# Does trade openness affect manufacturing growth in EMCCA countries? A panel cointegration analysis

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**Does trade openness affect manufacturing growth in EMCCA countries? A panel cointegration analysis**

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**Abstract**

This study uses panel data covering the period from 1984 to 2014, panel cointegration as well as Dynamic Ordinary Least Square method to investigate the effect of trade openness on manufacturing growth in Economic and Monetary Community of Central Africa (EMCCA) countries. The results reveal two effects. Firstly, there is a positive and significant effect of Foreign Direct Investment and investment on manufacturing growth. Secondly, there is an ambiguous effect of trade openness on manufacturing growth. Indeed, trade openness affects either negatively the manufacturing growth or has no effect on manufacturing growth in EMCCA countries. Whatever the case, EMCCA countries should develop their manufacturing sector before fully trading with foreign countries.

***Key words****:* Trade openness, Panel Cointegration, Dynamic Ordinary Least Square, Manufacturing growth, EMCCA countries.

*JEL Classification: F41, F43, O14*

# 1. Introduction

Since few years most political speeches in Africa as well as African economists' speeches tend to stress the necessity for African countries to industrialise and transform their raw material within the countries undoubtedly because of its benefits in term job employment, wealth creation and poverty reduction. This sector has been neglected for long time in Africa for the benefit of the agricultural sector. Indeed, just after its independence, Africa adopted import substitution policy which consisted in multiplying barriers to restrict importations in order to protect infant industries. Highly subsidise at that era, the African firms revealed their inefficiency when the governments stopped subsidising them because of the diminution state incomes resulting from the conjunction of decreases in oil price and dollar value but also because of the corrupted nature of African economies (Rodrik, 2001). This situation led to huge movement of privatisation of public enterprises, devaluation and demolition of barriers to trade (such as tariff and non-tariff trade barriers, price control, subvention etc) imposed by the sponsors (International Monetary fund and World Bank) under the umbrella of Structural Adjustment Programs (SAP) (Ogbu et al., 1995). These SAP resulted to the deindustrialization of Africa (Lall, 1995; Ogbu et al., 1995) and acceleration of specialization of Africa in the production of raw materials highly criticize by numerous economists (Ogbu et al., 1995). EMCCA countries have not been out of this vast movement. SAP led to the closing down of numerous firms and acceleration of EMCCA countries in the production and exportation of raw materials leading to high dependence from foreign countries. EMCCA countries are characterized by the dominance of the sector of services followed by the industrial and agricultural sectors with respectively on average a contribution to Gross Domestic Product of 41.6%, 34.2% and 24.1% in 2015. Although taking the second position the industrial sector employs less labour compare to the two other sectors. As example, agricultural sector employs about 47.6% of labour force in Cameroon (INS, 2016). Within the industrial sector, the manufacturing sector plays a crucial role with a modest contribution to EMCCA's GDP estimated at about 9.8% in 2015 Far from that emergent countries such as China whose contribution was near to 29,7% in 2013 (World Bank, 2017). However it is this sector that permitted the spectacular economic growth observed in most emergent economies today. Thus, to become emergent as promoted by EMCCA governments, the EMCCA countries must develop its manufacturing sector and engage a veritable structural transformation. Several factors are responsible for manufacturing growth and/or economic growth in the literature. these factors include the capital, labour, trade openness, Foreign

Direct Investment (FDI) etc (Chandran and Munusamy, 2009; Belloumi, 2014; Shahbaz, 2012). Amongst the factors, trade openness still divides scholars in the literature. On the one hand, trade openness supporters advance that trade liberalization leads to specialisation and division of labour which further increase productivity as well as economic growth (Harrison, 1991; Makki and Somwaru, 2004; Chandran and Munusamy, 2009). This economic growth comes about through technological and knowledge diffusion transmitted by traders (Grossman and Helpman, 1991). On the other hand, trade openness opponents use the argument of infant industry to discourage trade openness as a strategy for economic growth especially in poor developing countries and recommend trade protection as a short term strategy in order to prepare the economies to compete in international market in the long term (Bardhan, 1970; Vamvakidis, 2002) Whatever the case, the relationship between trade openness and economic growth is still ambiguous (Rodriguez and Rodrik, 2000). This study adds value to the existing debate by determining the effect of trade openness on manufacturing growth in EMCCA countries. The choice manufacturing sector is motivated by its determinant role for structural transformation achievement alongside with job creations.

The rest of the paper is organised as follows: section 2 deals with the methodology, section 3 is the presentation and discussion of results, and finally section 4 draws a conclusion.

## 2. Methodology

### 2.1. Data and model

Data used in this study are annual for four EMCCA countries[1] (Cameroon, Gabon, Central African Republic and Congo) covering the period of 1983 to 2014. Data were collected from the World Bank's (2017) database (World Development Indicator 2017 CD-ROM) and included the manufacturing value added growth (MVAG), the trade openness, the foreign direct investment (FDI) and investment (I). Trade openness was measured as the ratio of export plus import to gross domestic product (GDP), investment was captured by the gross fixed capital formation as percentage of GDP and foreign direct investment the FDI inflow as percentage of GDP. Following Makki and Somwaru (2004), we specified the model as follows:

Model 1: $MVAG_{it} = \beta_0 + \beta_1 TO_{it} + \beta_2 FDI_{it} + \beta_3 I_{it} + \varepsilon_{it}$ (1)

[1] These countries were selected based on the availability of data.

Where $MVAG_{it}$, $TO_{it}$, $FDI_{it}$, $I_{it}$, $\beta_j$ and $\varepsilon_{it}$ represent respectively, the manufacturing value added growth, the trade openness, the foreign direct investment, investment, the parameters and the error term. However, since the results might be sensible to the control variables included in equation above, a new model where all the control variables are removed from equation will be estimated. This model is represented in equation below:

Model 2 : $MVAG_{it} = \beta_0 + \beta_1 TO_{it}$ (2)

The two models are estimated by the estimation technique presented in subsection below.

**2.2. Estimation technique**

The primary step toward estimation of our model is the determination of stationarity property of series. In panel data several unit root tests are traditionally available to any researcher interesting in investigation of stationary of series. They are classified either into the first generation unit root tests or the second generation unit root tests. The former assumed that times series in the panel are cross sectionally independently distribute while the latter relaxes that assumption to account for possible cross sectional dependence of series (Pesaran, 2007). Since we are in presence of only four countries in this study, first generation unit root tests were privileged to studying the stationarity property of series. Accordingly the IPS test developed by Im et al. (2003) and the LLC test developed byLevin et al. (2002) were used in this study. The first one relies in assumption that series have individual unit root while the second assumed that the series have a common unit root.

The second step is the investigation of cointegration of variables. Variables are said to be cointegrated if there is at least one long relationship among them. The Westerlund Error-correction–based cointegration tests developed by Westerlund (2007). These tests were chosen over the traditional Pedroni tests (Pedroni, 1999) because they have small size distortions and high power in small sample context. Relying on the null hypothesis of no cointegration, the tests are based on structural rather than residual dynamics and hence do not impose any common factor restriction (Westerlund, 2007). The tests are made up of four different tests which test the null hypothesis by inferring whether the error correction term in a conditional panel error-correction model is equal to zero. Two tests are built to test the alternative hypothesis that the panel is cointegrated as a whole, and the other two tests the alternative that there is at least one individual which is cointegrated. The cointegration test assumes the following data generating process (3) re-parameterized in (4)

$$\Delta Y_{it} = \delta_i' d_t + \alpha_i (y_{it-1} - \beta_i' x_{it-1}) + \sum_{j=1}^{p_i} \alpha_{ij} \Delta Y_{it-j} + \sum_{j=0}^{p_i} \gamma_{ij} \Delta x_{it-j} + e_{it} \quad (3)$$

$$\Delta Y_{it} = \delta_i' d_t + \alpha_i y_{it-1} + \lambda_i' x_{it-1} + \sum_{j=1}^{p_i} \alpha_{ij} \Delta Y_{it-j} + \sum_{j=0}^{p_i} \gamma_{ij} \Delta x_{it-j} + e_{it} \quad (4)$$

Where t is the time varying from 1 to T and i the cross units varying from 1 to N. $d_t$ represents the deterministic components with its associated vector of parameters $\delta_i$ . $e_{it}$ is the error term and $\alpha_i$ the error correction term determining the speed at which the system corrects back to the long equilibrium. From the error correction data generating process above, Westerlund (2007) proceeds in three steps and compute the following statistics:

$$G_\tau = \frac{1}{N} \sum_{i=1}^{N} \frac{\hat{\alpha}_i}{SE(\hat{\alpha}_i)} \quad (5)$$

$$G_\alpha = \frac{1}{N} \sum_{i=1}^{N} \frac{T\hat{\alpha}_i}{\hat{\alpha}_i(1)} \quad (6)$$

$$P_\tau = \frac{\hat{\alpha}}{SE(\hat{\alpha})} \quad (7)$$

$$P_\alpha = T\hat{\alpha} \quad (7)$$

$G_\tau$ and $G_\alpha$ are then used to test the null hypothesis of no cointegration ($H_0$ : $\alpha_i = 0$ for all i) against the alternative of cointegration ($H_1^G$ : $\alpha_i < 0$ for at least one i) and the resulting tests are called group-mean tests. The other $P_\tau$ and $P_\alpha$ are used to test the null hypothesis versus$H_1^P$ : $\alpha_i = \alpha < 0$ and the resulting tests are called panel tests.

The third step is the real estimation of model. Following Narayan et al. (2010), we used the Dynamic Ordinary Least Squares (DOLS) as recommended by Kao and Chiang (2000). The choice of this method was guided by its good performance in term of bias reduction in finite sample both in homogenous and heterogeneous panels over the traditional Ordinary Least Squares (OLS) and Fully Modified Ordinary Least Squares (FMOLS) methods (Kao and Chiang, 2000).

## 3. Empirical results and discussions

### 3.1. Panel unit root test results

The table 1 shows the panel unit root test results of IPS and Pesaran tests. The tests were conducted in level and first difference with an optimal lags selected based on Aikake Information Criteria (AIC). The results show that all the variables are stationnary at level except foreign direct investment which is only stationary after first difference. Since we are in presence of mixture of integrated variable of order zero and one, The Westerlund Error-correction–based cointegration tests were performed to investigating whether the variables have a long-run relationship.

Table 1: Panel unit root test results

| Variables | IPS test | | LLC test | | Decision |
|---|---|---|---|---|---|
| | Level | First difference | Level | First difference | |
| Manufacturing Value Added Growth | -7.254*** (0.000) | -9.687*** | -7.510*** (0.000) | -4.460*** (0.000) | I(0) |
| Trade Openness | -2.599*** (0.005) | -7.295*** (0,000) | -2.513*** (0.006) | -7.399*** (0.000) | I(0) |
| Investment | -2.909*** (0.002) | -9.121 (0,000) | -3.004*** (0.001) | -8.184*** (0.000) | I(0) |
| Foreign Direct Investment | 1.224 (0.890) | -10.965*** (0,000) | 1.668 (0.952) | -13.942*** (0.000) | I(1) |

*Values in bracket are P values. ***, ** and * denote respectively significance at 1%, 5% and 10%*

*Source : computed by authors*

### 3.2. Panel cointegration results: Model 1.

Since some variables were integrated of order 1, it was then necessary to check if the variables are cointegrated in order to avoid spurious regression. The Westerlund Error-correction–based cointegration tests developed by Westerlund (2007) was used to investigate the cointegration amongst the variables. The tests conducted with and without constant term are presented in table 2 below.

Tableau 2: Westerlund Error Correction based cointegration test results: Model 1

| Statistics | No constant | | | Constant | | |
|---|---|---|---|---|---|---|
| | Value | Z-value | P-value | Value | Z-value | P-value |
| $G_\tau$ | -3.560 | -3.614 | 0.000 | -3.482 | -2.650 | 0.004 |
| $G_\alpha$ | -13.231 | -1.736 | 0.041 | -13.255 | -0.651 | 0.258 |
| $P_\tau$ | -7.054 | -3.372 | 0.000 | -7.260 | -3.235 | 0.001 |
| $P_\alpha$ | -12.522 | -2.613 | 0.005 | -13.507 | -1.844 | 0.033 |

*Source : computed by authors*

The results strongly reject the null hypothesis of no cointegration for all the four tests when none constant term is included in the regression. However, once the constant term is included in the regression only three tests confirm the hypothesis of cointegration amongst the variables. The non-rejection of the null hypothesis incurred in the group mean test $G_\alpha$ may be due to the supplemented constraint imposed on the error correction model. Nevertheless that result is marginal and we can conclude that the variables are cointegrated.

### 3.3 Long run estimates: Model 1

Since the manufacturing growth, foreign direct investment, trade openness and investment were found to be cointegrated, we use the DOLS to estimate the long run relationship between manufacturing growth, foreign direct investment, trade openness and investment. The results reported in table 3, suggest that the model is globally significant at 1 %.

Table 3: DOLS estimates: Model 1

| Variables | Coefficients | Standard errors |
|---|---|---|
| Trade Openness | -7.853* | 4.676 |
| Foreign Direct Investment | 0.855*** | 0.233 |
| Investment | 0.516*** | 0.122 |
| Wald chi2 (3) | 36.66 | |
| Prob > chi2 | 0.000 | |
| R-squared | 0.254 | |
| Number of observations | 112 | |

** significant at 10%; *** significant at 1%*

*Source: Authors' estimates*

The results further show that all the variables are significant but at different levels of significance. Indeed, the results show that trade openness badly affects manufacturing growth in EMCCA countries. A unit increase in trade openness will result to -7.85 point decrease in manufacturing growth in EMCCA countries. These results are in contradiction with the openness led economic growth theory supported by many scholars (Chand and Sen, 2002; Grossman and Helpman, 1991; Makki and Somwaru, 2004; Chandran and Munusamy, 2009) and promoted by the World Trade Organisation. This negative effect can be explained by the smallness of manufacturing sector in EMCCa countries put forward by Bardhan (1970) the manufacturing sector in EMCCA is still young and dominated by agri-food industries. The negative effect of trade openness on manufacturing growth obtained reinforce the skepticism of Rodriguez and Rodrik (2000) about the positive effect of trade openness on economic growth in general. The results also show that foreign direct investment plays a great role for the growth of manufacturing sector in EMCCA countries. A unit increase in foreign direct investment will result to 0.855 point increase in manufacturing growth in EMCCA countries. These are significant at one percent and are consistent with results obtained by past studies (Chandran and Munusamy, 2009; Makki and Somwaru, 2004). Foreign direct investment plays a great role in boosting manufacturing growth in EMCCA. It does it through technological transfer, stimulation of domestic investment and improvement on human capital (Makki and Somwaru, 2004). Finally, the results also reveal a positive and significant effect of investment on manufacturing growth in EMCCA countries. These are in straight line with past studies (Chandran and Munusamy, 2009; Makki and Somwaru, 2004; Onafowora and Owoye, 1998). In the same vein with Solow (1956), changes in investment permit to increase the capacity of production of the manufacturing firms. Since the results may sensible to control variables included in the Model 1, Model 2 was also estimated to check the robustness of our results.

### 3.4. Panel cointegration results: Model 2

The Westerlund Error-correction–based cointegration tests developed by Westerlund (2007) was used to investigate the cointegration between trade openness and manufacturing growth. The results are presented in table 4 below.

Tableau 4: Westerlund Error Correction based cointegration test results: Model 2

| Statistics | No constant | | | Constant | | |
|---|---|---|---|---|---|---|
| | Value | Z-value | P-value | Value | Z-value | P-value |
| $G_\tau$ | -3.710 | -5.255 | 0.000 | -4.126 | -5.228 | 0.000 |
| $G_\alpha$ | -17.520 | -6.032 | 0.000 | -19.319 | -4.474 | 0.000 |
| $P_\tau$ | -7.630 | -5.662 | 0.000 | -8.893 | -6.033 | 0.000 |
| $P_\alpha$ | -16.903 | -10.967 | 0.000 | -20.491 | -7.326 | 0.000 |

*Source : computed by authors*

The results show that all the tests are strongly significant demonstrating a strong long run relationship between trade openness and manufacturing growth in EMCCA countries.

### 3.5. Long run estimates: Model 2

The DOLS method was used to estimate the Model 2. The results in table 5 show that the model is not globally significant even at 10%.

Table 5: DOLS estimates: Model 2

| Variables | Coefficients | Standard errors |
|---|---|---|
| Trade Openness | 6.530 | 5.095 |
| Wald chi2 (3) | 1.64 | |
| Prob > chi2 | 0.200 | |
| R-squared | 0.058 | |
| Number of observations | 112 | |

*Source: Authors' estimates*

Although trade openness has a positive sign as expected by trade openness supporters (Makki and Somwaru, 2004; Chandran and Munusamy, 2009), its effect is not statistically different from zero even at 10% suggesting that trade openness does not affect manufacturing growth in EMCCA countries. However, since the variables were found cointegrated in the previous section, we swapped the dependent variable with the independent variable and estimated the effect of manufacturing growth on trade openness. We found that manufacturing growth has a positive and significant effect on trade openness[2] meaning that a rational country should develop its manufacturing sector before fully trading with foreign countries.

## 4. Conclusion

The objective of this study was to analyse the effect of trade openness on manufacturing growth in EMCCA countries. To achieve that objective, panel cointegration tests as well as the Dynamic Ordinary Least Squares (DOLS) were used to estimate two distinguished models of which the first controlled for other variables and the second removed all the control variables from the model. The results showed positive and significant effects of Foreign Direct Investment and investment on manufacturing growth in EMCCA countries.

The results also suggested an ambiguous relationship between trade openness and manufacturing growth. Whereas, the effect of trade openness on manufacturing growth was found negative and significant at only 10% in the first model, it was found positive and insignificant at even 10% in the second model. Whatever the case, trade openness affects either negatively the manufacturing growth or has no effect on manufacturing growth in EMCCA countries. Therefore EMCCA countries should develop their manufacturing sector before fully trading with foreign countries.

[2] The results are not reported  but are available on request

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