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# Econometric modeling of relationship between trade openness and economic development in Democratic Republic of Congo

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**Abstract**
The International Monetary Founds (IMF) observed that the degree of trade openness of Congolese economy is not sufficiently high. It recommended to authorities to increase it following economic agreement negotiated with European Union (EU) and the agreements negotiated with United States of America (USA). However, economic regression does not stop to worsen in Democratic Republic of Congo (DRC). That is why; this study aims to assess the long run relationship between trade openness and economic development in DRC. The data pooled from World Bank, covering the period from 1983 to 2017. The Augmented Dickey-Fuller test showed that variables are stationary in second difference. The Johansen test showed that one relation exists between variables. The assessment this nexus by cointegrating vector autoregressive (VAR) model, showed that economic development declines when trade openness increases. Moreover, improvement of terms of exchange favors the economic development. Where, the economic reforms must purpose the competitiveness of economic system of production.

**Keywords:** Trade openness, economic development, cointegrating VAR

## 1. Introduction
The International Monetary Founds (IMF) realized that the degree of trade openness of Congolese economy is not sufficiently high, it must increases following economic agreement negotiated with European Union (EU), and the agreements negotiated with United States of America (USA) [1]. At moment of this recommendation, trade openness was presented like a motor of development. Moreover, the Republic Democratic of Congo should consider its trade policies in priority. However, the relative performances indicate that it in incoherence with economic development. In addition, the walk of economic situation in general goes against theoretical pretention following that, trade openness leads to economic development. In this matter, a contradiction comes from conclusions of researchers. One side, some of them found that trade openness leads to economic development [2, 3, 4]. In the other side, others detected that trade openness has a negative impact on economic development [5, 6]. This means that trade openness policies of each country must depend on its particularities, which require put in evidence.

This contradiction is not ¨new, it can be pointed out that is come following from an old discussion between searchers. For this matter, Cling discovered two theses in literature. In one side, Dollar and Kraay) maintained that trade is good for growth. Knowing that effects of trade on inequalities are unspecified in the practice; they are according to the cases positive or negative, that growth is good for the poor and so that trade is good for the poor. In other side, a current of economists, which Rodrik was the chief put forward or oppose this syllogism: they throw back the existence of univocal relations in this domain and put before the complexity and diversity according the countries of mechanisms set to work, which testifies the lack of robustness of usual econometric estimations in them (*sic*) [7].

Then, in applying opinion of IMF, the DRC gets involved in several trade agreements implying the increasing of it trade openness. However, the economic regression does not stop to worsen. For testify that, the prime minister established that the number of industries passed from 9000 to 500, since 1960 to 2017 [1].

In addition, the gross domestic production per capita (GDPC) passed from 810 united American dollars (USD) in 1983 and settled to 409 USD in 2017. When, the rate of trade openness passed from 20% in 1983 to 112% in 2017. That is means that trade openness does not constitute an incontestable solution to the economic development. It can become a misfortune in the process of economic development. From which, the relative policies must depend on the state of relation with this last.

That is why; this paper aims to bring some elements of response to this question: does trade openness lead to economic development in DRC? The hypothesis of this research supports that trade openness should lead to economic regression in DRC. For that, this article purpose to assess the long run relationship between trade openness and economic development, measured by GDPC, using cointegrating VAR and in considering the terms of exchange like control variable.

## 2. Data and Methodology

### 2.1 Theoretical bases

Since long date, trade openness is considered as an economic growth motor. Following this acceptation, it allows an efficient allocation of resources through comparative advantages, technologies transfer and it encourages the competition in local and international markets. Several recent studies proved this conception in showing that trade openness lead to economic development [8, 9, 10, 11, 12, 13, 14, 15]. However, it was affirmed that world economy present enormous danger for developing countries in bad competitiveness, it offers too numerous opportunities [16]. That supposes that the effect of trade openness depend on the method, which this trade openness is catch [17].

This is thus, that several orientations disengage from analysis of this question. One category of researchers shows that trade openness remains in negative association with economic development [18, 19]. Others found a relation with feedback between trade openness and economic development [14, 20]. The relationship between trade openness and economic development is not non-laniary that is to say; it is in U-inverted in Sub-Saharan African countries. In short, the results on relationship between trade openness and economic development are diversified and contradictory.

In relying on idea following that, trade openness policies adopted in each country depend on its particularities; a gap deserves must be underlined in the literature namely the absence of an established relationship between trade openness and economic development in DRC. That is why; this study aims to fill it, especially since DRC commits itself in several under-regional and regional trade agreements. Moreover, it is important to know the trade orientations policies to adopt.

### 2.2 Econometric model and methodology

The yearly data used in this paper was collected from the World Bank database and covers the period from 1995 to 2017 in DRC. These yearly data was converted into quarterly data using cubic spline interpolation. DRC is chosen as a case of a developing country. Thus, the findings of this study could be extended to developing countries in general.

The paper employs the cointegration method suggested by Johansen and Juseluis. Letting $Z_t$, a vector that includes different variables, the VAR is represented as:

$$Z_t = \mu + \sum_{i=1}^{n-1} \Pi_i Z_{t-i} + \varepsilon_t \quad (1)$$

Where

$\Pi_i$ is a $n \times n$ matrix of parameters, $\mu$ is a constant term and $\varepsilon_t \approx iid(0, \Omega)$. The VAR system of expression (1) can be rewritten as a vector error correction model (VECM)

$$\Delta Z_t = \mu + \Pi Z_{t-1} + \sum_{i=1}^{n-1} \Gamma_i \Delta Z_{t-i} + \varepsilon_t \quad (2)$$

Where

$\Gamma_i$ Is the parameter of short-term coefficients and $\Delta$ is an expression for first difference series. The rank of $\Pi, r$, determines how many linear combinations of $Z_t$ are stationary. If $r > 1$, one is able to show the indirect relationship that exists between variables given a proper economic identification. For the sake of this paper, the vector $Z_t$ contains the gross domestic product per capita ($GDPC_t$), the terms of exchange (TEt) and trade openness rate ($TOR_t$) in a model called opened-economy. The possible cointegrating relation, when normalised by $GDPC_t$, is expressed as:

$$GDPC_t = c + \alpha TE_t + \beta TOR_t + \varepsilon_t \quad (3)$$

With the cointegrating vector given by $(1, -\alpha, -\beta)$ in this case.

## 3. Results

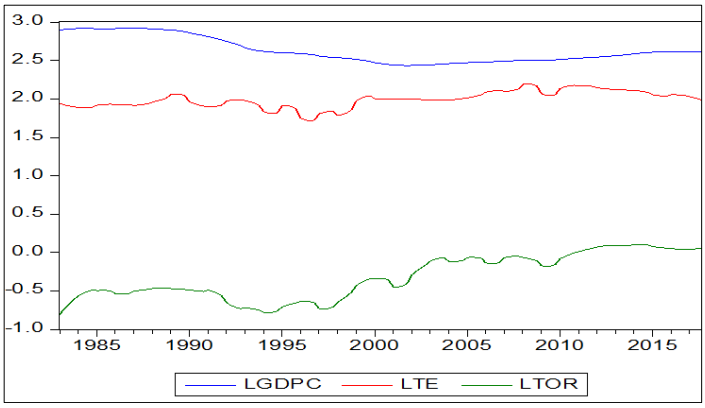


**Fig 1:** Graphs of variables

The figure 1 presents the graphs of variables, which show a tendency of cointegration before to assess the possible relationship between variables by cointegrating VAR; the first step is to use Johansen cointegration technique. For recall, Johansen cointegration applied when variables are non-stationary i.e. integrated at level one. Table 1 below shows that the Augmented Dickey Fuller (ADF) test did not reject the null hypothesis of unit root at level but at difference for all the variables. This shows that a cointegration between the 3 variables at level or I (2).

**Table 1:** Results of ADF test

| Variables | ADF test stat* level | Critical value** 5% | ADF test stat* 1st diff. | Critical value* 5% | Second diff | Critical value* 5% | Ordre d'intégration |
|---|---|---|---|---|---|---|---|
| LGDPC | -2.606088 | -2.882590 | -2.611234 | -2.882433 | -14.55559 | -2.882590 | I(2) |
| LTOR | -0.731614 | -2.884477 | -2.406576 | -2.884477 | -6.424345 | -2.884477 | I(2) |
| LTE | -1.835741 | -2.884477 | -2.507808 | -2.884477 | -6.605257 | -2.884477 | I(2) |

It emerges from this table that all variables are stationary in second difference. This allows thus to apply the cointegration test of Johansen which results are resumed in the table 2 below:

**Table 2:** Results of cointegration test of Johansen

| Unrestricted Cointegration Rank Test (Trace) | | | | |
|---|---|---|---|---|
| **Hypothesized No. of CE(s)** | ***Eigenvalue*** | **Trace Statistic** | **0.05 Critical Value** | ***Prob.*** ** |
| None * | 0.165398 | 31.57462 | 24.27596 | 0.0051 |
| At most 1 | 0.050181 | 7.166652 | 12.32090 | 0.3088 |
| At most 2 | 0.001602 | 0.216393 | 4.129906 | 0.6987 |

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values

| Unrestricted Cointegration Rank Test (Maximum Eigenvalue) | | | | |
|---|---|---|---|---|
| **Hypothesized No. of CE(s)** | ***Eigenvalue*** | **Max-Eigen Statistic** | **0.05 Critical Value** | ***Prob.*** ** |
| None * | 0.165398 | 24.40797 | 17.79730 | 0.0044 |
| At most 1 | 0.050181 | 6.950259 | 11.22480 | 0.2538 |
| At most 2 | 0.001602 | 0.216393 | 4.129906 | 0.6987 |

Max-eigenvalue test indicates 1 cointegrating eqn (s) at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values

The table 2 shows that is a cointegration at long run between the variables. The table 3 shows the results of estimation of this relation by VEC when GDPC is normalized.

**Table 3:** Output of estimation by VEC

| $Vector\ Error\ Correction\ Estimates\ Included\ observations$ : 137 $after\ adjustments$ $Standard\ errors\ in$ ( ) & $t-statistics\ in$ [ ] | |
|---|---|
| $Cointegrating\ Eq$: | $CointEq1$ |
| $LGDPP(-1)$ | 1.000000 |
| $LTE(-1)$ | −6.982127 |
| | (1.57568) |
| | [−4.43119] |
| $LTOR(-1)$ | 2.915512 |
| | (0.69784) |
| | [ 4.17788] |
| $C$ | 12.22861 |

$$\text{LGDPC} = -12{,}22 - 2{,}91\ \text{LTOR} + 6{,}98\ \text{LTE} \quad (4)$$

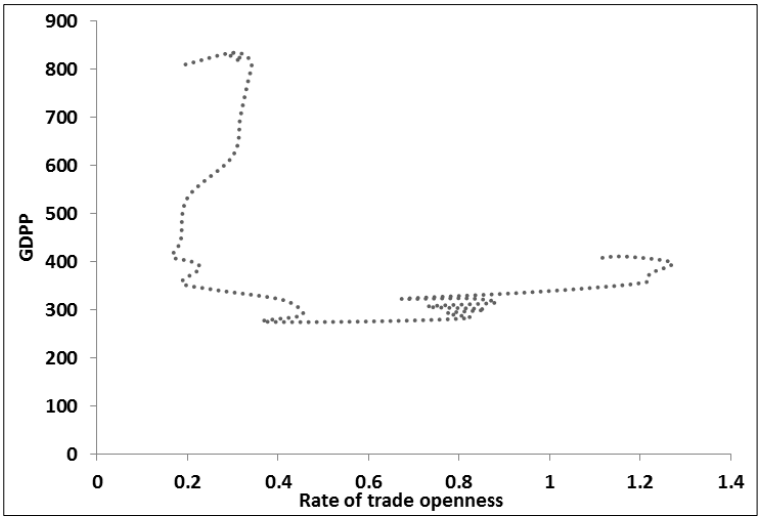


**Fig 1 :** evolution of GDPC following rate of trade openness

The equation (4) shows that when trade openness increases about 1%, economic development deceases about 2,91%. This result proves that the DRC cannot develop in favoring trade openness only. In addition, it confirms the statistic description below following that; economic development decreases when trade openness rises (figure 2). Concerning the terms of exchange, they have a positive effect on economic development. When they improve to 1%; economic development growths about 6,98%.

## 4. Discussion

The discussion on relationship between trade openness and economic development remains opened. Some searchers detected a positive impact of trade openness on economic development [21, 2, 9, 12, 10]. Others discovered a negative effect of trade openness on economic development [22, 23, 24, 25, 6, 18]. The result of this study corroborates opinion following that, the trade openness increasing leads to economic degradation. More trade openness increases, more economic development decreases. It does not corroborate too, the result according to it, a threshold exists, above it trade openness must not continue to increase for this last is not benefic that in under of this threshold [26].

Some of them argue that the positive impact of trade openness on economic development be explained by the presence of some complementary reforms to trade openness politics and markets flexibility. By versus, at absence of these elements, trade openness is far to be a motor of economic development. For these others, the international trade flux favor more the growth of rich countries that poor countries. For, the rich countries filled some conditions, which allow them to confront the extern concurrence that poor countries. Concerning DRC, that can be explained by rudimentary state of production system, very weak capacity to appropriate the technologies transfer and the presence of an economic growth extraction.

Our result corroborates the one according that, it exists a negative effect of trade openness on economic development at short run and long run [11, 19]. This is different of the result following that, it exists a significant relationship in feedback between these variables et vice versa [14, 20].

## 5. Conclusion and suggestions

The DRC has an economic partnership agreement with USA, EU, the Chine and it belongs almost at all regional and under regional organizations. In addition, the IMF realized that it degree of trade openness remains weak and demand to it to increase it in view to benefit in economic development form. This study purposed to assess the relationship between trade openness and economic development in DRC. For that, the aggregate data from World Bank database covering the period from 1983 to 2017. Using ADF and Johansen tests, we assess the long run relationship by VEC model. The result show that trade openness has a negative relation with economic development in DRC. Moreover, terms of exchange favor economic development. This implies that must to accompany the trade openness politics by other reforms in view to increase the competitiveness of Congolese economy. For that, it must find the causes of this state of relationship. It can allow the orientation of the new reforms.

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