Do Capital Inflows and Financial Development, Influence Economic Growth in West Africa? Further Evidence from Transmission Mechanisms

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ABSTRACT: This study investigates the channels through which shocks from foreign capital inflows and financial development are transmitted to economic growth in the ECOWAS region using quarterly data for the period between 2000 and 2017. The work adopted the panel vector autoregressive (pVAR) model in a generalized method of moments (GMM) framework to actualize its objective. The empirical results show that foreign direct investment (FDI), net domestic credit (CRE), and economic growth (ECG) all have significant relationships with each other, while gross capital formation (GCF), labour force (LF), and foreign aid (AID) have significant relationships with FDI, CRE and ECG. Furthermore, FDI and CRE have negative relationship with economic growth in the short run but have positive impulse response functions with economic growth in the long run. FDI and CRE exhibit positive relationship between themselves in the short run and negative relationship in the long run. Thus, the study recommends concerned policy makers to pursue financial deepening and enact credible policies that strengthen the financial system.

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In addition, a conducive socio-economic environment should be actively maintained so as to attract the required foreign capital inflows. Finally, more efforts should be made towards the establishment of a single monetary union, as it is likely to further strengthen the region and improve the trade among the member-countries. This should lead to further growth within the region.

JEL classification: F21, F36, F38, F43, G15, O16.

Keywords: Foreign Capital Inflows, Financial Development, Investment, Economic Growth, ECOWAS.

1 Introduction and motivation

Capital is an important variable for the growth of any economy. Foreign capital refers to the net capital sourced from outside the country. Foreign capital influence can come in various ways, either via an interest-free capital or with interest. Foreign capital serves as a major supplement to fill the gap in resource flows created by inadequate domestic capital flows, though some schools of thought argue that it is detrimental to domestic investment as it can crowd it out (Orji et al., 2019a). According to Ajide and Eregha (2014) and Anthony-Orji et al. (2018a), FDI is one of the major sources from which a country, especially developing country, can finance and sustain long-term growth. Orji et al. (2014) and Orji et al. (2019a) also posit that foreign aid, which is critical component of foreign inflows, can positively contribute to growth in host countries if conditions are favourable.

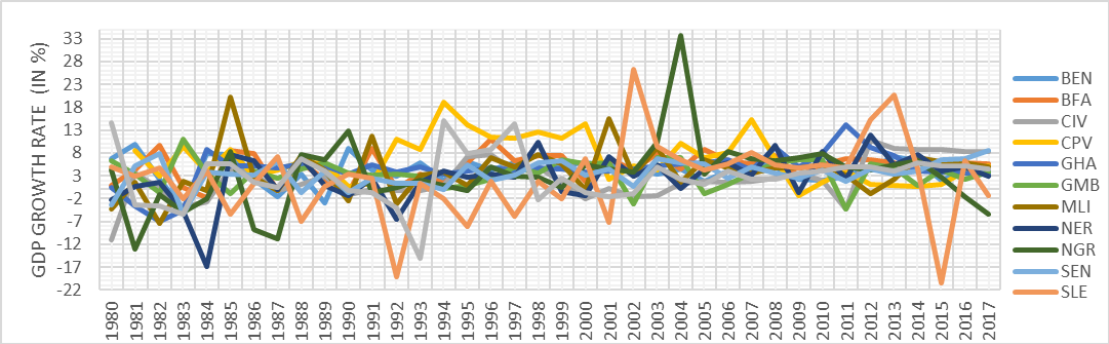
Financial development can refer to an increased supply of financial assets in addition to the level of ease of assessment of the financial assets in an economy (Anthony-Orji et al., 2021). The measure of financial development used in this study is the net domestic credit as a percentage of gross domestic product. Domestic credit is the amount of credit accessible to the economy from within the economy. Domestic credit often comes in the form of credit to private sector or in the form of banking sector credits, and both are usually given by the banking sector. The larger the amount of credit given the higher the level of financial development in an economy. According to Eze et al. (2016), domestic credit is a financial deepening indicator as it shows the amount of savings that the private sector mobilizes for investment, i.e., shows the extent of financial intermediation. Economic growth on the other hand, refers to the increase in the market value of goods and services produced in an economy over time and is measured by the output growth in an economy over a period. An economy is said to be experiencing economic growth when there is a positive change in output produced in an economy over the specified period due

to an increase in its productive capacity either through an increase in its technological capacity or through an increase in its infrastructural capacity. Economic growth has often been used as an indicator for soundness in a system or economy (Anthony-Orji et al., 2017).

According to financial development theories, financial deepening indicates that domestic credit accessed by the private sector increases. Financial deepening can lead to an increase in the net inflow of foreign capital as investors will find the economy attractive for investment (Azam, 2013; Adeniyi et al., 2012). If an economy attracts more inflow, it can lead to an increase in its capital stock, and given that the institutions are good and strong, it should translate to infrastructural development in key areas such as power or transport. This leads to a drastic reduction in the cost of production, which improves the business environment, which eventually leads to the economic growth.

It is pertinent to note that the economic growth in the Economic Community of West African States (ECOWAS) region has not be stable over the years. Figure 1 shows that many ECOWAS economies have experienced fluctuations in their output growth between 1980 and 2017.

Figure 1: GDP growth rate (%) for selected ECOWAS countries (1980-2017)



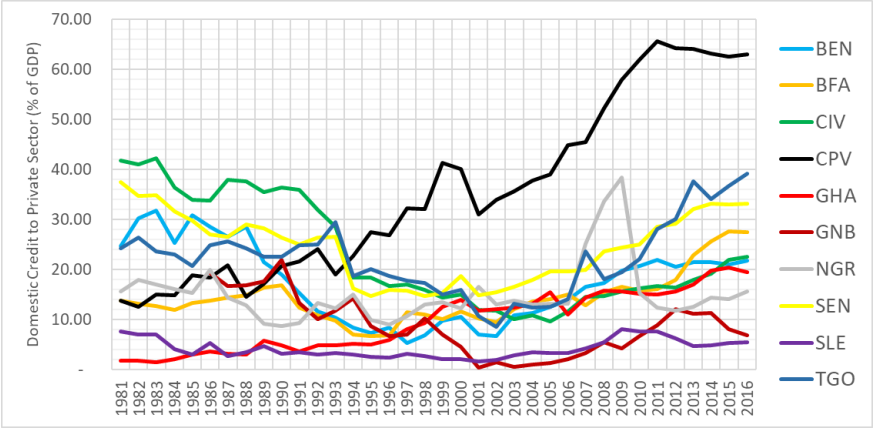
This lends credence to the assumption that ECOWAS economies do not have stabilized economies. For instance, Sierra Leone experienced recession (-20%) in 2015 while experiencing a growth rate of 6.28% in 2016. In addition, most ECOWAS economies exhibit similar growth rates which can be due to the similarities in their economies with respect to nature of exports and imports, nature of the domestic industrial sector among others. This has prompted various ECOWAS economies to look for ways to improve the economy and minimize the impact of external shocks on the domestic economy.

It has been argued that one channel that would engender development in their economies is capital investment or infrastructural investment. However, the fact that capital does not flow into financially repressed economies means that the national authorities need to attract foreign capital through the dismantling the international capital flows barriers. This is done in order to shorten the ever-widening gap between the current capital stock and the capital requirements caused by perpetual budget deficit and inadequate capital investment from the private domestic sector. Following the directive of the Bret-

ton Woods institutions (World Bank and International Monetary Fund); all ECOWAS member-countries liberalized their respective economies in the 1980s and early 1990s. Yet, one might argue that even though the ECOWAS member-countries liberalized their economies, the strength of this liberalized financial sector is still not certain. Again, the effect of the liberalized financial sector is yet to be felt optimally.

Even though the ECOWAS region has tried to undergo financial integration through the establishment of the Monetary Unions (UEMOA and WAMZ), the foreign capital flow into the region is still below expectation. This can be also observed in the African continent as whole. For example, statistics from the UNCTAD (2017) show that "over the past three decades or more, the values of capital inflows have fluctuated between $430.6 million in 1982 and $4,449 million in 2016. In general, there was a global decline in FDI inflows between 2015 and 2016, except in North America, which showed increase from $389,914 million in 2015 to $424, 825 million in 2016. Comparatively, in 2016, Europe was the highest global recipient of FDI inflow ($532,994). This was followed by Asia ($442,665), North America ($424,825) and Africa ($59,373). Hence, it is clear that the amount of capital inflow into the African continent was lower compared to other region".

Figure 2: Domestic credit to private sector as a ratio of GDP for selected ECOWAS countries (1981–2016)



Source: World Bank (2017).

Figure 2 shows that the financial deepening indicator (credit to private sector as a ratio of GDP) was also quite unstable across the ECOWAS countries. Although ECOWAS communities liberalized their economies, the liberalization did not produce the expected results since the financial sectors are still not optimum. Figure 2 also shows that the financial sector-deepening indicator (though unstable) indicates an upward trend, but the economic growth rate as presented in Figure 1 is yet to tow that pattern as it still heavily fluctuated in recent years.

The literature suggests that there is a clear relationship between financial development, financial openness, foreign capital flows, economic growth and other macroeconomic performance (Orji and Mba, 2011; Azam, 2013; Agbélénko and Kibet, 2015; Orji et al.,

2016; Anthony-Orji et al., 2018b; Orji et al., 2019a). However, the transmission channels through which foreign capital flows and financial development affect economic growth have not been resolved empirically.

Hence, the objective of this paper is to determine the channels through which shocks from foreign capital inflows and financial development are transmitted to economic growth in the ECOWAS region using quarterly data for the period between 2000 and 2017. The data sources are CBN Statistical Bulletin (Various Issues), World Bank Development Indicators (2017), International Financial Statistics (IFS) and United Nations Conference on Trade and Development (UNCTAD) data (2017). The following part of this paper is divided into four sections. Section 2 presents the literature review. Section 3 describes the methodology of the study. Section 4 contains the results and discussion. This paper ends with conclusions and policy recommendations in Section 5.

2 Empirical literature

A number of empirical studies attempted to look at foreign capital inflows and economic growth. Many studies looked at how financial development affected the growth in the ECOWAS region as a whole. A few studies tried to look at the impact of foreign capital development and financial development on economic growth yet studies on the channels of transmission among these core variables were relatively scare.

Looking at the relationship between capital flows, financial development and economic growth, Nzotta and Okereke (2009) examined the impact of financial deepening on economic development in Nigeria between 1986 and 2007. The study made use of secondary annual data, two-stage least squares method, trend analysis and nine explanatory variables including a financial deepening index. The results showed that the Nigerian financial deepening index was low over the years. They suggested that an effective financial intermediation had not been sustained in the financial system, especially in the area of credit allocation and the high level of monetization of the economy. Nwanna and Chinwudu (2016) investigated the effect that financial deepening had on the Nigerian economy between 1985 and 2014 using OLS technique while adopting the supply-leading hypothesis. The study indicated a positive and significant impact of both the bank-based and stock market financial deepening proxies on growth. In another study, Ndebbio (2004) looked at the relationship between financial deepening and economic growth and development among selected sub-Saharan African countries and pointed out that lack of growth of output was caused by a shallow financial depth.

Furthermore, Agbélénko and Kibet (2015), while studying financial development and economic growth in the WAEMU, between 1981 and 2015, using the GMM, discovered that there existed a bidirectional causality between financial development and growth and that financial development positively and significantly affected growth. This also lends credence to an earlier work done by Esso (2010). While examining the causal and co-

integrating relationship between financial development and economic growth in ECOWAS using data for the period between 1960 and 2005, he discovered that Liberia, Cote d'Ivoire, Burkina Faso, Sierra Leone, Cape Verde, and Ghana showed co-integrating relationship between financial development and growth. The work also suggested that while financial development 'led' growth in Mali and Ghana, the reverse was true for Cote d'Ivoire, Burkina Faso, and Sierra Leone. In addition, a bi-directional causality was found to have run in Liberia and Cape Verde. The study concluded that in the countries where finance 'leads' growth, priority should be given financial reforms and for countries that observe the reverse situation, the priority should be to promote growth. Ajide and Eregha (2014) investigated the relationship between foreign direct investment and economic freedom in the ECOWAS region using panel data analysis. The results suggested that ECOWAS countries should engage in promoting and monitoring a sound financial system while restricting unfettered business freedom and simultaneously sanctioning copyrights, patents, and franchise abuse in order to attract foreign direct investment.

Chiwira et al. (2016) looked at the relationship between financial development, integration, inclusion, and economic growth in SADC between 1980 and 2011. The result showed that the direction of causality between financial development and growth is uncertain. In the SADC region, the most banked countries were South Africa, Mauritius, Botswana, and Namibia; in addition, the South African economy exerted a significant influence on the performance of the financial sector of the region while Angola, Democratic Republic of Congo, Lesotho, and Madagascar had no stock exchanges. The study recommended that if the sole objective of a country looking at financial development, integration, and inclusion was to increase its growth, then it ought to prioritize empirical tests and ensure the presence of an enabling economic and socio-political environment.

To sum up, previous studies dealt mostly with foreign capital inflows and growth (Adofu, 2010; Nkoro and Uko, 2012; Orji et al., 2014, 2016, etc.) or the relationship between financial development and growth (Olayiwola et al., 2014; Jallohi, 2011; Ndebbio, 2004; Agbélénko and Kibet, 2015; Esso, 2010, etc.). This study is distinct on a few counts. First, it looks at the foreign capital inflow-financial development-economic growth linkage. Secondly, it adopts a panel VAR approach to determine the channels through which these variables are transmitted to growth.

3 Methodology

3.1 Model

In order to determine the channels through which shocks from foreign capital inflows and financial development are transmitted to growth in selected ECOWAS economies using quarterly data series for the period between 2000 and 2017, we proceed as follows.

To form the panel vector autoregressive model (panel VAR) for ECOWAS countries,

we let Y_{it} denote a vector of regressands, X_{it} denote the vector of K regressors for country i (as $i = 1, \ldots, N$), both at time t ($t = 1, \ldots, T$) and $Y_{it} = Y'_{1t}, \ldots, Y'_{NT}$. Therefore, equation (1) is a system of linear equations that represents a k-variate panel VAR for country i with panel-specific fixed and time effects:

$$Y_{it} = \Omega_1 Y_{it-1} + \cdots + \Omega_{p-1} Y_{it-p+1} + \Omega_p Y_{it-p} + X_{it}\beta + \psi_i + \lambda_t + \mu_{it} \tag{1}$$

where: Ω_p is a $G \times NG$ matrix for each lag $p = 1, \ldots, p$, β is an $F \times NG$ parameter matrix for K regressors to be estimated, ψ_i is a regressor-specific fixed effect (whose inclusion depends on the application), λ_t is a regressor's time effect and μ_{it} is a vector of idiosyncratic errors which are uncorrelated overtime and distributed as $N(0, \Sigma_{ii})$ with Σ_{ii} in the covariance matrices of order $G \times G$. In addition, we define $\text{Cov}(\mu_{it}, \mu_{jt}) = E(\mu_{it}, \mu_{jt}) = \Sigma_{ij}$ as the covariance matrix between the errors in pVARs of countries i and j. We refer to the above equation as the unrestricted panel VAR. We assume that the innovations exhibit the following characteristics: $E(\mu'_{it}\mu_{is}) = 0$, $\forall$ all $t > s$.

However, the unrestricted pVAR is generalized and one country's lagged variables can affect any other country's current variables, i.e., lagged values of country 1 variables can influence the current variables of country 2. In addition, there are no restrictions on the magnitude of such influences, i.e., events in country 1 can have different impacts in country 2 and yet a different impact in country 3. Moreover, the error covariance matrices which model the contemporaneous relationships are unrestricted, i.e., country 1 shocks could be strongly correlated with that of country 2 but weakly correlated with that of country 3. Unrestricted pVARs such as in Equation 1, can suffer from over-parameterization due to the high dimensionality of the parameter space (Koop and Korobilis, 2016).

Table 1: Possible specification restrictions in pVARS

Names	Restriction	No. restrictions imposed
No DIs from country k to j	$\Omega_{1,jk} = \cdots = \Omega_{p,jk} = 0$	$N(N-1)$
No SIs between countries k and j	$\Sigma_{jk} = 0$	$\frac{N(N-1)}{2}$
No CSH between countries k and j	$\Omega_{jj} = \Omega_{kk} \forall$ and $p = 1, \ldots, p$	$\frac{N(N-1)}{2}$

One strand of the macro VAR literature uses shrinkage and model selection methods to deal with such high dimensional parameter space. For instance, Bańbura et al. (2010) uses the Minnesota prior (Litterman, 1986) to estimate VARs of large dimension and on irrelevant coefficients, it imposes shrinkage towards zero. In addition, in this strand of literature, applications of the bayesian model average (BMA) just restrict each individual coefficient to be zero (or not). Although pVAR has varieties of restrictions of interest, which reflect the panel nature of the data, conventional large VAR approaches usually

ignore it. Hence, treating pVAR different from the conventional standard methods might be beneficial. An excellent survey of the various restrictions their respective implications are collected in Table 1 (Canova and Ciccarelli, 2013; Koop and Korobilis, 2016).

Dynamic interdependencies (DIs) refer to linkages across countries through pVAR coefficients and this means, based on Equation 1, that endogenous variables for each country are dependent on lags of endogenous variables for every country studied. Since our interest is to investigate the existence or non-existence of DIs, i.e., estimating a restricted pVAR, we formally define DIs between countries j and k, and partition the pVAR coefficient matrices for $p = 1, \ldots, p$ into $G \times G$ matrices $\Omega_{p,jk}$, in order to control whether lags of country k dependent variables enter the VAR for country j.

Static independencies are modelled through the error covariance matrix and $\Sigma_{jk} = 0$, infers that there are no SIs between countries j and k. However, the restrictions in SIs are always symmetric in contrast to the DI restrictions. For instance, if there are SIs from Nigeria to Ghana, they also exist from Ghana to Nigeria.

Cross-section heterogeneities occur provided there are differences in VAR coefficients across countries. Such homogeneity occurs between two countries if $\Omega_{jj} = \Omega_{kk}$ for $j \neq k$ and $p = 1, \ldots, p$.

As said above, our focus is on the approach of Love and Zicchino (2006) for two reasons. Firstly, it is simple to use and it is the only method that has publicly available Stata files. Secondly, this approach imposes that the slope coefficients are the same for all cross sections. Therefore, it shuts down most of the possible dynamic interdependencies and instead it is conceptually closer to taking an average (though not mathematically identical) of the slope coefficients. A big advantage of this approach is that it results in a number of feasible parameters to estimate and makes pVARs more suitable than individual VARs across each cross section.

3.2 Modelling foreign capital inflows and financial development shocks on economic growth

Expressing the functional relationship for the variables of interest, we have:

$$\mathrm{ECG}_{it} = f\left(x_{it}^{\beta}\right) \tag{2}$$

where: X_{it} is a 6×1 vector of regressors $\forall$ all $i = 1, \ldots, N$ and $t = 1, \ldots, T$, such that $X_{it} = (\mathrm{GCF}_{it}, \mathrm{CRE}_{it}, \mathrm{FDI}_{it}, \mathrm{LF}_{it}, \mathrm{AID}_{it}, \mathrm{OPEN}_{it})$, and β is a $D \times 6$ matrix of coefficients to be estimated. Then we introduce an idiosyncratic error term in order to accommodate for factors that affect the regressands:

$$\mathrm{ECG}_{it} = f\left(X_{it}^{\beta}\mu_{it}\right) \tag{3}$$

where: X is a matrix of all regressors, β is a vector of coefficients, and μ is an error term. Taking the natural log of (3) to linearize the function and express in a panel model form, in a matrix form, we get:

$$\ln \mathrm{ECG}_{it} = \ln \varphi_i + \beta_i \ln X_{it} + \ln \mu_{it} \tag{4}$$

Further, we express (4) in a panel VAR model form, in a vector form, we get:

$$\ln \mathrm{ECG}_{it} = \ln \varphi_i + \delta_p \ln \mathrm{ECG}_{it} + \beta_i \ln X_{it-p} + \ln \mu_{it} \tag{5}$$

Further, we introduce in (5) the panel individual-specific fixed effect ψ_i and time effect λ_t and, thus, express in panel VAR form:

$$\ln \mathrm{ECG}_{it} = \ln \varphi_i + \delta_p \ln \mathrm{ECG}_{it-p} + \gamma_p \ln X'_{it-p} + \beta \ln X_{it} + \psi_i + \lambda_t + \ln \mu_{it} \tag{6}$$

$$\ln X'_{it} = \ln \psi_i + \gamma_p \ln X'_{it-p} + \beta \ln X_{it} + \delta_p \ln \mathrm{ECG}_{it-p} + \psi_i + \lambda_t + \ln \mu_{it} \tag{7}$$

where: φ_i is a constant, $X'_{it} = (\mathrm{CRE}, \mathrm{FDI})$ and $X_{it} = (\mathrm{GCF}, \mathrm{LF}, \mathrm{AID}, \mathrm{OPEN})$.

Where ECG is economic growth rate or GDP per capita growth, CRE is net domestic credit to the private sector in an economy, which is the sum of the net domestic credit in an economy. LF is the labour force, which is proxied by the total labour force following Eze et al. (2016). FDI is the foreign direct investment, which shows the net capital inflows used for investment in the host country. GCF is the gross domestic investment, proxied by the gross capital formation. This refers to the present stock of capital or investment in an economy. AID is foreign aid proxied by the net official development assistance and net official aid following Orji et al. (2014). This should exhibit a positive relationship with economic growth as it adds to the stock of capital. OPEN is trade openness and it shows the amount of trade carried out by an economy with others. It is the value of exports plus imports as a ratio of the GDP. ECG is the Economic activity proxied by GDP per capita and it shows the economic performance of an economy over a period, usually a year. Positive economic growth has been often been used as an indicator for soundness in a system or in an economy (Orji et al., 2019b; Orji, 2012).

3.3 Estimation procedure

3.4 Generalized method of moments (GMM) estimation

Various GMM estimators are said to be able to get consistent estimates of the panel VAR equation especially in fixed T and large N settings. According to Anderson and Hsiao (1982), given the assumption of serially uncorrelated errors, we can consistently estimate the first-difference transformation using the equation-by-equation method by instrumenting lagged differences with differences and levels of Y_{it} from earlier periods. However, the problem of the first difference estimator is that it magnifies the gap in

unbalanced panels. For instance, if some Y_{it-1} are not available, then time t and $t-1$ first-differences are likewise missing. Moreover, as the lag order of the panel VAR increases, the necessary periods each panel observes increases. For instance, instruments in levels for a second-order panel VAR require that $T_i \geq 5$ realizations are observed for each subject.

Forward orthogonal deviation, as proposed by Arellano and Bover (1995) as an alternative transformation, does not share the weakness of the first-difference transformation as it subtracts the average of all available future observations, instead of using deviations from past realizations, thus, minimizing data loss. Past realizations remain valid instruments since they are not included in the transformation. Potentially, in the forward orthogonal deviation, only the most recent observation is not present in estimation. For example, only $T_i \geq 4$ realizations are necessary to have instruments in levels when estimating a second-orders panel VAR.

According to Holtz-Eakin et al. (1988), while equation-by-equation GMM estimation of the model can yield consistent estimates of panel VAR, estimating it as a system of equations may result in efficiency gains. Suppose the common set of $L \geq kp+l$ instruments is given by the row vector Z_{it}, where $X_{it} \in Z_{it}$, and equations are indexed by a number in superscript. Consider the following transformed panel VAR model based on equation (7) but represented in a more compact form:

$$Y_{it}^{*} = X_{it}\beta_i + \varepsilon_{it} \tag{8}$$

$$Y_{it}^{*} = \left[y_{it}^{1*} y_{it}^{2*} \dots y_{it}^{k-1*} y_{it}^{k*}\right] \tag{9}$$

$$Y_{it}^{*} = \left[X_{it-1}^{*} X_{it-2}^{*} \dots X_{it-p+1}^{*} Y_{it-p}^{k*} Z_{it}^{*}\right] \tag{10}$$

$$\varepsilon_{it}^{*} = \left[\varepsilon_{it}^{1*} \varepsilon_{it}^{2*} \dots \varepsilon_{it}^{k-1*} \varepsilon_{it}^{k*}\right] \tag{11}$$

$$\Omega' = \left[\Omega_1' \Omega_2' \dots \Omega_{p-1}' \Omega_p' \beta'\right] \tag{12}$$

where the asterisk (*) denotes some transformation of the original variable. If the original variable is denoted as m_{it} then, while the first difference transformation implies that $m_{it}^{*} = m_{it} - m_{it-1}$, the forward orthogonal deviation $m_{it}^{*} = \left(m_{it} - m_{it}^{\zeta}\right)\sqrt{T_{it}/\left(T_{it}+1\right)}$ where T_{it} is the number of available future observations for panel i at time t, and m_{it}^{ζ} is the average. Suppose that we stack observations over panels then over time. The GMM estimator is given by:

$$\Omega = \left(Y^{\zeta^{*}'} X W^{\zeta} X' Y^{\zeta^{*}}\right)^{-1} \left(Y^{\zeta^{*}'} X W^{\zeta} X' Y^{*}\right) \tag{13}$$

where: W^{ζ} is an $L \times L$ weighting matrix assumed non-singular, symmetric and positive semi-definite. If we assume that $E\left[X'\varepsilon\right] = 0$ and rank $E\left[Y^{\zeta^{*}'} X\right] = kp + l$, the GMM estimator is consistent. However, we can select the weighting matrix W^{ζ} in order to maximize efficiency (Hansen, 1982).

Estimating the model (system of equations) jointly makes cross-equation hypothesis testing straightforward, as we can carry out the Wald parameter tests based on the GMM

estimate of Ω and its covariance matrix. In addition, we can also carry out the Granger causality test, which has the null hypothesis that all coefficients on the lag of variable m are jointly zero in the equation for variable n.

3.5 Lag selection and impulse response functions

Choosing the optimal lag order in panel VAR specification and moment condition is a major criterion for a successful panel VAR analysis. Therefore, we focus on the autoregressive structure of the panel VAR, following Lütkepohl (2005) and Hamilton (1994) who both argue that if all moduli of the companion matrix Ω^{ζ} are strictly less than one, then the VAR model is stable.

A panel VAR that is invertible is stable if it has an infinite-order vector moving-average (VMA) representation and therefore, can provide known interpretation to estimated impulse-response functions and forecast error variance decompositions. Rewriting the model as an infinite vector moving-average, we can compute the simple impulse-response function Φ_i:

$$\Phi_i = \begin{cases} I_k & \text{and } i = 0 \\ \sum_{j=1}^{i} \Phi_{t-j\Omega_j} & \text{and } i = 1, 2, \ldots \end{cases} \tag{14}$$

There is no casual interpretation for the simple IRFs. A shock on one variable will probably be followed by shocks in other variables since the innovations ε_{it} are correlated contemporaneously. Suppose we have a matrix P, such that $P'P = \Sigma$. Then we can use P to orthogonalize the innovations as ε_{it}^{P-1} and thus, transform the VMA parameters into the orthogonalized impulse-responses $P\Phi_i$. The matrix P imposes identification restrictions on the system of dynamic equations. Although Sims (1980) proposed using the Cholesky decomposition of Σ to impose a recursive structure on a VAR, the decomposition is not unique as it depends on the ordering of variables in Σ.

The cross-equation error variance-covariance matrix and the asymptotic distribution of the panel VAR parameters can analytically be used to derive the impulse-response function confidence intervals. Alternatively, the Monte Carlo simulation and bootstrap resampling method could be used to estimate the confidence interval. Our study estimated impulse-response functions and also adopted forecast error variance decompositions.

4 Results and discussion

4.1 Data

In this study, the data on the variables of interest were sourced from World Bank Development Indicators (2017). The data runs from 2000Q1 to 2017Q4. 14 ECOWAS countries were selected due to the availability of data. Table 2 summarises the data collected.

Table 2: Summary of variables

Variable	Description
ECG	ECG is economic growth rate
GDPCI or ECGGR	GDP per capita growth
CRE and CREGR	CRE is net domestic credit to the private sector in an economy, which is the sum of the net domestic credit in an economy; CREGR is growth rate net domestic credit to the private sector
LF	LF is the labour force, which is proxied by the total labour force, following Eze et al. (2016)
FDI and FDIGR	FDI is the foreign direct investment, which shows the net capital inflows used for investment in the host country; Orji et al. (2021a) and Orji et al. (2021b) suggests that it has a priori positive influence on growth; FDIGR is growth rate of foreign direct investment
GCF and GCFGR	GCF is the gross domestic investment, proxied by the gross capital formation; this refers to the present stock of capital or investment in an economy; GCFGR is the growth rate of gross domestic investment
AID and AIDGR	AID is foreign aid proxied by the net official development assistance and net official aid following Orji et al. (2014); this should exhibit a positive relationship with economic growth as it adds to the stock of capital; AIDGR is the growth rate of foreign aid
OPEN	OPEN is trade openness and it shows the amount of trade carried out by an economy with others; it is the value of exports plus imports as a ratio of the GDP; OPENGR is the growth rate of trade openness

4.2 Descriptive analysis and trends

Table 3 shows that the average value of GDPCI is \$2080.22. It has a minimum value of \$1889.91 and a maximum of \$3230.94. This shows that there is a wide disparity between the values, which is due to differences in the various economies. Domestic credit has an average value of \$5.488 billion with a minimum of \$49.253 and a maximum of \$124 billion. This also suggests wide disparities, which is due to individual country differences. The foreign direct investment inflows has a mean value of \$183 million with a minimum of −\$385 million and a maximum of \$2.05 billion. Gross domestic investment has a mean value of \$1.58 billion with a minimum value of −\$13.30 million and a maximum value of \$22.70 billion across the entire panel. Labour force has an average value of 6.926 million people with a minimum of 149.697 thousand people and a maximum of 59.6 million people. Official development assistance and foreign aid averaged \$291 million in the entire sample period with a minimum of −\$97.5 million and a maximum value of \$3.04 billion, while trade openness has an average value of 17.89% with a minimum value of −3.95% and maximum value of 81.13%.

Table 3: Panel descriptive statistics

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
GDPCI	1008	2080.2276	187.7718	1889.90918	3230.9423
CRE	1008	5,480,000,000	17,100,000,000	49253.92	124,000,000,000
FDI	940	183,000,000	333,000,000	-385,000,000	2,050,000,000
GCF	1008	1,580,000,000	3,440,000,000	-13,300,000	22,700,000,000
LF	1008	6,926,937	11,800,000	149,697.2	59,600,000
AID	1007	291,000,000	400,000,000	-97,500,000	3,040,000,000
OPEN	1000	17.89375	9.28628	-3.95	81.13

4.3 Presentation of results - diagnostic tests

Section 4.3.1 presents the unit root test for the variables.

4.3.1 Unit root tests

This study uses the Im-Pesaran-Shin unit root tests as integrated in panel models.

Table 4: Im-Pesaran-Shin unit root test results

Variables	p-values (5%)	Integration order	Variables	(5%)	Integration order
ECG	0.0000	I(0)	ECGGR	0.0000	I(0)
LCRE	0.0000	I(1)	CREGR	0.0000	I(0)
LFDI	0.0000	I(1)	FDIGR	0.0000	I(0)
LGCF	0.0021	I(0)	GCFGR	0.0000	I(0)
LLF	0.0204	I(1)	LFGR	0.0186	I(0)
LAID	0.0003	I(0)	AIDGR	0.0000	I(0)
LOPEN	0.0000	I(2)	OPENGR	0.0000	I(1)

4.4 Panel VAR results

4.4.1 Lag selection

The procedure for choosing a lag length on the pVAR is done using a set of moment selection criterions and the results are collected in Table 4. While comparing the various information criterions, we concluded that the optimal lag length was lag two on 1/28 instrument lags. As a rule to thumb, we begin by choosing the specification that satisfies the Hansen's J statistics (i.e., the p-value must be greater than 5% so as to not reject the null hypothesis of valid over-identifying restrictions), which tests for the over-identifying restrictions in the model specifications criterion. This means that the specification first

needs to pass this test before choosing between the lag length that minimizes the MBIC, MAIC and MQIC. However, most often, we choose the lag length from the MAIC criterion, which is supported by Ng and Perron (2001). The over-identifying restrictions are valid since the Hansen's J-statistic is 0.3562723 at lag one and 0.3408482 at lag two.

Tables 5 and 6 present moment order lags selection iterations at different lags and the estimation output using the optimal lag lengths and the number of lag instruments. We note that 1/30 instruments gave the results using the first through the thirty-second lagged dependent variables as instruments.

Table 5: The optimal lag selection for regressands at lag (2)

Lag	CD	J-stat.	p-value	MBIC	MAIC	MQIC
1	0.7961104	271.2297	0.3187795	-1327.313	-250.7703	-674.805
2	0.7968039	260.6397	0.3408482	-1282.78	-243.3603	-652.7731

Table 5 shows that the optimal lag length selected is given by the lowest MBIC, MAIC & MQIC criterion, which is at lag one as it has the lowest MBIC, MAIC & MQIC. Given the above, the panel vector auto-regression results in a generalized method of moments framework must be examined. The results are presented below. However, the regression shall be estimated using two lags for it is on these lags that the pVAR is stable. Hence, the optimum lag is at lag two.

Table 6 shows the panel VAR regression results for foreign direct investment, financial development and growth. The second, third and fourth columns show the impact of shocks on the log of the growth rate of domestic credit, economic performance and foreign direct investment in the ECOWAS region.

The relationship between the GDP per capita growth (ecggr) and other variables suggests that the second lag of the growth rate of economic performance is negatively related to its first lag. This means that a standard deviation shock on the second lag will significantly decrease the growth rate in lag one by 2%. This in turn, might increase the log of economic performance by 60.9% all at 99% confidence interval.

A one standard deviation shock on domestic credit at lag two might increase the domestic credit growth rate by 3.8% in lag one; however, it is not significant. In addition, should a shock occur at lag one of domestic credit, it will significantly reduce the growth rate of economic performance by 21.5% at 99% confidence interval. Thus, a negative relationship exists between domestic credit and economic performance.

A shock on foreign direct investment inflows at lag two will increase its value at lag one by 3.14%, which, in turn, will reduce the growth rate of economic performance by 5.33% though not significantly. This reduction will in turn reduce that of foreign direct investment inflows by 9.4% at 99% confidence interval. Thus, a negative relationship exists between foreign capital investment and economic growth.

Furthermore, an increase in the gross capital formation (in millions of dollars) will

Table 6: pVAR results using GMM 1/28 instrument lags for ECOWAS region

pVAR	ECG	LCRE	LFDI
L1.ecggr	0.6090101***	-0.0488646***	-0.0940794***
	(0.0243601)	(0.0081408)	(0.0189964)
L2.ecggr	-0.0203583	0.0585892***	-0.1205219***
	(0.0109204)	(0.0056267)	(0.0274016)
L1.cregr	-0.2149615***	0.6843964***	0.3667188***
	(0.035544)	(0.0387894)	(0.0689528)
L2.cregr	0.0382058	0.0274574	-0.2296415**
	(0.0222206)	(0.0236232)	(0.0788161)
L1.fdigr	-0.0053366	0.0172073***	0.4211391***
	(0.0046674)	(0.0039423)	(0.0345244)
L2.fdigr	0.0031475	0.0095761***	-0.0283679
	(0.0028965)	(0.0028864)	(0.05564)
gcfgr	0.2152175***	0.1759512***	-0.3936591***
	(0.028706)	(0.0136973)	(0.0698315)
lfgr	-6.955889***	9.829251***	-18.2018***
	(1.443006)	(0.8917814)	(3.340214)
aidgr	0.0445914	-0.0399984***	0.3934623***
	(0.0155564)	(0.0094738)	(0.0465841)
open	-0.0003443	-0.000127	-0.0006297
	(0.0005125)	(0.0002155)	(0.0009741)

No. of Obs = 474. No. of Panels = 13. Hansen J-Statistics (252) = 262.73686 ($p = 0.308$). Standard errors in parentheses (). Legend: * $p < 0.01$; ** $p < 0.05$; *** $p < 0.001$.

significantly increase economic performance growth by 21.52%, showing a positive relationship between gross domestic investment and economy growth. A negative relationship exists between the logs of the growth rate of labour with that of economic performance. This is because a percentage increase in the labour force will significantly decrease economic performance by 6.955% at 1% level of significance.

Looking at the domestic credit, a shock on the domestic credit at its second lag will insignificantly increase its value in the first lag by 2.7%. This shock will in turn increase the log of the growth rate of domestic credit (in millions of dollars) by 68.43% at a 99% confidence interval.

A one standard deviation shock on economic performance at lag two will increase its value at lag one by 5.85%, which will in turn decrease the value of net domestic credit by 4.88% all at 1% confidence interval. Thus, a negative relationship exists between domestic credit and economic performance. A shock in the foreign direct investment inflows at its lag two will engender an increase in its lag one by 0.9%, which will in turn increase the value (in millions of dollars) of domestic credit by 1.7%. This will in turn increase foreign direct investment inflows by 36.6%, therefore showing a positive

relationship between domestic credit and foreign direct inflows.

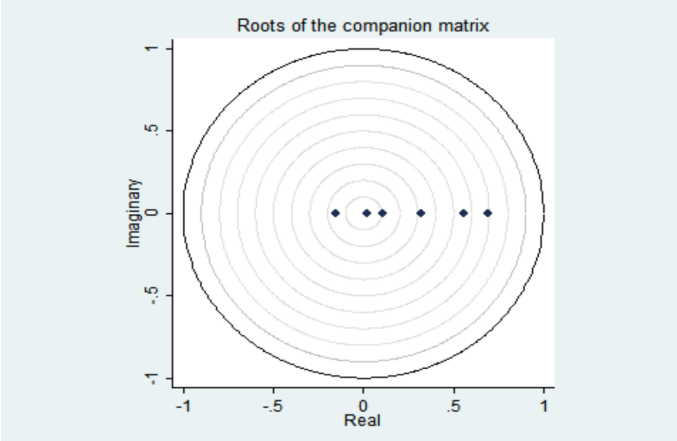
Moreover, an increase in the gross capital formation (in millions of dollars) will significantly increase domestic credit by 17.6%, showing a positive relationship between gross domestic investment and economy growth. A positive relationship exists between the growth rate of labour with that of domestic credit. This is because a percentage increase in the labour force will significantly increase net domestic credit by 9.82% at 1% level of significance. Increase in the foreign aid will significantly increase domestic credit by 4% at 1% level of significance.

A one standard deviation shock on foreign direct investment inflows at lag two will decrease its value at lag one by 2.8%, which will in turn increase its value (in millions of dollars) by 42.11%. A shock at economic performance at lag two will lead to a decrease in value in its lag one by 12.05% which will in turn lead to a further decrease in foreign direct investments inflows by 9.4% all at 1% confidence interval. Thus, a negative relationship exists between foreign direct investments and economic performance. A shock in the domestic credit at its lag two will decrease its value at lag one by 22.96%, which will in turn increase the value (in millions of dollars) of foreign direct investment inflows by 36.67%. Thus showing a positive relationship between domestic credit and foreign direct inflows.

An increase in the gross capital formation (in millions of dollars) will significantly decrease the foreign direct investment inflows by 39.37% at 1% confidence interval, showing a negative relationship between gross domestic investment and economy growth. Increase in the foreign aid will significantly increase domestic credit by 39.35% at 1% level of significance. Finally, negative relationship exists between the logs of the growth rate of labour with that of foreign direct investment. This is because a percentage increase in the labour force will significantly decrease net domestic credit by 18.2% at 1% level of significance.

4.4.2 Stability test results

Figure 3: Stability test results



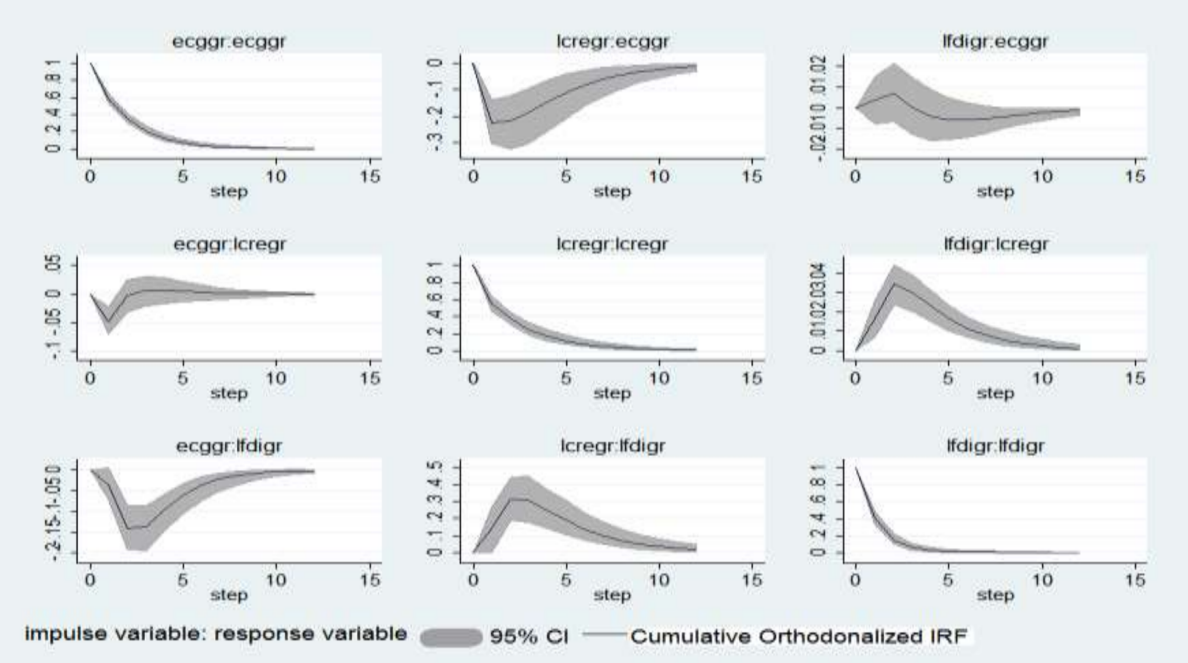
The diagram above shows that all eigenvalues lie inside the unit circle. Therefore, the pVAR satisfies the stability condition meaning that any form of forecasting done with the model is reliable.

4.4.3 Impulse response functions for financial development, foreign capital inflows and growth in ECOWAS

Figure 4 shows the impulse response functions for economic performance (ECGGR), domestic credit (CREGR) and foreign direct investment inflows (FDIGR).

For the response of growth rate of economic performance to itself, from period 0 to 5, it declined sharply, then it remained stable from period 5 (quarter 1 in the second year) to period 12 (quarter 4 in year 4). Therefore, it can be concluded that a one standard deviation shock (innovation) on the economy will cause a decline in its economic performance in the short run and maintain a stable level in its long run.

Figure 4: Impulse response functions for financial development, foreign capital inflows and growth in ECOWAS



For the response of log of growth rate of economic performance to that of domestic credit, from period 0 to 2, the growth rate of economic performance decreased sharply, it then increased sharply from period 3 to period 4 when it then maintained a gradually increase to period 6. It became stable until period 12 (year 4 quarter 4). Therefore, it can be concluded that a one standard deviation shock (innovation) on domestic credit will cause economic performance to decrease sharply in the short run, cause a sharp increase in the middle periods, then stabilize and die down in the long run.

For the response of growth rate of economic performance to that of foreign direct

investment, from period 0 to 2, there was a sharp decline in the value of economic performance, it remained stable from period 2 to period 3, and then it increased sharply until period 7 in which it then stabilized and died out in the 12th period. Therefore, it can be concluded that a one standard deviation shock (innovation) on foreign direct investment will cause economic performance to decrease sharply in the short run, stabilize for a period, then increase sharply while stabilizing in the long run.

In column two, for the response of growth rate of domestic credit to that of economic performance, from period 0 to 1, the growth rate of domestic credit decreased sharply, it then increased sharply from period 2 to period 7 when it then maintained a gradually increase to period 8. It became stable until period 12 (year 4 quarter 4). Therefore, it can be concluded that a one standard deviation shock (innovation) on economic performance will cause domestic credit to decrease sharply in the short run, cause a sharp increase in the middle periods, then increase gradually in the long run before stabilizing.

For the response of growth rate of domestic credit to itself, from period 0 to 6, it declined sharply, then it remained stable from period 6 (quarter 2 in the second year) to period 12 (quarter 4 in year 4). Therefore, it can be concluded that a one standard deviation shock (innovation) on the domestic credit will cause it to decline in the short run and maintain a stable level in its long run.

For the response of log of growth rate of domestic credit to that of foreign direct investment, from period 0 to 2, there was a sharp increase in the value of domestic credit, it remained stable from period 2 to period 3, and then it decreased sharply until period 7 in which it then stabilized and died out in the 12th period. Therefore, it can be concluded that a one standard deviation shock (innovation) on foreign direct investment will cause domestic credit to increase sharply in the short run, stabilize for a period, and then decrease sharply while stabilizing in the long run.

In column three, for the response of log of growth rate of foreign direct investment to that of economic performance, from period 0 to 2, the log of growth rate of foreign direct investment increased sharply, it then decreased sharply from period 2 to period 4 when it then gradually decreased to period 5 and then gradually rose until it evened out in period 12 (year 4 quarter 4). Therefore, it can be concluded that a one standard deviation shock (innovation) on economic performance will cause foreign direct investment to increase sharply in the short run, cause a sharp decline in the middle periods, and then increase gradually in the long run before evening out.

For the response of log of growth rate of foreign direct investment to that of domestic credit, from period 0 to 3, there was a sharp increase in the value of foreign direct investment, and then decreased sharply until period 7 in which it then stabilized and died out in the 12th period. Therefore, it can be concluded that a one standard deviation shock (innovation) on domestic credit will cause foreign direct investment to increase sharply in the short run, and then decrease sharply while stabilizing in the long run.

For the response of growth rate of foreign direct investment to itself, from period 0 to 4,

it declined sharply, then it remained stable from period 4 (quarter 2 in the second year) to period 12 (quarter 4 in year 4). Therefore, it can be concluded that a one standard deviation shock (innovation) on the foreign direct investment will cause it to decline in the short run and maintain a stable level in its long run.

5 Conclusion and policy recommendations

5.1 Conclusions

The literature seems to support a strong consensus that foreign capital inflows lead to economic growth. It also seems to hold different views regarding the relationship between financial development and economic growth across different economies. Therefore, this study investigated the channels through which shocks from foreign capital inflows and financial development are transmitted to economic growth in the ECOWAS region using quarterly data for the period between 2000 and 2017. To this end, we adopted the panel vector autoregressive (pVAR) model in a generalized method of moments framework to actualize its objective. The empirical results suggest that foreign direct investment (FDI), net domestic credit (CRE), and economic growth (ECG) all have significant relationships with each other, while gross capital formation (GCF), labour force (LF), and foreign aid (AID) have significant relationships with FDI, CRE and ECG. Moreover, FDI and CRE have negative relationship with economic growth in the short run but positive impulse response functions with economic growth in the long run. FDI and CRE exhibit positive relationship between themselves in the short run and negative relationship in the long run. Thus, the study recommends concerned policy makers to pursue financial deepening and enact credible policies that should strengthen the financial system. In addition, a conducive socio-economic environment should be actively maintained so as to attract the required foreign capital inflows. Finally, more efforts should be made towards the establishment of a single monetary union, as it will further strengthen the region and improve the trade among the member-countries. Efforts should also be made to strengthen the political system and institutional frameworks of the countries in the sub-region Isaac et al. (2021). This can lead to further growth within the region. In addition, impulse response functions suggest that foreign capital inflows and domestic credit do have impact on economic growth and vice versa. Therefore, economic growth leads to foreign capital inflows and financial development and foreign capital inflows and domestic credit also leads to growth in the ECOWAS region.

5.2 Policy recommendations

In recent times, the growth in ECOWAS member countries has been deeply fluctuating and foreign direct inflows attracted into the region has been meagre. Hence, the study recommends that; first, given that investors' perception is a major determinant of foreign

capital inflows, a good investors' perception will encourage the inflow of foreign direct investment in the region. Thus, member countries should create a conducive socio-political and economic environment for foreign investors to invest in the economies. Second, the Central banks of the Anglophone countries and the BCEAO (Banque Centrale des Etats de l'Afrique de l'Quest), should endeavour to formulate and maintain financial deepening-strengthening policies that will strengthen and secure the financial system against shocks in the international market. This is because, even though the economies are liberalized, we can see that the financial system is still not developed optimally. Third, although efforts were made in the establishment of a single monetary union, those efforts should be strengthened, as a monetary union will lead to intra-trade among the members. As a result, we can expect trade openness positively influence growth in the ECOWAS region.

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