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The Effect of Trade Openness on GDP Growth in Congo

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Abstract

The objective of this paper is to analyze the effect of trade openness on GDP growth in Congo. To this end, an economic analysis based on Autoregressive distributed lag model (ARDL) and annual data covering the period 1979 to 2019 have been used. The results show that trade openness has a positive effect on economic growth in Congo. Foreign direct investment (FDI), which is important for technology transfer, has no effect on GDP growth. The low level of human capital in the Congo may have contributed to this lack of effect of FDI exerting a long-term depressive effect of investment (GFCF) on economic growth. Another interpretation is that the gains from trade or the benefits of trade openness are higher for more educated populations. As a result, in a country where the oil industry (which is highly capital-intensive) accounts for 45% of GDP, policy implications have been formulated to strengthen education and R & D in order to reap the full benefits of trade openness.

Keywords

Trade Openness, GDP Growth, ARDL, Congo

1. Introduction

During the 1970s, two oil shocks occurred, one at the beginning and the other at the end of the decade. These shocks were followed in the 1980s by the Third World debt crisis and resulted in economic growth problems. These problems were addressed at the global level by international institutions, notably the International Monetary Fund (IMF) and the World Bank, through structural adjustment programs (SAPs). These programs were later reinforced in the 1990s by macroeconomic measures known as the Washington Consensus (Williamson, 1990), which established that opening countries to international trade and investment from the rest of the world is essential for sustained economic growth

(IMF, 2001).

The Congo, like most developing countries in IMF programs, has since liberalized its economy. But unlike some countries in the world, the Congo was already very open to international trade because of its dependence on the raw materials sector. For example, in 1980 the Congo's rate of openness to international trade was three times higher than that of the world as a whole, 120 to 39 (UNCTAD, 2022). Since then, in addition to its multilateral trade agreements, the Congo has opened up to international trade, first with the GATT, which became the World Trade Organization (WTO) in 1995, then with the ACP-EEC[1] agreements, the Lome and Cotonou Conventions and, since 1999, with its effective membership in the Regional Trade Agreement (RTA) of the Economic Monetary Community of Central African (CEMAC).

The question that arises is: What is the effect of trade openness on GDP growth in Congo? This question has important macroeconomic implications for public authorities. Indeed, at the theoretical level, extremely diverse positions coexist. For example, on the basis of cross-country regressions, Dollar (1992), Edwards (1992), Barro, & Sala-i-Martin (1995) and Sachs and Warner (1995) have observed that trade openness has a positive impact on economic growth. Levine and Renelt (1992) and Wacziarg & Welch (2003) have argued that trade openness affects economic growth through the investment channel. Rodriguez and Rodrik (2000) and Stiglitz (2004) argued that trade openness can be detrimental to economic growth in developing countries. Ari et al. (2022) show that trade openness has a negative effect on economic growth in Nigeria. In the denser studies, Romer (1986), Lucas (1988) and Alesina et al. (2005) highlighted the benefits of trade openness in light of the positive externalities in human capital accumulation and economic growth.

Based on a dataset covering the period 1979-2019, the objective of this research is to analyze the effects of trade openness on economic growth in Congo, and the hypothesis supported is the existence of positive effects of trade openness on economic growth. In addition to this introduction, the rest of this paper is structured as follows: the first section (1) presents the situation of GDP growth and trade openness in Congo. The second point (2) is devoted to the review of the literature. The methodology is presented in the third point (3). The fourth point (4), deals with the presentation and discussion of the results. Finally, the fifth and last point (5) is devoted to the conclusion and the economic policy implications.

2. GDP Growth and Trade Openness in Congo

Figure 1 shows the evolution of GDP growth and trade openness in Congo over the period 1979-2019 (**Figure 1**). The evolution of trade openness in Congo shows a fluctuating pattern over time, with recurrent and alternating oscillations.

[1]Trade between African, Caribbean and Pacific (ACP) countries and the European Economic Community (EEC), which became the European Union (EU) in 1993.

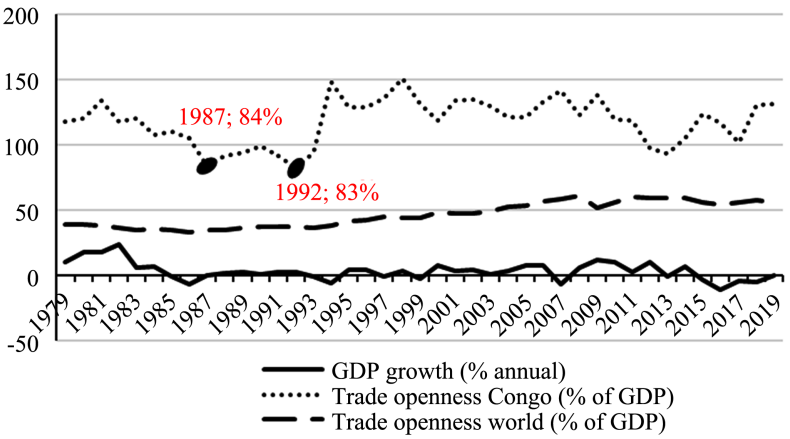

Figure 1. Trends in GDP growth and trade openness in Congo and the world over the period 1979-2019 (in percent). Source: Author based on WDI (2022) data.

Over the period 1992-1995, the average rate of change in GDP was 1.4 percent, compared to 1.7 percent for the period 1995-2000 (UNCTAD, 2022). The highest level of trade openness was recorded in 1998 (151%), while the lowest (83%) was recorded in 1992. These levels of trade openness are very high compared to the world average (**Figure 1**).

Over the entire 1979-2019 period, trade openness and GDP growth in Congo move in parallel, except for 1994, when this trend was temporarily interrupted by the devaluation of the CFA franc by half (50%) in relation to the French franc and, consequently, in relation to other foreign currencies. The devaluation increased the price of imported products needed for production, and the resulting decrease in purchasing power led to a drop in consumption and a sudden slowdown in production. The result was a drop in the average GDP growth rate in 1994. During this period, the Congo signed the treaty establishing the Central African Economic and Monetary Community (CEMAC), which brings together six countries that share the CFA franc and a regional trade agreement (RTA) creating a common market among member countries. This has contributed to an even greater openness to trade, although Congo is structurally a country whose economic growth is dependent on foreign markets. This is explained by Congo's specialization in the commodity sector. In 2019 commodities accounted for 96% of Congo's total exports, 80% of which were fuels (UNCTAD, 2022). In 2019, the oil sector accounted for 42% of Congolese GDP. Heavily destabilized by the sharp drop in oil prices in 2014, GDP fell by 34% in 2015 year-on-year and the GDP growth rate fell from 6.7% in 2014 to −3.6% in 2015. This was followed by a sharp drop in 2016 to −10.8% corresponding to the lowest GDP growth rate in the period 1979-2019.

3. Literature Review

The literature on openness to international trade and its effect on economic growth show that there is still no consensus, either theoretically or empirically.

3.1. Theoretical Framework

The theoretical review is structured in two approaches. The first focuses on the static gains from trade openness, and considers that the gains are to be found in the division of labor and specialization at both the national and international levels. These gains are analyzed in terms of mutual gains from trade, gains in collective well-being due to the effects of trade liberalization on the economic structure of countries, thus contributing to higher economic growth (Myint, 1958). This approach is represented by the traditional theories of international trade through Adam Smith's (1776) theory of absolute advantages, Ricardo's (1817) theory of comparative advantages and the HOS model (Heckscher, 1919; Ohlin, 1933; Samuelson, 1941). The second approach focuses on the dynamic gains from trade, and is represented by the new theory of international trade (Helpman & Krugman, 1985), supported by the theories of endogenous growth (Rivera-Batiz & Romer, 1991; Grossman & Helpman, 1991) and the new geographical economy (Krugman, 1981).

With regard to the first approach, the debate often starts with Adam Smith (1776) and his theory of absolute advantage. According to this theory, opening up to international trade should stimulate the division of labour, specialization and the rate of growth by directing resources towards the production of the good for which the country has an absolute advantage. In contrast to Adam Smith, David Ricardo (1817) extended international trade to countries that had no absolute advantage. He argued that international specialization and trade increase national income, which raises the level of production and increases the growth rate of the economy. The main conclusion of this theory is that each country can gain from free trade and achieve growth-enhancing productivity gains by specializing in the production in which it is relatively least bad. The Heckscher, Ohlin and Samuelson (HOS) model complements Ricardo's theory of comparative advantage by introducing the capital factor. The main conclusion of this theory is that each country must specialize in production that makes intensive use of the factor that is relatively most abundant in its territory. Although the traditional Ricardo-HOS trade theory emphasizes that openness to international trade leads to a one-time increase in production in co-trading countries and leads to a better allocation of resources according to comparative advantage, it does not explain how this economic growth will be maintained in the long run. Consequently, trade openness results in static gains.

The second approach provides an explanation for this problem based on the dynamic gains from openness. Romer (1986), Lucas (1988) and Grossman and Helpman (1991) have analyzed the benefits of trade in the light of positive externalities in the transmission of knowledge, the accumulation of human capital and the increasing returns embodied in technology. These externalities, which constitute dynamic gains, are identified as growth bonuses due to the effects of trade. Thus, by integrating the contributions of the new international trade theory and endogenous growth theories, these previously separate theoretical

contributions highlight imperfect competition, increasing returns to scale and product differentiation. To this end, trade openness appears to be a channel through which countries acquire knowledge, in particular through the technology incorporated in the products traded (Grossman & Helpman, 1991). These externalities combine to promote economic growth in co-trading countries. Moreover, the accumulation of human capital resulting from the learning-by-doing processes initiated during technology transfers plays an essential role in the growth process (Lucas, 1988; Mankiw, Romer, & Weil, 1992). Thus, the most open economies will tend to grow faster than those that are relatively closed. The debate has subsequently focused on the endogenous factors likely to generate the dynamic gains from openness and drive economic growth. In this context, IMF (2001) theorists argue that participation in global trade helps attract foreign direct investment (FDI) to developing countries. On this particular point, several theoretical studies have pointed out that the gains from trade openness are not spontaneous (Borensztein et al., 1998; Adams, 2009; Pahlavani, 2005), policy coordination between countries is necessary to promote economic growth (Alouini, 2010). For Fontagné and Guérin (1997), the impact of technological externalities linked to trade openness on economic growth depends on initial conditions, notably qualified human capital, a good level of technology and good governance.

3.2. Empirical Literature

Empirically, several studies have been conducted to analyze the effects of trade openness on economic growth, but there is no consensus on the results. Some studies have found that economies open to international trade grow faster, while other studies argue that this result is not robust, believing that the methods used in these studies have serious flaws, although a growing number of studies argue that the relationship between trade openness and GDP growth is not linear.

Dollar (1992) studied the effects of trade openness on economic growth on a sample of 95 developing countries covering the period 1976-1995. The results obtained through the ordinary least squares (OLS) method concluded that there is a positive effect of trade openness on economic growth.

Levine and Renelt (1992) found, on the basis of international regressions covering 119 countries and for the period 1960-1989, that trade openness promotes growth only indirectly, through greater investment. These results were obtained using the ordinary least squares method.

Edwards (1992) analyzed the relationship between trade openness and economic growth in a sample of 30 developing countries over the period 1970-1982. The results obtained from the ordinary least squares (OLS) method show that trade openness and economic growth have a positive association.

Rodriguez and Rodrik (2000) have verified the robustness of the results of the work on the existence of a positive and significant effect of trade openness on economic growth. Interpreted narrowly, Rodriguez and Rodrik argued that the

methods used in this work are seriously flawed. Important methodological problems were identified that expose the results of this work to different interpretations. As a result, they found little evidence to support that trade openness is significantly associated with economic growth.

Chang et al. (2009) studied the effects of trade openness on economic growth in a sample of 20 developed and 60 developing countries over the period 1960-2000. The results obtained from the generalized method of moments show that the effects of openness on economic growth are positive.

Busse & Koeniger (2012) examined the effects of trade openness on economic growth on a sample of 108 countries for the period 1971-2005. The results obtained from the system generalized method of moments, show that trade openness has a positive effect on economic growth.

Ramanayake & Lee (2015) analyzed the effects of trade openness on economic growth for 205 countries over the period 1980-2009. The results using combined ordinary least squares, fixed effects, and the generalized method of moments, showed a nonlinear relationship between trade openness and economic growth. The authors conclude that mere trade openness does not guarantee sustained economic growth.

Ramzan et al. (2019) studied the impact of trade openness on GDP growth in a sample of 82 countries during the period 1980-2014. The results obtained from the system generalized method of moments, show that there is a non-linear trend between trade openness and GDP growth. Trade openness can have a negative impact on GDP growth when countries have specialized in a low total factor productivity (TFP) level of development and conversely trade openness can have a positive effect on GDP growth when the TFP level is high.

Ari et al. (2022) analyzed the association between trade openness, foreign direct investment (FDI) and economic growth in Nigeria for the period 1996-2019. Results from an Autoregressive Distributed Lag (ARDL) model indicate that FDI and capital stock are related to economic growth in the short and long run. Trade openness, on the other hand, has a negative impact not only on short-run growth, but also on long-run growth. This latter analysis confirms the work conducted by Guei and Le Roux (2019) who showed that trade openness has a negative impact on growth in ECOWAS countries. Agbahoungba (2019) and Adu-Gyamfi et al. (2020) reached the same result, the former in the case of ECOWAS countries and the latter in the case of 9 West African countries.

The literature review has identified the need for more research on the effects of openness on GDP growth. The theoretical and empirical literature agrees on at least one point: there is no consensus among economists on the interaction between trade openness and economic growth.

4. Methodology

In this section, we analyze the effects of trade openness on GDP growth in Congo. After specifying the model used, we present the estimation method, the de-

scription of variables and data sources.

4.1. Specification of the Model

The objective of this article is to analyze the effects of trade openness on GDP growth in Congo. This analysis is based on the growth model of Solow (1956) and Swan (1956). This model, which is based on the production function, explains economic growth through the accumulation of capital, labor and the increase in productivity induced by technical progress. Formally it is presented as follows:

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha} \tag{1}$$

where, Y, A, K, L represent output, technical progress, capital stock, labor, respectively. t, α and $1-\alpha$ are in this order the period, the contribution of capital in output and the contribution of labor in output. Dividing Equation (1) by the factor L_t, (1) becomes:

$$\frac{Y_t}{L_t} = \frac{A_t K_t^{\alpha} L_t^{1-\alpha}}{L_t} = \frac{A_t K_t^{\alpha} L_t}{L_t L_t^{\alpha}} = \frac{A_t K_t^{\alpha}}{L_t^{\alpha}} \tag{2}$$

The linearization of (2), gives

$$\frac{\log Y_t}{\log L_t} = \log \frac{A_t K_t^{\alpha} L_t^{1-\alpha}}{L_t} = \frac{\log A_t + \log \alpha K_t}{\alpha \log L_t} \tag{3}$$

$$\log Y_t - \log L_t = \log A_t + \alpha \log K_t - \alpha \log L_t \tag{4}$$

$$\log Y_t = \log A_t + \alpha \log K_t + (1-\alpha) \log L_t \tag{5}$$

Taking $(1-\alpha)$ equal to β, (5) then becomes

$$\log Y_t = \log A_t + \alpha \log K_t + \beta \log L_t \tag{6}$$

Empirically, the present general framework for growth analysis has undergone several modifications following the work of Mankiw, Romer, and Weil (1992), Busse and Koeniger (2012), and Sekkach (2021). Building on Keho (2017), we assume that technical progress may be influenced by trade openness. Thus technical progress at time t, A_t can be specified as follows:

$$A_t = \rho \mathrm{OUV}_t^{\gamma} Z_t^{\theta} \tag{7}$$

OUV represents trade openness and Z other factors that influence technical progress. By replacing (7) in (6), the equation becomes

$$\log Y_t = \log\left(\rho \mathrm{OUV}_t^{\gamma} Z_t^{\theta}\right) + \alpha \log K_t + \beta \log L_t \tag{8}$$

$$\log Y_t = \log \rho + \gamma \log \mathrm{OUV}_t + \theta \log Z_t + \alpha \log K_t + \beta \log L_t \tag{9}$$

Levine and Renelt (1992), Baldwin and Seghezza (1996), Lee (1993), Wacziarg & Welch (2003) and Alesina et al. (2005) support the argument that trade openness promotes growth through its positive impact on investment (GFCF). Similarly, Adams (2009) has shown that foreign direct investment (FDI) has a positive impact on economic growth. Lucas (1998), Romer (1990) and other endogenous growth theorists emphasize human capital in explaining economic growth

(EDUC). Kuznets (1960) argued that economic growth is a function of the growth of the stock of useful knowledge, suggesting that the long-run growth rate of an economy is directly proportional to the number of creators of new knowledge, itself a function of population size (POP). Taking these different variables into consideration and incorporating the error term ε_t into Equation (8), the equation to be estimated is as follows:

$$\begin{aligned}\log Y_t = {} & \log \rho + \gamma \log \mathrm{OUV}_t + \theta \log \mathrm{POP}_t + \alpha \log \mathrm{FBCF}_t \\ & + \sigma \log \mathrm{IDE}_t + \beta \log \mathrm{EDUC}_t + \varepsilon_t\end{aligned} \tag{10}$$

4.2. Estimation Method

The economic literature on the effects of openness on economic growth in the context of time series is generally analyzed by classical cointegration techniques such as those of Engle and Granger (1987) or Johansen (1988). These tests require the use of integrated variables of the same order I (0) or I (1) and are more configured for large sample sizes. In order to overcome these shortcomings, Pesaran et al. (2001) propose a new approach called the Autoregressive Staggered Delay Model (ARDL). This approach allows the use of integrated series with different orders I (0) and I (1) and is adapted in the case of small samples and in the presence of explanatory variables (Narayan, 2005). According to Pesaran et al. (2001), the ARDL technique gives the possibility to deal simultaneously with long term dynamics and short term adjustments. It is precisely the flexibility that this technique allows that motivates the choice of its use, which involves the estimation of the following error correction model:

$$\begin{aligned}\Delta \mathrm{TC\_PIB}_t = {} & \alpha_0 + \sum_{i=1}^{m} \alpha_i^1 \Delta \mathrm{TC\_PIB}_{t-i} + \sum_{i=0}^{n} \alpha_i^2 \Delta \mathrm{OUV}_{t-i} + \sum_{i=0}^{p} \alpha_i^3 \Delta \mathrm{TC\_POP}_{t-i} \\ & + \sum_{i=0}^{q} \alpha_i^4 \Delta \mathrm{FBCF}_t + \sum_{i=0}^{r} \alpha_i^5 \Delta \mathrm{IDE}_{t-i} + \sum_{i=0}^{s} \alpha_i^6 \Delta \mathrm{EDUC}_{t-i} + \theta \mathrm{ECM}_{t-1} + \varepsilon_t\end{aligned}$$

4.3. Data Sources and Description of Variables

The data used in this study come from the World Bank (WDI) and the United Nations Conference on Trade and Development (UNCTAD) online databases. The data are observed on an annual basis, with a frequency ranging from 1999 to 2019.

Table 1 presents a summary of the variables used in the model, their sources, the authors who have already used them and the expected signs.

Table 2 below presents the descriptive statistics.

The results in Table 1 below, provide information on the volatility of the variables, as well as how they are distributed. The volatility of the variables is analyzed through the standard deviation, which shows the level of dispersion of the variables around their respective means. From these results, it appears that the population has a relatively low standard deviation value, suggesting a low dispersion around the mean.

Table 1. Summary of variables, sources, authors and signs.

Variables	Abbreviation	Source	Authors	Sign
Gross Domestic Product	GDP	WDI	Rasoanomenjanahary et al. (2022)	
Trade openness	OUV	UNCTAD	Ramanayake & Lee (2015)	positive
Population	POP	WDI	Mahfoudh et al. (2018)	positive
investment	FBCF	WDI	Alesina et al. (2005)	positive
Foreign direct investment	FDI	WDI	Bunje et al. (2022)	Négative
Gross secondary school enrolment ratio	EDUC	WDI	Harrison (1995)	positive

Source: Author based on WDI (2022) data.

Table 2. Descriptive statistics.

	TC_PIB	OUV	TC_POP	FBCF	IDE	EDUC
Mean	3.369478	117.7089	2.842881	34.32805	5.875337	50.53083
Median	2.611948	119.9735	2.832348	29.45063	1.890932	47.65034
Maximum	23.59770	150.7230	3.437563	81.02102	39.81094	71.05355
Minimum	−10.78324	82.52195	2.440535	14.50872	−11.19719	38.31460
Std. Dev.	6.925027	17.66423	0.235015	15.94908	10.79179	9.082073
Skewness	0.631761	−0.289552	0.736688	1.364374	1.534551	0.949481
Kurtosis	3.813193	2.203745	3.700456	4.450863	5.333084	2.703444
Jarque-Bera	3.857029	1.656031	4.546692	16.31642	25.39040	6.310592
Probability	0.145364	0.436915	0.102967	0.000286	0.000003	0.062626
Observations	41	41	41	41	41	41

Source: Author based on WDI (2022) data.

With respect to the distribution of the series, the results show that trade openness, gross domestic product, population and education are normally distributed. This normality is highlighted by the value of the probability associated with the Jarque-Berra statistic, which is greater than 5%, which allows us to accept the H0 hypothesis of the normality of the series, and to reject the alternative H1 hypothesis, according to which the series do not follow a normal distribution. For investment and foreign direct investment, they do not follow a normal distribution insofar as the probability associated with the Jarque-Berra statistic is less than 5%. However, given the number of observations, based on the law of large numbers, we can confirm that all the series tend towards a normal distribution, which allows us to follow our study.

Study of the stationarity of the variables

Once we are sure that the series are normally distributed, we need to check whether the variables are stationary, to avoid making spurious estimates that would lead to biased results. In the context of time series, several tests are used, the most common of which is the Augmented Dickey and Fuller Unit Root Test (ADF). In this work, the results from this test are reported in **Table 3** below.

The results of the various stationarity tests presented in **Table 3** below show that gross domestic product, population and foreign direct investment are integrated of order I (0), i.e. stationary in level. In first difference, all variables become integrated of order I (1). The integration of the variables in I (1) suggests the existence of a presumption of cointegration of the variables or the existence of long term cointegration relationships that must be confirmed through cointegration tests.

Different tests allowing the verification of cointegration between variables are highlighted in the context of time series (Engle and Granger; Johansen,). Nevertheless, in the situation where the variables are integrated of different order (I (0) and I (1)), Pesaran et al. (2001), show that these so-called standard tests become ineffective. They suggest using the Bond Test, which refers to estimates by the autoregressive lag model (ARDL).

It should be noted that the latter has the advantage of being able to estimate short-term dynamics and long-term effects for cointegrated or even integrated series at different orders Pesaran et al. (2001), but it is also appropriate in the case of small samples. The cointegration test, in the case of autoregressive models with staggered lags, is performed in two phases. The first one consists in determining the optimal lag from the Akaike criteria. The second phase compares the Ficher statistic with the boundary values in order to draw the conclusion.

- **Optimal offset: Optimal model**

We will use the Akaike Information Criterion (AIC) to select the optimal ARDL model, the one that provides statistically significant results with the least of the parameters. (**Figure 2**)

Through the Akaike criterion, the graph above shows that the ARDL (1, 4, 4, 1, 4, 0) model is the most optimal insofar as it offers the smallest value of AIC, which means that it is with this model that we record less information loss.

Table 3. Results of the stationarity tests.

Variables	In level	In first difference
TC_PIB	−3.567775**	
TC_POP	−3.567775**	
FBCF	−2.820516*	−6.287123***
EDUC	−1.429560	−5.736244***
IDE	−4.176815***	
OUV	−2.885897*	−7.344568***

Source: Author based on our estimates on Eviews 10. *, **, ***; indicates significance at the 10%, 5% and 1% level, respectively.

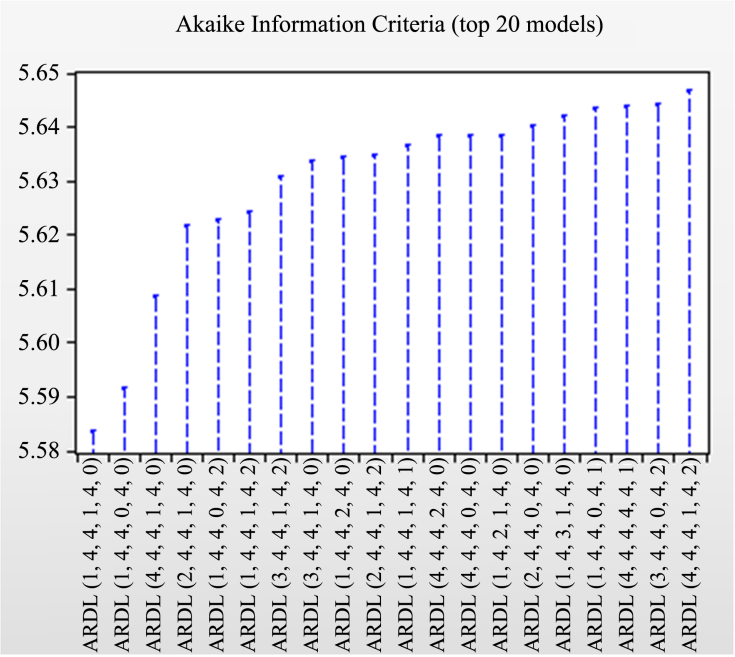

Figure 2. Choice of the optimal model. Source: Author based on WDI (2022) data.

➢ Cointegration test at the bounds

Following the automatic procedure of Eviews 10, the cointegration test of Pesaran et al. (2001) has as a prerequisite the estimation of the ARDL model. The computed test statistic, the Fisher F-value, will be compared to the critical values (which form bounds) as follows:

- If Fisher's F > upper bound, then cointegration exists between the variables
- If Fisher's F < lower bound, then cointegration does not exist between the variables
- If lower bound < Fisher's F < upper bound, then there is no conclusion about cointegration between the variables.

The results contained in **Table 4** below confirm the existence of long-term relationships between the variables. Indeed, it appears from these results that the value of the Ficher statistic (F-statistic; 13.21828) is higher than the values of the upper bound, whatever the threshold of significance retained (10%; 5% or 1%). The existence of long-run relationships allows us to estimate the long-run effects of trade openness on GDP growth in Congo, the results of which are presented in **Table 5** below.

The results of the different diagnostic tests obtained in this article are convergent and show that the model is of good quality. Indeed, these results highlight the acceptance of the null hypothesis in each case insofar as the probabilities are higher than 5%. Thus, we note on the one hand, through the Breusch-Godfrey and Breusch-Pagnan-Godfrey tests, respectively the absence of autocorrelation of residuals and heteroscedasticity. On the other hand, these results show through the Jarque-Bera and Ramsay tests that the residuals follow a normal distribution and that the model is well specified.

Table 4. Results of the cointegration test of Pesaran et al. (2001).

Variables	TC_PIB, TX_POP, EX_PIB, FBCF, EDUC, IDE, OUV	
F-statistic	13.21828	
	Lower bound	Upper bound
10%	2.08	3
5%	2.39	3.38
1%	3.06	4.15

Source: Author based on WDI (2022) data.

Table 5. Estimation result of the effects of trade openness on GDP growth in Congo.

Short run estimates			
Variables	**Coefficients**	***t*-statistic**	**Probability**
TC_PIB (−1)	0.054731	0.134077	0.4082
D (FBCF)	−0.346244	−5.444565	0.0000
D (FBCF (−1))	0.185109	3.695527	0.0018
D (FBCF (−2))	0.361165	6.148337	0.0000
D (FBCF (−3))	0.219226	3.735037	0.0016
D (IDE)	−0.013576	−0.201309	0.8428
D (IDE (−1))	−0.234044	−2.166146	0.0448
D (IDE (−2))	−0.025970	−0.227862	0.8225
D (IDE (−3))	−0.211090	−1.838222	0.0836
D (OUV)	0.111018	2.347031	0.0313
D (TC_POP)	−3.138491	−0.081043	0.9364
D (TC_POP (−1))	−169.7202	−1.921586	0.0716
D (TC_POP (−2))	270.3480	3.050472	0.0072
D (TC_POP (−3))	−231.5937	−5.904962	0.0000
CointEq (−1)*	−0.945269	−11.18861	0.0000
Long run estimates			
FBCF	−0.694764	−2.439733	0.0259
IDE	0.426884	1.350445	0.1946
OUV	0.198956	1.891233	0.0758
TC_POP	22.58775	3.768912	0.0015
EDUC	0.127069	0.820766	0.4231
C	−72.72615	−4.003828	0.0009

Continued

Diagnostic test of the model			
Type of test	**Tests**	**Values**	**Probability**
Autocorrelation	Breusch-Godfrey	0.76	0.48
Hétéroscédasticity	Breusch-Pagan-Godfrey	0.66	0.80
Normality	Jarque-Bera	0.63	0.72
Spécification	Ramsey (Fisher)	0.46	0.50
R-squared			0.786015
Ajusted R-squared			0.594555

Source: Author based on WDI (2022) data.

Moreover, the coefficient of determination (R2) equal to 0.786015 means that the variability of GDP growth is explained by the selected variables at about 79%. Thus, all of these results indicate that the model is of good quality and that the results can be discussed.

5. Discussion of the Results

The adjustment coefficient or recall force is statistically significant, negative and between zero and one in absolute value, which guarantees an error correction mechanism, and therefore the existence of a long-term relationship (cointegration) between variables. The estimation results (**Table 5**) show that in the short term, trade openness has a positive and significant instantaneous effect on economic growth at the 5% level. This suggests that trade openness and economic growth move in the same direction. However, the size of the effect depends on the nature of the shock. Thus, an increase in trade openness of 1%, all else being equal, improves the level of economic growth by 0.11%. This result confirms the findings of previous work by Chang et al. (2009), Busse & Koeniger (2012) and Oppong-Baah et al. (2022).

Unlike in the short run, the effect of trade openness on economic growth is significant in the long run at the 10% threshold. This result found in the case of Congo corroborates with those obtained by Ekodo and Ngomsi (2017) for the six countries of the Central African Economic and Monetary Community (CEMAC) including Congo. All in all, the results obtained in the short and long term suggest a positive effect of trade openness on economic growth in Congo. Nevertheless, they diverge with those obtained by Vlastou (2010), Brueckner & Lederman (2015), Musila & Yiheyis (2015) and Ari et al. (2022) who established the existence of negative effects of trade openness on GDP growth for 34 and African countries, 41 Sub-Saharan African countries, Kenya and Nigeria respectively.

Population (POP) has a positive and significant effect on long-term growth at the 1% threshold. Thus, an increase in population of 1%, all else being equal,

improves the level of growth by 22%. This result is in line with Alesina et al. (2005). Investment (GFCF) has an instantaneous negative and significant effect on growth in the short term; a 1% increase in investment would reduce GDP growth instantaneously by 0.34%. However, the effect becomes positive after one year. Thus, the cumulative short-term effect on GDP growth is larger, reaching about 0.41%. Thus, overall, investment has a positive effect on economic growth in the short run. This result corroborates with those obtained by (Keho, 2017) in Côte d'Ivoire. In the long run, the effect of a 1% increase in the level of investment would, all else being equal, lead to a 0.69% decrease in investment. This result is in line with those obtained by (Malefane & Odhiambo, 2018) in South Africa.

The absence of an effect of FDI on GDP growth in Congo could be linked to the insignificance of the human capital variable (EDUC). Indeed, the low level of human capital in Congo makes it difficult for foreign firms to adopt and transmit technology to local firms. Human capital has not yet had a full impact on GDP growth in Congo. This result is in line with Borensztein et al. (1998) who argued that FDI only contributes to economic growth if the host economy has sufficient absorptive capacity for advanced technologies.

6. Conclusion and Policy Implications

The objective of this paper was to analyze the effects of trade openness on GDP growth in Congo. Within this framework, an econometric analysis based on the Autoregressive Lagged Model (ARDL) and data (gross domestic product; trade openness; investment; foreign direct investment; population; gross secondary school enrollment rate) covering the period 1979 to 2019 were used. The results show that trade openness promotes GDP growth in Congo. Foreign direct investment (FDI) important for technology transfer has no effect on GDP growth. The low level of human capital in the Congo may have contributed to this lack of effect of FDI exerting a long-term depressive effect of investment (GFCF) on economic growth. Another interpretation is that the gains from trade or the benefits of trade openness are higher for more educated populations.

In view of the present results, economic policy implications should be geared towards strengthening education to fully reap the benefits of trade openness. Indeed, the country's dependence on the capital-intensive oil sector suggests that policies should be put in place to promote education and research and development (R & D) in order to fully benefit from the country's comparative advantages.

Thus, the public authorities in the Congo should pursue a policy of social inclusion aimed at limiting the impact of social inequalities on educational outcomes. Investment in human beings, schools, technical and vocational training and health is necessary. Malaria, which is a factor in children's absence from school, should be combated. Given its level of development, the Congo should give priority to secondary education because it integrates both general and tech-

nical training. The extractive sector (oil, gas, mining, etc.) that supports Congo's GDP is capital intensive. In this sense, the government should only invest more in research and development (R & D) to help the country appropriate imported technologies and disseminate them in the economy in order to improve supply and support sustainable GDP growth.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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