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**Foreign direct investment, three main sectors of
the economy and economic growth:
Evidence from West African Countries**

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Abstract. The study investigates the effect of foreign direct investment (FDI) on economic growth in 9 West African countries namely; Burkina-Faso, Cote d'Ivoire, Ghana, Guinea Bissau, Liberia, Niger, Nigeria, Senegal and Sierra Leone. Using panel data econometrics for the period 2000-2016, we found empirical evidence that suggests that the effect of FDI on economic growth is negative and statistically significant. Our results show that neither foreign direct investment nor the primary sector of economy (PSE) of this region are not an adequate mechanism to accelerate economic growth in West African countries. While, the secondary and tertiary sectors of economy of the region have a positive effect and statistically significant to explain the growth.

Keywords. Foreign direct investment, Sectors of the economy, Economic growth, Panel data, West African Countries.

JEL. C23, F62, N17.

1. Introduction

Foreign Direct Investment is an international movement of capital made to create, develop or maintain a subsidiary abroad or to exercise control or significant influence over the management of a foreign company.

The economic sector is a grouping of activities that appear to be similar. There are three main economic sectors: The first sector is the primary sector and all activities whose purpose is the exploitation of natural resources which includes: agriculture, fisheries, forests, mines and deposits. The second is the secondary sector which includes activities consisting of a more or less sophisticated transformation of raw materials (manufacturing industries, construction). Lastly, the tertiary sector which constitutes of activities that are complementary to agricultural and industrial activities such as trade, transport, financial activities, services provided to businesses, services rendered to private individuals, accommodation-catering, real estate, information-communication for the tertiary merchant

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and for the tertiary non-market are public administration, teaching, human health, social action according to English economist Colin Clark: "The conditions for economic progress" (1947).

Economic growth is an increase in the capacity of an economy to produce goods and services, compared from one period of time to another.

West Africa region is all countries settled in the west part of Africa, characterized by a wide range of ecosystems and production systems. Estimated at 372 million people in 2017, this region is among the region of Africa which benefits from foreign direct investment. According to the African Development Bank, services are the dominant sector in West Africa, since in the key countries, services contribute most to GDP as 37% (in Liberia and Sierra Leone, however, agriculture remains dominant). Across all countries in the region, manufacturing's share in GDP is the lowest of any sector. Manufacturing's highest share in the region is in Cote d'Ivoire, about 18 percent of GDP in 2017. In most West African countries, manufacturing is confined to light industry processing primary products and producing consumer goods. The agricultural sector is also a neglected sector in Africa and especially in the West Africa region. However, the majority of the labor force is in the agricultural sector, it has 65% of employment and gross domestic product (GDP) of 35% according to West Africa Agricultural Productivity Program (WAAPP). Foreign direct investment (FDI) flows to Africa has slumped to \$42 billion in 2017, a 21% decline from 2016, according to UNCTAD's World Investment Report 2018.

The purpose of this study is to examine the causal linkage between foreign direct investment and economic growth using panel data approach over the period 2000-2016 to observe the contribution of foreign direct investment to economic growth through the three main sectors of economic activity. This study allows us to take stock of what is preventing West Africa from advancing despite the many foreign direct investments the region is getting and the strengths it has in all economic sectors in these West African countries namely; Burkina-Faso, Cote d'Ivoire, Ghana, Guinea Bissau, Liberia, Niger, Nigeria, Senegal and Sierra Leone.

Several scientific studies have focused their research on FDI and economic growth in developing countries, in sub-Saharan Africa or in one country only, but rarely in the West Africa region based on major sectors economic. For this reason, our research is moving towards West Africa, looking for the relationship between FDI and the economic sector and growth. This research is important for this region because these countries have many assets and could also have a self-financing capacity; we want to examine the state of economic growth in this region and what contributes to it.

For this study, we process with panel data method, by using two models: fixed effect model (FEM) and random effect model (REM). To identify what is better to be used in the analysis between these three models, we use two tests: first test is apply Hausman test (1978), for choosing between FEM and REM. The second test is to use Breusch and

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Pagan Lagrangian multiplier or LM test which allows us to choose between a random effects regression and a simple OLS regression. The remainder of the paper is organized as follows: Section 2 provides a review of the literature regarding the FDI-growth. Section 3 outlines the model, data and econometric methodology. Section 4 discusses the empirical results. Finally, Section 5 summarizes the main findings of the study and provides some policy recommendations.

2. Literature review

Pelinescu, &Radulescu, (2009) found that most specialists think that FDI had a positive impact upon the economic growth in the receiving countries. They showed that it was a direct relation between the FDI flows (as percent of the GDP) and the growth of GDP per capita not just for the developed countries, but also for most of the developing countries. In this way, the countries that had attracted an important FDI volume had the highest economic growth rates. Since the early '60s of the 20th century, the times with the most intense foreign investment activities had coincided with a sudden increase in the macroeconomic indicators (especially the GDP). They concluded that only direct foreign investments would allow the re-specialization of the economy to surpass the situation of maintaining on the world markets only with food products and raw materials. Their experience shows that FDI substantially enhanced the national economies' re-specialization processes all over the world. They share the opinion of those specialists who affirm that FDI plays a determinant role in re-specializing the transition economies and in increasing the export potential. Also, FDI growth leads to increase in the manufactured production quantity, examining some structural changes which occurred under the influence of FDI in the economies of new European Union member states (the Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Slovakia, and Slovenia) and in South-East Europe, they draw also the attention upon the changes in the export potential of those countries.

In their study, Dritsaki, & Stiakakis (2014) featured on the relationship between foreign direct investments, exports, and economic growth in Croatia using annual time series data for the period 1994-2012. Several econometric models, including the bounds testing (ARDL) approach and the ECM-ARDL model were employed. The results confirm a bidirectional long run and short run causal relationship between exports and growth in order to offer new perspectives and insight for a new policy in Croatia for a sustainable economic growth.

Iamsiraroj & Ulubaşoğlu (2015) show several theories have been advanced on the beneficial effect of foreign direct investment (FDI) on economic growth. However, mixed empirical findings have resulted in a long-standing debate. They explore the global FDI-growth relationship through an 'informed' econometric analysis predicated on substantial guidance obtained from a detailed investigation of 880 estimates reported in 108 published studies. With model uncertainties alleviated and the core

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specification benchmarked against the aforementioned assessment, our econometric analysis, utilizing a global sample of 140 countries in the period 1970 to 2009, conclusively documents that FDI positively affects economic growth. Moreover, they find that this association holds globally as strongly as in the developing world as well as it is regional variation rather than within-country variation, and contemporaneous FDI rather than past FDI, which matters for growth. Finally, appropriate absorptive capacity indicators for positive growth are identified to be trade openness and financial development rather than schooling.

Seyoum, & Lin (2015) use annual balanced panel data to examine the Granger causal link between foreign direct investment (FDI) and economic growth (measured by real GDP growth) for 23 African countries covering the period from 1970 to 2011. Using recently developed panel econometric techniques, the present paper takes into account non-stationary and cross-section dependency in the dataset when analyzing the growth-FDI nexus. Their findings indicate two-way Granger causality link between FDI and economic growth. They showed that this causal link is not homogeneous among individual countries in the sample. More specifically, they observed unidirectional causality from FDI to GDP growth in Egypt, Gabon, and Mauritania, and from GDP growth to FDI in Côte d'Ivoire, Kenya, South Africa and Zambia. Their main finding remains robust to estimation between FDI as a fraction of gross capital formation and real GDP growth.

Anyanwu, & Yameogo (2015) analyze drivers of foreign direct investments (FDI) to West Africa using a panel dataset from 1970 to 2010. OLS and GMM techniques are used for the estimations. The main results indicate that there is a U-shaped relationship between economic development and FDI inflows to West Africa. In summary: (i) The quadratic element of real per capita GDP, domestic investment, trade openness, first year lag of FDI, natural resources (oil and metals) endowment and exports, and monetary integration have positive and significant effect on FDI inflows to West Africa; and (ii) there is a negative relationship between FDI inflows to the sub-region and loan component of ODA, economic growth, level of economic development (real GDP per capita), life expectancy, and domestic credit to the private sector.

Alvarado & Ponce (2017) examine the effect of foreign direct investment (FDI) on economic growth in 19 Latin American countries. Using panel data econometrics, they found robust empirical evidence that suggests that the effect of FDI on economic growth is not statistically significant in aggregated form. This result varies when they incorporate the levels of development reached by the countries in the region. FDI has a positive and significant effect on product in high-income countries, while in upper-middle-income countries the effect is uneven and non-significant. Finally, the effect in lower-middle-income countries is negative and statistically significant. Their findings show that FDI is not an adequate mechanism to accelerate economic growth in Latin America, with the exception of high-income countries.

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Sunde (2017) examines economic growth as a function of foreign direct investment and exports in South Africa, applying the autoregressive distributed lag model, known as the ARDL bounds testing approach to cointegration for the long run relationship between economic growth, foreign direct investment and exports. The error correction model was used to examine the short run dynamics; and the VECM Granger causality approach was used to investigate the direction of causality. It confirmed cointegration between economic growth, foreign direct investment and exports; it also indicates that both foreign direct investment and exports spur economic growth contrary to some studies, which found that FDI does not cause economic growth. The VECM Granger causality analysis found unidirectional causality between economic growth and foreign direct investment running from foreign direct investment to economic growth, unidirectional causality between foreign direct investment and exports running from foreign direct investment to exports and bidirectional causality between economic growth and exports. Its result confirms the FDI-led growth hypothesis for South Africa. On the policy front, the government could stimulate foreign direct investment through incentives to investors, creation of a good macroeconomic environment and a careful utilization of loose monetary policy to grow the economy.

Lin & Benjamin (2018) examine the interactions between economic growth, energy consumption and foreign direct investment among other factors using a panel dynamic ordinary least squares model for Mexico, Indonesia, Nigeria and Turkey (MINT), because they are emerging economies, have large population and favorable demography with high expectation for strong economic growth. To make the analysis more homogenous, these interactions were examined for individual country and as a group from 1990 to 2014 and coefficients of their long run economic growth function estimated. They found that there exist a bi-directional causal relationship between economic growth, energy consumption and FDI inflows for Mexico, a bi-directional causal relationship between economic growth and energy consumption, between economic growth and FDI inflows, and an unidirectional causal relationship from FDI to energy consumption for Indonesia as well as exist a bi-directional causal relationship between economic growth and energy consumption, between economic growth and FDI inflows, and an unidirectional causal relationship from FDI to energy consumption for Nigeria while Turkey had a bi-directional causal relationships between economic growth, energy consumption and FDI inflows. They conclude that diversification of economy to improve labor productivity is encouraged and over reliance on fossil fuel should be minimized.

Another study by Bermejo & Werner (2018) went to show that, it is often asserted with confidence that foreign direct investment (FDI) is beneficial for economic growth in the host economy. Empirical evidence has been mixed, and there remain gaps in the literature. The majority of FDI has been directed at developed countries. Single-country studies are needed,

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due to the heterogeneous relationship between FDI and growth, and because the impact of FDI on growth is said to be largest in open, advanced developed countries with an educated workforce and developed financial markets (although research has focused on developing countries). They fill these gaps with an improved empirical methodology to check whether FDI has enhanced growth in Spain, one of the largest receivers of FDI, whose gross domestic product growth was above average but has escaped scrutiny. During the observation period 1984–2010, FDI rose significantly, and Spain offered ideal conditions for FDI to unfold its hypothesized positive effects on growth. The results are robust and clear: The favorable Spanish circumstances yield no evidence for FDI to stimulate economic growth. The Spanish EU and euro entry are also found to have had no positive effect on growth. The findings call for a fundamental rethinking of methodology in economics.

Makiela, & Ouattara (2018), in their study, went to show that, the impact of foreign direct investment (FDI) on growth remains a thorny question for researchers and policy makers. At the theoretical level, it has been argued that, FDI is growth enhancing. However, existing empirical studies have left researchers and policy makers perplexed as these studies do not appear to find a strong relationship between the two variables. The findings, based on a sample of developed and developing countries over the period 1970–2007, conclusively reveal that FDI affects growth via inputs accumulation but not the total factor productivity growth channel. In addition, they suggest that factors other than FDI may have contributed to the increase in productivity witnessed in developing countries in recent decades.

3. Data set and model

The data from this study are taken from the World Bank website. The dataset used consists of 153 observations for West African countries from 2000 to 2016. The countries studied are Burkina-Faso, Cote d'Ivoire, Ghana, Guinea Bissau, Liberia, Niger, Nigeria, Senegal and Sierra Leone. A number of countries that could have been included in the sample were omitted for lack of sufficient data on some of the selected variables. This choice was not arbitrary because data from a single international source can overcome the challenges of convincing database methods and approaches.

The variables used for the empirical analysis in this study are: Dependent variable: Gross domestic product (GDP). Independent variables: Foreign Direct Investment (FDI), Labor Force Participation Rate (LFPR), Gross Fixed Capital formation (GFCF), Population Growth Rate (POGR), Primary Sector (PES), Secondary Sector (SSE) and Tertiary Sector (TSE).

The standard fixed effects (FE) and random effects (RE) regression models are used for the estimation. Fixed Effect assumes that, an element in the country, firm or company can have an impact or bias predictor or outcome variables and needs to be controlled. This is the reason behind the

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hypothesis of correlation between the entity's error term and the predictor variables. Fixed Effect suppresses the effect of these invariant characteristics over time, so that the net effect of the predictors on the outcome variable can be evaluated. In addition, time-invariant characteristics are unique to the individual and should not be correlated with other individual characteristics. Each entity is different, so the error term of the entity and the constant (which captures individual characteristics) should not be correlated with others.

Unlike the fixed effects model, random effects assume that the variation between features is random and uncorrelated with the predictor or independent variables included in the model. However, the Hausman test is used to decide on the appropriate model between Fixed Effect model and Random Effect model. The Hausman test therefore, tests the null hypothesis that the preferred model is the random effects. If the random effects and regressors are not correlated, we estimate the random effects model. On the other hand, if they are correlated, the fixed effects model would be appropriate. If the Hausman statistic is less than its critical value, we do not reject the null hypothesis that the regressors and the random effects are not correlated.

The relationships between variables were quantified using powerful econometric tools. To explore the relationship between foreign direct investment (FDI) and economic growth, the following empirical model was estimated.

$$LGDP_{it} = \alpha_i + \beta \times FDI_{it} + \sum_k \gamma^k \times control_{it}^k + \mu_{it} \quad (1)$$

where $LGDP_{it}$ is the logarithm of the gross domestic product per capita, which is a measure of a country's economic output that accounts for its number of people. FDI_{it} is an independent variable that denotes foreign direct investment, net inflows (% of GDP), which refers to the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. $control_{it}^k$ is a vector of k other control variables considered as traditional determinants of economic growth, Labor Force Participation Rate (LFPR), Gross Fixed Capital formation (GFCF), Population Growth Rate (POGR), Primary Sector (PES), Secondary Sector (SSE) and Tertiary Sector (TSE).

Therefore, it subscript stands for the i -country's observation value at time t for the individual variable. α_i stands for country specific factors which were not considered in the regression but it may differ across country but not within the country while the time is constant. μ_{it} is a random error term: $E(\mu_{it}) \sim N(0, \sigma^2)$.

4. Empirical findings

4.1. Pairwise correlation

The pairwise correlation outputs are shown in Table 1 below reports

Table 1. *Pairwise correlation*

	LGDP	FDI	LFPR	GFCF	POPG	PSE	SSE	TSE
LGDP	1							
FDI	-0.2716	1						
LFPR	-0.4034	-0.1705	1					
GFCF	-0.0191	0.1079	0.0128	1				
POGR	-0.4998	0.0718	0.2903	0.1885	1			
PSE	-0.6728	0.2136	0.1774	-0.0908	0.2664	1		
SSE	0.7808	-0.2840	-0.1072	0.1807	-0.3364	-0.7713	1	
TSE	0.5025	-0.0389	-0.2623	-0.1179	-0.1825	-0.8043	0.3892	1

Source: Author's computations

Pairwise correlation as presented in Table 1 show that LGDP is negatively related to foreign direct investment, labor force participation rate, gross fixed capital formation, population growth and primary sector of the economy. However, economic growth is positively related to secondary sector of the economy and to tertiary sector of economy. Among all variables, secondary sector of the economy is the most highly correlated with GDP while the least variable is gross fixed capital formation.

4.2. Pooled OLS regression estimations

We use Pooled OLS regression to derive unbiased and consistent estimates of parameters even when time constant attributes are present. The results are presented in Table 2.

Table 2. *Pooled OLS regression estimations (Dependent variable GDP per capita)*

Variable	Coef.	Std. Error	t-statistics	p-value
FDI	-.0016	.0005078	-3.25	0.001
LFPR	-.0073	.0011892	-6.19	0.000
GFCF	-.0013	.0014747	-0.88	0.379
POPG	-.0759	.0196541	-3.86	0.000
PSE	.0065	.002297	2.87	0.005
SSE	.0317	.0031088	10.21	0.000
TSE	.0111	.0026406	4.21	0.000
Cons	2.289	.2607174	8.78	0.000
R-squared	0.79			
Prob > F	= 0.0000			

Source: Author's own calculation

The Pooled OLS regression results indicated in Table 2, foreign direct investment, labor force participation rate and population growth have a negative impact and appear to be statistically significant to explain the economic growth. While, the gross fixed capital formation has a negative effect on economic growth and is not significant. Our three sectors of

economy such as primary sector, secondary sector and tertiary sector have a positive impact and significance to economic growth.

4.3. Hausman test

To decide between fixed or random effects we run a Hausman test where the null hypothesis is that the preferred model is random effects; the alternative hypothesis is that, the model is fixed effects.

Table 3. Hausman test results

Variable	Fixed	Random	Difference	Standard Error
FDI	-.0001306	-.0009335	.0008029	.
LFPR	-.0198604	-.011932	-.0079284	.0008244
GFCF	-.0014123	-.00053	-.0008823	.
POGR	.0006586	-.0180004	.018659	.
PSE	-.0062695	-.00446	-.0018095	.
SSE	-.0051655	.0043359	-.0095014	.
TSE	-.003695	.0001256	-.0038206	.

Test: Ho: Difference in coefficients not systematic (Random in appropriate); chi2(3) = 13.58; Prob > chi2 (*p*-value) = 0.06

Source: Author's own calculation

According to Table 3, the *p*-value is 0.06 greater than 5% so, we cannot reject the null hypothesis, meaning that Random effects Model is appropriated model for our study.

4.4. Random effects model

In our estimation, we use LGDP as a dependent variable and seven other explanatory variables such as foreign direct investment, labor force participation rate, gross fixed capital formation, population growth rate and primary, secondary, tertiary sector. The Random Effects estimation has been used after running the Hausman test whose findings were not significant, hence we accept the null hypothesis, that Random Effects model is appropriate (see Table 3). The results of the random effects estimation are reported in Table 4.

Table 4. Random effects estimates (Dependent variable GDP per capita)

Variable	Coef.	Std. Error	<i>t</i> -statistics	<i>p</i> -value
FDI	-.0009335	.0003543	-2.63	0.008
LFPR	-.011932	.0018944	-6.30	0.000
GFCF	-.00053	.0011112	-0.48	0.633
POGR	-.0180004	.0143027	-1.26	0.208
PSE	-.00446	.0022052	-2.02	0.043
SSE	.0043359	.0029053	1.49	0.136
TSE	.0001256	.0022771	0.06	0.956
Cons	3.764118	.2699709	13.94	0.000
R-sq: within	= 0.3011		rho	= 0.39
between	= 0.6076		Prob > chi2	= 0.0000
overall	= 0.5809			

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The results of the regression in Table 4 above show that the secondary and tertiary sector variables have positive effects on economic growth with very low participation. In addition to that, they are not statistically significant at the 5% level, indicating that these sectors have no influence on economic growth. As for the variables: primary sector, labor force participation, FDI negatively affects economic growth but is nevertheless statistically significant at the 5% level, which means that these variables influence the economic growth of the West African region. The variables for population growth and gross fixed capital formation are negative and statistically insignificant at the 5% level, which implies that whenever the government's expenditure and the population increase, the level of economic growth decreases.

This result shows that one percentage change in independent variable leads to β_i percentage change in the dependent variable. In this case, an increase in FDI by 1% is related to -.0009335% decrease in a specific region's growth, which means that FDI negatively influence economic growth in West Africa countries' economies. Similarly, for the three sectors such as primary, secondary and tertiary, there is also a negative correlation with economic growth, but unlike the other two sectors, the primary sector is significant for influencing economic growth.

4.5. Breusch and Pagan Lagrangian multiplier (LM) test for random effects

The LM test helps us decide between a random effects regression and a simple OLS regression. The null hypothesis in the LM test is that variance across entities is zero. This is no significant difference across units (i.e. no panel effect).

Table 5. Breusch and Pagan LM test results

LGDP	Var	Sd=sqrt(Var)
e	.0756094	.0749716
u	.0021784	.0466729
Test: Var(u)=0	.0013922	.0373126
Chibar2(1) = 94.33		
Prob > chibar2 = 0.0000		

Source: Own elaborations by authors

According to Table 5, when the probability value is 0.000, we reject the null hypothesis and conclude that the random effect is appropriate. It means that we have succeeded in rejecting the null value and concluding that the random effects are appropriate. This implies that there is evidence of significant differences between countries; therefore, you can run a random effect.

5. Conclusion remarks and policy implications

The study aimed to examine the causal link between foreign direct investment and economic growth over the period 2000-2016 in West

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African countries, namely; Burkina Faso, Côte d'Ivoire, Ghana, Guinea Bissau, Liberia, Niger, Nigeria, Senegal and Sierra Leone, using the data panel method measured by LGDP as dependent variable, and a number of independent variables, such as Foreign Direct Investment (FDI), Labor Force Participation Rate (LFPR), Gross Fixed Capital Training (GFCF), Population Growth Rate (POGR), Primary Sector (PES), Secondary Sector (SSE) and Tertiary Sector (TSE) in nine (9) countries in West Africa countries.

The study notes that foreign direct investment in West African countries negatively influences economic growth. An augmentation of FDI is a decline in economic growth. In the same way, for the three economic sectors, they do not affect the economic growth of the region. Good governance and careful testing should be put in place by the governments of the region on the choice of foreign direct investment and their partner, in order to properly filter and evaluate the interest generated by each foreign direct investment, if it is compatible to the need of the region or not. ECOWAS countries need to showcase foreign direct-investor investments where the foreign investor works closely with the local community by maximizing job creation and technology transfer. Similarly, they should fight corruption by adopting good governance to encourage the good investor to invest in the region and finally adopt a favorable policy for an equitable foreign investment where the two contracting parties are a win-win.

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