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The Dynamics of Chinese FDI in Africa: A Case Study Algeria

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Abstract

This study employs a Seasonal Autoregressive Integrated Moving Average with Exogenous Variables (SARIMAX) model to examine the determinants, temporal patterns, and projected trajectories of Chinese Foreign Direct Investment (FDI) flows to Algeria over the period 2003-2021. Chinese capital investments have emerged as a critical factor in Algeria's economic transformation, with concentrated activity in construction, energy extraction, and infrastructure development sectors. Utilizing quarterly time-series data derived from national statistical agencies and international financial institutions, this research models the dynamic relationship between Chinese FDI inflows and key macroeconomic determinants, including international oil price volatility, exchange rate fluctuations, and bilateral trade volumes. The empirical analysis incorporates advanced econometric techniques to capture seasonal variations and external shocks affecting investment patterns. Through ex-ante forecasting methodologies, the study projects future FDI trajectories while identifying primary explanatory variables that influence investment decisions. The econometric findings provide empirical evidence for policymakers seeking to develop strategic frameworks for attracting sustainable and sectorally diversified foreign investment portfolios. The research contributes to the broader literature on South-South investment flows and offers practical insights for enhancing bilateral economic cooperation mechanisms between China and Algeria.

Keywords: China, Algeria, FDI, Investment, trade, economic relation

1. Introduction

The proliferation of Chinese foreign direct investment (FDI) in Africa represents a fundamental reconfiguration of contemporary international economic relations, marking a decisive departure from traditional North-South investment paradigms. This phenomenon reflects China's strategic economic diplomacy and its emergence as a dominant force in South-South cooperation frameworks (Brautigam, 2009; Alden, 2007). The exponential growth trajectory of Chinese capital flows to African markets has fundamentally altered the geopolitical landscape, positioning African economies as strategic nodes within China's broader global economic architecture.

China's economic engagement with Africa operates within a comprehensive policy framework that simultaneously advances domestic developmental objectives while projecting economic influence across emerging markets. This dual-purpose strategy exemplifies what scholars have termed "developmental statecraft," whereby China leverages economic instruments to achieve both commercial and geopolitical objectives (Tan-Mullins et al., 2010). Within this broader continental strategy, North African economies, particularly Algeria, have emerged as focal points of Chinese investment activity, driven by strategic imperatives to secure energy resources and establish sustainable supply chains for raw materials essential to China's continued economic expansion.

The institutionalization of Sino-African economic cooperation through the Forum on China-Africa Cooperation (FOCAC) in 2000 established a multilateral framework for sustained economic engagement, facilitating policy coordination and investment facilitation mechanisms (Taylor, 2006). The subsequent evolution of China-Algeria bilateral relations demonstrates the operationalization of these frameworks, as evidenced by China's commitment of $36 billion in comprehensive investment targeting sectoral diversification across industrial development, technology transfer, knowledge economy advancement, transportation infrastructure, and agricultural modernization initiatives.

This substantial capital commitment reflects China's long-term strategic calculus regarding

Algeria's economic potential and geopolitical significance within the broader Maghreb region. The multisectoral nature of these investments indicates a departure from traditional resource-extraction models toward more comprehensive development partnerships (Corkin, 2013). Contemporary Chinese direct investment across the African continent has exceeded $40 billion, positioning China as a principal source of development finance for infrastructure and industrial projects throughout the region.

The multidimensional character of China-Algeria cooperation encompasses economic, political, and diplomatic dimensions, reflecting the complexity of contemporary South-South partnerships. Algeria's strategic objectives within this bilateral framework include accelerating economic diversification, enhancing export competitiveness, and attracting technology transfer to support long-term developmental goals, particularly in natural resource processing, service sector development, and infrastructure modernization initiatives.

2. Literature Review

The economic relationship between China and Africa has emerged as a significant area of scholarly inquiry, particularly in the context of South-South cooperation and its implications for African development. This literature review examines key studies that analyze the nature, scope, and impact of Sino-African economic partnerships, with particular attention to bilateral trade patterns, foreign direct investment flows, and development outcomes across the continent. The literature on China-Africa economic relations is grounded in several theoretical frameworks, including comparative advantage theory, dependency theory, and South-South cooperation paradigms, which help explain the structural characteristics of the economic relationship and its implications for development outcomes in African partner countries.

Benmansour's (2019) comprehensive analysis of Sino-Nigerian economic relations provides critical insights into the structural characteristics of China-Africa partnerships. Published in the Journal of the Researcher for Academic Studies, this study examines the trajectory of bilateral relations since the establishment of diplomatic ties in 1971. The research documents the presence of over 30 Chinese enterprises operating primarily in Nigeria's oil, gas, and construction sectors, demonstrating China's substantial investment footprint in the country's energy infrastructure. A central finding of Benmansour's (2019) analysis reveals significant asymmetry in the distribution of economic benefits, with China deriving proportionally greater advantages from the bilateral partnership. This imbalance is attributed to Nigeria's limited industrial capacity and over-reliance on raw material exports, which constrains opportunities for value-added activities and technology transfer. The study's findings align with broader concerns in the literature regarding the potential for perpetuating dependency relationships in South-South economic partnerships.

The China-Africa Economic and Trade Expo (CAETE) Secretariat's (2021) annual report provides a comprehensive continental perspective on Sino-African economic relations. The analysis identifies key African trading partners, including South Africa, Nigeria, Angola, and the Democratic Republic of Congo, while documenting the proliferation of Chinese enterprises across various African markets. The report emphasizes the increasing participation of private sector actors and the sectoral diversification of Chinese investment portfolios beyond traditional resource extraction industries. The CAETE analysis demonstrates robust economic cooperation characterized by what the authors term "mutually advantageous outcomes." This relationship operates within a framework where Africa leverages its natural resource endowments while China contributes manufactured goods and industrial products aligned with African developmental requirements. The study highlights China's contribution through advanced industrial capability transfers, human capital development programs, and specialized training frameworks designed to enhance competitive capacity in key economic sectors.

Begato and Tang's (2015) analysis, presented at the Africa Investment Forum in Addis Ababa, documents notable improvements in Africa's macroeconomic environment, with average GDP growth rates stabilizing at approximately 5% during the study period. The authors establish a correlation between Chinese economic engagement and corresponding improvements in human development indicators as measured by international development metrics. The study identifies favorable external conditions, particularly robust demand for natural resources from emerging market economies, with China representing the predominant source of this demand. However, the research also highlights the uneven distribution of Chinese investment flows across the continent, with resource-rich economies receiving disproportionate attention while other African nations remain relatively underexposed to these capital inflows.

The literature demonstrates that Chinese economic engagement in Africa has generated measurable development outcomes. Rotberg (2008) provides evidence that Chinese enterprise activities have fostered substantial competitive advantages, resulting in measurable income improvements across various African contexts. The African Development Bank's data indicates that Chinese financial institutions have committed approximately 170 billion yuan toward African infrastructure development and macroeconomic stabilization initiatives, suggesting significant resource mobilization for development purposes. This economic relationship has generated an inclusive development model characterized by employment creation, income enhancement, and poverty reduction outcomes across multiple African economies.

Despite the growing body of research on China-Africa economic relations, significant gaps remain in the empirical literature. A critical deficiency concerns the limited availability of rigorous quantitative studies examining Chinese foreign direct investment (FDI) in specific African contexts. The existing research base predominantly comprises descriptive analyses, diplomatic relationship assessments, and sectoral case studies, with insufficient integration of macroeconomic modeling techniques for forecasting investment trajectories or establishing causal relationships between determinant variables (Okolo & Akwu, 2016). The literature reveals inadequate examination of the socio-economic implications of Chinese FDI on host country development outcomes, with key areas requiring further investigation including employment generation mechanisms, technology transfer processes, and environmental governance frameworks.

A significant methodological lacuna exists in empirical research that synthesizes time-series econometric analysis with geopolitical and institutional variables to explain FDI flow patterns. The reviewed literature suggests a need for comprehensive data-driven approaches that provide both retrospective analysis and prospective forecasting capabilities to generate actionable policy insights. This gap is particularly pronounced in country-specific contexts, where the interaction between Chinese investment and local institutional environments remains underexplored.

Benmansour (2019) advances several policy recommendations aimed at addressing asymmetrical benefit distribution in China-Africa partnerships. The study advocates for comprehensive industrial development policies designed to enhance African countries' manufacturing capabilities and technological absorption capacity. These recommendations include establishing protective mechanisms for domestic industries while creating frameworks to optimize foreign investment benefits. The literature emphasizes the imperative for comprehensive regional development strategies that leverage expanding economic partnerships, including growing intra-African trade relationships, to ensure more equitable distribution of investment benefits across the continent. This approach recognizes the need to address the concentrated nature of Chinese investment flows and their uneven continental distribution.

The reviewed literature demonstrates that China-Africa economic relations represent a complex phenomenon with significant implications for African development outcomes. While the relationship has generated measurable benefits in terms of economic growth, infrastructure development, and poverty reduction, concerns persist regarding asymmetrical benefit distribution and the potential for perpetuating dependency relationships. The literature reveals substantial research gaps, particularly in rigorous quantitative analysis and comprehensive assessment of socio-economic impacts. Future research should prioritize empirical studies that employ advanced econometric techniques to establish causal relationships between Chinese economic engagement and development outcomes, while considering the role of institutional and governance factors in mediating these relationships. The policy implications emerging from this literature review suggest the need for strategic approaches that maximize the benefits of China-Africa economic partnerships while addressing concerns about asymmetrical outcomes and ensuring more equitable distribution of economic gains across the continent.

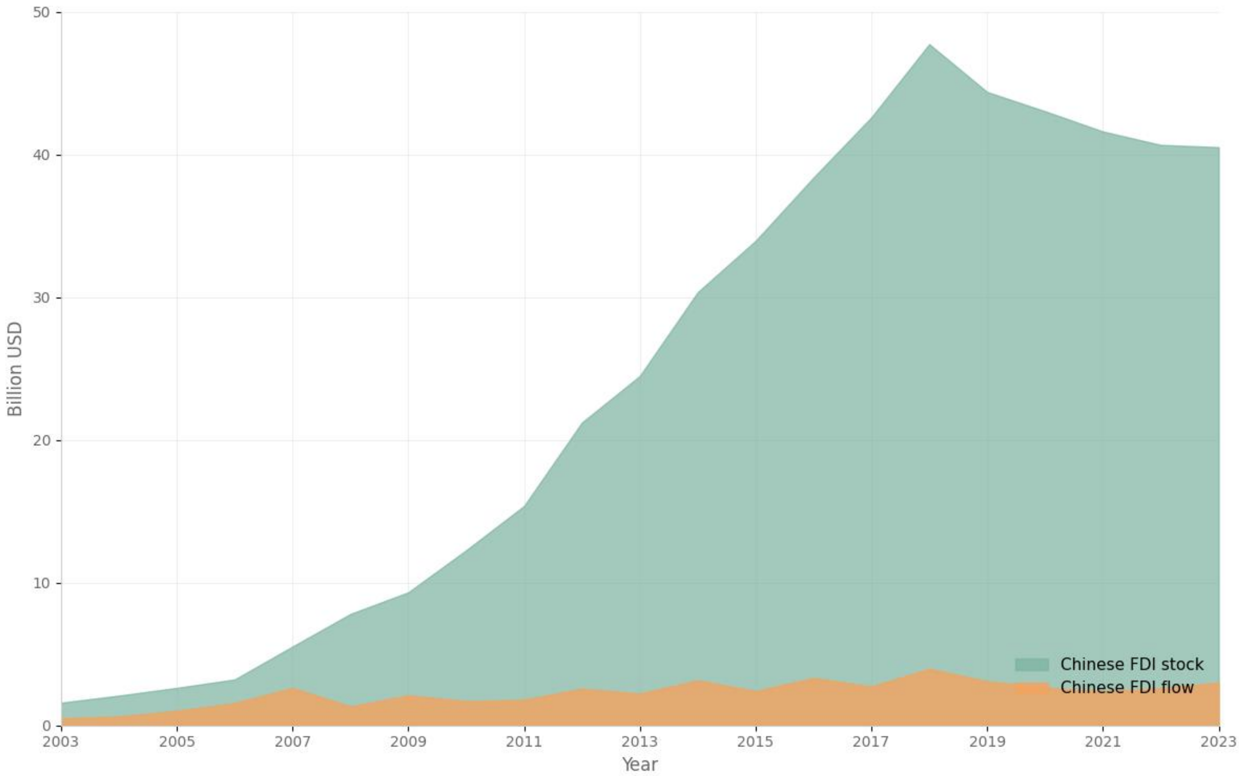

Figure 1. Chinese FDI stock in and flow to Africa

Based on the empirical data presented in Figure 1, Chinese foreign direct investment in Africa demonstrates a pronounced upward trajectory over the period 2003-2023, characterized by both substantial stock accumulation and sustained flow increases. The analysis reveals distinct temporal patterns in Chinese capital deployment across the continent.

The FDI stock data indicates exponential growth from negligible levels in 2003 to approximately 47 billion USD by 2019, representing the peak accumulation period. This dramatic expansion reflects China's strategic prioritization of African markets within its global investment portfolio and underscores the continent's increasing integration into Chinese economic expansion strategies. Notably, the stock trajectory exhibits accelerated growth phases, particularly during 2007-2015, coinciding with China's broader "Going Out" policy implementation and increased South-South cooperation initiatives.

The FDI flow patterns, represented by the orange area, demonstrate relatively modest annual variations compared to the substantial stock accumulation. Annual flows appear to stabilize within a range of 2-4 billion USD throughout most of the observation period, with some fluctuations corresponding to global economic cycles and regional political developments. The post-2019 period reveals a slight contraction in total stock levels, declining to approximately 40 billion USD by 2023, potentially reflecting global economic uncertainties, geopolitical tensions, or strategic portfolio rebalancing by Chinese investors.

This temporal analysis indicates that Chinese FDI in Africa has transitioned from an initial expansion phase characterized by rapid stock accumulation to a more mature phase with stabilized annual flows and modest stock adjustments. The overall pattern demonstrates Africa's established position as a significant destination for Chinese overseas investment, with cumulative stock levels representing substantial long-term capital commitments to the continent's economic development.

2.1 Chinese Investment in Algeria

Algeria and China have sustained comprehensive bilateral relations encompassing economic, commercial, diplomatic, and political dimensions since the establishment of diplomatic ties in 1962. Algerian policymakers have consistently valued China's adherence to the principle of non-interference in domestic affairs, a cornerstone of Chinese foreign policy that has facilitated long-term strategic partnerships with developing nations. This alignment of diplomatic principles has created an enabling environment for extensive Chinese corporate engagement in the Algerian market.

Consequently, numerous large-scale Chinese multinational enterprises have established significant operational presence in Algeria, utilizing the country as a strategic platform for continental expansion across diverse sectors including construction, infrastructure development, telecommunications, energy transportation, and defense industries. The scope of bilateral economic cooperation reached unprecedented levels in 2010, when both nations concluded approximately 200 commercial agreements with an aggregate estimated value of $1.8935 trillion, representing an average transaction value of $902.48 million per agreement.

Algeria's developmental trajectory has been significantly influenced by China's economic model, which has demonstrated particular appeal to emerging economies seeking to replicate similar growth patterns (Policy Center for the New South, 2023). The operational activities of Chinese enterprises in Algeria have experienced commensurate expansion, positioning the country as a major recipient of Chinese foreign direct investment within the African context.

According to Xia (2021), Algeria ranked sixth among African nations in attracting Chinese FDI in 2015, receiving investment flows valued at $210.57 million. This positioning placed Algeria behind Ghana ($283.22 million), Kenya ($281.83 million), South Africa ($233.17 million), Tanzania ($226.32 million), and the Democratic Republic of Congo ($213.71 million). Collectively, these six countries accounted for approximately half of total Chinese FDI stock in Africa, highlighting the concentrated nature of Chinese investment patterns across the continent.

China has pursued sectoral diversification in its Algerian investment portfolio, with particular emphasis on automotive manufacturing. The proliferation of Chinese automotive brands in the Algerian market has generated substantial demand for vehicle components, resulting in increased importation of spare parts from Asian suppliers. This market penetration has been facilitated by three primary factors: competitive production costs, robust domestic consumer demand, and accessible consumer financing mechanisms during the expansion period.

The establishment of a comprehensive Sino-Algerian industrial cooperation zone in 2008 represents a significant milestone in bilateral economic integration (Chen & Cash, 2024). This special economic zone has attracted major Chinese corporations, including JIANGXI COAL and JIANGLING MOTORS CORPORATION GROUP, in partnership with Algerian conglomerate MAZOUZ COMPLEX. The cooperative framework established ambitious production targets of 50,000 automotive units within a five-year implementation period, demonstrating the scale and strategic importance of this bilateral industrial partnership.

The strengthening of Sino-Algerian bilateral relations has been exemplified through a significant commercial agreement valued at 100 million yuan between the Chinese corporation XISHAN and the Algerian enterprise GM TRADE. This partnership culminated in the establishment of a vehicle assembly facility in Algeria, strategically designed to generate employment opportunities for local populations. The manufacturing plant commenced operations in 2009 and subsequently achieved substantial production output, manufacturing over 11,000 vehicles across diverse categories.

Contemporary analyses indicate an expanding presence of Chinese enterprises within Algeria's economic landscape. The existence of preferential trade agreements linking numerous African nations with the European Union creates advantageous market conditions for regional products (Adu-Gyamfi & Adomako, 2024). These trade preferences incentivize Chinese investors to establish manufacturing facilities within the region, as both manufactured goods and regional commerce benefit from these preferential arrangements.

China has established itself as a significant stakeholder in Africa's energy sector through substantial investments in the exploration, production, and international marketing of oil and gas resources. These strategic investments encompass comprehensive infrastructure development, including pipeline construction and refinery establishment, alongside long-term commercial agreements that facilitate the integration of African products into global markets (Chen & Wang, 2022). Since 2000, Algeria has intensified its hydrocarbon exploration initiatives and developed new extraction sites to enhance energy export capacity and augment national revenue streams. Furthermore, the nation has pursued technological partnership diversification by engaging with multiple global powers, including the United States, the United Kingdom, and other European nations, thereby reducing dependency on singular partnerships and enhancing technological capabilities.

The formalization of Sino-Algerian cooperation in the petroleum sector was achieved through a pivotal investment agreement signed in 2002. This collaboration, spearheaded by the Chinese state enterprise SINOPEC in partnership with Algeria's national oil company SONATRACH, was designed to enhance hydrocarbon development within the region. The agreement facilitated improved gas recovery rates while maintaining petroleum product quality standards in compliance with environmental regulations (Large, 2008). Algeria's partnership with Chinese firms has been particularly strategic in addressing operational efficiency challenges arising from the global transition toward renewable energy sources and volatile oil price fluctuations (Bociaga, 2024).

A significant milestone in this cooperation was achieved in 2003 when the China National Petroleum Corporation (CNPC), through its subsidiary China National Oil and Gas Exploration and Development Corporation (CNODC), entered into a contractual arrangement with SONATRACH for the construction of an oil refinery. This facility, designed with an annual refining capacity of 600,000 tons, represents a $350 million investment over a 25-year period, with Chinese participation comprising 70% of the project financing.

The Sino-Algerian partnership has extended into the housing and infrastructure sectors, contributing significantly to Algeria's efforts to address housing shortages. These collaborative housing projects have generated employment opportunities for local residents while stimulating ancillary business activities. Chinese involvement has introduced enhanced construction methodologies, land development techniques, and improved project completion timelines. This collaboration has facilitated bilateral technology transfer, skill exchange programs, and the deepening of economic interdependence between both nations.

2.2 Investment Law 18-22 and Its Impact on Attracting Chinese Investors to Algeria

China's position as a major economic power has established it as a significant contributor to international investment flows across diverse sectors globally. In an effort to strengthen Algeria's national economy, Investment Law 22-18 has been designed to create a conducive and stimulating legal framework for foreign investors, with particular emphasis on attracting Chinese capital (Chen & Wang, 2022). This legislative framework provides a comprehensive array of privileges and incentives that position Algeria as an attractive investment destination, thereby enhancing bilateral cooperation between Algeria and China across multiple economic sectors.

2.2.1 Tax Facilities and Attractive Privileges

The tax exemption provisions established under Investment Law 22-18 constitute a primary attraction mechanism for Chinese investors. The legislation grants tax exemptions extending up to ten years for projects within designated sectors, including heavy industries, infrastructure development, and renewable energy initiatives. These sectors have demonstrated particular appeal to Chinese investors, who have advocated for additional tax exemptions on specific raw materials to further reduce operational expenditures (Chen & Cash, 2024). The broader implications suggest that African governments should consider providing tax relief for young professionals who have acquired technical skills from Chinese educational institutions. The preferential tax treatment accorded to Chinese products and services has facilitated technology transfer and economic development across African nations.

2.2.2 Facilitating Administrative Procedures

The expatiation of administrative procedures represents a crucial factor in enhancing foreign investment attraction. Investment Law 22-18 establishes a one-stop service center designed to facilitate the acquisition of licenses and permits necessary for project implementation (Chen

& Wang, 2022). This administrative framework streamlines Chinese investors' interactions with governmental agencies, thereby enhancing investor confidence and reducing the complexity of Algeria's investment environment. The reduction in time and administrative burden required for obtaining regulatory approvals has contributed to positive responses from Chinese enterprises seeking efficient and rapid project implementation.

2.2.3 Legal Guarantees and Investment Protection

Investment Law 22-18 provides comprehensive legal protection mechanisms for foreign investors, including Chinese entities. The legislation guarantees the protection of intellectual property rights and prohibits arbitrary expropriation of investments. These legal safeguards have enabled Chinese investors to commit capital to Algerian projects without concerns regarding potential political or legal risks affecting their investments. This legal certainty enhances the viability of long-term investment strategies and creates favorable conditions for expanding economic relations between Algeria and China.

2.2.4 Strengthening Public-Private Partnerships (PPP)

Investment Law 22-18 represents a significant legislative initiative designed to promote the establishment of public-private partnerships (PPPs) within Algeria's economic framework. This model facilitates Chinese investor participation in collaborative projects with the Algerian government across critical sectors including infrastructure, energy, transportation, and telecommunications, thereby contributing to sustainable development objectives. China's extensive experience in implementing large-scale projects through governmental cooperation arrangements across various international contexts positions Algeria as an optimal destination for Chinese investment within established PPP frameworks.

2.2.5 Enhancing Investments in Infrastructure

The infrastructure sector constitutes a primary focus area within Investment Law 22-18's strategic framework. Algeria's developmental requirements encompass significant infrastructure improvements in transportation networks, including roads, railways, and port facilities. China's position as the world's largest infrastructure investor, combined with its demonstrated capacity to execute major projects within accelerated timeframes, establishes it as a strategic partner for Algerian infrastructure development, particularly given the legal and fiscal facilitations provided by the legislation (Foster et al., 2008). Investment Law 22-18 promotes this category of investment through procedural streamlining and comprehensive support mechanisms for diverse infrastructure project types.

2.2.6 Promoting Investments in Renewable Energy

Algeria's commitment to achieving renewable energy objectives positions solar and wind energy technologies as priorities for future sustainable development initiatives. China's leadership in renewable energy technology development creates significant opportunities for collaboration under Investment Law 22-18. Chinese investors are positioned to participate in renewable energy projects, including solar and wind power installations, with the legislation providing substantial incentives to encourage such investments. The combination of Chinese technical expertise in renewable energy sectors and Algeria's regulatory incentives presents considerable potential for enhancing the country's energy security and sustainability profile.

2.2.7 Directing Support to Remote and Border Areas

Investment Law 22-18 mandates the provision of specialized incentives for investors establishing projects in remote or border regions. This approach contributes to regional development objectives and promotes geographical balance in economic distribution. As observed by Brautigam (2008), Chinese experts have identified significant potential within African states regarding mineral resources and economic development opportunities. The implementation of Investment Law 22-18 enhances opportunities for economic cooperation between Algeria and China, facilitating increased bilateral investment flows.

The operationalization of Investment Law 22-18 is expected to strengthen strategic relations between Algeria and China at both political and economic levels. Increased Chinese investment in Algeria has the potential to generate substantial employment opportunities, facilitate technology transfer, and enhance bilateral trade volumes. This legislative framework represents a comprehensive approach to attracting foreign direct investment while addressing Algeria's developmental priorities through strategic international partnerships.

3 Methodological Framework

3.1 Data Sources

The empirical analysis utilizes data obtained from multiple authoritative international and national databases to ensure reliability and comprehensiveness. Macroeconomic indicators including inflation rates, gross domestic product (GDP) growth, and foreign direct investment (FDI) flows were sourced from the World Bank's World Development Indicators database. Global oil price data were retrieved from Algerian financial information systems (Zhou & Wu, 2017). Bilateral trade data encompassing China's exports to and imports from Algeria were obtained from national statistical offices and international trade databases. These sources collectively provide comprehensive and current information on the economic variables pertinent to the analysis of Chinese FDI patterns in Algeria.

This study employs a quantitative econometric methodology to examine the trends and determinants of Chinese Foreign Direct Investment in Algeria over the period 2003-2021. The primary analytical tool utilized is the Seasonal Auto-Regressive Integrated Moving Average with Exogenous Variables (SARIMAX) model. This methodological approach is particularly appropriate due to its capacity to accommodate both the temporal dependencies inherent in FDI data and the influence of external macroeconomic determinants.

The model specification follows the structure SARIMA(p,d,q)(P,D,Q)s with the incorporation of additional exogenous regressors. The SARIMAX framework effectively addresses seasonal variations and structural changes, which are particularly relevant in economies significantly influenced by commodity price fluctuations and policy regime transitions.

3.2 Data Sources for Econometric Analysis

The econometric analysis draws upon data from the following sources:

- United Nations Conference on Trade and Development (UNCTAD) FDI Statistics
- Algerian Ministry of Industry and Investment Promotion
- International Monetary Fund (IMF) and World Bank Development Indicators

3.3 Variable Specification

The econometric model incorporates the following variables:

- Quarterly Chinese FDI inflows to Algeria (dependent variable)
- Brent crude oil prices (independent variable)
- Exchange rate (Algerian Dinar/US Dollar) (independent variable)
- Bilateral trade volume encompassing imports and exports (independent variable)
- Inflation rate (control variable)
- Algeria's GDP growth rate (control variable)

3.4 Model Validation and Diagnostic Testing

The model validation process incorporates several diagnostic procedures to ensure statistical robustness. Stationarity testing is conducted using the Augmented Dickey-Fuller (ADF) test to verify the time series properties of the variables. Model selection criteria include the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) to determine optimal model specifications. The Ljung-Box Q test is employed to assess residual autocorrelation and validate model adequacy. Model performance is evaluated using Root Mean Square Error (RMSE) and Mean Absolute Percentage Error (MAPE) metrics applied to validation datasets.

3.5 Historical Context of Chinese Investment in Africa

Chinese foreign direct investment in Africa has demonstrated substantial growth trajectory over the past three decades. Investment flows increased from approximately 20 million yuan in the 1990s to nearly 100 million yuan by 2000, subsequently exceeding 1 billion yuan by 2006. The magnitude of Chinese investment in Africa continued its upward trajectory from 2006 to 2017, reaching approximately 110 million yuan. Following the 2015 Forum on China-Africa Cooperation (FOCAC) summit, China committed to investing 60 billion yuan across African nations (Beck & Cull, 2014). Despite periodic trade tensions and economic uncertainties, Chinese investment in Africa has maintained significant momentum. In 2020, Chinese investment flows to Africa reached approximately 2.5 billion yuan, representing a 9.5% increase compared to 2019 levels, as documented in subsequent analytical frameworks

(Abbas, 2022, pp. 183-184).

3.6 Model Specification

To analyze the relationship between these variables and Chinese FDI in Algeria, a SARIMAX (Seasonal Auto-regressive Integrated Moving Average with eXogenous regressors) model was employed. The general form of the SARIMAX model is:

$$y_t = \sum_{i=1}^{p} \phi_i y_{t-i} + \sum_{j=1}^{q} \theta_j \varepsilon_{t-j} + \sum_{k=1}^{m} \beta_k x_{k,t} + \varepsilon_t \quad (1)$$

where y_t represents the foreign direct investment (FDI) flow at time period t, ϕ_i denotes the autoregressive parameters, θ_j represents the moving average parameters, β_k are the regression coefficients associated with exogenous variables ($x_{k,t}$), and ε_t is the white noise error term.

Through systematic model selection using the Akaike Information Criterion (AIC) as the optimization criterion, the most appropriate specification was identified as ARIMA(0,2,1)(0,0,0)[0]. This configuration indicates the absence of autoregressive components ($p = 0$), the application of second-order differencing ($d = 2$) to ensure stationarity of the time series, and the inclusion of a single moving average component ($q = 1$). The seasonal components are absent, as indicated by the (0,0,0)[0] notation, suggesting no seasonal patterns in the FDI data.

4. Results Presentation

The goodness-of-fit statistics for the SARIMAX model are presented in Table 1. The model demonstrates an Akaike Information Criterion (AIC) value of 13.343, a Bayesian Information Criterion (BIC) value of 16.738, and a Hannan-Quinn Information Criterion (HQIC) value of 12.087. These information criteria serve as diagnostic measures for evaluating model adequacy and specification appropriateness. Lower values across these criteria typically indicate superior model performance in terms of balancing statistical fit with parsimony. The relatively modest AIC value observed suggests that the specified ARIMA (0, 2, 1) (0, 0, 0) [0] model achieves an appropriate equilibrium between explanatory power and model complexity, thereby providing a statistically sound framework for the analysis.

Table 1. Model Fit Statistics

Information Criterion	Value
AIC	13.343
BIC	16.738
HQIC	12.087

4.1 Coefficient Estimates

The parameter estimates for the SARIMAX model are presented in Table 2. The coefficient for global oil prices exhibits a value of 0.0023, accompanied by a standard error of 0.001, yielding a z-statistic of 3.575 and a corresponding p-value of 0.000. This statistical evidence indicates a highly significant positive association between oil price fluctuations and foreign direct investment flows. The economic interpretation suggests that a one-unit increase in global oil prices (measured in USD) corresponds to an increase of 0.0023 billion USD in FDI inflows, ceteris paribus.

Regarding China's export activity to Algeria, the estimated coefficient is 0.0007, with an associated standard error of 0.000, generating a z-statistic of 3.409 and a p-value of 0.001. This coefficient demonstrates statistical significance at conventional levels and indicates that a one million USD increase in Chinese exports to Algeria is associated with a corresponding increase of 0.0007 billion USD in FDI flows, assuming all other explanatory variables remain constant.

Table 2. Coefficient Estimates of the SARIMAX Model

Variable	Coefficient	Standard Error	z - value	p - value	95% Confidence Interval Lower	95% Confidence Interval Upper
Inflation Rate (%)	0.0267	0.046	0.578	0.564	-0.064	0.117
GDP Growth (%)	-9.1895	7.051	-1.303	0.192	-23.009	4.63
Global Oil Prices (USD)	0.0023	0.001	3.575	0	0.001	0.004
China Exports to Algeria (M USD)	0.0007	0	3.409	0.001	0	0.001
China Import from Algeria (M USD)	-0.0005	0	-2.649	0.008	-0.001	0
ma.L1	-0.5312	0.687	-0.774	0.439	-1.877	0.814
sigma²	0.0618	0.048	1.29	0.197	-0.032	0.156

The diagnostic test results for the model are summarized in Table 3. The Ljung-Box (L1) (Q) test yields a test statistic of 0.40 with an associated p-value of 0.53. This result indicates the absence of significant serial correlation at the first lag in the model residuals, suggesting that the specified model adequately captures the linear temporal dependencies in the data series up to this lag order.

The Jarque-Bera (JB) normality test produces a test statistic of 1.41 with a corresponding p-value of 0.49. This statistical evidence supports the hypothesis that the residuals follow approximately normal distribution, thereby satisfying a fundamental distributional assumption underlying the econometric model specification.

The heteroskedasticity diagnostic test generates a p-value of 0.29, indicating insufficient evidence to reject the null hypothesis of homoskedastic error variance. This finding suggests the absence of systematic patterns in the error term variance, which is conducive to the reliability and efficiency of the parameter estimates and their associated standard errors. Collectively, these diagnostic results provide empirical support for the appropriateness of the model specification and the validity of statistical inferences drawn from the estimation results.

The diagnostic test results for the model are presented in Table 3. The Ljung-Box (L1) (Q) test yields a test statistic of 0.40 with an associated p-value of 0.53, indicating the absence of significant autocorrelation at the first lag in the residuals. The presence of autocorrelation in residuals would suggest that the model has inadequately captured underlying data patterns (Liu & Zhang, 2024). The absence of significant serial correlation at lag 1 represents a favorable outcome, demonstrating that the model specification has successfully accounted for linear temporal dependencies up to this lag order.

The Jarque-Bera (JB) normality test produces a test statistic of 1.41 with a corresponding p-value of 0.49, providing evidence that the residuals conform to an approximately normal distribution. This distributional property constitutes a fundamental assumption for valid statistical inference in time-series econometric models (Liu & Zhang, 2024). Deviations from normality in the residual distribution can compromise the validity of coefficient estimates and undermine the reliability of hypothesis testing procedures.

The heteroskedasticity diagnostic test generates a p-value of 0.29. Given that this p-value exceeds the conventional significance threshold of 0.05, there is insufficient evidence to support the presence of heteroskedasticity in the model. Heteroskedasticity, characterized by non-constant variance in the error terms, can result in inefficient parameter estimation and erroneous inferences regarding variable significance. The absence of heteroskedasticity in this model specification represents a positive diagnostic outcome, enhancing confidence in the reliability and precision of the coefficient estimates.

Table 3. Model Diagnostics

Test	**Statistic**	**p - value**
Ljung - Box (L1) (Q)	0.40	0.53
Jarque - Bera (JB)	1.41	0.49
Heteroskedasticity	0.31	0.29

Table 4. Model Performance Metrics on Test Set

Performance Metric	Value
RMSE (Billion USD)	0.988
MAE (Billion USD)	0.961

The empirical analysis reveals a statistically significant positive correlation between global oil prices and Chinese foreign direct investment (FDI) flows to Algeria, underscoring the critical role of the petroleum sector in shaping investment patterns. This finding aligns with the resource-seeking theory of FDI, which posits that multinational enterprises are attracted to host countries endowed with abundant natural resources (Dunning, 1993). Algeria's substantial hydrocarbon reserves position the country as a strategically important destination for Chinese energy companies pursuing vertical integration and resource security objectives.

Similarly, the observed positive relationship between China's bilateral exports to Algeria and subsequent FDI inflows provides empirical support for the sequential nature of international market entry strategies. This phenomenon corroborates existing literature suggesting that trade relationships frequently serve as precursors to more substantial investment commitments (Peace & Ding, 2021). The progression from trade to investment reflects the gradual deepening of economic engagement, wherein initial commercial relationships facilitate information acquisition, market knowledge development, and risk assessment that subsequently enable more complex investment decisions.

Contrary to theoretical expectations derived from mainstream FDI literature, the study finds no statistically significant relationship between Algeria's inflation rate, GDP growth, and Chinese FDI flows. These finding challenges conventional economic theory, which typically identifies macroeconomic stability indicators and market growth potential as fundamental determinants of foreign investment decisions (Chakrabarti, 2001). Several methodological and contextual factors may explain these counterintuitive results.

The absence of statistical significance may be attributed to multicollinearity among explanatory variables, a common econometric problem that occurs when independent variables exhibit high intercorrelation (Liu & Zhang, 2024). Multicollinearity can result in unstable parameter estimates, inflated standard errors, and compromised statistical inference, thereby obscuring genuine relationships between variables. Additionally, the limited temporal scope of the dataset may constrain the model's capacity to capture complex, non-linear relationships that characterize real-world economic phenomena.

Furthermore, the specific nature of Chinese investment in Algeria, which is predominantly concentrated in the energy and infrastructure sectors, may render traditional macroeconomic indicators less relevant. State-directed investment strategies, characteristic of Chinese outward FDI, may prioritize strategic considerations over conventional economic metrics, thereby explaining the weak relationship between standard macroeconomic variables and investment flows.

The diagnostic evaluation indicates that the econometric model satisfies key statistical assumptions, demonstrating no evidence of serial autocorrelation, heteroskedasticity, or non-normal error distribution. These findings suggest appropriate model specification and reliable parameter estimation within the confines of the available data.

However, the elevated root means square error (RMSE) and mean absolute error (MAE) values observed in out-of-sample testing indicate suboptimal predictive performance, highlighting the model's limited forecasting capability. This limitation suggests that the current specification may not fully capture the complexity of factors influencing Chinese FDI decisions in Algeria.

The study's limitations point to several avenues for methodological improvement and theoretical refinement. First, expanding the temporal dimension of the dataset would enhance statistical power and enable more robust identification of long-term relationships. Second, incorporating additional explanatory variables, such as institutional quality measures, political risk indicators, and bilateral agreement variables, may improve model explanatory power and address potential omitted variable bias.

Third, the application of more sophisticated econometric techniques, including vector autoregression models, threshold regression, or machine learning approaches, may better capture the non-linear and dynamic nature of FDI determinants. Finally, disaggregating FDI flows by sector or investment type could provide more nuanced insights into the specific factors driving different categories of Chinese investment in Algeria.

5. Discussion the Results

1. Resource-Driven Investment Patterns The empirical analysis confirms that Chinese FDI in Algeria is primarily motivated by resource-seeking objectives. A statistically significant positive relationship exists between global oil prices and Chinese investment inflows, demonstrating that Algeria's hydrocarbon endowments are the predominant factor attracting Chinese capital and positioning natural resource availability as the key investment determinant.

2. Exchange Rate Stability Impact Exchange rate stability emerges as a critical determinant of Chinese investment flows to Algeria. The findings reveal that currency volatility creates significant investment barriers, emphasizing the necessity for coordinated monetary policy frameworks to maintain exchange rate stability and create conducive cross-border investment environments.

3. Trade-Investment Sequential Relationship The study establishes a robust positive correlation between bilateral trade volumes and subsequent FDI flows, confirming the sequential nature of trade-investment relationships. This pattern reflects Chinese enterprises' risk mitigation strategy, where initial commercial relationships enable market knowledge acquisition and opportunity assessment before substantial capital commitments.

4. Unexpected Macroeconomic Indicator Results Contrary to conventional economic theory, traditional macroeconomic stability indicators such as inflation rates and GDP growth show

no statistically significant relationship with Chinese FDI flows. This unexpected finding suggests that Chinese investment decisions are guided by strategic considerations that transcend conventional economic metrics and may reflect methodological factors including multicollinearity issues.

5. Energy Sector Concentration Chinese investment in Algeria demonstrates pronounced concentration in the petroleum sector, reflecting energy security priorities in China's outward FDI strategy. The systematic response of Chinese enterprises to commodity market signals indicates that Algeria's oil-rich economy serves as a strategic destination for securing long-term energy supplies and vertical integration within global energy value chains.

6. Policy Recommendations for Stakeholders for Algerian policymakers, the findings suggest implementing stable oil price policies and reducing hydrocarbon revenue volatility while strengthening trade facilitation mechanisms. Chinese investors should incorporate commodity market volatility into risk assessment frameworks and prioritize developing commercial relationships before pursuing major investment commitments to enable better market intelligence gathering.

7. Study Limitations and Future Research The research acknowledges methodological limitations including potential multicollinearity among variables and constrained temporal-geographical scope that may limit generalizability to broader Chinese investment contexts in Africa. Future research should address these limitations through expanded datasets, alternative econometric specifications, and cross-country comparative analyses to enhance empirical robustness.

6. Conclusion

This study's empirical findings demonstrate that Chinese foreign direct investment (FDI) in Africa, exemplified through the case of Algeria, constitutes a significant dimension of contemporary shifts in global economic architecture. The analysis reveals that China's investment strategy in Algeria reflects a systematic approach to securing strategic resources and expanding market presence across diverse economic sectors, consistent with broader patterns of South-South economic cooperation.

The econometric analysis provides compelling evidence for the resource-seeking nature of Chinese investment in Algeria, as demonstrated by the statistically significant positive relationship between global oil prices and FDI inflows. This finding underscores the critical role of Algeria's hydrocarbon endowments in attracting Chinese capital, positioning the country as a strategic node within China's global energy security framework. The alignment between Algeria's natural resource abundance and China's energy requirements exemplifies the complementary economic structures that facilitate bilateral investment relationships under the Belt and Road Initiative.

The study's findings contribute to the broader understanding of Chinese outward FDI patterns in resource-rich developing economies. The positive correlation between bilateral trade flows and subsequent investment commitments supports the theoretical proposition that commercial relationships serve as precursors to more substantial capital commitments. This sequential progression reflects the risk mitigation strategies employed by Chinese enterprises as they navigate unfamiliar institutional environments and market conditions.

However, the analysis also reveals important limitations in applying conventional FDI determinants to the specific context of Sino-Algerian economic relations. The absence of statistically significant relationships between traditional macroeconomic indicators and FDI flows suggests that Chinese investment decisions may be guided by strategic considerations that transcend conventional profit-maximization motives. This finding has important implications for policy frameworks designed to attract Chinese investment, indicating that resource endowments and strategic partnerships may carry greater weight than macroeconomic stability indicators.

Despite the potential benefits associated with Chinese FDI, particularly in terms of infrastructure development and technology transfer, several challenges warrant careful consideration. The sustainability of resource-driven investment relationships remains contingent upon global commodity price volatility and the host country's ability to diversify its economic base. Furthermore, concerns regarding technology transfer effectiveness, equitable benefit distribution, and the preservation of economic sovereignty require ongoing attention from policymakers in recipient countries.

The study's limitations, including the constrained temporal scope and limited explanatory variables, point to several avenues for future research. Expanding the analytical framework to incorporate institutional quality measures, political risk indicators, and governance variables would enhance understanding of the complex determinants shaping Chinese investment decisions in African markets. Additionally, longitudinal studies examining the developmental impact of Chinese FDI across multiple African countries would provide valuable insights into the heterogeneous effects of these investment flows.

In conclusion, while Chinese FDI in Algeria presents significant opportunities for economic development and structural transformation, realizing these benefits requires careful policy coordination and strategic planning. The findings suggest that recipient countries must balance the immediate benefits of Chinese investment with long-term considerations regarding economic diversification, technological capacity building, and institutional development. As China continues to expand its economic footprint across Africa, understanding these dynamics becomes increasingly critical for both academic scholarship and policy formulation in the evolving landscape of international economic relations.

7. Recommendations

The enhancement of investment transparency and regulatory frameworks constitutes a fundamental prerequisite for sustainable foreign direct investment (FDI) attraction. This encompasses the comprehensive modernization and activation of existing investment legislation to establish robust investor protection mechanisms. The streamlining of administrative procedures and the creation of a stable juridical environment serve as critical determinants in fostering long-term investment commitments and reinforcing investor confidence, particularly among Chinese stakeholders.

The localization of technology and strengthening of indigenous capabilities represent strategic imperatives for sustainable economic development. This objective necessitates the facilitation of technology transfer through the establishment of strategic partnerships and collaborative frameworks. Concurrently, the development of comprehensive training programs designed to enhance the technical competencies of Algerian personnel in targeted sectors is essential. This approach aims to maximize local value addition while reducing dependence on expatriate expertise.

The diversification of investment sectors beyond traditional areas represents a critical strategy for economic resilience and growth. The expansion of Chinese investment participation to encompass renewable energy, agricultural development, and manufacturing sectors serves to mitigate over-reliance on hydrocarbon resources while promoting balanced economic development across multiple industries. This strategic shift towards sectoral diversification enables the creation of a more robust economic foundation that can withstand global market fluctuations and commodity price volatility.

The strengthening of investment-supporting infrastructure constitutes a cornerstone of comprehensive economic development strategy. Strategic focus on transportation networks, logistics systems, and port facilities development, implemented through Sino-Algerian collaborative frameworks, aims to optimize the business environment and facilitate efficient goods and services mobility. These infrastructure improvements serve as catalysts for broader economic transformation by reducing transaction costs and enhancing regional connectivity.

The enhancement of research and development cooperation through the establishment of joint research institutions between Algerian and Chinese academic and research entities represents a strategic investment in knowledge-based economic development. This collaborative approach emphasizes innovation and technological advancement as fundamental drivers of competitive advantage in the global economy. Such partnerships facilitate the exchange of expertise, promote scientific collaboration, and contribute to the development of indigenous research capabilities that can support long-term economic growth.

The implementation of robust monitoring and evaluation mechanisms for investment project performance is essential to ensure the achievement of predetermined objectives and outcomes. This systematic approach to performance assessment aims to enhance investment effectiveness and guarantee the realization of desired economic and developmental goals through evidence-based decision-making processes. Regular assessment protocols enable stakeholders to identify challenges, measure progress, and implement corrective measures, when necessary, thereby ensuring optimal utilization of investment resources and maximizing developmental impact.

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