR (Common Market of the Southern Cone) and 10.83% for CARICOM (Caribbean Common Markets)

The observation of official statistics relating to the foreign trade of the CEMAC countries between 1995 and 2010, reveal three major stylized facts which have moreover been fairly recurrent since the 1960s. The first relates to the evolution of its main partners, where Europe with France leading despite the Chinese breakthrough, still remain its main trading partner. The second relates to the droop of intra-community trade, which is evolving only slightly and therefore places CEMAC behind all the other RECs in the world. The third relates to the internal and external dynamic trends in CEMAC trade, dictated by natural endowments and not resulting from a diversification strategy or opening up policy. However, Cameroon suffered various major external shocks due to the collapse of commodity prices in the 1980s; these shocks led to a slowdown of its economy.

The situation worsened in 1988 following the fall in agricultural growth[2] and the disengagement of the state from the agricultural sector characterized by the end of agricultural subsidies and the closure of several agricultural banks. The direct consequences of the disengagement of the state and the liberalization of the agricultural sector was, on the one hand, the abandonment of certain crops considered unprofitable like perennial crops (coffee, cocoa, hevea) by farmers and on the other hand, by the growing interest in food crops which allow both to feed the family and improve incomes, in the presence of a strong demand for food products emanating from neighboring countries. In some regions of Cameroon, coffee plants have been uprooted and replaced by vegetable crops (tomatoes, pepper, carrots), by roots and tubers (cassava, cocoyam, potatoes, yams) and by cereals (maize).

In the case of CEMAC countries like Gabon and Equatorial Guinea, import of food products mainly came from Cameroon (BEAC, 2008). According to BEAC (2008), Gabonese imports from the CEMAC zone were around 4.6% in 2005, of which 3.29% came from Cameroon. In total, around 69.6% of food imports in 2005 came from Cameroon. Cameroon has become the "bread basket of Central Africa", but also, a country with low income and deficit in food products (PFRDV). One of the causes of the food deficit is an agricultural production which grows slowly compared to the domestic and sub regional demands (Gabonese and Equatorial Guinea demand in particular). Urban markets and markets located in production areas are overflowed by exporters from border countries (Gabon and Equatorial Guinea) and by local traders. However, in view of the fact that Cameroon is at the center of trade in the CEMAC zone, it is important to understand how the prices in the markets of neighboring countries can react in the face of an increase in prices in the Cameroonian markets. Everything that can explain why the Cameroonian consumer surplus would be threatened.

Indeed this study would be one of the first to test the integration of Cameroonian markets and the markets of the Central African sub-region, notably those of Gabon Congo and Equatorial Guinea. Most studies analyzing the role of cross border trade on the integration of agricultural markets have focused on Asian countries (Sanogo, 2008; Maliki and Sanogo, 2010). Some rare studies have studied cross-border trade in Central Africa (Engola-Oyepet Herrera, 1997, Massuyeau, 1998). Massuyeau (1998) explained why various prices and the parallel exchange rates are transmitted only slightly on the northern Cameroonian markets. Engola-Oyep and Herrera (1997) have shown that the increase in exports to Nigeria leads to price increases in Cameroon. However, even if Douya et al. (2006), show the rigid nature of the agricultural supply in the CEMAC which could not only induce an increase in prices but also conditions the rationing of the quantities consumed by households.

In the same vein, Granger and Elliott (1967) assessed the price relationships of several English markets. Their results reveal a significant interaction and suggest that there are adjustments to the price shocks of spatially separate markets. Gupta and Mueller (1982) also used Granger causality to examine price adjustments between the German pork markets and found that the markets are not efficient. Alexander and Wyeth (1994) assessed the integration of rice markets in Indonesia using Granger causality tests. Their results show that there are causal links between several markets spatially separated. They

[2] The real growth rate of agricultural GDP turns around -15 % in 1988 (WDI, 2012)

confirmed that the sources of supply are more important than demand to stimulate agricultural prices.

In the same vein, Goodwin et al (1999) used Granger causality tests in a context of multivariate co-integration to assess the spatial relationships between regional markets for more foodstuffs after the reforms in Russia. Their results reveal that due to the gradual adjustments to price shocks, integration can occur in the long run. To consolidate this approach, many authors like Ravallion (1986) and Timmer (1987) have also proposed market integration tests based dynamic models. Generally, these models can be interpreted as autoregressive vector models with restriction tests on the parameters of the dynamic models. Dynamic models are thus an alternative to standard regression (correlation) models and Granger's causality tests. Timmer (1987) also uses a dynamic model, but adopts different hypothesis. Timmer assumes that central market prices are predetermined in relation to prices in remote areas and the first-order model is sufficient to measure price dynamics. To reinforce this idea, Timmer (1987) argues that, for highly integrated markets, the effects of delayed shocks on regional markets should be small compared to the shocks at time t and at time t-1 on the reference markets.

Impulse response functions are also used to analyze market integration. Williams and Bewley (1993) used impulse response function analysis to examine spatial price relationships for Australian livestock markets. Most of the published studies apply co-integration methods on space prices (Ardeni, 1989; Goodwin and Schoeder, 1991; Goletti, 1993; Golleti and Christian-Tsigas, 1995 and Goletti et al, 1995). Likewise the debate was brought down this time on models of the regime change, the use of which has also made it possible to measure the degree of market integration by taking account of the thresholds. Prakash (1996); Obstfeld and Taylor (1997); Spiller and Wood (1998); Spiller and Wood (1998); Abdulahi (2000); and Araujo et al, (2005) have also adopted this regime change models. However, the second recurring historical fact is that CEMAC appears to be one of the least integrated sub-regions in the world. Indeed the statistics of the total intra-community trade ranks the zone in last position compared to certain African communities like COMESA, UMA and even UEMOA. The comparison is quite interesting with UEMOA, of which the countries are also members of the Franc Zone. The average figures for the period 1995-2010 show that the internal trade of UEMOA is approximately 4.26 times higher than that of the CEMAC. With COMESA, this ratio increased to around 10 times (BEAC, 2012). This could equally explain the fragility of these economies. Moreover, the analysis of market integration which has received particular attention in developing economies often characterized by the fragmentation of markets due to insufficient transport and communication infrastructure and the unstable political environment. (Ravallion, 1986).

We are therefore interested in examining the effects of oil revenues and the mobility of workers on the demand for Cameroonian food products through a gravity model taking into consideration the mobile nature of the dependent variable (trade in food products). In the first section, it will consist of an analysis which highlights the weight of the oil rents and labor mobility on trade between Cameroon and the oil exporting border countries. Given the endogenous nature of certain variables and perhaps the omission of some that could be decisive, a test strategy will be used.

This undeniable contribution in this chapter, because it contributes to the debate on perfect markets and imperfections between different spatially separated markets using panel data. Panel estimation explains the unobserved fixed effects specific to each country (or to each agricultural product), thus eliminating any possible source of bias in omitted variables. Furthermore, by including the lagging explanatory variables, the panel procedure makes it possible to control the potential endogeneity problem. Besides, to assume that the causality is inverse ie. That the demand formulated by other countries plays a role on the rise in prices on the consumer markets in Cameroon.

3. Analysis framework, methodology and data.

3.1. Analytical framework

The analytical framework of this study is mainly deduced from the theoretical presentation of Viner (1951). For theoretically, the idea of promoting sub-regional integration as a strategy to accelerate economic growth through the effects of the creation and diversion of trade that it induces is not new. . Frankel and Rose (1998) and Rose (2000) show that increases in predicted trade imply the existence of a trade potential which depends theoretically on several factors, among others wealth per capita of the country, natural endowment, institutional arrangements, productive complementarity and infrastructural capital cited by Avom et al. (2013). Nevertheless, in the framework of the present study, emphasis will be placed on the wealth per capita of the country and natural endowments. Empirically, the gravity model appeared as a pertinent tool for the verification of these developments Carrère (2002).

3.2. Methodology

To highlight the weight of oil rents or oil revenues on the mobility of workers and the demand for food products between Cameroon and bordering oil exporting countries, we have used a gravity model. The choice of a gravity model is not trivial even if, moreover, there are several techniques and methods of evaluation whether it is labor mobility or trade (the demand for food products). Among them, the gravity model is a simple tool often giving good results to predict not only the mobility of workers but also bilateral trade. Anything that requires that we presents its theoretical basis and the justification for this background.

3.3. Theoretical foundations of the gravity equation

Originally, the gravity model is based on the relationship between the forces of attraction of trade and the obstacles of trade. Based on Newton's principle of gravity, the gravity model highlights the exchange between two countries according to their respective Gross Domestic Product (GDP) as an approximation of the economic power of the countries and the distance between them as an approximation transportation costs. The first formulations of the gravity equation found their foundations in the studies of Tinbergen (1963), Poyhonen (1963) and Pulliain in (1963). The gravity model suffered for a long time from a lack of theoretical anchoring. Several theoretical studies, including that of Anderson (1979) have overcome this problem.

The gravity model is a generic name for the family of quantitative models developed by the astronaut Stewart in 1940. It has been very successful since the early 1960s (Evenett and Keller, 2002). The analytical framework is underpinned by three fundamental

assumptions: (i) the maximization of profits by firms in monopolistic competition, (ii) the maximization under constraint of utility by consumers, and (iii) the specialization of the supply of goods between countries (Bergstrand. 1989; Anderson, 1979; Anderson and van Wincoop, 2003; Helliwell and Schembri, 2005).

Since Tinbergen (1962), the gravity model has become a popular instrument for analyzing foreign trade. This model, initially deduced intuitively to analyze bilateral trade flows between countries, is based on the principle of gravity introduced by specialists in space economics. In accordance with this principle, the intensity of trade between two countries is proportional to the product of their GDP and inversely proportional to the distance between them. The theoretical foundations of the gravitational model have gradually developed in the work of Anderson (1979), Bergstrand (1985 and 1989), Deardorff (1995), and Evenett and Keller (1998).

The gravity model proposed in the context of this work draws on empirical literature on the subject. It draws in particular on the work of Miniesy, and Nugent (2005), Batra (2004) and Fontagné et al (2002). So, to estimate the effect of oil rent on labor mobility and the demand for Cameroonian food products on the macroeconomic level, we use for this purpose a gravity model.

3.4. Econometric model: justification

The gravity model is a generic name of the family of quantitative models developed by the astronaut Stewart in 1940. It has known a great success since the beginning of the 1960s (Evenett and Keller, 2002). The analytical framework is underpinned by three fundamental hypotheses: (i) the maximization of profits by firms in monopolistic competition, (ii) the maximization under constraint of utility by consumers, and (iii) the specialization of the supply of goods between countries (Bergstrand, 1989, Anderson, 1979, Anderson and van Wincoop, 2003; Helliwell and Schembri, 2005). Since Tinbergen (1962), the gravity model has become a popular tool for empirical analysis of external trade. This model, initially deduced intuitively to analyze bilateral trade flows between countries, is based on the principle of gravity introduced by specialists in space economics.

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The theory of exchange shows that at constant prices, an increase in the quantity available of a factor will lead to an increase in the production of the good whose production function is intensive in this factor, to the detriment of the production of the second. As an illustration, this result suggests that the development of the exploitation of a natural resource, such as petroleum in a country (Gabon, Equatorial Guinea for example), is likely to delay the development of other sectors of the economy, such as the agricultural sector. The FAO already showed in 2006 the existence of a strong domination of the sectors based

on natural resources (mining and petroleum). Massive exports from these sectors, generating significant foreign exchange earnings, make other sectors of the economy (for example, the agriculture sector) less competitive. We are in the presence of the income effect, the incomes of rentier countries are increasing, which leads to an increase in demand for agricultural products. To estimate the impacts of the rent from countries bordering Cameroon on the intensification of agricultural exports and on the mobility of workers, we will have to specify the gravity model.

3.5. Gravity model: Empirical specification

Empirically, the gravity equation is derived from Newtonian gravitational physics which states that "two bodies attract each other in proportion to their masses and the inverse square of the distance between them[3]". The first application in economics was the work of Tinbergen (1961). In this research, we use a gravity model according to the theoretical specification proposed by Anderson and Van Wincoop (2003). According to the proponents of this approach, consumers have preferences of the CES (constant elasticity of substitution) type with an elasticity of substitution common to all goods and greater than unity ($\sigma > 1$). In this perspective, the gravity equation can take the following form:

$$X_{ij} = \frac{Y_i Y_j}{Y_G}\left[\frac{t_{ij}}{\Pi_i P_j}\right]^{1-\sigma}$$

Y_i Y_j, are the GDP of the trading partner countries and Y_G the overall GDP of the CEMAC countries. t_{ij} represents the cost of trade from country i to country j. If the hypothesis of the symmetry of costs is verified, i.e. if $t_{ij} = t_{ji}$ implying $\Pi_i = P_j$ the gravity equation can be rewritten as follows:

$$X_{ij} = \frac{Y_i Y_j}{Y_G}\left[\frac{t_{ij}}{P_i P_j}\right]^{1-\sigma}$$

P_i P_j, the price indices of countries i and j are the costs linked to trade between a country and all its partners. Intuitively, the gravity model explains the intensity of the bilateral trade flows of the countries by their respective masses (GDP) and the distance between

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[3] $F_{ij} = g\frac{M_i M_j}{D_{ij}^2}$ F : force of attraction. M_{ij} the body mass i (j) and g is the constant of gravitation and D_{ij} the distance which separate the two body.

them. Thus, starting from the econometric transformation of the Tinbergen model (1962) the model becomes in the following form:

$$D_{ij}^{\ d} = \beta_0 \frac{Y^{\beta_1}{}_i Y_j^{\ \beta^2}}{D^{\beta_3}{}_j} \exp(\varepsilon_{ij})$$

$D_{ij}^{\ d}$ represents the total bilateral demand for food products between the country i and j, Y_i Y_j are the respective GDPs of the countries and D_{ij} the distance between them. The β_i s are the parameters to estimate and ε_{ij} is a nuisance factor. In addition, we will apply the logarithm to all explanatory variables except dummy variables. By referring to the specification of the augmented log-linear form (Rose, 2000) and the increase of certain variables, the gravity model becomes

$$LogD_{ijt}^{\ d} = \beta_0 + \beta_1 Log\,\mathrm{Re}nte_{it} + \beta_2 Log\,\mathrm{Re}nte_{jt} + \beta_3 LogMigrant\_trav_{it} + Log\beta_4 Migrant\_trav_{jt} + \beta_5 LogMigrant_{it} + \beta_6 LogMigrant_{jt} + \beta_7 Logdistw_{it} + \beta_8 Logdistw_{jt} + \beta_9 LogPIB_{it} + \beta_{10} LogPIB_{jt} + \beta_{11} Inflation_{it} + \beta_{12} Inflation_{jt} + \beta_{13} Comcol + \beta_{14} Log(\mathrm{Re}nte_{it} * Comcol) + \beta_{15} Log(\mathrm{Re}nte_{jt} * Comcol) + \beta_{16} comlang\_ethno + \beta_{17} Comlang\_off + \varepsilon_{ijt}$$

This requirement is essential because the use of logarithmic variables is at the level of their interpretation. Since the coefficients translate simply elasticities. Then, as Feensta (2004) pointed out, the addition of a specific country effect to the gravity model is in perfect adequacy with the theoretical framework and allows for a robust estimator for the variable of interest. This specific effect brings together all the other invariant factors which affect the volume of trade. In the same vein, by extending this analysis, Cheng and Wall (2005) have shown that bilateral effects are preferable to individual effects. And it is this last proposal which is retained. Thus, by integrating the bilateral (μ_{ij}) and temporal (λ_t) effects and by grouping the variables by nature, we obtain the compact model with compound errors with two following factors:

$$Log(D_{ijt}^{\ d}) = \beta_0 + \sum_{k=1}^{p} \beta_k LOg(Q_{ijt}) + \sum_{k=p+1}^{n} \beta_k (Dm_{ij}) + \mu_{ij} + \lambda_t + \varepsilon_{ijt}$$

Q_{ijt} is the vector of quantitative variables and Dm_{ij} , is the vector of qualitative variables. Nevertheless, despite the virtues recognized by this model, the estimation of gravity models faces two major problems: On the one hand, the bias quite often is due to the omission of certain important variables and on the other hand, the selection bias due to the high concentration of zero values in the dependent variable (when bilateral trade flows are

almost non-existent between a pair of countries). We will obviously discuss these problems and then propose solutions using the different estimators recently used in the literature.

The different empirical studies on the model of gravity (Salvo. 2010: Xu 2010; Santos Silva and Tenreyro, 2006; Eaton and Tamura, 1994) used three estimators, namely the ordinary least squares (OLS) estimator, the Tobit estimator, the Pseudo-Maximum Poisson Likelihood (Poisson) estimator.

The gravity model has often been estimated, by ordinary least squares on cross-sectional data. However, it is important to take into account the dynamics of the data, to detect the effects that cannot be easily observed in the cross-sectional data and to have less collinearity between the variables. To do this, we adopt the ordinary least squares in panel. However, ordinary least squares with fixed effects present several econometric problems in the context of gravity models. For example, the presence of "country pair" fixed effects in the model does not allow the effect of explanatory variables invariant in time like distance, the language and common boundaries. To get around this problem, we use the Fixed Effect Vector Decomposition (FEVD) estimator proposed by Plümper and Troeger (2007) and which allows the identification of the effect of explanatory factors invariant in time while controlling for the unobserved heterogeneity through fixed effects.

The other problem from which ordinary least squares (OLS) suffer is the heteroskedasticity of the residuals. The heteroskedasticity of the residuals is a common problem, particularly in the case of cross-sectional or panel data. It is indeed quite probable that the variance of the residues is different according to the countries considered. Theoretically, the presence of heteroscedasticity does not bias the estimated coefficients, but it does affect the standard deviations of these coefficients and also the Student statistics (Ereudenberg et al, 1998).

In the presence of heteroscedasticity, the linear log form of equations (2) and (3) could invalidate the assumption of zero conditional expectation of the error term of the linear regression (Santos Silva and Tenreyro. 2006). The OLS estimates would therefore not be convergent. In order to solve this problem, Santos Silva and Tenreyro (2006) recommend using a Pseudo-Maximum Likelihood Poisson estimator (PPML). The Poisson estimator is recommended by the literature in the presence of strong heteroskedasticity (see Santos Silva and Tenreyro. 2006; Westerlund and Wilhelmsson. 2006, Siliverstovs and Schumacher, 2009: Carrère et al, 2009 and Yu, 2010). This estimator thus presents the advantage of being convergent in the presence of heteroskedasticity and of treating in a robust manner the problem of the high concentration of zero values in the dependent variable. The specification is based on the use of the dependent variable (agricultural exports) in level and not in log. The Poisson estimator integrates all the observations and thus avoids a potential selection bias (de Sousa and Lamotte, 2009). This bias is all the more likely since in our sample, we have zero values in the data for bilateral exports of agricultural products.

The PPML estimator of Santos Silva and Tenreyro (2011) is an extension of the work of Santos Silva and Tenreyro (2006) by considering that the data are generated by a model with constant elasticity. The authors confirmed that the PPML estimator is the best suited, even when the proportion of zeros in the sample is very large. The results of the Poisson estimator will not be presented in this chapter, but only the results of the PPML estimator.

Another estimation technique used to estimate the gravity model is the Tobit estimator (see Anderson and Marcouiller, 2002; Hassan Al-Atrash and Yousef, 2000 Mansfield et al, 2000; Rose, 2004). The Tobit model recognizes the existence of null values in the dependent variable and treats it by normalizing the distribution of errors. Indeed, the infinitely small values of trade between two countries are often considered as missing data, or even zero.

3.6. Data

The main data used in this work come from WDI (2005), Global Bilateral Migration and BEAC (2012). The oil rent variable is used as a proxy for oil wealth. This variable, taken from the World Bank's Adjusted Saving Project database, is much more detailed than the other proxy variables associated with oil abundance. The oil rent appears to be the equivalence of oil resources in oil wealth (Bolt et al., 2002). The calculation of the pension is carried out in several stages. In a first step, we obtain the unit rent by the difference between the price on the world market and the unit cost of extraction. For negative values of unit rent, it is assumed that this result is due to incomplete data on extraction costs (Bolt et al., 2002). For these cases, an adjustment is made. It consists in taking the average of the positive "rental rate" of the 5 most recent years in the country. The rent rate thus obtained is multiplied by the price. The result is a positive unit rent. In a second step the rent unit is multiplied by the quantity extracted from the product considered, this operation leads to the desired rent. Finally, the oil rent variable is expressed as a percentage of GDP. To estimate the effect of the oil rent on labor mobility and flows trade in food products in the CEMAC zone, our main variables are movements of workers from country 1 to country 2, the difference in GDP between 2 countries, movements of workers between 2 countries in the previous period, capturing the effect of networks, exports of food products from Cameroon to other border countries (or other CEMAC countries), the oil rent of countries importing Cameroon food products, the Gross Domestic Product of Cameroon and its trading partners, border and common language indicators and geographic distance.

The oil rent indicator is calculated by the World Bank between 1970 and 2004. The oil rent was calculated by the market value of the resource extracted minus the average cost of extraction, using the following formula (Bolt, Matete and Clemens, 2002): Rent = (production volume) (market price - average unit cost of production) - Production: Production data come from different sources: BP, AIE, International Petroleum Encyclopedia and the Monthly Bulletin Statistics published by the United Nations. Regarding the price, it was obtained by considering the average of four gross spot prices in dollars per barrel and were then converted into dollars per ton (source: BP). As far as costs are concerned: Production costs come mainly from AIE data (unit $/ ton).

The information on food exports of Cameroonian food products comes from BEAC data for the period 2010-2017. The main products imported from Cameroon by the other CEMAC countries are: fresh or chilled potatoes, dried beans, tomatoes fresh but sweet; fresh or dry pineapple.

Following Martin and Pham (2007), we can hypothesize that the majority of zero trade flows between a pair of countries reflect an absence of trade. It is important to take into account the zero values of trade flows. Indeed, these zero flows contain important information for understanding the structure of trade between the exporting country and its

trading partners. The dependent variable is unidirectional trade as suggested by Baldwin and Taglioni (2006)

The solution proposed by the empirical literature (Eaton and Tamura. 1994, Helpman et al, 2008) is to add a constant to the dependent variable when estimating the linear log model so as to preserve the observations for which bilateral trade is zero. The variable labor mobility will be understood from the global bilateral migration data from the IOM over the period 2010-2017 relaying migratory flows between Cameroon and the four other CEMAC countries. This labor migration is the share of migrants from other countries to Cameroon of working age. Here, we have considered the 20-65 age bracket.

The interaction term is used to measure the effect of oil revenue shocks in neighboring countries of Cameroon on the level of food exports from Cameroon, we introduce a multiplicative term of the oil rent crossed with a variable indicating the existence of common border (Border). We hope for a positive and significant coefficient of this multiplicative variable (border * rent) and exports. This will mean that the rent from countries bordering Cameroon has a positive effect on the intensification of its agricultural exports.

Economic size: the economic size of the exporter (Cameroon) and importers (the other countries) is measured by the Gross Domestic Product (GDP). We expect a positive and significant influence of the GDP of the exporting country and the importing country on bilateral trade. Indeed, it is assumed that an increase in the GDP of the exporting country (Cameroon) will translate into an increase in its wealth and its competitiveness in the same way, an increase in the GDP of the country importing the products: Similarly, an increase in the GDP of the country importing agricultural products is accompanied by a wealth effect allowing it to increase its demand for imports of agricultural products. This is all the more likely to occur if the increase in aggregate income in the importing country has come at the expense of the expansion of domestic agricultural supply due to internal and sectoral migration of the labor factor.

Linguistic and geographic proximity: the data on the official language (common language) and the distance come from Mayer and Zignago (2006). The common official language is a dummy variable (i.e. is equal to 1 if the two partner countries have a common language and 0 otherwise). According to Trotignon (2009), sharing a common language (Lang) acts as a proxy for cultural rapprochement and leads to a reduction in commercial transaction costs. Geographic distance plays an important role in the various empirical studies on trade and particularly in the gravity model (Baldwin and Taglioni, 2006; De Groot et al, 2004; Kleinert and Toubal, 2010; Linders and De Groot 2006; Rose, 2007: Zwinkels and Beugelsdijk, 2010). Geographic distance is an approximate measure of transportation cost. The distance is generally measured between the capitals of the two partner countries. The greater the distance between the partners, the higher the transport costs. The real effective exchange rate comes from the World Development Indicators (WDI, 2014) database of the World Bank, the opening and inflation come from the BEAC database.

The choice of Cameroon is justified by the fact that this country (with enormous social and economic potential) is often presented as the "breadbasket of Central Africa" by the Cameroonian public authorities. However, despite the increase in agricultural production recorded in Cameroon, the problems linked to agricultural supply remain topical. Indeed,

the 2008 food crisis followed by hunger riots poses the problem of stable integration of production and consumption markets in Cameroon (INS, 2014)

4. Restitution and discussion of the empirical results

Table 2.1 presents the summary of the results of the different techniques for estimating the gravity equation. These results show to what extent the oil rent affects labor migration and the demand for Cameroonian food products in light of the signs that precede the different coefficients of these models. This is in fact the expected effect since the other economies are less diversified. To do this, all the estimated coefficients, except the coefficients associated with the dummy variables, are interpreted as elasticities. This posture leads us to relay the sensitivity of these variables on the demand for Cameroonian food products (table, 2.1). In columns (1), (2), (3) of Table 2.1, the coefficient associated with the interactive variable has a positive and significant sign at 1% and 5%. This obviously consolidates the validation of the hypothesis that the oil rent, precisely when it increases in the countries bordering Cameroon, stimulates the development of exports of Cameroonian food products. The effect is almost nil for the case of rentier countries not bordering Cameroon. Indeed, the coefficient associated with the additive term of the annuity variable is not statistically different from zero.

Table 1 : Different estimation methods

Estimators	*OLS*	*XTFEVD*	*PPML*
	(1)	(2)	(3)
Dependent Variable	*Log (1+prod_viv)*	*Log (1+prod_viv)*	*prod_viv*
Oil Rent	*-0.003* *(-0.968)*	*-0.003* *(-0.576)*	*-0.001* *(-0.978)*
Migrant_trav	*-1.0718**** *(0.01)*	*1.1**** *(0.03)*	*0,99**** *(0,02)*
*Rente*comcol*	*0.037**** *(4.416)*	*0.034*** *(2.179)*	*0.006**** *(2.741)*
comcol	*-2,942**** *(-1,634)*	*-1,935* *(-1,197)*	*-0,853**** *(-9,980)*
distw	*-2.932**** *(-3.260)*	*1.9800* *(0.469)*	*-0.843**** *(-9.980)*
(PIB-PIB cmr)	*-3.291**** *(-4.77)*	*-3.367**** *(-5.29)*	*-3.282**** *(-4.72)*
inflation	*0220*** *(1.31)*	*0.217*** *(1.31)*	*0.217** *(1.72)*
Comlang_ethno	*3.048* *(1.407)*	*7.0377**** *(4.34)*	*7.0894**** *(3.76)*
Constant	*-168.9514** *(69.8863)*	*-154.3**** *(-2,994)*	*-21,61**** *(-4,600)*
Numbers of observations	*120*	*120*	*120*
R		*0.532*	*0.345*
Numbers of country pairs	*4*	*4*	*4*

Source: Computed by author: the robust t-statistics are in brackets, without brackets. *** p<0.01, ** p<0.05, *p<0.1

With regard to worker migration, it can be seen that between 2010 and 2017, an increase of 1% in oil revenues from oil-exporting countries that trade with Cameroon is significantly greater than 1. This means that we are in the framework of an explosive

process. That is to say the movements of workers increase by 100% each year. And this remains entirely logical if we refer to the neoclassical theory and the new theory on labor migration (Combes et al 2010).

Column 1 of Table 1 above presents the results of the estimation by ordinary least squares (OLS). The coefficient of the multiplier *Comcol*rente pétrolière* suggests a positive relationship between rentier countries in the CEMAC region and demand for Cameroonian food products. This is all the more reinforced and confirmed by the XTFEVD specification presented in column (2) and which simultaneously makes it possible to control for the fixed pair country effects and for the effect of invariant factors over time at bilateral level (distance, common language, border).

The border variable (comcol) which captures the border effect (Erankel et al, 1995) is neither significant nor positive. This is not surprising since in the model with multiplicative variables, its coefficient identifies the effect of the common border in the specific case of neighboring countries with an almost zero level of oil rent. This particular case characterizes a country like the Central African Republic which is at the same time bordering on Cameroon, but is not an oil economy. The volume of trade between Cameroon and this country is relatively low.

More generally, the bilateral distance variable appears significant and negative between specifications, reflecting the magnitude of transaction costs weighing on trade. Many studies have shown that intra-African trade is very weak and is between 10 and 12%; 80% of African exports go to Europe (UN, 2011). In short, African countries do little trade with each other and direct most of their exports to developed countries. The other characteristic of intra-African trade is the large weight of the cross-border informal sector. According to United Nations statistics (2010), only 60% of trade is declared and recorded. However, when we dwell on the sign of the one preceding the distance with the model (XTFEVD)[4], we notice that, unlike a traditional gravity model, the coefficient is not negative: it is positive. We could expect the fact that the more geographically distant two countries the less there should be a flow of workers between them.

The elasticity of the difference in GDP between Cameroon and its partners acted negatively and significantly for all 3 estimates. This result was not expected. This elasticity is negative and significantly different from zero, which means that an increase in the GDP of partner countries will allow Cameroon to increase its wealth and also improve its competitiveness. Given that the real income effect following the increase in oil revenues will stimulate an increase in their capacity to demand Cameroonian food products. This would further strengthen the price elasticity of demand between Cameroonian exports of food products and the oil-producing countries.

With regard to inflation, we realize that a variation of an additional unit leads to an increase in demand for Cameroonian food products which would be contrary to economic theory and the intended effect. But in fact, the quarrel is that food products are considered to be luxury products. As a result, their demand is rather an increasing function of price. This can also justify the ill-being of Cameroonian households. The coefficient of the common language variable (Comlang ethno) is positive, but significant for the last two gravity models in columns (2), (3), of Table 1. We expected a positive and significant impact,

[4] Effect vector decomposition

because language common promotes bilateral exchanges thanks to the ability to communicate directly. The higher the direct communication, the higher the bilateral trade.

Regarding the different estimation methods, when the problems of heteroskedasticity of the residuals, the effect of invariant explanatory factors over time and the unobserved heterogeneity are resolved, by examining model by model, we realize that the method OLS and that of Fixed Effects Vector Decomposition (Eixed Effect Vertor Decomposition) reinforce the thesis that high oil revenues reduce the competitiveness of all non-oil sectors excluding vital sectors like agriculture and manufacturing and leaving oil as only functional source of income. This approach is further developed in the review of the literature on the Dutch syndrome from the perspective of a curse on oil revenues. Because this oil revenue hindered the diversification of these economies and then did not induce the effects of links and complementarity between the different sectors (World Bank, 2018); Sachs and Wamer (1995); Corden and Neary (1982); Rybczynski, (1955).

Summarily, the aim of this research has been achieved since I have succeeded in demonstrating that high oil revenues reduce the competitiveness of all non-oil sectors excluding vital sectors like agriculture and manufacturing and leaving petroleum as the only functional source of income. Then, I clearly identified that income inequalities, linguistic proximity and the high demand for Cameroonian food products. Finally, the results reveal that there is a strong correlation between worker mobility, demand for Cameroonian food products and oil rent.

5. Conclusion

This article has examined the impacts of oil rent and those of worker migration on the demand for Cameroonian food products in order to perfectly understand the sources of the increase in Cameroonian exports of food products to the CEMAC countries, in which they had an income effect following the increase in oil revenues. It has analyzed the contribution of oil rent shocks in the countries bordering Cameroon on their demand for imports of Cameroonian food products. Empirically, several major facts caught our attention. Firstly, the econometric results show that the growth in oil revenues and the effect of worker migration in the CEMAC zone have favored the expansion of Cameroonian exports of food products. In a second step, the elasticity of exports in relation to the growth of foreign oil revenues and the migration of workers is significant and strongly positive. In addition to the rigidity of the real agricultural supply, the increase in exports of Cameroonian food products to the oil-producing countries in the CEMAC zone can have mixed effects in general equilibrium. Third, if there is a reorientation of the supply of food products with a preference for foreign buyers, price tensions may increase on local Cameroonian markets, and consequently reducing the consumer surplus of Cameroonian thus his well-being. Indeed, a 1% increase in oil revenues from oil exporting countries that trade with Cameroon is significantly greater than 1. This means that we are in the middle of an explosive process. In other words, the movements of workers increase by 100% every year. And this remains entirely logical if we refer to the neoclassical theory and the new theory on labor migration (Combes et al. 2010).

In short, natural resources undermine the development and diversification of these economies and in reality justify the conspiracy and the ill-being of these economies (IMF, 2017). In terms of recommendations for economic policies, the diversification of the economy, the increase in exports, the transformation of the production apparatus as well

as the mastery of technology are the levers on which the States must invest themselves more.

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