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Would rising real GDP boost the combined effects of economic openness and public investment on unemployment in Cameroon?

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Abstract

The objective of this study is to evaluate the impact of economic openness and public investment on unemployment in Cameroon by exploiting the 1991T1-2017T4 quarterly data. The empirical literature about this subject has led to controversial results. The ARDL estimate showed that the effects of foreign direct investment, public investment and trade openness on unemployment are not isolated, but they strongly depend on the level of the real GDP both in the short-run and in the long-run. In that case, foreign direct investment, trade openness and public investment significantly reduce the unemployment rate. As a result, the increase in the growth rate will reinforce the positive effects of these variables on employment in Cameroon.

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1. Introduction

The contribution of economic liberalization and public investment to the process of reducing unemployment is the subject of heated debate among economists. Indeed, the migration of jobs to the South is currently a major concern for both developed and developing countries. For developed countries, plant closures and relocations lead to job losses and an increase in the unemployment rate. The context in these countries is, paradoxically, both a situation of lack of employment and a decrease in the active population (OREM, 2005). Southern countries, on the other hand, have a comparative advantage through abundant low-cost labor. The majority of theoretical studies and empirical investigations have focused on the impact of economic liberalization captured by FDI, exports and imports on economic growth (Qudah, 2016, Pulstova, 2016, Muntah, Khan, Haider and Ahmad, 2015, Agrawal, 2015, Melnyk, Kubatko and Pysarenko, 2014, Otto and Ukpere, 2014).

However, there are some recent specific studies that have focused on the impact of trade openness and real GDP on unemployment. As an illustration, Nwaka et al. (2015) used the Error Correction Model (ECM) to show that, in the long term, real output and per capita income led to a decrease in unemployment, but that the open trade policy was associated to an increase in the unemployment rate in Nigeria. In addition, Goznor (2014) examined the impact of four different measures of trade openness and globalization on unemployment in the G7 countries: Canada, France, Germany, Italy, Japan, England and the United States. It concludes that, in addition to macroeconomic indicators and market size, all measures of openness are negatively and significantly associated with the unemployment rate. Halit (2013) assessed the impact of trade liberalization on the growth rate of sectoral employment in both developed and developing countries. The estimation results revealed that trade opening in the form of larger trade volumes did not create jobs in developing countries. In addition, they found that higher trade volumes have a positive effect on industrial employment and services in developing countries. However, trade barriers have an adverse effect on employment growth in services in developed countries. To our knowledge, few studies have analyzed the combined effects of economic openness (captured by trade openness and FDI), and public investment by interaction with real GDP trends on unemployment in Cameroon.

According to the World Bank (2016), the coverage rate of imports by exports increased from 68.3% in 2014 to 67% in 2015 in Cameroon. Exports of goods decreased by 6.2% in 2015 compared to 2014 and amounted to $ 2,400.2 billion, as a result of lower sales of crude oil (-21.4%) and fuels and lubricants (-35.2%). Imports totalled 3,575.1 billion, down 4.5% from 2014 (MINFI, 2014). Over the period from 2000 to 2014, 15 years in total, the foreign direct investments (FDI) captured by the Republic of Cameroon are estimated at 5 billion US dollars, or about 2750 billion CFA francs, according to the United Nations Conference on Trade and Development (2015). In addition, UNCTAD (2017) released the report on foreign direct investment, which improved by 2 percent in 2018 ($ 1850 billion). With regard to employment, the labor force participation rate for persons aged 15 and over, as defined by the International Labor Office (ILO, 2016), decreased to 72.1% in 2014 as against 76, 2% in 2010 and 81.9% in 2007. The ILO states that this rate is higher in rural areas (77.3%) than in urban areas (66.9%). On the public expenditure side, the government confirms its commitment to increase public investment spending in order to have a lasting impact on growth and employment. Indeed, the investment budget is constantly increasing and its share in the total budget has increased from 26.3% in 2010 to 30.2% in 2014, then to 30.7% and 36% in 2015 and 2016 respectively. However, did the economic openness and public investment interacting with economic growth can really contribute to a significant reduction of the unemployment rate in Cameroon? In other words, did an increase in growth can simulate the effects of volume of trade, FDI inflows and public investment in the reduction process of unemployment in Cameroon? The response to this concern invites us to assess the simultaneous effects of FDI, trade openness and public

investment on unemployment on the one hand, and to examine whether through support for real growth, economic openness and public investment can really promote employment in Cameroon.

This article is organized as follows: Section 2 reviews the case studies, Section 3 describes the methodology and data; Section 4 presents and interprets the results; finally, section 5 concludes.

2. Literature review

2.1. Effect of economic liberalization on unemployment

The general intuition of the positive association between trade and unemployment is that trade improves the economic value of the marginal product of labor. Dutt et al. (2009) argue that trade openness, which improves overall labor productivity, will reduce unemployment and lead to more job creation and job search. Similarly, on the basis of their unemployment research model with heterogeneous firms, Felbermayr et al. (2011) also argue that trade liberalization reduces unemployment as long as it improves overall productivity. This occurs by crowding out the least productive firms and reallocating the workforce to more productive firms. Matusz (1996) also agrees that trade can improve the productivity of the whole economy and thereby reduce the unemployment rate. The reason is that trade leads to a greater division of labor due to an increase in the variety of available intermediaries. Helpman and Itskhoki (2010), on the other hand, argue that reducing trade barriers can lead to increased unemployment.

Janiak (2006) also shows that a higher trade exposure is associated with a higher equilibrium unemployment rate. The reason is that the removal of jobs by the exit of small, low-productivity enterprises exceeds the jobs generated by the large productive units. Uwubanmwen and Ogiemudia (2016) examined the effect of foreign direct investment on economic growth in Nigeria using annual time series covering the period 1979-2013. The error shows an immediate and delayed effect on the Nigerian economy in the short term, but a non-significant negative effect in the long term. Pulstova (2016) studied the effects of foreign direct investment and exports on economic growth in Uzbekistan over the period 1990-2014. Using a descriptive method, he found that an increase in foreign direct investment could lead firms to increase their product exports. The work of Muntah, Khan, Haider and Ahmad (2015) focused on the impact study of foreign direct investment on Pakistan's economic growth between 1995 and 2011. They conclude that there is a negative effect of FDI on real GDP in that country. Agrawal (2015), having conducted a study in the five BRICS economies (Brazil, Russia, India, China and South Africa), has the same results. In addition, the use of the Johansen cointegration technique and Granger causality for the period 1972 to 2013 allows Ali (2014b) to find that FDI and inflation have long-term negative effects on the economic growth of Pakistan.

2.2. Impact of public investment expenditure on unemployment

From a Structural VAR analysis and a Stokastic Inter-temporal General Equilibrium (DSGE) model, Mortensen and Pissarides (1994), Monacelli et al. (2010) show that increasing public spending reduces unemployment. In the same vein, Mayer and al. (2010), Campolmi and al. (2011), Kuo and Miyamoto (2014) lead to the same results. However, still using structural VAR, Bruckner and Pappa (2012), as well as Yuan and Li (2000) show that budget expansions exacerbate unemployment. Several investigations into the relationship between the unemployment rate, its determinants and its effect on growth have been conducted by Oladeji (1987), Anyanwu (1997), Umoru (2003), Olufemi (2004), Iyoha (2004) , Adebayo and Ogunrinola (2006), Gbosi (2005), Onwioduokit (2006), Sodipe and Ogunrinola (2011), Bakare (2011), Ihugba and Njoku (2011). In a recent study, Nwosa (2014) adopted the ordinary least squares technique to examine the impact of government spending on unemployment and the poverty rate in Nigeria using annual data from 1981-2011. He finds that these expenditures

have a positive and statistically significant effect on unemployment; but a negative and significant impact on the poverty rate.

In the light of literature, we find that the problem of unemployment has always been a challenge in every state. Nevertheless, there is little study on unemployment. In Cameroon, the slightly more recent studies of Gachili and Dazoue (2018) carried out over the period 1987-2013, show using OLS estimation that trade opening has a negative and significant effect on economic growth. Our study stands out because, in addition to assessing the simultaneous impact of foreign direct investment, trade openness and public investment on unemployment, it looks at the influence of real GDP on this relationship.

3. Methodology and data

In order to evaluate empirically the role of GDP on the effect of economic opening and public investment on unemployment in Cameroon, we employ the Autoregressive distributed approach (ARDL). In this section, the estimation strategy is discussed (section 3.1) and the data is described (section 3.2).

3.1. Methodology

Several models examining the impact on unemployment of macroeconomic variables were used in the empirical literature, but the one that is better adapted for our case is inspired by the works of Steinar and Sparman (2014) who modeled the relationship between public investments and unemployment. To capture economic openness, foreign direct investment (FDI) and trade openness (OPEN) were considered. Hence the following function:

Unepl= f (EC, PRI, PUB, FDI, OPEN, RGDP).....(1)

From this functional relation, we have the equation:

$$Unepl_t = \alpha_0 + \alpha_1 PRI_t + \alpha_2 PUB_t + \alpha_3 RGDP_t + \alpha_4 EC_t + \alpha_5 OPEN_t + \alpha_6 FDI_t + \varepsilon_t \quad .....(2)$$

In equation (2) $Unepl$ represent the unemployment rate in percentage of total labor force; PRI is the gross fixed capital formation for private sector; PUB is the gross fixed capital formation for public sector; $RGDP$ represent the gross domestic product per capita in annual percentage; $OPEN$ is the ratio to real GDP of the summation of import and export; FDI measure net inflows of foreign direct investment, in percentage of GDP and EC which mesure economic credit is the domestic credit to private sector in percentage of GDP.

In this analysis, we use the Auto-Regressive Distributed Lag (ARDL) formulation. So, it will be possible to jointly estimate the model in the short-run and the long-run. Moreover, there will be no difficulty in taking into account variables both stationary in level (I (0)) and at first difference (I(1)) or cointegrated (Pesaran and Shin, 1999). In fact, the ARDL is more flexible and could be implemented when all the series are I(0), I(1) or both I(0)[1] and I(1) contrary to Engle and Granger (1987), Johansen test (1988) which requires that all the variables should be integrated at the first difference. Also, it takes into account the problem of the endogeneity of variables and remains applicable when some variables of the model are endogenous (Nkengfack and al, 2014). Therefore, our main equation (2) can be rewritten as follow:

$$\Delta Unepl_t = \alpha_0 + + \sum_{i=1}^{p} \alpha_{1i} \Delta Unepl_{t-i} + \sum_{i=0}^{q_1} \alpha_{2i} \Delta PUB_{t-i} + \sum_{i=0}^{q_2} \alpha_{3i} \Delta PRI_{t-i} + \sum_{i=0}^{q_3} \alpha_{4i} \Delta RGDP_{t-i} + \sum_{i=0}^{q_4} \alpha_{5i} \Delta EC_t + \sum_{i=0}^{q_5} \alpha_{6i} \Delta OPEN_{t-i} + \sum_{i=0}^{q_6} \alpha_{7i} \Delta FDI_t$$
$$+ \alpha_8 PUB_{t-i} + \alpha_9 PRI_{t-i} + \alpha_{10} RGDP_{t-i} + \alpha_{11} EC_{t-i} + \alpha_{12} OPEN_{t-i} + \alpha_{13} FDI_{t-i} + \mu_t \quad .....(3)$$

[1] According to Ouattara (2004), the main limitation of ARDL method is that it can't be applied when the order of integration is greater than 1.

Or, α_2,…….,α_7, are the short-run dynamics coefficients and α_8,…….,α_{13} the coefficients of long-run equilibrium.

In order to show the influence of real GDP on the relationship between foreign direct investment (FDI), trade openness (OPEN), public investment (PUB) and the unemployment rate (Unepl), we integrate progressively interactive variables $FDI * RGDP$; $PUB * RGDP$ and $OPEN * RGDP$ in equation 2. We obtain the following equations:

$$\Delta Unepl_t = \lambda_0 + \sum_{i=1}^{p} \lambda_{1i} \Delta Unepl_{t-i} + \sum_{i=0}^{q_1} \lambda_{2i} \Delta PUB_{t-i} + \sum_{i=0}^{q_2} \lambda_{3i} \Delta PRI_{t-i} + \sum_{i=0}^{q_3} \lambda_{4i} \Delta RGDP_{t-i} + \sum_{i=0}^{q_4} \lambda_{5i} \Delta EC_{t-i} + \sum_{i=0}^{q_5} \lambda_{6i} \Delta OPEN_{t-i} + \sum_{i=0}^{q_5} \lambda_{7i} \Delta FDI_{t-i} + \sum_{i=0}^{q_6} \lambda_{8i} \Delta (FDI * RGDP)_{t-i}$$
$$+\lambda_9 PUB_{t-i} + \lambda_{10} PRI_{t-i} + \lambda_{11} RGDP_{t-i} + \lambda_{12} EC_{t-i} + \lambda_{13} OPEN_{t-i} + \lambda_{14} FDI_{t-i} + \lambda_{15} (FDI * RGDP)_{t-i} + \mu_t \quad (4)$$

Where, λ_2,……., λ_8 are the short-run dynamics coefficients and λ_9,……., λ_{15}; the coefficients of long-run equilibrium.

$$\Delta Unepl_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta Unepl_{t-i} + \sum_{i=0}^{q_1} \beta_{2i} \Delta PUB_{t-i} + \sum_{i=0}^{q_2} \beta_{3i} \Delta PRI_{t-i} + \sum_{i=0}^{q_3} \beta_{4i} \Delta RGDP_{t-i} + \sum_{i=0}^{q_4} \beta_{5i} \Delta EC_{t-i} + \sum_{i=0}^{q_5} \beta_{6i} \Delta OPEN_{t-i} + \sum_{i=0}^{q_5} \beta_{7i} \Delta FDI_{t-i} + \sum_{i=0}^{q_6} \beta_{8i} \Delta (PUB * RGDP)_{t-i}$$
$$+\beta_9 PUB_{t-i} + \beta_{10} PRI_{t-i} + \beta_{11} RGDP_{t-i} + \beta_{12} EC_{t-i} + \beta_{13} OPEN_{t-i} + \beta_{14} FDI_{t-i} + \beta_{15} (PUB * RGDP)_{t-i} + \mu_t \quad (5)$$

Where, β_2,…..,β_8, are the short-run dynamics coefficients and β_9 ,……., β_{15} the coefficients of long-run equilibrium.

$$\Delta Unepl_t = \gamma_0 + \sum_{i=1}^{p} \gamma_{1i} \Delta Unepl_{t-i} + \sum_{i=0}^{q_1} \gamma_{2i} \Delta PUB_{t-i} + \sum_{i=0}^{q_2} \gamma_{3i} \Delta PRI_{t-i} + \sum_{i=0}^{q_3} \gamma_{4i} \Delta RGDP_{t-i} + \sum_{i=0}^{q_4} \gamma_{5i} \Delta EC_{t-i} + \sum_{i=0}^{q_5} \gamma_{6i} \Delta OPEN_{t-i} + \sum_{i=0}^{q_5} \gamma_{7i} \Delta FDI_{t-i} + \sum_{i=0}^{q_6} \gamma_{8i} \Delta (OPEN * RGDP)_{t-i}$$
$$+\gamma_9 PUB_{t-i} + \gamma_{10} PRI_{t-i} + \gamma_{11} RGDP_{t-i} + \gamma_{12} EC_{t-i} + \gamma_{13} OPEN_{t-i} + \gamma_{14} FDI_{t-i} + \gamma_{15} (OPEN * RGDP)_{t-i} + \mu_t \quad (6)$$

Where γ_2,…,γ_8 are coefficients of short-term dynamics and γ_9,……,γ_{15} the long-run equilibrium coefficients.

Before estimating our equation, we must test cointegration. In fact, several procedure for cointegration exist in the economic literature such as Engle and Granger (1987), Johansen test (1988), Johansen and Juselius test (1990) and recently, the Auto Regressive Distributed Lags (ARDL) approach to cointegration developed by Peseran and al. (1999; 2001). This study adopts the ARDL in order to fill the shortcomings of the other techniques. The procedure is based on the Wald-test (F-statistic). This test is currently a test of hypotheses of non-presence of cointegration among the variable (H_0) against the existence or presence of cointegration among the variables (H_1) such as shown below:

H_0: $\alpha_8 = \alpha_9 = \alpha_{10} = \alpha_{11} = \alpha_{12} = \alpha_{13} = 0$ (There is no cointegration among the variables)

H_1: $\alpha_8 \neq \alpha_9 \neq \alpha_{10} \neq \alpha_{11} \neq \alpha_{12} \neq \alpha_{13} \neq 0$ (There is cointegration among the variables)

We test the significance of the delay of the variable by taking into account the constraint of an error correction model (ECM). The asymptotic distribution of this test (Fisher's) is not standardized under the null hypothesis of no cointegration between the variables. Therefore, the calculated value of this statistic must, to validate or invalidated one of the hypotheses, be compared with the critical values established by the procedure of Pesaran and al. (2001). The lower critical bound assumes that all the variables are I(0) meaning that there is no cointegration relationship between the examined variables. The upper bound assumes that all the variables are I(1) meaning that there is cointegration among the variables. When the computed F-statistic is greater than the upper bound critical value, then H_0 is rejected (the variables are cointegrated). If the F-statistic is below the lower bound critical value, then H_0 cannot be rejected (there is no cointegration among the variables). When the computed F-statistics falls between the lower and the upper bound, then the results are inconclusive.

Thus, equation (3), (4), (5) and (6) in the ARDL version of the error correction model can be expressed as equation (7), (8), (9) and (10) respectively. If, there is cointegration, we can developed an Unrestricted error correction model (ECM) based on the procedure of Pesaran and al. (2001). The errors corrections version of ARDL model pertaining to the variables in equation (3), (4), (5) and (6) respectively are as follow:

$$\Delta Unepl_t = \alpha_0 + + \sum_{i=1}^{p} \alpha_{1i} \Delta Unepl_{t-i} + \sum_{i=0}^{q_1} \alpha_{2i} \Delta PUB_{t-i} + \sum_{i=0}^{q_2} \alpha_{3i} \Delta PRI_{t-i} + \sum_{i=0}^{q_3} \alpha_{4i} \Delta RGDP_{t-i} + \sum_{i=0}^{q_4} \alpha_{5i} \Delta EC_t + \sum_{i=0}^{q_5} \alpha_{6i} \Delta OPEN_{t-i} + \sum_{i=0}^{q_6} \alpha_{7i} \Delta FDI_t$$
$$+ \delta ECT_{t-1} + \varepsilon_t \quad (7)$$

$$\Delta Unepl_t = \lambda_0 + \sum_{i=1}^{p} \lambda_{1i} \Delta Unepl_{t-i} + \sum_{i=0}^{q_1} \lambda_{2i} \Delta PUB_{t-i} + \sum_{i=0}^{q_2} \lambda_{3i} \Delta PRI_{t-i} + \sum_{i=0}^{q_3} \lambda_{4i} \Delta RGDP_{t-i} + \sum_{i=0}^{q_4} \lambda_{5i} \Delta EC_{t-i} + \sum_{i=0}^{q_5} \lambda_{6i} \Delta OPEN_{t-i} + \sum_{i=0}^{q_5} \lambda_{7i} \Delta FDI_{t-i} + \sum_{i=0}^{q_6} \lambda_{8i} \Delta (FDI * RGDP)_{t-i}$$
$$+ \varphi ECT_{t-1} + \varepsilon_t \quad (8)$$

$$\Delta Unepl_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta Unepl_{t-i} + \sum_{i=0}^{q_1} \beta_{2i} \Delta PUB_{t-i} + \sum_{i=0}^{q_2} \beta_{3i} \Delta PRI_{t-i} + \sum_{i=0}^{q_3} \beta_{4i} \Delta RGDP_{t-i} + \sum_{i=0}^{q_4} \beta_{5i} \Delta EC_{t-i} + \sum_{i=0}^{q_5} \beta_{6i} \Delta OPEN_{t-i} + \sum_{i=0}^{q_5} \beta_{7i} \Delta FDI_{t-i} + \sum_{i=0}^{q_6} \beta_{8i} \Delta (PUB * RGDP)_{t-i}$$
$$+ \phi ECT_{t-1} + \varepsilon_t \quad (9)$$

$$\Delta Unepl_t = \gamma_0 + \sum_{i=1}^{p} \gamma_{1i} \Delta Unepl_{t-i} + \sum_{i=0}^{q_1} \gamma_{2i} \Delta PUB_{t-i} + \sum_{i=0}^{q_2} \gamma_{3i} \Delta PRI_{t-i} + \sum_{i=0}^{q_3} \gamma_{4i} \Delta RGDP_{t-i} + \sum_{i=0}^{q_4} \gamma_{5i} \Delta EC_{t-i} + \sum_{i=0}^{q_5} \gamma_{6i} \Delta OPEN_{t-i} + \sum_{i=0}^{q_5} \gamma_{7i} \Delta FDI_{t-i} + \sum_{i=0}^{q_6} \gamma_{8i} \Delta (OPEN * RGDP)_{t-i}$$
$$+ \rho ECT_{t-1} + \varepsilon_t \quad (10)$$

The term Error-correction (ECM), relates to the fact that last period deviation from long-run equilibrium (the error) influences the short-run dynamics of the dependent variable; thus, the coefficients of ECT, respectively $\delta, \varphi, \phi, \rho$ represent the speed of adjustment, because they measures the speed at which dependent variable returns to equilibrium after a change in explanatory variables. These coefficients ($\delta, \varphi, \phi, \rho$) must have negative sign and be significant to confirm cointegration relationship. If it is not the case, we will estimate only the short-run equation by using OLS method.

3.2. Data

Because of the lack of observations on unemployment, the data used are quarterly because the small size of our sample (n = 27 <30). They come from the World Bank's statistical database (World Development Indicator, 2018) and cover the period 1991T1-2017T4. In the model specification, credit to the economy (EC), foreign direct investment (FDI), trade openness (OPEN), public investment (PUB) and private investment (PRI) are taken as a ratio of GDP. For all our data, we used Denton's quarterly data method.

4. Results and discussions

This section presents the results of preliminary analysis on the variables (section 1) and ARDL estimation (section 2).

4.1. Preliminary analysis

Here, we present respectively the result of time series unit root tests, cointegration test, descriptive statistics and correlation matrix between the variables.

4.1.1. Unit root tests

The synthesis of these tests appears in Table 1 below. It can be noted that the test results of Augmented Dickey Fuller (1979) and Phillips-Perron (1988) converge. Among the variables selected, five (Unepl, PUB, PRI, FDI, OPEN) are stationary in first difference and the two others are in level (RGDP, EC). Because the majority of variables are stationary in first difference, it is necessary to check the cointegration between them.

Table 1: ADF and PP unit root tests

Variables	ADF		PP		Decision
	Probability		Probability		
	I(0)	I(1)	I(0)	I(1)	
Unepl	0.4687	0.0928*	0.5130	0.0123**	I(1)

OPEN	0.1109	0.0012***	0.3802	0.0151**	I(1)
PUB	0.7610	0.0467**	0.6298	0.0429**	I(1)
PRI	0.6509	0.0899*	0.8693	0.0060***	I(1)
RGDP	0.0005***	-	0.0133**	-	I(0)
FDI	0.2537	0.0060***	0.2193	0.0003***	I(1)
EC	0.0047***	-	0.0006***	-	I(0)

Note: ADF: Augmented-Dickey-Fuller; PP: Philips-Perron. *; **; *** represent respectively the significances level at 10%, 5% and 1%.
Source: Author's calculations from "Eviews 9"

4.1.2. Long-run cointegration test of Pesaran and al. (1999, 2001)

Still called " Bounds Cointegration test ", this test establishes the existence of a long-run relationship between the variables generated in the model. The objective of this test is to compare Fisher's calculated F-value at the critical intervals of Pesaran and Shin (1999) at the significance level of 1%, 5% and 10%. Table 2 below shows convergent results. In this table, we find that the tabulated Fisher values are all greater than the critical values at 5% threshold. Hence, the existence of a long-run relationship between the unemployment rate (Unepl) and the explanatory variables (PUB, PRI, FDI, RGDP, EC, OPEN).

Table 2: Bounds cointegration test

Estimated model	**Optimal lag**	**Value of F-statistics**	**Decision**
$Unepl = f(rgdp, pub, pri, fdi, open, ec)$	1	3.9236**	Cointegration
$Unepl = f(rgdp, pub, pri, fdi, open, ec, fdi * rgdp)$	1	3.4791**	Cointegration
$Unepl = f(rgdp, pub, pri, fdi, open, ec, pub * rgdp)$	1	3.4962**	Cointegration
$Unepl = f(rgdp, pub, pri, fdi, open, ec, open * rgdp)$	1	3.4837**	Cointegration

Critical values of Pesaran	**10%**		**5%**		**1%**	
	I(0)	**I(1)**	**I(0)**	**I(1)**	**I(0)**	**I(1)**
	2.2	3.09	2.56	3.46	3.29	4.37

Source: Author's calculations using "Eviews 9"

There is therefore sufficient evidence to reject the null hypothesis of no cointegration. In this respect, we can conclude the existence of a long-run relationship between the variables mobilized in the model. In addition, after performing a regression of the model by Least Ordinary Squares (OLS), the residuals of each estimate were captured. The results of stationarity tests performed on said residues are all stationary at level (I (0)).

4.2. ARDL estimation of the model

Before doing this estimation, it is necessary to proceed to the determination of the optimum ARDL models using Akaïke Information Criteria (AIC).

4.2.1. Determination of optimal ARDL model

In order to determine the optimal ARDL, the method of "Akaike Information Criterion" was raised. As can be seen, the optimal ARDL model (a, b, c, d, e, f, g, h) is that for which this criterion is minimum. Of course, the number of delays built into the estimate is not the same for all models. We could retain ARDL(2, 0, 0, 1, 0, 1, 0) for equation 3; ARDL(2, 4, 0, 4, 0, 0, 4, 1) for equation 4; ARDL(2, 4, 0, 4, 1, 1, 4, 0) for equation 5, ARDL(2, 0, 0, 4, 4, 1, 4, 4) for the sixth equation.

4.2.2. ARDL model estimate

In Table 3 below, we present the estimations of our model:

Table 3: Combined effect of economic openness and public investment on unemployment in Cameroon interacting with real GDP growth rate

	Dependent variable: Δ(Unepl)			
	Short-run dynamics coefficients			
Independent variables	*Estimation of Equation 3*	*Estimation of Equation 4*	*Estimation of Equation 5*	*Estimation of Equation 6*
Δ(EC)	-0.0065	0.0185	0.0357	-0.2064**
	(-0.5375)	(0.2629)	(0.4987)	(-2.5870)
Δ(FDI)	-0.01566	0.0076	-0.0723	-0.0444
	(-0.3128)	(0.2334)	(-1.3251)	(-0.8272)
Δ(PRI)	0.08259	0.1035	0.1078	0.0926
	(1.1929)	(1.0256)	(0.9939)	(0.8683)
Δ(PUB)	-0.00913	-0.0126	-0.0882*	-0.0121
	(-0.4151)	(-0.6155)	(-1.8481)	(-0.5344)
Δ(OPEN)	-0.00651	0.0019	-0.03009	**-0.0699****
	(-0.7007)	(0.1397)	(-1.3775)	**(-2.2354)**
Δ(RGDP)	-0.00205	0.0261	-0.0251	-0.0027
	(-0.1624)	(0.4871)	(-0.2876)	(-1.3905)
*Δ(FDI *RGDP)*		-0.0389		
		(-1.1424)		
*Δ(PUB*RGDP)*			**0.0311****	
			(2.1069)	
*Δ(OPEN*RGDP)*				**0.01077*****
				(3.6616)
ECT (-1)	**-0.05439****	**-0.1991****	**-0.1247 ****	**-0.1773****
	(-2.5407)	**(-2.8648)**	**(-2.6931)**	**(-2.6427)**
	Long-run equilibrium coefficients			
EC	-0.1085	**-0.2348*****	-0.1600	**-0.3354*****
	(-0.5057)	**(-3.2428)**	(-1.3643)	**(-3.5943)**
FDI	0.9721	**0.0383***	0.6693**	**0.4945****
	(1.3515)	**(1.7313)**	(2.2301)	**(2.5888)**
PRI	**-0.6981***	**-0.2605*****	**-0.7502*****	**-0.2695****
	(-1.8931)	**(-2.8340)**	**(-4.2108)**	**(-2.4644)**
PUB	-0.2009	-0.0635	**-0.1072***	0.0684
	(-0.4053)	(-0.6086)	**(-1.7670)**	(0.5435)
OPEN	-0.6501	-0.0586	0.09374	**-0.0930***
	(-0.4825)	(-1.3998)	(1.0654)	**(-1.6946)**
RGDP	-0.1365	0.0395	-0.6413	-1.1643***
	(-0.8147)	(0.4715)	(-1.3677)	(-2.9840)
*FDI*RGDP*		**-0.3493*****		
		(-5.2053)		
*PUB*RGDP*			**-0.2493****	
			(-2.0805)	
*OPEN*RGDP*				**-0.0389*****
				(-3.9114)
C	**9.8825***	**3.5403*****	**1.3920*****	**5.2215*****
	(1.7891)	**(9.6506)**	**(4.5653)**	**(7.6439)**
R^2	0.8126	0.8279	0.8202	0.8183
$\bar{R}^2$	0.7808	0.7995	0.7946	0.7891
	Models diagnostics			
Breusch Godfrey auto-correlation test	0.1881 **	0.1284 **	0.1094 **	0.1071 **

Jacques Bera normality test	2,055 (P-value: 0.3872)	2,549 (P-value: 0.3503)	2,324 (P-value: 0.3745)	2,287 (P-value: 0.3814)
ARCH heteroscedasticity test	0.2850 **	0.2241 **	0.2321 **	0.2682 **

Note *: *; **; *** represent the significances level at 10%, 5% and 1% respectively. The values in brackets are the t-student ratios of the coefficients*

Source*: Author estimations using "Eviews9"*

In Table 3 above, all estimates are made by the ARDL. It appears from the general diagnostics that there is no autocorrelation and heteroskedasticity, as the respective probabilities of Breusch Godfrey and ARCH are all above the 5% threshold. In addition, the distribution follows a normal distribution because the Jacque-Bera residues normality test have the probabilities values above the 5% threshold. All these tests allow us to approve the validity of the chosen model. In addition, this model is well adjusted because the coefficient of determination R^2 and the adjusted coefficient of determination $\bar{R}^2$ are both above 75%. From the estimation of the main model contained in column 1 of Table 3, the specific examination of the variables of interest (foreign direct investment, trade openness, public investment) shows that they do not contribute to a significant reduction in the unemployment rate in Cameroon in the short and long-run. These results are opposite to those obtained by Helpman and Itskhoki (2010), Janiak (2006). Among the explanatory variables, only private investments contribute significantly to the reduction of unemployment in Cameroon at 10% threshold in the long-run. In other words, an increase of 1% in private investment leads to a drop of unemployment at 0,6981% in the long-run. This result corroborates with that of Touna Mama et al. (2002) for which private investment is one of the key factors for growth in a country. For that first estimation, we remark that, the majority of coefficients are not significant when evaluating the unique effect of interest variables. This shows that there exist an indirect relationship between economic openness, public investment and unemployment. The interaction between variables of interest and real GDP growth is shown in columns 2, 3 and 4. Looking about interaction coefficient of these variables, we realize that the effect of the foreign direct investment, public investment and trade openness on unemployment depend on the level of real GDP.

In the short-run, public investment significantly reduce unemployment rate at 0,0571% ($\frac{\partial \Delta Unepl}{\partial \Delta pub} = -0{,}0882 + 0{,}0311\Delta GDP$); and trade openness at 0,05913% $\left(\frac{\partial \Delta Unepl}{\partial \Delta open} = -0{,}0699 + 0{,}01077GDP\right)$ when real GDP increase by 1%. Nevertheless, foreign direct investment contribute to unemployment reduction at 0,0313% ($\frac{\partial \Delta Unepl}{\partial \Delta fdi} = 0{,}0076 - 0{,}0389GDP$), but the result is not significant. Adopting the same reasoning in long-run, the results are more consistent. In fact, the unemployment significantly reduce by 0,311%, 0,3565% and 0,1319% respectively as the marginal effects of foreign direct investment, public investment and trade openness if real GDP rate increase by 1%.

5. Conclusion

At the end of our analysis, we were discussing the role of economic growth in influencing effects of economic openness and public investment on unemployment in Cameroon. The ARDL estimate shows that the unique effect of FDI, PUB and OPEN to the reduction of unemployment rate are not significant neither in the short-run, nor in the long-run. Whereas, the interaction of these variables of interest with GDP leads to the significant reduction of unemployment rate in the short-run and in the long-run. But, the result are more consistent in the long run than in the short-run when increasing the level of GDP because unemployment reduction are 0,311%; 0,3565% and 0,1319% respectively as the marginal

effects of foreign direct investment, public investment and trade openness if real GDP rate increase by 1%. So, the effect of economic openness and public investment depend on the level real GDP. Hence the need to boost the rate of growth to strengthen the benefits of economic openness and public investment on employment in Cameroon.

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Appendix

Tableau 6: Variables definition

Variables	Variables definitions (measurement)	Sources
OPEN	Trade opening (exports + imports/GDP)	World Bank (WDI, 2018)
PRI	Gross fixed capital formation, private sector (% of GDP)	World Bank (WDI, 2018)
FDI	Foreign direct investment, net inflows (% of GDP)	World Bank (WDI, 2018)
PUB	Gross fixed capital formation, public sector (% of GDP)	World Bank (WDI, 2018)
EC	Domestic credit to private sector (% of GDP)	World Bank (WDI, 2018)
RGDP	Real GDP (GDP per capita growth, annual %)	World Bank (WDI, 2018)