Foreign Capital Flows and Industrial Output in West African Countries: Does Institutional Quality Matter?

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Abstract
We examine the nexus between foreign capital inflows and industrial output in the ECOWAS region, accounting for the role of institutional quality using an ARDL-based dynamic panel data model that considers non-stationarity and heterogeneity effects. We find that foreign direct investment enhances industrial activities in both the short and long run. However, the impact of external loans on industrial output is only significant in the long run. When foreign direct investment interacts with institutional quality, the positive effect on industrial output is reinforced. The external loan interaction with institutional quality poses a statistically significant negative impact on the industry in the long run. We conclude that FDI is a more effective driver of industrial growth than external loans in West African countries.

Keywords: *ECOWAS, external loan, foreign direct investment, industrial output, institutional quality,*

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1. Introduction

In economies where finance is inadequate, there is a tendency for low levels of investment in the industrial sector, leading to slow economic growth (Sule, 2019). Evidence shows that foreign capital inflows can be advantageous because they assist the expansion of infrastructure, technology, and human capital, creating a knowledge-based economy that supports economic export of goods and services (Phimmavong, 2017; Adegboye et al., 2020a). African economies have attracted capital inflows, including foreign direct investment, external loans, over the years (African Development Bank, 2013; Nyang`oro, 2017; IMF, 2019; UNCTAD, 2020; Sandow *et al.*, 2022; Olaoye et al., 2022). Despite these inflows, countries in sub-Saharan Africa still grapple with high poverty levels, weak human capital development, structural imbalances, weak institutions, and inadequate infrastructure (Ogbonna et al. 2021), impediments to industrial development. Also, the nexus between capital flows and economic growth is predicated on the quality of institutions (Adegboye et al., 2020b; Ogundipe et al., 2020; Hayat, 2019).

Since the 1960s, Africa's industrialization strategies have evolved significantly with the adoption of several policies and strategies like the Import Substitution Industrialization (ISI) strategy, Structural Adjustment program, and Accelerated Industrial Development Action Plan for Africa (UNIDO, UNCTAD, and MovingUp, 2011; UNECA, 1989; AfDB, OECD, & UNDP, 2017). For instance, in the ECOWAS region, the West Africa Common Industrial Policy

(WACIP) was instituted in 2010 to maintain a solid industrial structure that is globally competitive, environment-friendly, and capable of significantly improving people's living standards by 2030. However, the region continues to be confronted with challenges such as infrastructural deficit, macroeconomic instability, insecurity, and poor institutional quality that hinder foreign capital flow (Orji, Uche & Ilori, 2014; NEPAD/UNECA, 2014; The ECOWAS Commission, 2018; The Nigerian Economic Summit Group, 2022). The West Africa region's industrial sector remains largely underdeveloped compared to other similar regions across the globe (Ologbenla, 2020). This evidence, as 2016 statistics reveal, the industrial sector's growth rate in big countries like Nigeria, Senegal, and Ghana fell by 2.5%, 2.1%, and 1.2%, respectively (Ajide, 2014; Keho, 2018). This trend is also attributable to poor institutional quality and other macroeconomic imbalances (International Labour Organization, 2015; World Bank, 2016; Lavallée & Roubaud, 2019; Ologbenla, 2020).

There exist several extant literatures on foreign capital inflows and growth in the ECOWAS region (Githaiga & Kilong'i, 2023; Ndiweni & Bonga-Bonga, 2021; Ologbenla, 2020; Musibau et al., 2017; Nyang`oro, 2017; Orji *et al.,* 2014; Houssem & Hichem, 2011). The few existing studies in the context of our study are country-specific (Okonkwo, 2016; Sule, 2019). The only related study on foreign capital inflows and industrial growth was carried out in SSA (Ojo et al. 2017; Tougem et al. 2021; Oduola, Bello & Popoola 2022; Appiah et al. 2023). Thus, we conclude that the role of institutional quality in moderating the impact, with particular reference to ECOWAS economies, remains unexplored, thus the major motivation for this study. We considered institutional quality as a moderating factor because of its dominant role emphasized in literature (Adegboye et al., 2020b; Ogundipe et al., 2020). Secondly, to achieve this, this study adopts Principal Component Analysis (PCA) to generate an index for institutional quality based on the metrics of rule of law, voice and accountability, political stability, regulatory quality, government effectiveness, and control of corruption. This approach is superior to that of Oduola, Bello, and Popoola (2022), who only considered the political quality index. All these were achieved within the panel ARDL modeling framework that elicits both the short-run and long-run dynamics of the relationship.

To the best of the authors' knowledge, this investigation of foreign capital inflows in ECOWAS has often been represented by FDI alone, whereas we make use of both foreign direct investment and external loans. The outcome of this study stands to enhance the efficient use of capital, improve policy insights, and attract higher-quality investments. Also, the study will help mitigate risks like misallocation of resources, guide targeted development strategies, and foster regional industrial integration by promoting stronger governance and regulatory frameworks. This approach ultimately maximizes the industrial growth benefits from foreign capital inflows and creates a more stable investment environment across ECOWAS member states. Hence, it is imperative to examine the dynamics of the nexus to tease out implications for investors, businesses, and policymakers. The rest of the paper proceeds as follows: Section 2 presents a brief literature review. Section 3 deals with the methodology. Section 4 presents the empirical results. Section 5 discusses the findings and conclusions.

2. Literature Review

Conceptual Clarification

Conceptually, World Bank (2003) describes capital flows as vital for stimulating productivity and investments, encompassing FDI, portfolio investments, loans, aid, and

remittances. IMF (2007) broadens this definition by including debt relief and technical expertise aimed at addressing macroeconomic challenges. Capital flows play a crucial role in socio-economic development, as these funds finance projects that bolster growth and complement national development (Githaiga & Kilong'i, 2023). In sub-Saharan Africa, capital flows remain essential for bridging funding gaps and fostering growth (Adams et al., 2017). Primary components, as noted by Musibau et al. (2019), include remittances, FDI, and official development assistance, external loans that support various sectors of recipient economies. On the other hand, industrial output is defined by the value created through the transformation of resources into goods (Sule, 2019). Industrialization involves shifting economic resources from agriculture to manufacturing, which increases growth and resilience to external shocks (Adejugbe, 2004; Todaro & Smith, 2011). It also encourages technological adoption and higher productivity, as observed in economies like Japan and China (Sule, 2019). For African nations, industrialization offers a pathway to economic restructuring by enabling shifts from low- to high-productivity sectors (AfDB, OECD, and UNDP, 2017). This shift requires effective industrial policies and institutions to facilitate sustained growth (UNECA, 2014).

Theoretical Framework

From a theoretical perspective, endogenous growth model (Frankel, 1962; Rebelo, 1991; Pagano, 1993) suggests that capital inflows supplement domestic savings, enhancing long-term growth by promoting productivity. The dual-gap model (Chenery & Strout, 1966) extends this by illustrating how capital inflows offset deficits, thus supporting sustainable development (Oloyede, 2002; Kose et al., 2010). Institutional theory by North (1990) asserts that robust institutions attract foreign capital and boost socioeconomic development by reducing transaction costs and ensuring an environment conducive to investment (Rodrik et al., 2004). Acemoglu et al. (2003, 2005) emphasize that institutional quality, over macroeconomic variables, is the primary driver of output growth by reducing corruption, enhancing regulation, and ensuring accountability. Institutions that protect property rights and enforce the rule of law facilitate resource allocation (Rodrik et al., 2004), while weak institutions increase investment costs and deter productivity (Daniele & Marani, 2011). Effective institutions are fundamental in sub-Saharan Africa for ensuring the benefits of growth reach poorer populations (Thorbecke, 2013). Research supports the role of institutional quality as a determinant of FDI inflows, where good governance and protection of property rights significantly impact investment attraction (Buchanan et al., 2012; Shah et al., 2016). All things considered, these viewpoints demonstrate how important it is for capital flows, industrial production, and institutional quality to work together to promote sustainable growth and economic transformation, especially in emerging nations.

Empirical Studies

According to findings from extant literature, Shikur (2024) shows that economic freedom, FDI inflows, and institutional factors, such as corruption control and regulatory quality, have significant short-run impacts on industrialization in low to middle-income African countries. These findings align with other studies (e.g., Ologbenla, 2020) that suggest limitations in the industrial growth effects of institutional quality within the Economic Community of West African States (ECOWAS). Adegboye et al. (2020a) emphasize that

institutional quality is crucial for economic development and for attracting FDI in sub-Saharan Africa. Similar studies, such as Githaiga and Kilong'i (2023) reinforce the notion that institutional quality moderates the impact of FDI on capital development in sub-Saharan Africa. This suggests that effective institutions can enhance the positive outcomes of foreign investments on both economic and capital development.

Numerous studies affirm that FDI promotes economic growth under specific conditions. Orji et al. (2022) highlight FDI as a growth driver in the ECOWAS region. Rehman et al. (2021) further argue that institutional quality boosts FDI inflows in emerging economies, underscoring the complementary role of robust institutions. However, studies like Sule (2019) reveal that FDI's impact varies by context, finding negative effects on industrial growth in Nigeria. Similarly, Adeola (2017) finds that FDI significantly support growth in select African economies, underscoring FDI's conditional effectiveness. Several studies reveal threshold effects, showing that institutional development levels condition the relationship between capital inflows and growth. Ndiweni and Bonga-Bonga (2021) report a threshold effect in the relationship between capital inflows and growth, influenced by institutional development levels. Nxumalo and Makoni (2021) also confirm that FDI attraction depends on institutional quality in emerging markets, a finding corroborated by studies like Somé (2018), who identified regulatory quality as the most significant factor in manufacturing growth.

Studies like Musibau et al. (2017) find that FDI and other capital inflows significantly drive long-term growth in West African countries. Moreover, dynamic panel analyses by Phimmavong (2017) indicate that while aggregate capital inflows may not always correlate positively with growth, FDI remains beneficial. Nxumalo and Makoni (2021) and Qamruzzaman et al. (2021) show that FDI, institutional quality, and innovation outputs maintain significant bidirectional causality, pointing to a cyclical relationship wherein improved institutions attract FDI, which then further supports institutional enhancements. On the findings from country-specific studies, Sule (2019) notes the varying impact of different forms of foreign capital on Nigeria's industrial growth. Similarly, Okonkwo (2016) finds that foreign portfolio investment contributes positively to industrial growth in Nigeria, demonstrating how the effectiveness of foreign capital can differ even within a region. The diverse methodologies employed, from panel ARDL to fixed effects models, consistently emphasize the varying impacts of foreign capital inflows contingent upon institutional quality, trade openness, and country-specific contexts, as illustrated by Haq et al. (2017) and Orji et al. (2014).

Research consistently shows that external debt negatively impacts economic growth, particularly in sub-Saharan Africa (SSA) (Senadza et al., 2017; Manasseh et al., 2022; Azolibe, 2022). These studies, which employ the GMM estimation technique, emphasize the importance of directing foreign loans toward projects capable of generating sufficient returns to repay the debt. Similarly adverse effects of external debt on growth are found in East and Southern Africa (Jama, 2021; Mumba & Li, 2020), as well as in other regions like Asia, the Pacific, and the Western Balkans (Lau et al., 2022; Hoti et al., 2022; Hameed et al., 2021). The result of the dynamic system GMM reveals that the direct impact of both capital flight and external debt, as well as their combined effect on economic growth, was found to be significantly negative in SSA (Agyeman, Sakyi & Oteng-Abayie, 2022). Moving further, Tarawalie and Jalloh (2021) find a nonlinear relationship between external debt and real GDP in ECOWAS member states. Zaghdoudi (2020) reports that while external debt can support economic growth under low-

debt conditions in middle- and low-income countries, it becomes detrimental at higher levels, a finding echoed by Jarju et al. (2016) in the West African Monetary Zone. Also, Ring et al. (2021) and Omotor et al. (2020) highlight the role of governance quality in moderating the impact of external debt on growth, suggesting that effective governance can mitigate some of the negative effects associated with external debt. This is substantiated by the finding of Sandow, Oteng-Abayie, and Duodu (2022), revealing that the effect of external debt on economic growth tends to be significantly positive for SSA countries with strong public sector management quality using system-GMM.

Research on capital inflows and economic growth often emphasizes foreign direct investment (Orji et al., 2014; Musibau et al., 2017; Ozekhome, 2017; Anidiobu et al., 2020; Orji et al., 2022). However, studies linking capital flows and industrial output are limited, particularly those examining the moderating effect of institutional quality (Ologbenla, 2020; Sule, 2019; Okonkwo, 2016). Existing research on institutional quality generally focuses on capital flows and economic growth (Githaiga & Kilong'i, 2023; Ndiweni & Bonga-Bonga, 2021; Adegboye et al., 2020a) but is limited to industrial output. Studies on foreign capital inflows and industrial growth rarely include institutional quality as a moderator, with few exceptions (Oduola, Bello, & Popoola, 2022). There are also many studies on external debt and growth in SSA, with a focus on institutional quality (Ring et al., 2021; Manasseh et al., 2022), yet little on industrial growth in ECOWAS. This study aims to bridge this gap by examining how institutional quality influences the relationship between capital flows, including FDI and external loans, and industrial output in ECOWAS.

3. Materials and Methods

This study, therefore, seeks to investigate the connection between capital flows and industrial output in West Africa. While taking cognizance of the role of institutional quality, the Panel Autoregressive Distributed Lag modeling framework (PARDL) is adopted to elicit both the short-run and long-run dynamics of the relationship for the period 1992 to 2024. The sampling framework comprised the 15 countries that constitute West Africa countries, which are Benin, Burkina Faso, Cabo Verde, Cote d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo. The inclusion and exclusion criteria were based on the availability of data for the period. Panel data were extracted from the World Development Indicators (WDI) by the World Bank and the World Governance Indicators. The dependent variable employed in this study is industry (including construction) and value-added (current US$) in the selected countries. The predictor variable is capital inflow, which is disintegrated into Foreign direct investment, net inflows (BoP, current US$), and External debt stocks, total (DOD, current US$), and the moderating variable of institutional quality index. The complementary variables include inflation proxied by the consumer price index and government industrial expenditure measured in US$.

Model Specification

The study utilizes the Panel Autoregressive Distributed Lag (PARDL) model, developed by Pesaran et al. (1999), to explore short- and long-term impacts of multiple variables on industrial growth in West Africa. This model accommodates different integration orders (I(0) and I(1)) and variable lags, differentiating short-run and long-run effects. Three estimators are applied: the Mean Group (MG), Pooled Mean Group (PMG), and Dynamic Fixed

Effects (DFE). PMG assumes homogeneous long-run slopes with heterogeneous short-run coefficients, while MG allows for complete heterogeneity, and DFE imposes uniform short-run coefficients. These estimators are chosen for their robustness in capturing both short- and long-term equilibrium, unlike traditional models. A Hausman test confirmed the PMG estimator's efficiency, supporting its assumption of long-run homogeneity for this study, which uniquely examines capital flows' effects on industrial growth with institutional quality as a moderator in West African countries. In this study, the long-run panel ARDL (p, q) is specified as follows:

$$Y_{i,t} = \sum_{j=1}^{q-1} \varphi_j^i \, Y_{i,t-j} + \sum_{j=1}^{p-1} \eta_j^i \, cv_{i,t-j} + + \sum_{j=1}^{p-1} j\chi_j^i \, I_{i,t-j} + \mu_i, + \xi_{i,t} \qquad [1]$$

Where the panel dataset with groups/countries is indexed by $i = 1, 2, \dots, N$; periods indexed by $t = 1, \dots, T$; j is the number of lags; p and q are the lags of the dependent and independent variables, respectively. All variables represent the country i in period t. $Y_{i,t}$ represents industrial output in million US dollars in the $period_{i-t}$; $CV_{i,t}$ is a set of control variables and $I_{i,t}$ represents the institutional quality measures, inflation, and government industrial expenditure. In specific, $\varphi_{i,t}$represents the long-run parameters of the lagged dependent variable; $\eta_{i,t}$, and $X_{i,t}$In addition to the long-run coefficients, but also refer to the lagged independent variables, which in our case are control variables and the institutional variable. To estimate the adjustment coefficient and long-run dynamics, the dynamic panel ARDL (p, q) is represented by the following equation:

$$\Delta Y_{i,t} = \sum_{j=1}^{q-1} \beta_j^i \, \Delta Y_{i,t-j} + \sum_{j=1}^{p-1} \alpha_j^i \, \Delta cv_{i,t-j} +$$
$$\sum_{j=1}^{p-1} j_\sigma^i \, \Delta I_{i,t-j} + \sum_{j=1}^{q-1} \gamma_j^i \, \theta ECT_{i,t-j} + \mu_{i,} + \xi_{i,t} \qquad - \quad - \quad - \qquad [2]$$

Where, $\beta_{i,t}$ represents the short-run parameters of the lagged dependent variable; $\alpha_{j,t}$, and $\sigma_{i,t}$ represent the short-run coefficients linking industrial growth with its past values and the variables of interest $cv_{i,t}$and $I_{i,t,}$ but of the lagged independent variables, that in this case is the institutional variable. θ_i is the adjustment coefficient of the long-run dynamics. $\gamma_{i,t}$ displays the speed of adjustment to the long-run equilibrium. The long-run relationship between multi-explanatory variables and industrial growth exists if θ_i is negative and significant, then there is a cointegration relationship among the variables.

Based on previous empirical studies, the study controls for two macroeconomic factors: inflation as well as government expenditure on the industrial sector. According to the underlining assumptions of the endogenous-growth AK model, if A is a positive constant that reflects the level of technology, and "K" here is taken in a broader sense to include physical as well as human capital, then a simple, intensive form of the AK production function where aggregate output is a linear function of the aggregate capital stock may be specified as follows:

$$Y_t = Af(K) \qquad - \quad - \quad - \quad - \quad - \quad - \quad - \qquad [3]$$

Y_tThe actual amount produced (aggregate output), A, is the efficiency of production (technological level), which is a positive constant, K is the size of capital stock, and L denotes labor. Based on the three assumptions that guide the dual-gap model, the model [4] below explicitly incorporates capital inflows as a factor of growth and development, as postulated by the theories. Taking a cue from empirical literature (Adegboye et al., 2020a; Ologbenla, 2020; Sule, 2019), the regression models for the research are shown below:

$$IDO_{it} = \alpha_o + \alpha_1 FDI * INSQ_{it} + \alpha_2 EXL * INSQ_{it} + +\alpha_3 X_{it} + \varepsilon_{it} \quad [4]$$

Where: IDO_{it} is Industrial Output, FDI_{it} is foreign direct investment, EXL_{it} is external loan, $INSQ_{it}$ is institutional quality. (All interaction terms were computed using Principal Component Analysis to generate an index for institutional quality.) X_{it} represents the complementary variables of inflation and government industrial expenditure. ε_{it} is error term, α_o is the intercept, $\alpha_1 - \alpha_n$ are beta-coefficients, i is cross-sectional units (countries) and t is the study period (1990 to 2023).

The choice of these variables is hinged on the theoretical postulation that for economic growth to be attained, institutional framework and capital inflow components (FDI, portfolio investment and external loans) should be present in the model (Neeliah & Seetanah, 2016; Osabuohien et al., 2018; Ejemeyovwi et al., 2018; Ogundipe et al., 2020). This is the gap in the literature that this study aimed to fill.

4. Results and Discussion

Table 1 displays the summary statistics for the four main variables under examination. It highlighted the mean, standard deviation, skewness and kurtosis. The mean values account for the average values for each variable for the individual countries investigated. In a similar manner, the computed standard deviation indicates how clustered/dispersed the series is around their means or the volatility of the series. The skewness shows the direction of the movement/fluctuations, either right-positive or left-negative, and kurtosis shows the heaviness of the tail from what is typical of a normal distribution.

Table 1: Summary Statistics

	Industrial Output				Foreign Direct Investment			
Country	**Mean**	**N_Std. dev.**	**Skew**	**Kurt**	**Mean**	**N_Std. dev.**	**Skew**	**Kurt**
Benin	-1395.800	-0.647	0.164	1.981	96.881	1.354	0.863	2.463
Burkina Faso	2205.428	0.795	0.717	2.270	87.045	1.588	1.387	4.101
Cabo Verde	2.10E+08	0.391	-0.009	1.355	77.957	0.779	0.309	2.136
Cote d'Ivoire	6306.169	0.702	0.9110	2.542	454.923	0.784	1.562	5.349
Gambia	177.0387	0.524	0.964	2.812	60.129	0.994	1.933	6.315
Ghana	8651.766	0.993	0.690	1.763	1499.480	0.977	0.274	1.315
Guinea	2139.952	0.698	1.363	4.188	217.587	1.583	2.422	9.459
Guinea-Bissua	1.00E+08	0.000	0.213	1.664	13.256	1.056	2.157	9.809
Liberia	251.743	1.042	0.783	1.969	442.953	1.515	1.833	5.057
Mali	1817.692	0.674	0.316	1.743	247.146	0.963	0.770	2.582
Niger	1456.156	0.653	0.319	1.448	311.374	1.132	0.671	1.949
Nigeria	73403.810	0.609	0.256	1.709	3038.078	0.857	0.818	2.539
Senegal	3325.273	0.544	0.614	2.259	468.290	1.429	2.193	6.986
Serra Leone	264.244	0.710	2.881	11.429	169.491	1.310	1.800	6.292
Togo	817.579	0.676	0.312	1.512	59.288	2.683	2.171	10.791
Average	5896.819	0.558	0.485	1.252	453.167	1.267	1.199	3.495

Note: Standard deviation, skewness, and kurtosis are shortened as Std. dev., skew, and kurt, respectively.

The data in Table 1 reveals significant variation in both industrial output (IDO) and foreign direct investment (FDI) across different countries. Nigeria leads in IDO with the highest mean value (73403.810), while Benin records the lowest mean (-1395.800). The normalized standard deviations (N_Std. dev.) for IDO are generally lower compared to FDI, indicating greater stability in industrial output. The skewness values for IDO are predominantly positive, with Serra Leone exhibiting the highest skewness (2.881). In terms of FDI, Ghana has the highest mean (1499.480), whereas Guinea-Bissau has the lowest (13.256). FDI shows higher normalized standard deviations, reflecting greater volatility compared to IDO. All FDI distributions are positively skewed, with Guinea showing the highest skewness (2.422). Kurtosis values for both variables differ significantly across countries, with Serra Leone's IDO (11.429) and Togo's FDI (10.791) displaying the highest peaks.

Table 2: Summary Statistics

	External Loans				Institutional Quality Index			
Country	**Mean**	**N_Std. dev.**	**Skew**	**Kurt**	**Mean**	**N_Std. dev.**	**Skew**	**Kurt**
Benin	2304.33	0.836	2.131	6.566	9.34E-16	1.663	0.484	1.719
Burkina Faso	4882.771	0.874	0.591	1.632	-5.55E-16	1.863	-0.496	2.178
Cabo Verde	8.76E+08	0.807	0.552	1.713	-5.29E-16	1.727	0.925	2.568
Cote d'Ivoire	16200.25	0.395	1.720	5.591	-8.10E-16	2.313	0.174	1.598
Gambia	608.9644	0.358	1.448	4.625	-1.15E-15	1.852	-0.260	2.000
Ghana	17847.46	0.819	0.798	2.191	-2.87E-16	1.796	-0.219	1.698
Guinea	3081.014	0.273	0.625	4.243	-1.50E-15	1.744	-0.676	3.116
Guinea-Bissua	8.19E+08	1.250	-0.716	2.226	3.27E-16	1.771	-0.120	1.681
Liberia	2100.063	0.527	0.151	2.041	2.16E-16	2.344	-0.269	1.274
Mali	3454.177	0.378	1.314	4.090	-7.58E-16	2.089	-0.570	2.265
Niger	2251.025	0.564	1.700	5.065	-3.92E-16	1.958	-0.292	1.593
Nigeria	43359.64	0.520	1.510	4.121	-7.02E-16	1.793	-0.141	1.410
Senegal	8957.230	1.018	1.758	5.021	-5.46E-16	1.645	-1.170	3.641
Serra Leone	1472.52	0.309	0.516	3.610	-1.57E-16	2.202	-0.362	1.388
Togo	1646.835	0.412	1.657	5.873	2.09E-16	1.953	-0.357	2.272
Average	58406573.339	0.623	0.775	2.310	0.000	1.637	-0.285	1.418

Note: Standard deviation, skewness, and kurtosis are shortened as Std. dev., skew, and kurt, respectively.

The data on Table 2 shows substantial variation in External Loans across countries, with Cabo Verde having the highest mean (8.76E+08) and Gambia the lowest (608.9644). The normalized standard deviations for External Loans vary significantly, with Guinea-Bissau showing the highest volatility (1.250). Most countries display positive skewness in External Loans, indicating right-skewed distributions, with Benin having the highest skewness (2.131). The kurtosis values for External Loans are generally high, suggesting heavy-tailed distributions, with Benin showing the highest peak (6.566). Regarding the Institutional Quality Index computed using PCA, all countries have means very close to zero, as expected for a standardized index. The normalized standard deviations for this index are relatively consistent across countries, ranging from 1.645 to 2.344. Skewness values for the Institutional Quality Index are mixed, with seven countries showing negative skewness and eight showing positive, indicating varied asymmetries in institutional quality distributions. The kurtosis values for the Institutional Quality Index are generally lower than for External Loans, suggesting more normal distributions.

Table 3: Summary of Stationarity Test

Test method	IDO	FDI	EXL	INSQ	CPI
Null Hypothesis: Unit Root with common process					
Harris-Tzavalis [rho]	-0.0472***b	0.8153 ***a	0.1257***b	0.1141***b	0.5185***b
Null Hypothesis: Unit Root with Individual Process					
Im, Pesaran & Shin [Z-t-tilde]	-11.1996***b	-2.7933**a	-9.1735 ***b	-10.5958***b	-8.1262***b
Null Hypothesis: Unit Root with cross-sectional dependence					
Pesaran CD test [z[t-bar]] (lag 2)	-3.424***b	-3.337***a	-1.377 *b	-3.843***b	-2.722***b
Null hypothesis: No unit root with common unit root process					
Hadri [Z-stat.]	73.8481***a	32.7812 ***b	67.4170 ***b	50.3092***a	72.7991***a
Number of Cross-Sections	15	15	15	15	15
Number of Periods	34	34	34	34	34
Total Number of Observations	510	510	510	510	510

Note: *a and b denote stationarity at the level and at the first difference, respectively; *p < 0.05; **p < 0.01; ***p <0.001*

Table 3 represent the summary results test of Harris-Tzavalis, Im-Pesaran-Shin, Pesaran CD, and Hadri methods to assess stationarity. The Harris-Tzavalis and Im-Pesaran-Shin tests, which assume a null hypothesis of a unit root, reject the null for all variables at the 1% significance level (except for FDI at 5% for the Im-Pesaran-Shin test), indicating stationarity. The Pesaran CD test, which accounts for cross-sectional dependence, also rejects the unit root null hypothesis for all variables at the 1% level (except for External Loans at 10%), further supporting stationarity. However, the Hadri test, which assumes a null hypothesis of no unit root, rejects its null for all variables at the 1% level, suggesting non-stationarity. This contradiction between the Hadri test and the others is not uncommon in panel unit root testing and may be due to the Hadri test's sensitivity to cross-sectional dependence or heterogeneity. The preponderance of evidence from these tests suggests that most variables are likely stationary, but the conflicting results from the Hadri test indicate some uncertainty, particularly for foreign direct investment and external loans.

Noted that γ_i is the error correction parameter denoting the potential of long-run equilibrium in the relationship, λ_i is the long-run estimates and δ_{ij} are the short-run estimates. Faced with two alternative estimators for the model, the Hausman test serves as a point of reference in selecting between the MG and PMG as the preferred result. Generally, the estimation is conducted with PMG as the null and the MG as the alternative. The statistical significance of the Hausman test indicates a preference for the MG, otherwise, PMG is preferred, however, where the MG is null, the non-significance of the Hausman statistics indicates a preference for the MG over the PMG. Therefore, the discussion of the results depends on the estimator backed by the Hausman test.

The panel ARDL-based estimates presented in Table 4 are from the model with no control variables in the nexus between industrial output and capital flows. First, we account for the short and long-run features inherent in a dynamic panel ARDL model. The coefficients on the error correction term (ECT) are consistently correctly signed and statistically significant, going by the result of MG and PMG in scenarios 2 and 4. Starting with the estimates obtained from the baseline model with no control variables, we show that both in the short-run and long-run, FDI has positive impacts on the industrial activities among the ECOWAS region according to PMG results in scenarios 3 and 4. This indicates that FDI provides quick access to capital and technological improvement, allowing for rapid improvements in productivity and output. This eventually leads to integration into global value chains, fostering a more competitive and diversified industrial base. However, acknowledging this finding finds support in a number of existing studies (see, for example, Shikur, 2024; Orji et al., 2022; Ozekhome, 2017; Musibau et al., 2017). However, external loans only positively impact the industrial sector in the long run (see PMG) in scenario 3. This outcome could be due to the time-intensive nature of key factors like the gradual development of infrastructure, human capital, and supportive institutions. However, while acknowledging this finding finds support in a number of existing studies (see Sule, 2019) but contrary to other extant literature (see, Anidiobu et al., 2020; Nyang`oro, 2017; Jarju et al. 2016). It must be pointed out that the magnitude and statistical significance of the effects are relatively small, demonstrating that the inflows are quite negligible to account for significant growth in the industrial sector, which is in line with the earlier finding by Tarawalie and Jalloh (2021) in ECOWAS member states.

The panel ARDL-based estimates presented in Table 5 are from the model with control variables in the nexus between industrial output and capital flows. The coefficients on the error correction term (ECT) are consistently correctly signed and statistically significant going by the result of MG and PMG (see scenario 2 & 4). The estimates obtained from the extended model with the control variable show that in the short-run, FDI has positive impacts on the industrial activities according to MG and PMG results (See scenarios 2 & 4) (see, Shikur, 2024). This finding is consistent with the earlier result in Table 3a on the baseline model. Similarly, in the long run, FDI also exerts a significant positive impact on the industrial sector, according to MG and PMG (see scenarios 1 & 3). In line with the earlier finding in Table 5, the external loan also exerts a significant positive impact on the industrial sector only in the long-run according to MG and PMG results (see scenarios 1 & 3) in line with empirical finding (Oteng-Abayie & Duodu, 2022). This gives credence to the result in Table 5 and indicates the slow process of technology adoption and market expansion.

The panel ARDL-based estimates presented in Table 6 are from the model with the interaction of institutional quality in the nexus between FDI and industrial output. The coefficients on the error correction term (ECT) are consistently correctly signed and statistically significant, going by the result of MG and PMG (see scenarios 2 & 4). Accordingly, FDI*INSQ exhibits a significant positive impact on industrial output only in the short run. This indicates that the existing quality of institutions within this region cannot be sustained over a long period to engender FDI contributions to the industrial sector due to challenges in maintaining the existing institutional setup, thus limiting continued positive impacts. This outcome is also acknowledged in the earlier empirical studies conducted in Africa (see, Shikur, 2024; Somé, 2018). This is corroborated by Ologbenla (2020), who said that institutional quality in the ECOWAS failed to significantly enhance industrial growth. This demonstrates

the quality of institutional matters in the nexus between FDI and industrial output (Ndiweni & Bonga-Bonga, 2021; Adegboye et al., 2020a; Iheonu et al., 2017).

The panel ARDL-based estimates presented in Table 7 are from the model with the interaction of institutional quality in the nexus between EXL and industrial output. The coefficients on the error correction term (ECT) are consistently correctly signed and statistically significant, going by the result of MG and PMG (see scenarios 2 & 4). The estimates obtained on EXL*INSQ exert a significant negative impact on industrial output only in the long run (see PMG in scenario 3). This finding conforms to the earlier findings in the literature ((see, Anidiobu et al., 2020; Nyang`oro, 2017). The implication is that, over time, even relatively good institutions may struggle to manage external loans effectively, leading to resource misallocation, increased debt burdens, and potential institutional degradation that hinders industrial development.

5. Conclusion and Policy Implication

The ongoing effort to achieve industrialization has continued to be the focal foreign policy framework in developing countries, particularly in the ECOWAS region, in which the attraction of foreign investment often leads to more frequent changes in policies and reforms. Our study expands on the existing research about the drivers of industrial growth by examining the possibility that institutional quality could exacerbate the adverse effects of foreign direct investment and external loans on industrial output. To test this hypothesis, we analyze scenarios within the ECOWAS region using an ARDL-based dynamic panel data model that considers non-stationarity and heterogeneity effects. We find that foreign direct investment enhances industrial activities in both the short run and long run. However, the impact of external loans on industrial output is only significant in the long run. When foreign direct investment interacts with institutional quality, the significant positive impact on industrial output is reinforced, giving credence to earlier findings. However, the external loan interaction with institutional quality poses a negative impact on the industry in the long run, though statistically significant. Conclusively, this implies that FDI is a more effective driver of industrial growth compared to external loans. The policy implication is how to entrenched quality institutions in the quest for industrialization to drive policies and program implementation. These are essential fundamentals that foreign investors look out for to guarantee returns on their investment in foreign countries.

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Appendix

Table 4: Industrial with Capital Flow Variables with No Control Variables

	(1) MG	(2) MG	(3) PMG	(4) PMG
γ		-0.163*** (0.0491)		-0.0910** (0.0387)
δ^{FDI}		-2.12e-05 (0.000118)		0.000201* (0.000103)
δ^{lnEXL}		0.00692 (0.0446)		-0.0175 (0.0408)
λ^{FDI}	-0.00671 (0.0104)		0.000218*** (5.19e-05)	
λ^{lnEXL}	1.038 (0.654)		1.030*** (0.123)	
$Constant$		0.639 (0.542)		-0.0750 (0.0604)
$Hausman\ Test$			0.45	0.7988
$Observations$	495	495	495	495

Note: Standard errors in parentheses while *** p<0.01, ** p<0.05, * p<0.1

Noted that γ_i is the error correction parameter denoting the potential of long-run equilibrium in the relationship, λ_i is the long-run estimates and δ_{ij} are the short-run estimates.

Table 5: Industrial Output with Capital Flow Variables with Control Variables

	(1) MG	(2) MG	(3) PMG	(4) PMG
γ		-0.0893** (0.0386)		-0.0893** (0.0386)
δ^{FDI}		0.000178** (9.05e-05)		0.000178** (9.05e-05)
δ^{lnEXL}		-0.00561 (0.0370)		-0.00561 (0.0370)
δ^{INSQ}		0.00403 (0.0103)		0.00403 (0.0103)
λ^{FDI}	0.000207*** (5.53e-05)		0.000207*** (5.53e-05)	
λ^{lnEXL}	1.089*** (0.126)		1.089*** (0.126)	
λ^{INSQ}	-0.000407 (0.0435)		-0.000407 (0.0435)	
$Constant$		-0.116 (0.0758)		-0.116 (0.0758)
$Hausman\ Test$			6.31	0.075
$Observations$	495	495	495	495

Note: Standard errors in parentheses while *** p<0.01, ** p<0.05, * p<0.1

All the variables are expressed in logs

Table 6: Industrial Output with FDI Interaction with Institutional Quality

	(1) MG	(2) MG	(3) PMG	(4) PMG
γ		-0.211*** (0.0506)		-0.0836** (0.0394)
δ^{FDI}		0.000118 (0.000283)		0.000584* (0.000339)
$\delta^{FDI*INSQ}$		0.000164 (0.000149)		0.000109 (0.000164)
δ^{EXL}		7.03e-06 (2.91e-05)		-2.93e-05 (4.29e-05)
δ^{INSQ}	-0.0923 (0.169)	-0.0183 (0.0193)	-0.0459 (0.0436)	
λ^{FDI}	0.00386*** (0.00107)		0.000119 (9.75e-05)	
$\lambda^{FDI*INSQ}$	4.84e-05 (0.000814)		5.31e-05 (5.06e-05)	
λ^{EXL}	0.000610** (0.000281)			
λ^{lnEXL}			1.176*** (0.148)	
λ^{INSQ}				0.0102 (0.00990)
Constant		1.829*** (0.545)		-0.159 (0.0980)
Hausman Test			23.59	0.0000
Observations	495	495	495	495

Note: Standard errors in parentheses while *** p<0.01, ** p<0.05, * p<0.1

Table 7: Industrial Output with External Loan Interaction with Institutional Quality

	(1) mg	(2) mg	(3) pmg	(4) pmg
γ		-0.221*** (0.0482)		-0.111*** (0.0406)
δ^{FDI}		-0.000156 (0.000140)		-5.60e-05 (9.77e-05)
$\delta^{EXL*INSQ}$		1.54e-06 (3.64e-06)		4.39e-05 (3.67e-05)
δ^{EXL}		-2.05e-05 (4.59e-05)		8.09e-05 (7.27e-05)
δ^{INSQ}	0.0345 (0.140)	0.0300 (0.0264)	-0.137*** (0.0317)	
λ^{FDI}	0.00346 (0.00234)		0.00389*** (0.000602)	
$\lambda^{EXL*INSQ}$	-0.000179 (0.000162)		-3.01e-10*** (7.49e-11)	
λ^{EXL}	0.00100 (0.000896)			
λ^{lnEXL}			-0.323*** (0.106)	
λ^{INSQ}				-0.0284 (0.0357)
$Constant$		1.927*** (0.563)		1.469** (0.599)
$Hausman$			4.26	0.2347
$Observations$	495	495	495	495

Note: Standard errors in parentheses while *** p<0.01, ** p<0.05, * p<0.1