Journal of International Business and Economy (2013) **14**(1): 49-70 (22 pages)

JIBE
Journal of International Business and Economy

Arnaud F. Djemmo

TRADE FACILITATION AND PERFORMANCE OF MANUFACTURING EXPORTS FROM CAMEROON

ABSTRACT

Cameroon's "Vision 2035" considers the increase of manufacturing exports as the key factor of its "emergence" in 2035. In this context, measures to reduce manufacturing production and export costs should be taken with primary attention to reforms in trade facilitation. We use an augmented gravity model to evaluate the impact of five trade facilitation measures - *port efficiency, customs efficiency, regulatory environment, use of ICT and quality of roads* - on the performance of the manufacturing exports from Cameroon. Our results confirm the positive role of physical infrastructures on African exports. Using the Poisson Pseudo Maximum Likelihood to deal with the presence of "zero" in our bilateral trade matrix, we find that port efficiency and quality of roads are the main drivers of trade facilitation in Cameroon.

Key Words: Cameroon, emerging country, gravity model, manufacturing exports, trade facilitation, poisson pseudo-maximum likelihood

Arnaud F. Djemmo
FSEG-University of Yaoundé II-Soa

Correspondence: Arnaud F. Djemmo
Faculty of Economics and Management,
University of Yaoundé II-Soa, Cameroon
E-mail: a.djemmo@gmail.com/ djemard@yahoo.fr
Tel: 00237-75-67-46-40

First Received: Nov. 20th 2012
Final Revision Accepted: Apr. 15th 2013

INTRODUCTION

The Cameroon's vision by 2035 is that of an "emerging country, democratic and united in its diversity". "*As an emerging country, the ambition is to become a strong, diversified and competitive economy where manufacturing is predominant (in GDP and exports) and integration into global economy is effective, the level of poverty is residual and its GDP per capita ranks it among the middle-income countries* (MINEPAT, 2009)". Therefore, this "Vision" considers the increase of manufacturing exports as the key to the "emergence" of Cameroon by 2035.

Despite the optimism displayed by the "Vision", the trade performance of Cameroon will remain below the global average. According to latest statistics, international trade would account for nearly 30% in the formation of global GDP and is expected to increase its influence in 2020 around 50% (WTO, 2011). For Cameroon, the share of exports in GDP should rise from 21.7% in 2007 to only 35.8% in 2020 and this rate would reach 50% of GDI only around 2035. On this latter date, manufactured goods account for nearly 60% of total exports against 5.7% in 2007 (MINEPAT, 2009). While the exports of agricultural commodities and oil will decline from 20.5% and 50.7% between 2005 and 2007 from 9.8% to 21.9% by 2035. In the world, manufactured goods already accounted for 81% of world exports in 2005, percentage extraordinarily stable over the last fifteen years (UNIDO, 2009).

In order to achieve its long-term development objectives, Cameroon should be able to respond positively to the demands of international trade, in manufactured goods, characterized by an important competition by integrating in its evolution the globalization requirements to build a sustainable development. Then, its trade operations must be in accordance with the constraints of efficiency, productivity and competitiveness.

Successful integration into the global economy depends on many factors upon which trade facilitation (TF) can act positively. By improving the efficiency of the international supply chain, TF can increase trade flows while rationalizing resources allocation (Orliac, 2005). The objective of TF is to minimize transaction costs and complexity of regulations, while allowing governments to maintain an efficient level of control. Then, reforms in TF must be in the forefront of discussions on public policies to implement in order to reduce production and export costs of manufactured goods in Cameroon.

Besides the ambition to become an "emerging country", the issue of TF is particularly important for Cameroon for two main other reasons. On the one hand, the country is currently involved in two major trade liberalization processes: the Doha Round at the

world trade organization (WTO) and the Economic Partnership Agreements (EPAs) with the European Union (EU). TF is an essential prerequisite in order to seize the new opportunities that will arise there in terms of additional markets access. On the other hand, the country is the main transit point for goods from and to Chad and Central African Republic, which are landlocked. TF measures in Cameroon would be beneficial for these two countries in particular, and to the all Economic Community of Central African States (CEMAC) sub-region in general.

The purpose of this paper is to evaluate the impact of five TF measures *(port efficiency, customs efficiency, regulatory environment, use of ICT and quality of roads)* on the export performance of Cameroon. In accordance with Vision 2035, we will focus on the exports of manufactured goods in order to determine the most indicated TF measures to adopt and to demonstrate their role on the development of Cameroonian manufacturing exports.

To move on, the work will first locate Cameroon in relation to current discussions on TF. Then, we will have a review of empirical literature on the topic. At the end, we will conduct an econometric simulation about a gravity model augmented by five indicators reflecting the main channels of TF in Cameroon in order to determine our observations concerning the policies to be prioritized.

CAMEROON AND THE CURRENT NEGOTIATIONS ON TRADE FACILITATION

TF was officially born in 1996, following the Singapore Ministerial Declaration. The desire to reduce transaction costs and charges associated was one of the main reasons which lent to consider that TF was a grown up subject for negotiations in the WTO (CCI, 2005). The rationale being that, since tariffs and other traditional barriers were lowered or eliminated, there was the need to do the same for the others constraints. There is no commonly accepted definition of TF. Cameroon is engaged in trade negotiations within the WTO under the Doha Development round and EPAs with the EU within the Central Africa group. TF is actively discussed in these two instances with different scopes.

WTO negotiations in trade facilitation

In the negotiations of Doha Round, TF is part of the main issues and concerns about "implementation". In WTO, TF is considered as *"the simplification and harmonization of international trade procedures, including activities, practices and procedures that are involved in collecting, presenting, communicating and processing data required for the movement of goods in international trade"*. As highlighted by the previous negotiations, this definition has a very limited scope and covers three GATT Articles: Article V on freedom of transit, the important Article VIII on rights and procedures to import and export, and Article X on publication and administration of trade regulations (WTO, 2011).

Currently, TF is one of the most advanced topics of current WTO negotiations with an almost final *"draft status"*, involving several regulatory provisions organized around 12 main points:

- *Article 1:* Publication and Availability of Information (covering publication; information available through Internet; enquiry points; and notification);
- *Article 2:* Prior Publication and Consultation (covering intervals between publication and entry into force; opportunity to comment on new and amended rules; and consultations) ;
- *Article 3:* Advance Rulings ;
- *Article 4:* Appeal Procedures ;
- *Article 5:* Other Measures to Enhance Impartiality, Non-Discrimination and Transparency (covering conditions applied to import alerts; detention of shipments; and test procedures) ;
- *Article 6:* Disciplines on Fees and Charges Imposed on or in Connection with Importation and Exportation;
- *Article 7:* Release and Clearance of Goods (including pre-arrival processing; separation of release from final determination and payment of Customs duties, taxes, fees and charges; risk management; post clearance audits; average release times; authorized operators; and expedited shipments);
- *Article 8:* Consularization;
- *Article 9:* Border Agency Cooperation;
- *Article 10:* Formalities Connected with Importation and Exportation (covering their periodic review; reduction; and harmonization with international standards; the acceptance of commercially available information; use of single windows;

disciplines on pre-shipment inspection and customs brokers; and temporary admission of goods);

- *Article 11:* Freedom of Transit;
- *Article 12:* Customs Cooperation.

These twelve families of measures have been re-organized, in order to take into account similarities between measures, underlying shared components, as well as areas where further distinctions were warranted.

There are also several provisions related to TF on some agreements such as import licensing, customs valuation, rules of origin and pre-shipment inspection.

Trade facilitation within the framework of EPA between Central Africa and EU

Cameroon is engaged in negotiating an EPA with the EU within the framework of Central Africa group whose the other countries are: Gabon, Central Africa Republic, Chad, Congo, Equatorial Guinea, Democratic Republic of Congo and Sao Tomé and Principe. To date, Cameroon is the only country in this sub-region that has signed an interim EPA, which is not yet implemented.

TF has been identified at the outset of negotiations in 2004, as one of the main objectives of the EPA negotiations. In the Cameroon interim EPA, currently used as a basis for negotiation of the regional EPA, the parties recognize the importance of customs and TF. This recognition resulted in Chapter 3 entitled *"Customs Regime and Trade Facilitation"*. The points raised here are: simplification of administrative procedures, customs cooperation, trade norms, transit of products, relationships with business and customs value.

As part of discussions at the regional EPA, the sanitary and phytosanitary measures and technical barriers to trade are also discussed in the negotiations on TF.

EMPIRICAL LITTERATURE ON TRADE FACILITATION

Since the official birth of TF in 1996, several authors have attempted to assess its potential impact on trade flows. Some studies used a computable general equilibrium model to estimate the benefits of TF. In these models, TF is modelled as a reduction in international trade costs or an improvement of productivity in the field of international

transport. It is therefore considered as a technical progress affecting trade operations, according to the method adopted by Hertel, Walmsley, and Itakura (2001).

Other studies have recently used a gravity model to estimate the effects of TF on trade flows, due to significant developments made by Wilson, Mann and Otsuki (2003a, 2003b, 2004); these authors introduced four indicators reflecting the main channels of TF: port efficiency, customs efficiency, regulatory environment and e-commerce. In a first study published in 2000, Wilson, Mann and Otsuki compare the impact of lower tariffs in APEC and the improvement in TF. They found that lower tariffs by 6.5% to 0 would save 27.8 billion US dollars, an amount that can be achieved with only a 0.55% improvement in ports efficiency, or 5.5% of improvement in customs environment, 3.7% of e-commerce.

In 2003, these authors found an increase of 254 billion in intra-APEC trade resulting from an improvement in half of TF. Kim, Lee and Park (2004) arrived at the conclusion that 50% improvement of customs procedures would result in an increase in imports of about 1.7 to 3.4% in APEC industrialized countries, 2 to 4.5% for newly industrialized countries and from 7.7 to 13.5% for developing countries of the region. In 2004, Wilson, Mann and Otsuki expanded their sample to 75 developed and developing countries and found that improvement in four TF indicators leads to an increase of manufacturing trade of about 377 billion; all regions benefit in terms of export and import. Using the methodology developed by Wilson, Mann and Otsuki (2003a, 2003b, 2004), Orliac (2005) found that e-commerce and port efficiency are the key TF variables in China. This result is explained by the block up of ports due to the growth of the economy and the landlocked of some Chinese provinces.

Concerning the impact of TF in Africa, Njinkeu, Wilson and Fosso (2007) expanded the sample used by Wilson, Mann, and Otsuki (2004) to 25 African countries in order to present an "agenda" of TF to African countries. In 2009, they examined the impact of TF on intra-African trade. They found that port efficiency and services infrastructures are the main factors that have a positive impact on intra-African trade. Iwanow and Kirkpatrick (2007) construct aggregated indicators of TF (in the on-the-border side), and infrastructure for 2003 and 2004, by applying simple average to primary indicators mainly collected from Doing Business and the World Development Indicators (WDI). They estimate a standard gravity model augmented with these indicators and find a positive impact of the three indicators on exports. Theirs findings are that policies that improve their indicators yield a higher effect in African countries compared with the rest of the world. Using detailed data on transit, documentation, ports and customs delays on Africa's

exports collected by Doing Business at the World Bank, Freund and Rocha (2010) find that transit delays have the most economically and statically significant effect on African exports. They find that a one-day reduction in inland travel times leads to a 7% increase in exports.

To carry out as well as possible our study, we use an augmented gravity model to identify areas with greatest need in terms of TF in Cameroon. Contrary to the work cited above involving African countries that are limited to the services infrastructures, we added an additional TF indicator, the quality of roads, in order to capture the impact of transport infrastructure. In fact, among all transport means, road is the most used for trade between African countries. In a recent study on companies in eight African countries, Gad (2009) found that a large majority of them prefer road transport, mainly because of the absence of other means, including the ineffectiveness of rail services and the high cost of air travel.

Our study is also distinguished by the use of the Poisson Pseudo Maximum Likelihood (PPML) to deal with the presence of "zero" in our bilateral trade matrix. Santos and Silva (2007) test this estimator against alternative techniques and find that it performs quite well even in the presence of measurement errors in the dependent variable.

IMPACT OF TRADE FACILITATION ON MANUFACTURING EXPORTS

Definition of trade facilitation indicators

A myriad of indicators related to different aspects of TF at the country level and at the extensive geographic coverage have recently been collected by different organizations and were used in empirical research to estimate their impact on trade. Iwanow and Kirkpatrick (2007) used the World Bank doing business and Logistic performance index. Sadikov (2007) used the number of signatures. Martinez-Zarzoso and Marquez-Ramos (2008) used the costs and time involved in exporting and importing. Persson (2010) used the number of days needed to export or import.

There have also been efforts to construct a more composite "TF indicator", consisting of measurements of port efficiency, customs efficiency, regulatory environment, and e-business infrastructure (Wilson, Mann, and Otsuki, 2003a, 2004) or services

infrastructures (Njinkeu, Wilson, and Fosso, 2007, 2009). In this study, we follow this last approach developed by Wilson, Mann and Otsuki by construct five composite TF indicators which reflect the main channels of TF in Cameroon: *Ports efficiency, customs efficiency, regulatory environment, use of information technology and communication (ICT), and quality of roads*.

Ports efficiency measures the quality of port and airport infrastructures. This indicator is constructed in accordance with GATT Article V on freedom of transit and Article 11 of WTO *"Draft status"* on TF. We hope that an improvement of this indicator will have a positive impact on trade flows.

Customs efficiency measures the indirect costs such as transparency and formation of the customs administration, corruption, or complicated procedures. It is representative of the GATT Article VIII and Article VI of *WTO Draft status* on TF, which urges member countries to limit all fees and formalities connected with importation and exportation to the approximate cost of customs services.

Regulatory environment measures the economic approach of regulation. Well developed institutions which meet the requirements of Article X of GATT, Article I and II of WTO Draft status, will have a positive impact on trade by reducing transaction costs of business operations and thus improve the market efficiency. A good regulatory environment also attracts foreign investment. The objective of this indicator is therefore to highlight the political and actual application of rules, compliance with international standards, but also the general perception of the regulatory environment (Njinkeu, Wilson and Fosso, 2007).

Use of ICT measures the extent to which an economy uses telecommunication and information networks to improve its efficiency and its structural change and to reduce its trade costs. Governments and public institutions should provide information technologies in order to: Reduce costs related to trade procedures for both the private and the public sectors, increase productivity and transparency of the public sector, and facilitate the implementation of trade promotion policies and trade agreements. Greater use of ICT should therefore improve trade.

Quality of Road is an important aspect of TF in African countries. Among all transport means, road is the most used for trade between African countries. In a recent study on companies in eight African countries, Gad (2009) found that a large majority of them prefer road transport, mainly because of the absence of other means, including the ineffectiveness of rail services and the high cost of air travel. Improving the quality of roads should have a positive effect on Cameroonian exports.

One might question the reason why these particular dimensions of TF have been chosen. Apart from the fact that these indicators reflect partial aspects of the current negotiations on TF at WTO, we also notice that these are global indicators, little disaggregated, and based on perceptions and specific assumptions. In our study however, we choose to use these five indicators because they best reflect the main channels of TF in Cameroon, those by which government can achieve the most benefits in short term. Except the quality of road, many studies on TF adopted the fourth others variables and found that they are a good drives of TF. In addition, their construction is relatively easy and the data needed to their construction are available over a long period and homogeneous (from a single source).

Methodology and data

With a well-established theoretical basis and a minimum requirement in terms of data, gravity equations have become one of the most popular analysis tools of international trade. These equations can be basic, augmented, dynamic, use cross sectional or panel data. Two main reasons can explain the central role of gravity model in empirical work on international trade (Piermartini and Teh, 2005). The first reason is the need for detail in explaining bilateral trade flows offered by this model: The R-squared that measures the explanatory power, is usually between 6.5 and 9.5% depending on the sample. This is exceptional given the transversal nature of the data. The second reason is that it provides a simple method to test the role of other variables that affect trade.

Gravity model was originally developed by Tinbergen (1962) to explain bilateral trade flows by gross national income and geographical distance between countries. Recent theoretical and empirical studies have given more legitimacy to this model (Anderson and Van Wincoop, 2003; Evenett and Keller, 2002; Feenstra, Markusen and Rose, 1998; Frankel, 1997) to include other important factors for bilateral trade such as population, GDP per capita, regional trade agreements and language/ethnicity.

The use of gravity model is subjected to many criticism and boundaries. These are detailed by Hummels and Levinsohn (1995) or Evenett and Keller (2002). Thus, several points can be problematic, for instance the estimations of the elasticity of distance in trade costs that are often too high, the absence of non-tradable sectors and import goods solely directed towards the domestic market, the elasticity of substitution between domestic and foreign goods are never different from those between domestic goods, the

models involve trade between all countries and in all sectors, which is not always the case. There are also remoteness problems that justify the use of fixed effects for many studies. In specific case studies of TF, such models do indicate a greater or lesser high sensitivity of TF indicators on trade flows but does not lead to a direct analysis of the effectiveness in the reduction in trade costs. However, the biggest problem faced by the gravity model is the heterogeneity of countries in the sample (Fontagné, Pajot, and Pasteels, 2002).

Despite these criticisms, the gravity model is the most used in studies on the impact of policies on TF. Wilson, Mann, and Otsuki (2003a) have brought some very interesting developments by introducing new indicators in order to evaluate TF policies. Our study will use a gravity model.

Traditional gravity equation used to calculate the trade potentials between countries incorporates indicators such as GDP, GDP per capita, distance between the two partners, tariffs, dummies adjacency ownership, belonging of a trade agreement and finally, a dummy variable of common languages between partners.

As part of our study, this equation will be augmented by five variables representing the main channels of TF in Cameroon i.e., *customs efficiency, port efficiency, regulatory environment, use of ITC and quality of roads*. The equation estimated is as follows:

$$\log Trade_{ij}^{t} = \beta_1 \log(1+tariff) + \beta_2 \log PE_i^t + \beta_3 \log CE_i^t + \beta_4 \log RE_i^t + \beta_5 ICT_i^t + \beta_6 \log QR_i^t + \beta_7 \log GDP_i^t + \beta_8 \log GDP_j^t + \beta_9 \log GDPPC_i^t + \beta_{10} \log GDPPC_j^t + \beta_{11} \log dist_{ij}^t + \beta_{12} APEC + \beta_{13} CEMAC + \beta_{14} EU + \beta_{15} ENG + \beta_{16} FR + \beta_{17} Adjacency + \beta_{18} Colony + \alpha_{ij} + \varepsilon_{ij}^t$$

The equation will be estimated on a sample of 19 countries, representing the main export destinations of Cameroon's manufactured goods, considering the years 2007, 2008, 2009 and 2010. Besides Cameroon, our sample will consist of the following countries: Belgium, Benin, UK, Cote d'Ivoire, Germany, China, Spain, USA, France, India, Italy, Nigeria, Netherlands, Portugal, South Africa, Senegal, Tunisia, Turkey, and Chad.

It is worth noting that the others countries of CEMAC zone are the main destinations of manufacturing exports from Cameroon. However, we can include all of them in our study due to the lack of data on TF indicators about them.

Table 1: Gravity variables definition

$Trade_{ij}^{t}$ = Manufacturing exports of country i to country j

PE = Ports Efficiency
CE = Customs Efficiency
RE = Regulatory Efficiency
ITC = Use of ITC
QR = Quality of roads
GDP = Gross Domestic Product
GDPPC = GDP per capita
DIST = Distance between country i and country j
TARIFF = Average applied Tariff

Adjacency: takes the value 1 if country i is adjacent to country j and 0 otherwise
FR = Dummy equal to 1 if both countries speak French language and 0 otherwise
ENG: Dummy equal to 1 if both partners speak English language and 0 otherwise
APEC, CEMAC and EU are RTA dummies that take the value 1 if the both partners belongs to one of these RTA and 0 otherwise
Colony: Dummy =1 if both countries are the same colonizer, 0 otherwise

i = Exporter and **j** = Importer α_{ij} = Country pair fixed effects

Data uses in this study are derived from various sources. Bilateral trade flows are from COMTRADE database and downloaded via WITS software developed by the World Bank. Values are expressed in million USD. We will follow the literature regarding the trade flows by defining manufactured goods as the categories 5-8 of ISIC Revision 1, with the exception of the subcategory 68 (non-ferrous metals). Tariffs are from TRAINS database developed by UNCTAD and downloaded via WITS software. Tariff rates are simple average applied tariffs by country j on exports of country i. Distance is measured between capitals and downloaded from gravity database developed by CEPII and available on its website. The CEPII "gravity dataset" also includes data on language, colonial relations and common ownership.

Construction of trade facilitation indicators

The construction of TF indicators will be made by aggregation of a number of indices. Our indicators are obtained by calculating a simple average of these indices. Due of their availability and the need for consistency, all indices that we use come from "Global competiveness Report (GCR)" published by the World Economic Forum. The GRC provides indices based on micro-data from annual surveys at firm level, on a representative group of enterprises. Indices were formed from the study interviews conducted with a large number of international traders trading in the countries studied.

These actors were chosen because of the heterogeneity of sectors and size. The data collected are for years 2007, 2008, 2009 and 2010.

- Ports Efficiency (PE):
  - Quality of port Infrastructure
  - Quality of air transport infrastructure
- Customs Efficiency (CE):
  - Prevalence of trade barriers
  - Burden of customs procedures
  - Degree of customs orientation
- Regulatory Efficiency (RE):
  - Efficiency of legal framework
  - Intellectual property protection
  - Burden of government regulation
  - Transparency of government policymaking
  - Public trust of politicians
  - Favoritism in decisions of government officials
- Use of ICT (ICT):
  - Availability of latest technologies
  - Firm-level technology absorption
- Quality of roads (QR):
  - Quality of roads

Estimation issues

There is a growing literature on the fact that "zeros" are actually surprisingly present in the bilateral trade matrices. Haveman and Hummels (2004) found that nearly a third of bilateral trade matrix is empty. Helpman, Melitz, and Rubinstein (2008) found, on a sample of 158 countries, that nearly half of the "countries pairs" do not have trade. On the basis of their model, Helpman et al. (2008), argue that disregarding "zero trade" observations has important consequences for the empirical analysis. If the dependent variable is zero, the OLS estimation will produce biased results because log-linear model is not defined for observations with "zero trade".

To solve the problem, Helpman et al. (2008) propose a two-stage estimation process to obtain unbiased and consistent estimation of their gravity equation. Ranjan and Tobias (2007), Njinkeu, Wilson, and Fosso (2007, 2009) used use the threshold Tobit estimator

with a gravity model. Iwanow and Kirkpatrick (2007), propose to generate a Heckman selection model. Santos Silva and Tenreyro (2006) and Westerlund and Wilhelmsson (2006) also propose to use the Pseudo Maximum Likelihood estimation techniques such as Poisson regression with fixed effects, which is often used for count data. Santos Silva and Tenreyro (2006) show that under weak assumptions (the gravity model contains the correct set of explanatory variables); the PPML estimator provides consistent estimates of the original nonlinear model. As argued by Shepherd (2009), the interpretation of the coefficients from the Poisson model is straightforward, and follows exactly the same pattern as under OLS. Although the dependent variable is specified as exports in levels rather than in logarithms, the coefficients of any independent variables entered in logarithms can still be interpreted as simple elasticities.

The PPML estimator generally performs very well with only small bias and size distortion. Therefore, since the PPML estimator is becoming increasingly available using standard statistical software packages, these results suggest that it should be a valuable tool for econometric analysis of the gravity model. In addition, Santos Silva and Tenreyro (2006) highlights that, the PPML is a robust approach to correct the heteroscedasticity that is usual present in gravity models. This study is thus distinguished by using the PPML estimator.

Considering the construction of our TF indicators and literature, we expect that the results of our regression will have the following signs for the five TF indicators:

Table 2: Expected sign of our TF measures

TF measures	Expected sign	Comments
PE	+	To increase port efficiency in the exporter country must increase Tradeij
CE	+	To improve the customs environment must increase Tradeij
RE	+/-	To improve ER can increase Tradeij because of transparency for example, but also reduce Tradeij because of strengthening of the regulations
ICT	+	To increase the use of new technologies should increase Tradeij
QR	+	To improve the quality of roads will reduce delivery times and thus increase Tradeij

Regression results

Our regression was performed on data with a panel of 20 countries from 2007 to 2010. These countries represent the top 20 major trading partners of Cameroon. Panel data is a combination of time series and cross sections. These data allow several general types of heterogeneity. For a single cut, they depend only on observed "country pair" attributes and the estimations may be biased if there is an additional observed component in the propensity of the pairs of country to trade. With panel data, this type of heterogeneity can be controlled for by using country-pair and year fixed effects. Fixed-effects models allow for unobserved or misspecified factors that simultaneously explain trade volume between two countries. For our study, we considered the "country pair" fixed effects. As our paper focuses on Cameroon, we interact our TF indicators with a Cameroonian dummy.

OLS regression (Pooling)

The OLS results show that distance has the expected negative and significant effect on trade. GDP of the exporter and importer have positive signs respectively significant and insignificant. GDP per capita of the exporter has a significant and negative coefficient and GDP per capita of the importer has a positive coefficient.

Concerning our TF indicators, port efficiency and quality of road are significant and positively related to exports. Regulatory efficiency has a positive but not significant effect. Customs efficiency and use of ICT are negatively associated with exports and their "influences" are not significant. These lasts results are conflicting with our expectations.

As for the regional trade agreements, all of them have positive effect on trade flows: CEMAC and APEC have positive and not significant coefficients; EU has also a positive but significant coefficient. French and English languages have positive and significant effect.

However, we cannot consider these results which imply the absence of individual specific effects, confirmed by the Hausman test. The panel data allow us to proceed with the estimation of the model with individual fixed effect for "countries pairs". In this case, we will hold more explanatory account that is time-invariant such as distance, language, etc.

Fixed effects regression

Taking into account the "countries pairs" fixed effects; the signs of coefficients obtained are as ambiguous as those of the previous regression. Regulatory efficiency certainly has a

positive effect on exports but we should note that its influence is not significant. Customs efficiency is negatively and significantly related to exports. Coefficient of port efficiency is negative and not significant, what is absurd from the point of view of literature. The coefficient of the quality of roads and use of ICT affects positively and significantly exports.

The ambiguity of the results of this regression may result from the fact that we have ignored the presence of "zeros" in our bilateral trade matrix. As mentioned above, if the dependent variable is zero, the OLS estimation will produce biased results because the log-linear model is not defined for observations with "zero trade". We will therefore proceed to the Poisson regression to correct the bias from zero values.

PPML regression

We first estimate the gravity equation using all of our TF indicators simultaneously, and then we estimate it using only one indictor at a time.

In the first case, regulatory environment and customs efficiency have negative and significant effects on manufacturing exports flows. The coefficient of quality of roads and those of use of ICT have maintained positive and significant coefficients. Coefficient of ports efficiency has a positive sign and it is significant, with a coefficient not only greater than those of the other TF indicators, but also greater than those obtained in previous regressions.

When we run a regression each TF indicator taken separately, we observe that coefficients of customs efficiency and the use of ICT have negative signs respectively significant and insignificant. Ports efficiency and quality of roads have positive and significant coefficients while regulatory environment has a positive and not significant coefficient.

An important finding in this study is that, throughout our various regression scenarios, we have also found that CEMAC regional trade agreement has always kept a positive and significant coefficient which often exceeds those of our TF indicators. This implies that regional integration is an important determinant of bilateral trade flows between Cameroon and in pairs of CEMAC custom union.

Interpretation of results

We should be moderate in the interpretation of the results of our regression because the heterogeneity of countries in our sample might cause bias in the estimation of coefficients of our TF variables.

Our results show that ports efficiency and quality of roads are both TF indicators that have the greatest impact in the referent group of countries around Cameroon. An improvement of each of these two indicators by 1% would increase the volume of manufacturing exports, respectively, by more than 2.9% and 2.3%. These results are understandable because port and airport are the main entries and exit points of goods with Cameroon's main trading partners outside the continent (EU, USA, China, etc.) whereas roads remain the main supply channel for partners within the continent, including peers of CEMAC zone and Nigeria.

The positive and significant impact of ICT can be explained by the explosion of ICT development which has led to faster transport systems and methods, cheaper, and more efficient. The use of ICT is complementary with other TF measures such as customs reforms and transparency of regulation (customs automation and online dwelling procedures); this could be the reason why ICT has a negative impact in trade flows when we run a regress it separately.

The effects of the two other TF variables (regulatory environment and customs efficiency) are more ambiguous. The negative effect of customs efficiency is absurd with regard to the current literature (Clarke, 2005; Njinkeu, Wilson and Fosso, 2007, 2009). Besides methodological problems, this negative effect might be the consequence of having not taken into account the level of TF of partners in our gravity equation (potential effect of improved domestic customs offset by deterioration in the level of partner). Also, several external factors over which governments have little control, such as performance of clearing and forwarding agents, shippers and shipping line strategies, also play an important role in the determination of dwelling times (Refas and Canten, 2011).

It is important to note the positive and significant coefficient of CEMAC regional trade agreement throughout our different regressions scenarios. The CEMAC regional trade agreement is one of the main factors that influence positively Cameroonian manufacturing exports. It increases the manufacturing exports of Cameroon by more than 4%. This result is also understandable because the other countries members of CEMAC are the main buyers of manufactured goods made in Cameroon.

CONCLUSION

The aim of our study was to evaluate the effects of TF on the Cameroonian exports and determine policies to be implemented.

At the end of our study, two major facts have caught our attention. The first one confirms the contribution of TF reforms to the supply elasticity of manufacturing exports in the medium term. The second one confirms the role of physical infrastructures on the development of African exports: ports efficiency and quality of roads appear to be the key factors of TF in Cameroon, with a current potential superior than the reduction of traditional barriers that are tariffs and international transportation costs (represented by distance). It is therefore an imperative and a priority for the Cameroon's government to improve the efficiency of its ports and the quality of its roads for a successful integration into international trade. It should strengthen these efforts with a leadership role in regional integration process underway in the CEMAC zone in order to enable Cameroon to benefit from economies of scale and learning, necessarily to meet the international market competition.

REFERENCES

Anderson, J. and E. Van Wincoop. 2003. Gravity with Gravitas: A Solution to the Border Puzzle."*American Economic Review* 93 (1): 170- 192.

Clarke, R. G. 2005. Beyond Tariff and Quotas: Why Don't African Manufacturing Enterprises Export More? *World Bank Policy Research Working Paper* No. WPS3617.

CCI. 2005. Les entreprises et les négociations de l'OMC sur la facilitation des échanges. *Genève : CCI, 2005, 75 p. Article technique n° BAS-05-34.F*

Evenett, S. and W. Keller. 2002. On theories explaining the success of the gravity equation. *Journal of Political Economy* 110: 281–316.

Fontagné L., M. Pajot et J.-M. Pasteels (2002). Potentiels de commerce entre économies hétérogènes: un petit mode d'emploi des modèles de gravité. *Économie et Prévision* 152-153 (1-2): 115-139.

Haveman, J. and D. Hummels. 2004. Alternative hypotheses and the volume of trade: the gravity equation and the extent of specialization. *Canadian Journal of Economics,* 37 (1): 199-218.

Helpman, E., M. Melitz, and Y. Rubinstein. 2008. Estimating trade flows: trading partners and trading volumes. *Quarterly Journal of Economics* 103 (2): 441-487.

Hertel, T. W., T. Walmsley, and K. Itakura. 2001. Dynamic effect of the "new age" free trade agreement between Japan and Singapore. *Journal of Economic Integration* 16 (4): 446-84.

Hummels, D. and J. Levinsohn. 1995. Monopolistic competition and international trade: reconsidering the evidence. *Quarterly Journal of Economics* 110: 799-836.

Gad, M. 2009. A better future for Africa: recommendations from the private sector. Paper presented at the Africa Commission, Copenhagen: Confederation of Danish Industry.

Iwanow, T and C. Kirkpatrick. 2007. Trade facilitation and manufacturing exports: is Africa different? Prepared for the 'Economic Development in Africa' Conference organized by the Centre for Study of African Economies, University of Oxford, 18th-20th March 2007.

Kim, S., H. Lee, and I. Park. 2004. Measuring the impact of APEC trade facilitation: a gravity analysis. Paper presented at the APEC EC Committee meeting 30 September 2004 in Santiago, Chile.

Martinez-Zarzoso, I. and L. Marquez-Ramos. 2008. The effect of trade facilitation on sectoral trade. *B. E Journal of Economic Analysis & Policy* 8 (1): Article 42.

MINEPAT. 2009. Cameroun vision 2035. *Document de travail* (February).

Njinkeu, D., J. S. Wilson, and B. P. Fosso. 2007. Trade facilitation: what is it and how do it help. *AERC Collaborative Research on Export Supply Response, Working Paper* No. ESWP_08.

Njinkeu, D., J. S. Wilson, and B. P. Fosso. 2009. Expanding trade within Africa: the impact of trade facilitation. *ILEAP/JEICP, Background Brief* No. 14. May 2009.

Orliac, T. 2005. Les enjeux de la facilitation des échanges en Chine. Unpublished master thesis, Institut d'études Politiques, Sciences-Po, Paris.

Piermarti, R and R. Teh. 2005. Demystifying modelling methods for trade policy. *WTO discussions paper* N° 10.

Persson, M. 2010. Trade Facilitation and the Extensive and Intensive Margins of Trade. Working Papers Series 828. Research Institute for Industrial Economics.

Ranjan, P. and J. L. Tobias. 2007. Bayesian inference for the gravity model. *Journal of Applied Econometrics* 22 (4): 817–838.

Refas, S and T. Cantens. 2011. Why does cargo spend weeks in African ports? The case fo Douala, Cameroon. *Policy Research Working Paper* 5565. The World Bank, Africa Region Transport Department, February 2011.

Sadikov, A. 2007. Border and behind-the-border trade barriers and country exports. *IMF Working Paper* No. 07/292. Washington, D.C.: International Monetary Fund.

Santos Silva, J. and S. Tenreyro. 2006. The log of gravity. *The Review of Economics and Statistics* 88: 641-658.

Shepherd, B. 2009. Dealing with zero trade flows. ARTNeT capacity building workshop for trade research: "Behind the border" Gravity modeling. Wednesday, September 23, 2009.

UNIDO. 2009. *Industrial development report 2009-Breaking in and moving up: New industrial challenges for the bottom billion and middle-income countries.* Vienna: UNIDO.

Westerlund, J and F. Wilhelmsson. 2006. Estimating the gravity model without gravity using panel data. February 14, 2006.

Wilson, J. S., C. L. Mann, and T. Otsuki. 2003a. Trade facilitation and economic development: measuring the impact. *World Bank Working Paper* 2988, Washington, D.C.

Wilson, J. S., C. L. Mann, and T. Otsuki. 2003b. Trade facilitation and economic development: a new approach to quantifying the impact. *World Bank Economic Review* 17(3): 367-389.

Wilson, J. S., C. L. Mann and T. Otsuki. 2004. Assessing the potential benefit of trade facilitation: a global perspective. *World Bank Working Paper* 3224, Washington.

WTO. 2011. Draft consolided negociating text – revison 8. Draft TN/TF/W/165/Rev.8, World Trade Organization, Negotiating Group on Trade Facilitation, August 2011.

APPENDIX

Table 3: Trade facilitation summary statistics

Variable	Mean	Obs	Std. Dev.	Min	Max
CE	1520	4.868625	1.092088	2.6	6.65
RE	1520	3.629875	0.7315486	2.4	5.18
PE	1520	4.559625	0.5714332	2.96	5.46
ITC	1520	5.769375	4.649409	3.1	6.5
QR	1520	4.51875	1.413095	1.6	6.7

Source: Authors' computations based on Global Competitiveness Reports

Table 4: Correlation matrix

	Trade	Distance	Tariff	GDPi	GDPj	GDPPCi	GDPPCj	CE	PE	RE	ICT	QR
Trade	1.000											
Distance	-0.172	1.0000										
Tariff	-0.1075	0.2815	1.0000									
GDPi	0.1988	-0.2295	0.2720	1.0000								
GDPj	0.3286	0.1007	0.2610	-0.0602	1.0000							
GDPPCi	0.2240	-0.7703	-0.2448	0.4047	-0.0469	1.0000						
GDPPCj	0.3545	0.0413	-0.2080	-0.0544	0.4514	-0.1009	1.0000					
CE	0.2014	-0.6148	-0.1484	0.2558	-0.0426	0.7779	-0.0995	1.0000				
PE	0.2196	-0.7062	-0.1462	0.2477	-0.0450	0.8012	-0.1066	0.8511	1.0000			
RE	0.2629	-0.4662	-0.0153	0.2907	-0.0389	0.6622	-0.0855	0.7785	0.7640	1.0000		
ICT	0.1457	-0.5831	-0.1065	0.3219	-0.0495	0.6919	-0.1034	0.8736	0.8573	0.6714	1.0000	
QR	0.2133	-0.7294	-0.1482	0.3352	-0.0493	0.7809	-0.1004	0.8620	0.8217	0.6847	0.7882	1.0000

Source: Authors' computations based on Global Competitiveness Reports

First Received: Nov. 20th 2012
Final Revision Accepted: Apr. 15th 2013

Table 5: Regression results

	Pool cross section	OLS Fixed effect	Poisson PML regression					
			All TF variables	RE	CE	PE	ICT	QR
lndist	-0.917354***							
	(0.093325)							
lntariff	0.1235273	-0.1996316*	-0.056316***	-0.052445***	-0.057051***	-0.049180***	-0.051013***	-0.043598***
	(0.1031645)	(0.1049334)	(0.000357)	(0.000036)	(0.0000359)	(0.000036)	(0.000036)	(0.0000363)
lnGDPi	1.388134***	-4.541781**	7.716958***	6.056657***	7.079922***	6.540098***	6.563177***	4.488092***
	(0.0415293)	(1.595873)	(0.0014617)	(.0012429)	(.0013265)	(.0012438)	(0.0013221)	(0.0012753)
lnGDPj	0.6809903***	0.527295***	0.4179777***	0.4241116***	0.4248124***	0.4240399***	0.4240061***	0.4228697***
	(0.0344364)	(0.0296777)	(0.000012)	(0.0000162)	(0.000012)	(0.000012)	(0.000012)	(0.0000121)
lnGDPPCi	-0.335894***	4.616943***	-7.422302***	-5.446231***	-6.480263***	-5.870113***	-5.970584***	-4.131723***
	(0.0991974)	(1.416926)	(0.0014734)	(0.0012621)	(0.0013469)	(0.0012613)	(0.0013461)	(0.0012841)
lnGDPPCj	0.103949**	0.1812982**	0.2915313***	0.2992822***	0.2992129***	0.2979013***	0.2987703***	0.2983328***
	(0.0493124)	(0.0444213)	(0.0000162)	(1.8e+04)	(0.0000162)	(0.0000162)	(0.0000162)	(0.0000162)
lnREi	0.2738697	0.0407709	-0.6852874***	0.2921634***				
	(0.4497001)	(0.980852)	(0.0002404)	(0.0001833)				
lnCEi	-0.9997135	-3.026971**	-4.416456***		-1.002849***			
	(0.6580285)	(1.212999)	(0.0005296)		(0.0003862)			
lnPEi	2.067013*	-1.065413	4.189973***			2.119856***		
	(1.143999)	(1.923291)	(0.0007808)			(0.0005204)		
lnICTi	-0.6909642	5.332881**	1.682212***				-0.603548***	
	(0.9232205)	(2.137661)	(0.0005377)				(0.0004733)	
lnQRi	2.49654***	11.138***	3.895559***					2.346739***
	(0.4371268)	(1.144498)	(0.0005518)					(0.000441)
APEC	0.7555348	1.437672**	1.135544***	1.123202***	1.120254***	1.125153***	1.122984***	1.128209***
	(0.6735482)	(0.6176583)	(0.0000489)	(0.0000489)	(0.0000489)	(0.0000489)	(0.0000489)	(0.000049)
CEMAC	2.702951	5.259598***	4.557111***	4.268703***	4.193358***	4.484124***	4.284014***	4.447893***
	(1.774307)	(1.634652)	(0.0071283)	(0.0071279)	(0.0071279)	(0.0071281)	(0.0071279)	(0.007128)
UE	0.452242*	1.762381***	0.8143613***	0.8267713***	0.8225301***	0.830464***	0.8282518***	0.8359061***
	(0.2344621)	(0.1670286)	(0.0000512)	(0.0000515)	(0.0000514)	(0.0000515)	(0.0000515)	(0.0000517)
Adjacency	0.3231092							
	(0.2424752)							
Colony	-0.1075712							
	(0.217562)							
ANG	0.3283033*							
	(0.2116661)							
FR	1.494591***							

(0.1790631)

NB: Apart the pooling regression, all the others regressions include "country pair" fixed effects. Robust standard errors are in brackets. * Significant at 10%; ** significant at 5%; *** significant at 1%.

Sources: Authors' computations based on WEF Global Competitiveness Reports for trade facilitation indicators, COMTRADE for trade flows, UNCTAD TRAINS for tariffs, World Bank WDI for GDP and CEPII for the others variables.