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Impact of Development Finance Institutions on Industrialisation and Infrastructure Development: Evidence from the ECOWAS Bank for Investment and Development

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Keywords: DFIs, industrialisation, infrastructure, 3SLS

JEL Classification: C51, G24, O14

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Impact of Development Finance Institutions on Industrialisation and Infrastructure Development: Evidence from the ECOWAS Bank for Investment and Development+

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I. Introduction

Industrialisation can be explained as the process of building up a nation's capacity to convert raw materials and other inputs to finished goods, including manufacturing goods for other production or final consumption (Anyanwu et al. 1997; Ogbuabor et al. 2018). Industry, particularly manufacturing, is considered critical to the transition of economies from low-income to higher-income status because of the higher productivity and technological dynamism associated with manufacturing (Weiss 2018). In countries with surplus labour, industrialisation seems to be the only way to absorb large numbers of workers in productive employment and, in doing so, to generate a surplus for reinvestment (Lewis 1953, 1954; Weiss 2018).

Notwithstanding the particular emphasis placed on industrialisation and infrastructure development in international planning strategies, whether through the United Nations' ninth Sustainable Development Goal (SDG 9) or the fourth and tenth goals of the African Union's Agenda 2063, the weakest factors in the process of achieving structural transformation in developing countries remain their inability to adequately develop their infrastructure and industrial sector.[1] For example, the manufacturing sector in low-income countries was able to contribute only an average of 9.8 percent to gross domestic product (GDP) between 2010 and 2021. In Sub-Saharan Africa, the manufacturing sector's contribution to GDP over the same period was estimated at 10 percent on average. The combined value added by the manufacturing sector in East Africa and in Southern Africa was only 10.6 percent of GDP on average. The combined value added by the manufacturing sector in West Africa and in Central Africa was 10.4 percent of GDP. In the Economic Community of West African States (ECOWAS), the manufacturing sector contributed only an average of 9.1 percent to GDP, with a more significant disparity among countries than within the above-mentioned economic blocs (Table 1). Much remains to be achieved in West Africa regarding infrastructure development. The African Infrastructure Development Index reflects the low level of industrialization and infrastructure development in ECOWAS countries (table 1). On a scale of 100, the countries' average is 17.9 for overall infrastructure development. That average reflects 8.4 for ICT infrastructure (hardware, software, networks, and facilities that enable information sharing and processing), 7.2 for transport, 2.7 for electricity infrastructure, and 58.02 for water supply and sanitation infrastructure.

Several development finance institutions (DFIs) have been created not only to support the efforts of governments and the private sector to promote industrialisation but also to promote infrastructure development and regional economic integration in their areas of intervention.

The need for reconstruction after the two world wars renewed the impetus for DFIs. As reconstruction proceeded, DFIs provided long-term finance to relatively new industrial sectors (such as iron, steel, and shipbuilding) and infrastructure development (Gershenkron 1952; Cameron 1953; Diamond 1957; De Aghion 1999). Despite the preponderant role played by DFIs in the reconstruction of European countries and in the development of Asian countries, the direct quantitative contribution of these institutions to industrialisation is often questioned (De Aghion 1999).

[1] SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialisation, and foster innovation. Goal 4 of the African Union's Agenda 2063 focuses on transformed economies, with the following priority areas: sustainable and inclusive economic growth; science, technology, and innovation as drivers of manufacturing, industrialisation, and added value; economic diversification and resilience. Goal 10 of the agenda focuses on creating world-class infrastructure across Africa, prioritising communications and infrastructure connectivity.

The ECOWAS Bank for Investment and Development (EBID) is a DFI created in 1975. Its mission is to promote the financing of both national and regional development programmes and projects for the emergence of an economically strong, industrialised, and prosperous West Africa that is fully integrated into the global economic system to take advantage of the opportunities offered by globalisation. EBID directed 51.59 percent of its disbursements to finance infrastructure projects between 2010 and 2021. During that same period, and in line with its objective of supporting the private sector and promoting the industrial sector's development, the bank devoted an average of 38.24 percent of its disbursements to funding private sector projects. However, only 7.42 percent of the bank's disbursements were directed to support industrial sector development between 2010 and 2021.

This paper is the first to analyse the impacts of EBID's interventions on ECOWAS member states' industrialisation and infrastructure development, which are crucial for achievement of Sustainable Development Goal (SDG) 9 of the United Nations and goals 4 and 10 of the African Union's Agenda 2063.

Using panel data on ECOWAS member states over the period 2010 to 2021 and simultaneous equation modelling estimated by the three-stage least squares technique, the paper makes three findings. First, EBID's disbursements to the industrial sector positively impact ECOWAS member states' industrialisation. Second, overall infrastructure development and the specific development of ICT, electricity, and water supply and sanitation infrastructure positively impact ECOWAS member states' industrialisation. Third, there exists a U-shaped relationship on the one hand between EBID's disbursements to infrastructure projects and the development of overall infrastructure and on the other hand between EBID's disbursements to the infrastructure projects and the development of ICT infrastructure.

The paper contributes to the literature in two ways. First, it provides evidence to show the involvement of the EBID in achieving SDG 9 and goals 4 and 10 of the African Union's Agenda 2063. Second, it answers the question raised by De Aghion (1999) about the direct quantitative contribution of DFIs to their member states' industrialisation by showing the direct contribution of a subregional DFI to its member states' industrialisation.

The rest of the paper is structured as follows. Section 2 presents the literature review, Section 3 discusses the data and methodology, Section 4 focuses on results presentation and interpretations, and Section 5 concludes the paper.

2. Literature Review

2.1. DFIs' Theoretical Underpinning

Three critical theoretical bases of development finance institutions are market failure theory (Stiglitz and Heertje 1989; De Aghion 1999; Amsden 2001; Andonov et al. 2025), economic development theory (Lewis 1954; Todaro and Smith 2015), and institutional theory (North 1990; Acemoglu and Robinson 2013). According to market failure theory, the inability of commercial banks to provide long-term loans and to intervene in specific high-risk sectors has encouraged the emergence of DFIs. According to economic development theory, a synergy unfolds for financing projects in multiple sectors, including human capital, infrastructure, industrialization, innovation, governance, rural development, social development. Through their resource mobilization capacity and capital structure, DFIs are entities whose objectives align with this theory. By helping to build

institutional capacity in key sectors, DFIs strengthen development from the institutional theory perspective, which argues that development depends not only on market forces but also on the functioning and strength of institutions.

2.2. Development Finance Institutions and Industrialisation

The rapid industrialisation of continental Europe in the 19th century has been attributed to the emergence of large DFIs (Gershenkron 1952; Cameron 1953; Diamond 1957; De Aghion 1999). These institutions are known to have played a crucial role in the rapid industrialisation process of continental Europe and Japan (Gershenkron 1952; Cameron 1953; Diamond 1957; Yasuda 1993; De Aghion 1999). At that time, the existing commercial banks could not provide industry with long-term finance for two main reasons (De Aghion 1999). First, they were unwilling to bear the inevitable risks associated with financing new enterprises. Second, they lacked the specialised skills required to deal with the (higher-risk) long-term investments. DFIs are development banks that are also recognised for their contra-cycle intervention capacity in times of crisis, when commercial banks have difficulty financing economic activities (De Luna-Martínez and Vicente 2012).

DFIs are a type of financial intermediation institution that helps a country or a community through project financing to reach a higher and more sustainable level of development (Cameron 1953; De Aghion 1999; Ogbuabor et al. 2018). They are a national or international financial institution designed to provide medium- and long-term capital for productive investment, usually accompanied by technical assistance, in developing countries (De Aghion 1999; Ogbuabor et al. 2018). They typically fill the gap left by undeveloped capital markets and commercial banks, which are reluctant to offer long-term financing for critical development projects (De Aghion 1999; Ogbuabor et al. 2018). In summary, development banking can be explained as a form of financial intermediation that provides financing to high-priority investment projects in developed or developing economies (Cameron 1953; De Aghion 1999; Pragash 2016; Ogbuabor et al. 2018). Such projects are usually aimed at attaining the goal of industrialisation (Diamond 1957; De Aghion 1999; Ogbuabor et al. 2018).

Development banks played an important role in facilitating Europe's industrialisation and post-war reconstruction by providing long-term finance (Thorne and Du Toit 2009). More than a century ago, the United States, Great Britain, and several Central European countries built their industrial base through the long-term investment financing of banks that, at the time, performed the entrepreneurial function of funding high-risk projects or taking on the risk of entering into new fields of production (De Aghion 1999; Ogbuabor et al. 2018). DFIs involved in long-term financing were then called industrial banks (Ogbuabor et al. 2018). There are four models of development banks (Ogbuabor et al. 2018). Policy development banks are created to directly support the national government's economic policies. Special-purpose development banks are created to support specific sectors of the economy. Multi-purpose or universal development banks undertake both development projects and commercial businesses. Lastly, commercially oriented development banks undertake development through commercial banking services.

Several factors can prevent development banks from promoting industrialization and economic development (Cameron 1953; De Aghion 1999; Gutierrez et al. 2011; Ogbuabor et al. 2018). One such factor is the development banks' inability to mobilise and make vast amounts of money available for large-scale development projects that can spark industrial and overall economic development. Another is lending at very high interest rates, which, at best, is worrisome and

predatory and which clearly negates the broad objective of development banking. Yet another factor is lending to private enterprises owned by politically exposed persons with close ties to officials of the governments funding the development banks. Poor project conception, implementation and supervision, and risk management are other critical factors in most development banks' failure to drive industrial and overall economic development (De Luna-Martínez and Vicente 2012; Ogbuabor et al. 2018).

Despite the significant role played by development institutions such as Crédit Mobilier, Crédit Foncier, the German Kredintaltanlt fur Weidarufban, the International Bank of Reconstruction and Development, the Development Bank of Japan, and the Industrial Bank of Japan in the reconstruction of European countries after the two world wars and in the development of Japan, the direct quantitative contribution of these institutions to industrialisation is often questioned (De Aghion 1999).

However, since the second half of the 20th century, several development banks have been established in developing countries, particularly in Africa, to meet the challenges of industrialisation, economic growth, and development in their member states (Wang 2017). Examples include the African Development Bank (AfDB) established in 1964; the Islamic Development Bank established in 1973; the West African Development Bank established in 1973; the ECOWAS Fund for Cooperation, Compensation and Development established in 1975 and renamed the ECOWAS Bank for Investment and Development (EBID) in 1999; the Development Bank of Central African States established in 1975; and the Development Bank of Southern Africa established in 1983. All these development finance institutions were created to be the financial arms of the communities to which they are linked.

EBID's mission is to promote the financing of both national and regional development programmes and projects for the emergence of an economically strong, industrialised, and prosperous West Africa that is fully integrated into the global economic system with a view to taking advantage of the opportunities offered by globalisation. In line with its mission, EBID has, since 2010, implemented three successive strategic plans, which have clearly highlighted the relative importance it attaches to industrialisation promotion in West Africa. EBID's management is aware of the negative impact of the above-mentioned factors, which could lead to the bank's failure. It is working hard to minimise the adverse effects of these factors on the bank's operations to increase the impact of the bank's interventions on behalf of the West African industrial sector. Consequently, this study seeks to test Hypothesis 1: an increase in EBID disbursements to the industrial sector of ECOWAS member states improves their industrialisation levels.

2.3. Infrastructure Development and Industrialisation

The precursors of endogenous growth theory (Romer 1986; Lucas Jr 1988; Barro 1990) have shown the catalytic role that infrastructure can play through new knowledge about economic growth and, by extension, industrialisation. Infrastructural development positively and robustly affects industrialisation (Nkemgha et al. 2023). Structural change, understood as the development of the manufacturing sector, is optimized with the development of infrastructure, particularly ICT and energy infrastructure (Malah Kuete and Asongu 2023).

Most studies have found positive effects of ICT infrastructure on productivity (Cardona et al. 2013). These beneficial effects are first experienced in both goods and services firms, then industries, and

then entire economies (Carol 2008). ICT development helps improve manufacturing industries' productivity (Abri and Mahmoudzadeh 2015). The major factor influencing industrial sector productivity in Sub-Saharan Africa is the quantity and quality of telecommunication infrastructure (Azolibe and Okonkwo 2020).

Energy is essential in overall efforts to achieve sustainable development (Vera and Langlois 2007). Energy infrastructure is an essential input in the industrialisation process of any country (Azam et al. 2021). Energy is necessary for producing and transporting goods from the point of production to the point of sale (Estache and Fay 2007; Nkemgha et al. 2023). Theoretically, the availability of adequate and efficient electricity infrastructure not only improves the quality of life of populations but also promotes rapid industrialisation (Rud 2012; Nkemgha et al. 2023).

However, lack of access to electricity inflates production costs and makes developing countries uncompetitive (Nnimmo 2007). For example, the poor nature of the electricity supply in Nigeria has imposed significant costs on the industrial sector (Aigbokan 1999; Nwankwo and Njogo 2013). India's poor power sector is thought to have slowed its export growth during the 1990s, limiting its comparative advantage in labour-intensive products (Mundial 2000; Rud 2012). Electricity in any nation boosts industrial production (Nwankwo and Njogo 2013; Olufemi 2015). An increase in electricity provision is associated with increased manufacturing output in India (Rud 2012). The relatively low level of industrial sector productivity in Sub-Saharan Africa is largely due to poor electricity and transport infrastructure and underutilization of water supply and sanitation infrastructure (Azolibe and Okonkwo 2020).

The above literature shows that infrastructure development is essential in the industrialisation process and that poor infrastructure development increases the costs of industrialisation, leading to Hypothesis 2, infrastructure development positively impacts ECOWAS member states' industrialisation, and Hypothesis 3, an increase in EBID disbursements to infrastructure improves infrastructure development in ECOWAS member states.

3. Data and Methodology

3.1. Data Sources

The study used panel data collected on the 15 ECOWAS member states from 2010 to 2021. Table 1 presents the descriptive statistics of the data, and Appendix 1 summarises the variables, highlighting their description and sources.

Table 1 Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Manufacturing value added	165	9.05	3.91	1.53	17.38
EBID disbursement in the industrial sector	180	7.42	19.96	0	100
EBID disbursements in infrastructure	180	51.59	42.03	0	100
EBID disbursement in private sector	180	38.24	42.76	0	100
Africa Infrastructure Development Index	180	17.92	9.83	3.82	50.43
Transport Composite Index	180	7.24	5.89	1.79	27.48
Electricity Index	180	2.69	3.08	0	15.3
ICT Composite Index	180	8.40	6.60	0.02	28.02
Water Supply and Sanitation Composite Index	180	58.02	14.17	23.64	89.87
Domestic credit to the private sector by banks	177	18.11	13.15	0.005	65.82
Government expenditures	180	21.30	5.72	9.76	39.16
Gross fixed capital formation	168	20.53	8.85	5.47	49.38
Foreign direct investment	180	5.68	12.71	-2.57	103.3
Household final consumption	180	70.44	18.52	5.20	114.0
Industrial sector employment	180	12.01	5.46	5.15	22.63
Human Development Index	180	0.49	0.07	0.331	0.665
Rule of law	180	-0.64	0.48	-1.61	0.66
GDP growth	180	4.50	4.18	-20.49	20.72
Imports	165	36.03	12.03	8.23	82.47
Exports	165	24.80	8.16	6.47	46.75

Source: Authors.

3.2. Methodology

3.2.1. Simultaneous Equations Modelling

This study relies on the theoretical basis of simultaneous equation modelling developed by Zellner and Theil (1962) to determine the impacts of EBID's interventions on ECOWAS member states' industrialisation and infrastructure development. Simultaneous equation modelling is the best approach to jointly analyse the impact of EBID's industrial interventions and infrastructure interventions on the industrialization and infrastructure development of ECOWAS member states.

The study assumes a complete system of M linear stochastic equations in M jointly dependent variables and λ predetermined variables. Further, N is the number of observations. Then any structural equation, say the T^{th}, can be written in the following form for all observations combined:

$$y_T = Y_T\gamma_T + X_T\beta_T + \mu_T \text{ with } \quad \mu_T = Z_T\delta_T + \eta_T \tag{1}$$

where y_T, is the column vector of observations on one of the jointly dependent variables occurring in that equation; Y_T is the N x m_T matrix of values taken by the explanatory dependent variables of that equation; Y_T is the corresponding coefficient vector; X_T is the N x l_T matrix of values taken by the explanatory predetermined variables; β_T is its coefficient vector; η_T is the column vector of N structural disturbances; and

$$Z_T = \begin{bmatrix} Y_T & X_T \end{bmatrix} \qquad \text{with} \qquad \delta_T = \begin{bmatrix} \gamma_T \\ \beta_T \end{bmatrix} \tag{2}$$

Further, X is considered to be the N x λ matrix of values taken by all (λ) predetermined variables, and it is supposed that its rank is λ . The objective is to estimate the parameter δ_T vectors and, for this purpose, it will be supposed that all equations are identifiable. This implies:

$$\lambda \geq n_T = m_T + l_T \qquad \text{with} \qquad T = \{1, \ldots, M\} \tag{3}$$

where n_T is the total number of coefficients to be estimated in the T^{th} equation.

3.2.2. Model Specification

Based on the study's objective and Zellner and Theil's (1962) model presented above, the empirical simultaneous equation system model is specified as follows:

$$\begin{cases} Manufac_{it} = \gamma_{11} InfraDev_{it} + \beta_{11} EBIDIndDib_{it} + \beta_{1T}{}^{1}X_{it} + \varepsilon_{it} \\ InfraDev_{it} = \gamma_{21} GDP_{it} + \beta_{21} EBIDInfraDib_{it} + \beta_{2T}{}^{2}X_{it} + \varepsilon_{it} \\ GDP_{it} = \beta_{31} C + \beta_{32} G + \beta_{33} GFCF_{it} + \beta_{34} \mathrm{Im}p + \beta_{35} Exp + \beta_{3T}{}^{3}X_{it} + \varepsilon_{it} \end{cases} \tag{4}$$

In the first equation of (4), $\boldsymbol{Manufac_{it}}$ represents manufacturing value added; $\boldsymbol{EBIDIndDib_{it}}$ represents EBID disbursement in the industrial sector; and ${}^{1}X_{it}$ represents a set of control variables composed of domestic credit to the private sector by banks, government expenditures, gross fixed capital formation, foreign direct investment, household final consumption, industrial sector employment, human development index, square of human development index, and rule of law. In the second equation of (4), GDP_{it} represents GDP growth; $\boldsymbol{EBIDInfraDib_{it}}$ represents EBID disbursements in infrastructure; ${}^{2}X_{it}$ and represents a set of control variables composed of domestic credit to the private sector by banks, government expenditures, gross fixed capital formation, foreign direct investment, human development index, and square of EBID disbursements in infrastructure. In the third equation of (4), C_{it} represents household final consumption; G_{it} represents government expenditures; $GFCF_{it}$ represents gross fixed capital formation; Imp_{it} represents imports; represents exports; and ${}^{3}X_{it}$ represents a set of control variables composed of EBID disbursement in the private sector, foreign direct investment, human development index, square of human development index, and rule of law. In all the equations in (4), λ and β represent the coefficients to be estimated and ε_{it} is the error term. In the first two equations of (4), $\boldsymbol{InfraDev_{it}}$ represents an indicator to capture infrastructure development. To do so, the study successively uses as a proxy the African Infrastructure Development Index and three of its four components, namely the Electricity Index, the ICT Composite Index, and the Water Supply and Sanitation Composite Index. All the variables used in the system of equations (4) are explained and described in Appendix 1.

3.2.3. Estimation Technique

The empirical model highlighted by (4) is a system of three simultaneously estimated equations. Based on Zellner and Theil (1962) and Klein (1969), variables such as manufacturing value-added variables, the proxies used to capture infrastructure development, and GDP growth potentially raise an endogeneity issue. The most appropriate estimation technique to resolve this issue is the three-stage least squares (3SLS) technique (Theil 1962). Furthermore, if the set of instrumental variables in the empirical model is common to all equations, the 3SLS technique is like the multi-equation generalized method of moments (GMM) technique and gives the results the robustness of GMM estimators. However, before estimating the simultaneous equation model, the study first uses the single-equation estimation techniques to show what the results would be if the simultaneous equation model were not used. Because the various Hausman tests have shown the existence of a fixed effect in the model, the study first estimates the fixed effect models and then presents the two-stage least squares (2SLS) estimates, which address the endogeneity problem in single-equation estimates. Finally, the study estimates the simultaneous equation model using the 3SLS technique.

4. Results and Discussion

Because the results of the 3SLS technique are more robust than those of the fixed effect and the 2SLS techniques, the study interprets only the results of the 3SLS technique. All the 3SLS regressions show that the different coefficients of EBID disbursements in the industrial sector, which explain the manufacturing sector's addition of value, are positive and significant. Hence, an increase in EBID disbursements to the industrial sector leads to an increase in the manufacturing sector's addition of value and, therefore, to an increase in the industrialisation level. This result confirms the first hypothesis, according to which an increase in EBID disbursements to the industrial sector of ECOWAS member states will improve their levels of industrialisation. Moreover, in the case of EBID and its member states, this result provides a clear answer to the

question raised by De Aghion (1999) about the direct quantitative contribution of DFI interventions to the industrialisation of DFI member states.

The 3SLS results in table 2 indicate that the African Infrastructure Development Index (AIDI) coefficient explaining the manufacturing sector's addition of value is positive and significant at the 10 percent level, which implies that overall infrastructure development has a positive impact on ECOWAS member states' industrialisation. This result confirms the second hypothesis, according to which infrastructure development positively impacts ECOWAS member states' industrialisation. This result is also consistent with the importance and direct role, or positive externalities, of energy, telecommunications, and other infrastructure in producing and processing goods. This result corroborates that of Nkemgha et al. (2023), who find that infrastructure development positively influences industrialisation.

Regression 5 in table 2 shows that an increase in the industrial sector's employment is accompanied by an increase in the value added by the manufacturing sector. This finding implies that an increase in the industrial sector workforce is accompanied by an increase in the quantity of goods produced, which in turn raises the revenue and value generated by the sector. The same regression shows that an improvement in the Human Development Index is positively associated with an increase in the value added by the manufacturing sector. At the same time, regression 6 in table 2 shows that human development positively influences infrastructure development. These results can be explained by the fact that skilled and healthy people are essential to and more efficient in manufacturing and other design activities during infrastructure construction. Romer's (1990) increasing returns model indicates that human capital has a significantly positive effect on output at the industry level.

Regression 6 in table 2 shows that the coefficient of EBID disbursements in infrastructure, which explains the African Infrastructure Development Index, is negative and significant at the 1 percent level. However, the coefficient of *the square* of EBID disbursements in infrastructure is positive and significant at the 1 percent level. The combined effect of these two results shows a U-shaped relationship between EBID disbursements in infrastructure and overall infrastructure development. This effect indicates that EBID interventions in infrastructure tend to hurt infrastructure development in the short term but help it in the long term. Although he does not find the same inverted U-shape between DFI disbursements and infrastructure development, Sesele (2022) concludes that DFIs help promote infrastructure development.

This study's result can be explained by the time it takes to complete infrastructure work before it is put into service. While infrastructure is under construction, any resources disbursed to finance it have mitigated effects. Only once the infrastructure is put into service does infrastructure financing positively impact infrastructure development. Moreover, it is only in the medium to long term that infrastructure financing, which requires a great deal of resources, reaches the threshold at which it can have a positive impact on infrastructure development.

Regression 6 in table 2 shows that banks' increased domestic credit to the private sector positively impacts overall infrastructure development. This result is consistent with the fact that private sector construction companies most often carry out public infrastructure construction contracts and that these companies most often request credit from banks to fulfil these contracts. This result corroborates Kumari and Sharma's (2017) argument that private financing not only provides the required funds but also the expertise, innovation, modern technologies, and effective strategies

that reduce the risks associated with infrastructure projects. In addition, foreign direct investment has a positive influence on infrastructure development. The combination of the positive impact of bank-provided credit to the private sector and the positive influence of foreign direct investment on infrastructure development leads to the stipulation that financial development is an essential factor in the infrastructure development process. According to Kirkpatrick et al. (2004), foreign direct investment and infrastructure are, in fact, two sides of the same coin: foreign direct investment helps improve infrastructure status, and well-developed infrastructure is instrumental in attracting more foreign direct investment.

Table 2 Interaction of Industrialisation, EBID Interventions, and Overall Infrastructure Development

	Single Equation, FE	Simultaneous Equations, 2SLS			Simultaneous Equations, 3SLS		
VARIABLES	**(1) Manufacturing VA**	**(2) Manufacturing VA**	**(3) AIDI**	**(4) GDP Growth**	**(5) Manufacturing VA**	**(6) AIDI**	**(7) GDP Growth**
EBID disbursement in the industrial sector	0.00392	0.0266***			0.0272***		
	(0.00476)	(0.0101)			(0.00952)		
African Infrastructure Development Index (AIDI)	0.0945	0.136			0.184*		
	(0.0674)	(0.103)			(0.0987)		
Domestic credit to the private sector by banks	0.000515	-0.0181	0.240***		-0.0262	0.239***	
	(0.0400)	(0.0355)	(0.0440)		(0.0339)	(0.0427)	
Government expenditures	-0.00333	-0.0530	0.381***	-0.191**	-0.0857	0.374***	-0.184**
	(0.0370)	(0.0642)	(0.106)	(0.0949)	(0.0616)	(0.103)	(0.0915)
Gross fixed capital formation	-0.0239	-0.113**	-0.181***	0.0421	-0.108**	-0.179***	0.0477
	(0.0275)	(0.0498)	(0.0616)	(0.0678)	(0.0476)	(0.0598)	(0.0654)
Foreign direct investment	-0.0568	0.0345	0.224*	0.245**	0.0258	0.233**	0.246**
	(0.0366)	(0.0736)	(0.122)	(0.111)	(0.0706)	(0.119)	(0.107)
Household final consumption	0.0211	-0.161***		-0.0513	-0.164***		-0.0472
	(0.0175)	(0.0277)		(0.0451)	(0.0264)		(0.0435)
Industrial sector employment	-0.0714	0.550***			0.517***		
	(0.111)	(0.0892)			(0.0846)		

Table 2 Interaction of Industrialisation, EBID Interventions, and Overall Infrastructure Development

	Single Equation, FE	Simultaneous Equations, 2SLS			Simultaneous Equations, 3SLS		
VARIABLES	**(1) Manufacturing VA**	**(2) Manufacturing VA**	**(3) AIDI**	**(4) GDP Growth**	**(5) Manufacturing VA**	**(6) AIDI**	**(7) GDP Growth**
Human Development Index	-82.21*	102.8**	87.19***	81.82	107.9**	87.18***	83.44
	(42.48)	(44.61)	(6.302)	(59.01)	(42.29)	(6.116)	(56.93)
Square of Human Development Index	77.27	-137.1***		-99.92*	-146.0***		-101.7*
	(47.58)	(42.21)		(59.97)	(39.94)		(57.86)
Rule of law	1.680*	-1.027		1.620	-0.611		1.551
	(0.856)	(0.949)		(1.235)	(0.903)		(1.191)
EBID disbursement in infrastructure			-0.154***			-0.142***	
			(0.0421)			(0.0406)	
GDP growth			-0.0919			-0.123	
			(0.233)			(0.224)	
Square of EBID disbursement to infrastructure			0.00148***			0.00136***	
			(0.000425)			(0.000409)	
EBID disbursement to private sector				0.00326			0.00251
				(0.00771)			(0.00742)
Imports				-0.0184			-0.0269
				(0.0518)			(0.0499)

Table 2 Interaction of Industrialisation, EBID Interventions, and Overall Infrastructure Development

	Single Equation, FE	Simultaneous Equations, 2SLS			Simultaneous Equations, 3SLS		
VARIABLES	**(1) Manufacturing VA**	**(2) Manufacturing VA**	**(3) AIDI**	**(4) GDP Growth**	**(5) Manufacturing VA**	**(6) AIDI**	**(7) GDP Growth**
Exports				0.209***			0.219***
				(0.0702)			(0.0677)
Constant	29.82***	-2.039	-31.78***	-8.724	-1.568	-31.63***	-9.624
	(9.780)	(11.15)	(3.875)	(15.22)	(10.57)	(3.750)	(14.68)
Observations	161	159	159	159	159	159	159
R-squared	0.156	0.599	0.816	0.202	0.576	0.815	0.202
Number of groups	14						
Hausman test: P-value	0.0000						

Source: Authors.
Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; VA = value added.

All the 3SLS regressions show that foreign direct investment positively impacts economic growth. The capacity to attract foreign direct investment is an indicator that makes it possible to assess a country's financial development, the increase in which stimulates economic growth. This result corroborates the results of Osei and Kim (2020), who find that foreign direct investment fosters growth in general and those of Asongu and Odhiambo (2020), who find that foreign direct investment has an overall net positive effect on economic growth through ICT tools.

The 3SLS results also show a positive relationship between exports and economic growth. Disregarding re-exports, any increase in exports is induced by increased production and access to external markets, which ultimately stimulates economic growth. This result is consistent with that of Raghutla (2020), who finds that, in the long run, trade openness has a significantly positive impact on economic growth, and that of Juliansyah et al. (2022), who find that exports have a positive impact on economic growth in both the short and long run.

After this stage of results analysis, the African Infrastructure Development Index is successively replaced by its various components in simultaneous equation system model (4) to capture the particularity of the development of specific infrastructure like ICT (table 3), electricity (table 4), and water supply and sanitation (Appendix 2).

Regression 5 in table 3 shows that considering the specificity of ICT infrastructure in the model confirms the positive impact of EBID disbursements to industrial projects on the value added by the manufacturing sector. The results also show that ICT infrastructure development positively and significantly impacts ECOWAS member states' industrialisation. This result demonstrates the catalytic effect of ICT infrastructure on financial development by facilitating financial transactions (transaction speeds, transaction security, and so on) as well as the role played by ICT infrastructure in the production process. This result corroborates the results of Abri and Mahmoudzadeh (2015) and Azolibe and Okonkwo (2020), who have shown that ICT infrastructure helps improve manufacturing industries' productivity.

Table 3 Interaction of Industrialisation, EBID Interventions, and ICT Infrastructure Development

	Single Equation, FE	Simultaneous Equations, 2SLS			Simultaneous Equations, 3SLS		
VARIABLES	**(1) Manufac_VA**	**(2) Manufac_VA**	**(3) ICT Composite Index**	**(4) gdprate**	**(5) Manufac_VA**	**(6) ICT Composite Index**	**(7) gdprate**
EBID disbursement in the industrial sector	0.00506	0.0235**			0.0238**		
	(0.00478)	(0.0104)			(0.00947)		
ICT Composite Index	-0.0235	0.127			0.190**		
	(0.0423)	(0.0937)			(0.0885)		
Domestic credit to the private sector by banks	0.0155	0.0152	0.00910		0.0149	0.0190	
	(0.0396)	(0.0291)	(0.0476)		(0.0277)	(0.0453)	
Government expenditures	-0.00834	-0.0610	0.223*	-0.191**	-0.0817	0.200*	-0.178**
	(0.0372)	(0.0676)	(0.115)	(0.0949)	(0.0644)	(0.110)	(0.0907)
Gross fixed capital formation	-0.0332	-0.140***	-0.00474	0.0421	-0.145***	-0.00938	0.0732
	(0.0269)	(0.0464)	(0.0666)	(0.0678)	(0.0438)	(0.0645)	(0.0647)
Foreign direct investment	-0.0389	0.0632	0.0473	0.245**	0.0820	0.0612	0.216**
	(0.0364)	(0.0728)	(0.132)	(0.111)	(0.0694)	(0.127)	(0.106)
Household final consumption	0.0143	-0.161***		-0.0513	-0.172***		-0.0229
	(0.0174)	(0.0285)		(0.0451)	(0.0265)		(0.0425)
Industrial sector employment	0.0212	0.496***			0.478***		
	(0.109)	(0.0697)			(0.0632)		

Table 3 Interaction of Industrialisation, EBID Interventions, and ICT Infrastructure Development

	Single Equation, FE	Simultaneous Equations, 2SLS			Simultaneous Equations, 3SLS		
VARIABLES	**(1) Manufac_VA**	**(2) Manufac_VA**	**(3) ICT Composite Index**	**(4) gdprate**	**(5) Manufac_VA**	**(6) ICT Composite Index**	**(7) gdprate**
Human Development Index	-112.7***	109.9**	48.10***	81.82	122.5***	48.29***	78.68
	(42.14)	(44.43)	(6.815)	(59.01)	(40.71)	(6.578)	(55.62)
Square of Human Development Index	124.9**	-138.2***		-99.92*	-154.4***		-96.87*
	(47.99)	(43.34)		(59.97)	(39.60)		(56.56)
Rule of law	1.480*	-0.377		1.620	-0.00509		1.232
	(0.858)	(0.817)		(1.235)	(0.750)		(1.165)
EBID disbursement in infrastructure			-0.124***			-0.109***	
			(0.0455)			(0.0415)	
Square of EBID disbursement to infrastructure			0.000803*			0.000731*	
			(0.000459)			(0.000416)	
GDP growth			-0.335			-0.393*	
			(0.252)			(0.237)	
EBID disbursement to private sector				0.00326			-0.00175
				(0.00771)			(0.00721)
Imports				-0.0184			-0.0441
				(0.0518)			(0.0484)

Table 3 Interaction of Industrialisation, EBID Interventions, and ICT Infrastructure Development

	Single Equation, FE	Simultaneous Equations, 2SLS			Simultaneous Equations, 3SLS		
VARIABLES	**(1) Manufac_VA**	**(2) Manufac_VA**	**(3) ICT Composite Index**	**(4) gdprate**	**(5) Manufac_VA**	**(6) ICT Composite Index**	**(7) gdprate**
Exports				0.209***			0.253***
				(0.0702)			(0.0662)
Constant	34.22***	-2.764	-15.44***	-8.724	-3.744	-15.40***	-11.05
	(9.492)	(11.30)	(4.191)	(15.22)	(10.35)	(4.008)	(14.35)
Observations	161	159	159	159	159	159	159
R-squared	0.146	0.576	0.511	0.202	0.532	0.497	0.196
Number of groups	14						
Hausman test: P-value	0.0001						

Source: Authors.
Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; VA = value added.

Regression 6 in table 3 shows a U-shaped relationship between EBID disbursements to infrastructure projects and ICT infrastructure development. This result implies that EBID's infrastructure interventions positively influence ICT infrastructure development only in the long term. This result corroborates the results from regression 6 in table 2, which indicate the exact relationship between EBID disbursements in infrastructure and overall infrastructure development.

Once again, the results show that EBID disbursements in favour of industrial projects positively impact the value added by the manufacturing sector (regression 5, table 4). Including the specific development of electricity infrastructure in the model shows a significantly positive impact of electricity infrastructure development on the value added by the manufacturing sector (regression 5, table 4). Because electricity is an essential input without which no industrialisation activity can be undertaken, it is logical to find that electricity infrastructure development positively impacts the value added by the manufacturing sector. Beyond confirming once again the second hypothesis, this result corroborates the results of Nwankwo and Njogo (2013) and Olufemi (2015), who find that electricity increases industrial output in any nation and that of Rud (2012), who finds that an increase in electricity supply is associated with an increase in manufacturing output.

However, EBID's infrastructure interventions still need to impact electricity infrastructure development significantly in the subregion (regression 6, table 4). Given the critical role played by electrical infrastructure in the production and industrialisation process, EBID must increase its financing of electricity infrastructure development projects to positively impact subregions' industrialisation level.

The results of considering water supply and sanitation infrastructure are presented in Appendix 2. Regression 5 in Appendix 2 shows that developing water and sanitation infrastructure positively impacts industrialisation. Beyond being an essential element of life, water is an essential input in most processing industries (food, cosmetics, and so on) and construction. Therefore, improving water supply and sanitation infrastructure development positively influences industrialisation levels. This result corroborates that of Azolibe and Okonkwo (2020), who find that one reason for the under-industrialisation of Sub-Saharan African countries is the lack and under-utilisation of water supply and sanitation infrastructure.

Table 4 Interaction of Industrialisation, EBID Interventions, and Electricity Infrastructure Development

	Single Equation, FE	Simultaneous Equations, 2SLS			Simultaneous Equations, 3SLS		
VARIABLES	**(1) Manufacturing VA**	**(2) Manufacturing VA**	**(3) Electricity Composite Index**	**(4) GDP Growth**	**(5) Manufacturing VA**	**(6) Electricity Composite Index**	**(7) GDP Growth**
EBID disbursement in the industrial sector	0.00449	0.0202*			0.0181*		
	(0.00475)	(0.0117)			(0.0102)		
Electricity Composite Index	0.158	1.466**			2.271***		
	(0.174)	(0.647)			(0.560)		
Domestic credit to the private sector by banks	-0.00347	-0.0365	0.0565***		-0.0747**	0.0540***	
	(0.0431)	(0.0382)	(0.0162)		(0.0350)	(0.0158)	
Government expenditures	-0.00605	-0.0745	0.0874**	-0.191**	-0.146**	0.0891**	-0.204**
	(0.0371)	(0.0732)	(0.0387)	(0.0949)	(0.0688)	(0.0374)	(0.0913)
Gross fixed capital formation	-0.0311	-0.0762	-0.0109	0.0421	-0.0684	-0.00926	0.0193
	(0.0269)	(0.0589)	(0.0228)	(0.0678)	(0.0539)	(0.0222)	(0.0653)
Foreign direct investment	-0.0436	-0.0505	0.0732*	0.245**	-0.109	0.0729*	0.258**
	(0.0354)	(0.0948)	(0.0441)	(0.111)	(0.0880)	(0.0425)	(0.107)
Household final consumption	0.0163	-0.105**		-0.0513	-0.101***		-0.0590
	(0.0171)	(0.0419)		(0.0451)	(0.0370)		(0.0433)
Industrial sector employment	-0.0284	0.705***			0.714***		
	(0.104)	(0.128)			(0.111)		

Table 4 Interaction of Industrialisation, EBID Interventions, and Electricity Infrastructure Development

	Single Equation, FE	Simultaneous Equations, 2SLS			Simultaneous Equations, 3SLS		
VARIABLES	**(1) Manufacturing VA**	**(2) Manufacturing VA**	**(3) Electricity Composite Index**	**(4) GDP Growth**	**(5) Manufacturing VA**	**(6) Electricity Composite Index**	**(7) GDP Growth**
Human Development Index	-90.10**	188.5***	26.65***	81.82	171.5***	26.68***	51.19
	(42.64)	(57.32)	(2.340)	(59.01)	(49.59)	(2.264)	(56.64)
Square of Human Development Index	94.91**	-258.7***		-99.92*	-264.3***		-69.69
	(44.87)	(71.21)		(59.97)	(61.60)		(57.57)
Rule of law	1.576*	-1.563		1.620	-1.543*		1.816
	(0.854)	(1.056)		(1.235)	(0.920)		(1.185)
EBID disbursement to infrastructure			-0.00172			-0.00257	
			(0.00363)			(0.00322)	
GDP growth			0.0210			0.0139	
			(0.0786)			(0.0718)	
EBID disbursement to private sector				0.00326			0.00553
				(0.00771)			(0.00739)
Imports				-0.0184			-0.0171
				(0.0518)			(0.0496)
Exports				0.209***			0.205***
				(0.0702)			(0.0674)

Table 4 Interaction of Industrialisation, EBID Interventions, and Electricity Infrastructure Development

	Single Equation, FE	Simultaneous Equations, 2SLS			Simultaneous Equations, 3SLS		
VARIABLES	**(1) Manufacturing VA**	**(2) Manufacturing VA**	**(3) Electricity Composite Index**	**(4) GDP Growth**	**(5) Manufacturing VA**	**(6) Electricity Composite Index**	**(7) GDP Growth**
Constant	30.62***	-21.92	-13.03***	-8.724	-12.77	-12.99***	0.210
	(10.01)	(14.23)	(1.432)	(15.22)	(12.33)	(1.358)	(14.61)
Observations	161	159	159	159	159	159	159
R-squared	0.149	0.474	0.733	0.202	0.154	0.734	0.199
Number of groups	14						
Hausman test: P-value	0.0000						

Source: Authors.
Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; VA = value added.

5. Conclusion

This paper sought to determine the impacts of EBID's interventions on ECOWAS member states' industrialisation and infrastructure development. Through a simultaneous equation modelling estimated by the three-stage least squares technique, it made three findings. First, EBID's disbursements to the industrial sector positively impact ECOWAS member states' industrialisation. Second, the development of overall infrastructure and the specific development of ICT, electricity, and water supply and sanitation infrastructure positively impact ECOWAS member states' industrialisation. Third, there exists a U-shaped relationship on one hand between EBID's disbursements to infrastructure projects and the development of overall infrastructure, and on the other hand between EBID's disbursements to infrastructure projects and the development of ICT infrastructure.

The paper's first hypothesis, according to which an increase in EBID disbursements to the industrial sector of ECOWAS member states will improve their levels of industrialisation, is confirmed by results under all conditions. The second hypothesis, according to which infrastructure development positively impacts ECOWAS member states' industrialisation, is confirmed for the indicator covering overall infrastructure and for the ICT, electricity, and water supply and sanitation components. The third hypothesis, according to which an increase in EBID disbursements to infrastructure improves infrastructure development in ECOWAS member states, is confirmed only in the long term. There are two main reasons for the results related to the third hypothesis. First, because infrastructure projects are generally implemented over the medium term, it is over the long term that the aggregate effect of infrastructure financing has a positive influence on infrastructure development. Second, because of the significant amount of money required to finance infrastructure, it is often in the medium term and even in the long term that all the aggregate financing for infrastructure reaches the critical threshold necessary to positively influence infrastructure development.

The results have two policy implications. First, EBID management should pursue its aggressive resource mobilisation strategy at reasonable and non-prohibitive rates to increase the EBID's disbursements to industrial projects to more significantly impact ECOWAS member states' industrialisation. Second, EBID management should initiate in-depth audits of the infrastructure project financing process to correct any shortcomings and reinforce good practices with the aim of improving the impact of EBID's infrastructure financing on the subregion's infrastructure development. One limitation of the present study is that the unbalanced panel data did not allow the analysis to be extended to determine the thresholds required for the quadratic relationships between variables established by the paper's results. Future research will seek to overcome this limitation.

Appendixes

Appendix 1 Variables Summary

Variable	Variable description	Source
Manufacturing value added	Calculated as a percentage of GDP, the manufacturing sector's value added is the net output of the manufacturing sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources.	World Development Indicators
EBID disbursement to the industrial sector	Calculated as a percentage of EBID's total disbursements in all the bank's areas of intervention, EBID's disbursements to the industrial sector represent the total disbursements to industrial projects. This variable is used to capture EBID's intervention in the industrial sector.	EBID's West African Development Outlook
EBID disbursements to infrastructure	Calculated as a percentage of total EBID disbursements to all the bank's areas of intervention, EBID disbursements to infrastructure represent total disbursements to transport, electricity, ICT, and water supply and sanitation infrastructure projects. This variable is used to capture EBID's contribution to infrastructure development.	EBID's West African Development Outlook
EBID disbursement to private sector	Calculated as a percentage of total EBID disbursements to all the bank's areas of intervention, EBID disbursements to the private sector represent all disbursements to projects initiated by private sector promoters. This variable is used to capture EBID's contribution to the promotion and development of the private sector.	EBID's West African Development Outlook
Africa Infrastructure Development Index (AIDI)	The African Infrastructure Development Index is a composite index calculated on four infrastructure components: transport, electricity, ICT, water supply and sanitation. The index ranges from 0 to 100. As its name suggests, is used to capture infrastructure development in African countries.	AfDB's Africa Infrastructure Knowledge Program
Transport Composite Index	The Transport Composite Index is a component of AIDI. The index is calculated based on the total paved roads (kilometres per 10,000 inhabitants) and the total road network in kilometres (per square kilometre of exploitable land area).	AfDB's Africa Infrastructure Knowledge Program
Electricity Index	The Electricity Index is a component of AIDI. The indicator is measured in millions of kilowatt-hours produced per hour and per habitant. The index is calculated based on the total electricity production of a given country, including energy imported from abroad. This production includes both private and public energy generated.	AfDB's Africa Infrastructure Knowledge Program
ICT Composite Index	The ICT Composite Index is a component of AIDI. The index is calculated based on the total phone subscriptions (per 100 inhabitants), the number of Internet users (per 100 inhabitants), the fixed broadband Internet subscribers (per 100 inhabitants), and the international Internet bandwidth (Mbps).	AfDB's Africa Infrastructure Knowledge Program

Appendixes

Appendix 1 Variables Summary

Variable	Variable description	Source
Water Supply and Sanitation Composite Index	The Water and Sanitation Composite Index is a component of AIDI. The index is calculated based on improved water source (percentage of population with access) and improved sanitation facilities (percentage of population with access).	AfDB's Africa Infrastructure Knowledge Program
Domestic credit to the private sector by banks	Calculated as a percentage of GDP, domestic credit to the private sector by banks refers to financial resources provided to the private sector by other depository corporations (deposit-taking corporations except central banks), such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment. This variable is often used as a proxy for financial development.	World Development Indicators
Government expenditures	Calculated as a percentage of GDP, a government's total expenditure consists of total expenses and the net acquisition of nonfinancial assets.	World Economic Outlook database
Gross fixed capital formation	Calculated as a percentage of GDP, gross fixed capital formation includes land improvements; purchases of plant, machinery and equipment; and construction of roads, railways, and other infrastructure, including schools, offices, hospitals, private residential accommodations, and commercial and industrial buildings.	AfDB Socio-Economic Database
Foreign direct investment	Foreign direct investments are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvested earnings, other long-term capital, and short-term capital as shown in the balance of payments. This variable is often used as a proxy for financial development and is measured as a percentage of GDP.	World Development Indicators
Household final consumption	Household final consumption expenditure represents the final consumption of households and nonprofit institutions. It includes imputed rent for owner-occupied dwellings but excludes purchases of dwellings, and it also includes any statistical discrepancy. The variable is measured as a percentage of GDP.	AfDB Socio-Economic Database
Industrial sector employment	Calculated by dividing the number of persons of working age engaged in a production activity or a service in exchange for pay or profit in the industrial sector by the total number of persons of working age employed.	World Development Indicators
Human Development Index	The Human Development Index is based on the following three indicators: longevity, as measured by life expectancy at birth; educational attainment, as measured by a combination of adult literacy and combined primary, secondary, and tertiary enrolment ratios; and standard of living, as measured by real GDP per capita.	AfDB Socio-Economic Database/UNDP, Human Development Report

Appendixes

Appendix 1 Variables Summary

Variable	Variable description	Source
Rule of law	Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. This indicator varies from -2.5 (weak rule of law) to 2.5 (strong rule of law) and is used as a proxy for a country's institutional quality.	Worldwide Governance Indicators
GDP growth	GDP growth is measured as the year-on-year change in GDP at constant prices, with a base year specific to each country. Expenditure-based GDP is calculated as total final expenditure at purchaser prices (including the free-on-board value of exports of goods and services) minus the free-on-board value of imports of goods and services.	World Economic Outlook database
Imports	Measured as the percentage change in the volume of imports, imports correspond to the overall change in the quantities of total imports whose characteristics (goods and services and their prices) are unchanged.	World Economic Outlook database
Exports	Measured as the percentage change in the volume of exports, exports correspond to the overall change in the quantities of total exports whose characteristics (goods and services and their prices) are unchanged.	World Economic Outlook database

Appendix 2 Interaction of Industrialisation, EBID Interventions, and Water Supply and Sanitation Infrastructure Development

	Single Equation, FE	Simultaneous Equations, 2SLS			Simultaneous Equations, 3SLS		
VARIABLES	**(1) Manufacturing VA**	**(2) Manufacturing VA**	**(3) WSS Composite Index**	**(4) GDP Growth**	**(5) Manufacturing VA**	**(6) WSS Composite Index**	**(7) GDP Growth**
EBID disbursement in the industrial sector	0.00386	0.0274***			0.0268***		
	(0.00465)	(0.0103)			(0.00966)		
Water Supply and Sanitation Composite Index	0.111**	0.0987			0.151**		
	(0.0426)	(0.0625)			(0.0590)		
Domestic credit to the private sector by banks	-0.0227	-0.00723	0.0495		-0.00395	0.00323	
	(0.0407)	(0.0307)	(0.0985)		(0.0293)	(0.0922)	
Government expenditures	0.0144	-0.0557	0.783***	-0. 191**	-0.0990	0.812***	-0.228**
	(0.0372)	(0.0648)	(0.238)	(0.0949)	(0.0620)	(0.228)	(0.0901)
Gross fixed capital formation	-0.0368	-0.130***	-0.339**	0.0421	-0.113**	-0.310**	0.00550
	(0.0264)	(0.0464)	(0.138)	(0.0678)	(0.0442)	(0.133)	(0.0641)
Foreign direct investment	-0.0332	0.0525	0.0454	0.245**	0.0435	0.0474	0.256**
	(0.0349)	(0.0722)	(0.274)	(0.111)	(0.0692)	(0.262)	(0.106)
Household final consumption	0.0272	-0.164***		-0.0513	-0.161***		-0.0633
	(0.0173)	(0.0276)		(0.0451)	(0.0260)		(0.0418)
Industrial sector employment	-0.170	0.625***			0.618***		
	(0.117)	(0.1 19)			(0.112)		

Appendix 2 Interaction of Industrialisation, EBID Interventions, and Water Supply and Sanitation Infrastructure Development

	Single Equation, FE	Simultaneous Equations, 2SLS			Simultaneous Equations, 3SLS		
VARIABLES	**(1) Manufacturing VA**	**(2) Manufacturing VA**	**(3) WSS Composite Index**	**(4) GDP Growth**	**(5) Manufacturing VA**	**(6) WSS Composite Index**	**(7) GDP Growth**
Human Development Index	-143.7***	23.07	140.6***	81.82	20.55	141.4***	123.1**
	(41.45)	(75.28)	(14.11)	(59.01)	(70.99)	(13.55)	(54.44)
Square of Human Development Index	135.9***	-59.71		-99.92*	-64.63		-145.0***
	(41.36)	(66.55)		(59.97)	(62.74)		(55.39)
Rule of law	1.976**	-1.723		1.620	-1.623		3.369***
	(0.852)	(1. 190)		(1.235)	(1.122)		(1.141)
EBID disbursement to infrastructure			-0.0926			-0.0700	
			(0.0942)			(0.0864)	
Square of EBID disbursement to infrastructure			0.00101			0.000623	
			(0.000951)			(0.000872)	
GDP growth			0.486			0.394	
			(0.521)			(0.494)	
EBID disbursement to private sector				0.00326			0.00877
				(0.00771)			(0.00708)
Imports				-0.0184			0.0109
				(0.0518)			(0.0476)

Appendix 2 Interaction of Industrialisation, EBID Interventions, and Water Supply and Sanitation Infrastructure Development

	Single Equation, FE	Simultaneous Equations, 2SLS			Simultaneous Equations, 3SLS		
VARIABLES	**(1) Manufacturing VA**	**(2) Manufacturing VA**	**(3) WSS Composite Index**	**(4) GDP Growth**	**(5) Manufacturing VA**	**(6) WSS Composite Index**	**(7) GDP Growth**
Exports				0.209***			0.179***
				(0.0702)			(0.0653)
Constant	42.00***	13.80	-22.71***	-8.724	13.70	-22.48***	-14.95
	(9.762)	(16.58)	(8.675)	(15.22)	(15.63)	(8.220)	(14.05)
Observations	161	159	159	159	159	159	159
R-squared	0.185	0.585	0.557	0.202	0.530	0.562	0.185
Number of groups	14						
Hausman test: P-value	0.0000						

Source: Authors.
Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; VA = value added.

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