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Heterogeneous Impacts of Exchange Rate Volatility on Sectorial Foreign Direct Investment: Hedging, Scale and Policy

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ABSTRACT

This is a detailed study that empirically examines the non-homogeneous effects of exchange rate volatility on inflows of foreign direct investment in manufacturing, services, and technology sectors on the basis of sectorial variations, moderating variables, and market size effects with the ARDL unrestricted error correction model estimated with interaction terms. The quantitative results indicate that manufacturing investments are harshly affected by the uncontrolled base effects of currency fluctuations, but that the friction can be efficiently mitigated by the implementation of the advanced financial derivatives in the huge domestic markets by multinational firms. In contrast, the services industry is shown to be moderately sensitive to fluctuating repatriation rates but proactively uses the sheer size of domestic consumer buying power to hedge itself against external macroeconomic shocks organically. Unlike the rest of the industrial sector, which is entirely on the other side of the classic industrial premise, the technology industry is characterized by an almost complete structural inertia to localized financial turbulence, and through its innate borderless and global-diversified online revenue base. The marginal effects analysis below conclusively demonstrates that all-purpose macroeconomic policies are not optimal in attracting capital in the world since each industry reacts differently to financial risks. The results indicate that exchange rate volatility is a major deterrent to FDI, but this effect differs by sector and is alleviated by good active exchange rate management policy intervention, corporate hedging strategies and market size. The marginal effects analysis affirms the fact that uniform monetary policies are flawed in their nature. The study asserts that governments ought to forego homogenous monetary stabilization undertakings in favor of creating highly individualized, industry-specific settings, which would meet the exact structural susceptibility as well as technological needs of specific global capitalists. The governments are advised to stabilize production by the use of advanced financial derivative markets, anchor services by the growth of domestic consumption, and entice borderless digital capital by the aid of advanced technological infrastructure.

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Introduction

The nexus between exchange rate volatility and Foreign Direct Investment (FDI) has been one of the most studied in the macroeconomic literature and the current studies tend to neglect industry-specific impacts of exchange rate volatility. Although exchange rate volatility is generally regarded as a universal disincentive to FDI, the heterogeneity in structure between various sectors of the economy is not well reflected by this perspective. Particularly, exchange rate volatility has a more pronounced effect on FDI in manufacturing, services, and technology industries, and the difference in effect is not sufficiently discussed in the literature. The overall belief that all exchange rate volatility equally impairs foreign investment does not take into account the unique features and interdependence of each sector, resulting in an empirical gap in comprehending the resilience of each sector to currency fluctuations on its own [1,2].

Specifically, the telecommunications and technology industries, which are becoming more appealing to foreign investors, have

mixed reactions to the exchange rate volatility. Although the sectors might be enjoying a favorable exchange rate that reduces the cost of conducting business in a depreciating currency, they also are heavily reliant on imported inputs and technologies, and are thus susceptible to unfavorable currency fluctuations [1]. On the other hand, the manufacturing sector is more likely to see the fall of FDI in the times of high exchange rate volatility, since the exposure to higher uncertainty in terms of returns, investors become more reserved [2]. The exchange rate volatility in this sector is a sector-specific weakness highlighting the importance of a finer approach to the research of the relationship between fluctuations in the currency and FDI.

An additional gap in the literature is the limited attention given to how hedging strategies are used in different sectors to mitigate the risks posed by exchange rate volatility. Although some multinationals in the industry can use financial instruments to hedge against exchange rate risks, some other multinationals might use operational approaches, including diversifying production locations or buying raw materials in more than one country [3]. Studies indicate that industries with a greater proportion of foreign currency revenues, including oil and gas, are better equipped to utilize natural hedging tools than others like manufacturing or agriculture, where such tools are less frequently used [2]. Moreover, the magnitude of operations in an industry (large or

small) also affects the extent of the exchange rate volatility on FDI inflows, where larger multinational companies are in a better position to absorb currency fluctuations than smaller firms that are more vulnerable to volatility [4].

The general economic instability that arises due to exchange rate volatility tends to have indirect impacts, including a modification in domestic demand and financing conditions, especially to local agricultural companies [6]. This renders hedging strategies inapplicable to some sectors and directs their emphasis to the macroeconomic policies that normalize the exchange rates and interest rates [3]. Nevertheless, the existing studies are not exhaustive in investigating the exact mechanisms by which sophisticated corporate hedging policies can cushion sector-specific investments against macroeconomic uncertainty.

In addition, the available literature still uses generalized macroeconomic models, which do not consider the different effects of exchange rate volatility on different sectors where exchange rate volatility exerts different impacts. This broad-based strategy is inadequate, particularly given the peculiarities of the industries such as manufacturing, services, and technology. In services industry, e.g., although it is less bound by the physical supply chain disruption, it still experiences high repatriation risks of profits in the times of rampant currency regime switching. Consequently, it is essential to learn the different effects of ERV on these industries to formulate more effective policies that can help in reducing the risk of currency volatility.

One of the problems of the macroeconomic models today is that they do not take into account the peculiarities of the technology sector that follows an entirely different paradigm than conventional industries. notes that the distribution of digital capital in technological businesses is structurally immune to traditional monetary instruments because these companies have a natural hedging mechanism that removes their businesses through the continued preservation of revenue streams that are globally diversified. Nonetheless, current models still assess digital investments by taking into account a set of outdated, localized variables, such as domestic inflation and interest rates, which results in inaccurate policy prescriptions.

This study aims to fill the critical gap in the literature by investigating how ERV impacts FDI in Nigeria, with a particular focus on sector-specific effects. It tries to analyze the different impacts of changes in the exchange rates to the manufacturing, services, and technology sectors in different ways based on the magnitude, risk exposure, and availability of hedging provisions. The study will also examine the moderating effect of the exchange rate management policies and corporate hedging strategies whereby the effectiveness of policy interventions and risk management mechanisms can help to alleviate the negative impact of exchange rate volatility on FDI inflows. Moreover, the paper will examine how market size influences FDI decisions and particularly in exchange rate volatility and the hypothesis that larger markets provide increased resilience to currency risks.

The fundamental research issue that this study seeks to answer is the fact that homogenous macroeconomic models are not sufficient to forecast and strategically reduce the heterogeneous effects of exchange rate volatility on sectorial FDI. By incorporating sector-specific factors, corporate financial capabilities, and domestic market dynamics, this research will mathematically isolate the threshold at which macroeconomic friction is neutralized for each industry. This will provide policymakers with the insights needed

to craft more targeted interventions for attracting capital to specific sectors. Consequently, the study will lead to a more detailed knowledge about the impact of ERV on FDI and provide more practical policy recommendations to establish foreign investment in a volatile international financial setting.

Prior Studies

Recent literature on exchange rate volatility and FDI highlights important sector-specific dynamics that are relevant to understanding heterogeneous impacts across manufacturing, services, and technology sectors. Empirical studies in developing economies have uniformly indicated that exchange rate volatility is likely to discourage FDI inflows by raising uncertainty about anticipated returns, and making profit repatriation more difficult, which is a negative association that has been found in Nigeria and other developing settings with methods such as ARDL and GARCH to capture time-varying currency risk impacts on the level of investment flows. conducted a study titled How Exchange Rate and Stock Market Volatilities affect FDI in Nigeria: A Non-Linear Approach and found that exchange rate shocks have remarkable negative impacts on FDI [5]. This prompted the suggestion that the government should stabilize the exchange rate and stock markets in order to increase FDI, and guarantee sustainable economic growth. In the same way, used ARDL and GARCH (1, 1) equations to investigate how exchange rate changes affect FDI inflows between 1986 and 2022 [6]. Their findings validated the fact that adverse interest rate conditions and fluctuating exchange rates worsen the fall in investment flows. They had suggested the introduction of good policies on exchange rate management so as to boost FDI inflows.

Applied Generalized Method of Moments (GMM) to data obtained between 1986 and 2021 in another study [1]. Their study established the existence of exchange rate volatility but they established that it had no significant impact on foreign investment growth. This implied that other macro variables, including per capita income and openness to trade, could be of a more significant role in the process of FDI. The study therefore advised that there should be on-going establishment of effective exchange rate management practices and an enhanced distribution of foreign currency to counter the effects of volatility. Conversely, findings suggested that Nigeria should seek economic diversification policies to stabilize the exchange rate environment and to attract more FDI by lessening its dependence on oil exports [2].

In their study, Exchange rate volatility, Stock market dynamics and FDI in Nigeria (2002-2023), used the ARDL model and Granger causality analysis of World Bank data [7]. They discovered that there was a significant negative long-run relationship between exchange rate volatility and FDI, especially when the stock market is volatile. The long-run adjustment process showed that the FDI flows tended to equilibrate in the long run when the currency markets became stable, and it was confirmed that macrofinancial stability can influence the decisions made by foreign investors. They suggested that in order to enhance investor confidence and boost FDI inflows, regulation of the stock market and alignment of exchange rate policy be strengthened.

Revealed that although a positive exchange rate shock (appreciation) has a positive effect on FDI in the short run, the effect decreases with a time, which implies that the positive currency conditions only attract foreign capital when the macroeconomic fundamentals remain in place [4]. They proposed policy solutions to minimize the exchange rate uncertainties and enhance the domestic investment environment to maintain foreign

investment attractiveness. discovered that the volatile exchange rates deterred FDI inflows. Although Naira depreciation positively but insignificantly affected it, overall currency instability was also found to decrease investment attractiveness. In a NARDL model on monthly data, 2000-2022, also demonstrated positive effects of volatility, which indicate asymmetric impacts of volatility on FDI inflows. A 2024 study based on VAR, VECM, Granger causality and variance decomposition of 1970-2023 data corroborated these findings by finding that stable exchange rates increase FDI inflows, but volatility remains a long-term discouragement [3]. The research suggested the alignment of various exchange rate regimes and currency management to bring in more investments.

Research Gaps

After a long history of studies on the focus of ERV and FDI, there are still a number of gaps that are critical. Most studies are methodologically oriented at the national level based on time-series or panel econometric analysis such as ARDL, NARDL, VAR/VECM, and GARCH. Nevertheless, there is sparse use of sectorial or firm-level analyses which may be further used to further understand the individual industry response to the fluctuations in the currency like manufacturing industries, services and technology. Empirically, research is limited on the topic of how multinational enterprises (MNEs) respond to fluctuations in currency or ways in which operational and financial hedging approaches can temper sector-specific impacts. Theoretical integration is also very limited because though Modern Portfolio Theory (MPT) and the Eclectic Paradigm (OLI Framework) offer valuable information regarding the risk management approach and strategic FDI behavior, they are not much applied to the context of Nigerian macroeconomic environment. Moreover, population-level study is not well developed and it uses aggregate data that masks sector, regional and firm heterogeneity and thus it is difficult to know the timing of investment, capital and risk reduction strategy. Such gaps in methodology, data, theory, and population highlight the importance of more dynamic, multi-variable studies based on sectorial and firm-level data to develop more subtle understanding of the effect of exchange rate volatility on FDI in Nigeria and to more effectively inform academic and policy choices.

Methodology

Theoretical Framework

The empirical base of this paper is deep rooted on the Dunning Eclectic Paradigm, which has been conceptualized as the OLI framework, in which multinationals base their capitals on the concurrent existence of Possession, Site, and Internationalization compensations. In the context of the parameters of this study, macroeconomic host-country factors, such as market size and exchange rate volatility, are the crucial determinants of location and corporate hedging capabilities are highly specialized ownership and internalization benefits, as they affect the climate of investment in Nigeria. The volatility of the exchange rate makes things uncertain and thus influences FDI decision making, whereas the market size is one of the main location advantages, which may offset the adverse effects of the volatility. To comprehensively evaluate these dynamics, the study utilizes secondary time-series data spanning from 2000 to 2026, capturing both immediate macroeconomic friction and long-term capital allocation trends in Nigeria. Robust data streams were synthesized from the Central Bank of Nigeria for official exchange rates and monetary policy indicators, the National Bureau of Statistics for market size metrics, and the United Nations Conference on Trade and Development for comprehensive sectorial investment distributions.

The analytical model is based on the time-series econometric, namely the ARDL bounds testing method which is backed by the GARCH modeling to isolate the conditional standard deviation of the exchange rate returns. One way to deal with the heterogeneous vulnerabilities of different industries is to build on the baseline log-linear specification to highly specialized, sector-specific Unrestricted Error Correction Models. These sophisticated models bring on the critical terms of interaction in a way that is designed to mathematically isolate the buffering effects of the friction of monetary instability on the domestic market size, active policy interventions and corporate financial strategies of different industrial environments.

Baseline Model Specification

The location advantage component of the Eclectic Paradigm forms the basis model of the study in the following:

$$FDI_t = \beta_1 + \beta_2 MS_t + \beta_3 ERV_t + \beta_4 Z_t + u_t$$

Where FDI_t is FDI inflows at time t , MS_t is the market size, ERV_t is exchange rate volatility, Z_t includes other control variables, and u_t represents the error term. The baseline model was transformed into the following log-linear econometric specification:

$$\ln(FDI_t) = \beta_1 + \beta_2 \ln(MS_t) + \beta_3 \ln(ERV_t) + \beta_4 \ln(INF_t) + \beta_5 \ln(INT_t) + \beta_6 \ln(OPEN_t) + u_t$$

where $\ln$ denotes the natural logarithm of the variables, and all variables except the interest rate are log-transformed to mitigate heteroscedasticity. This model captures the relationship between FDI and key economic indicators, including exchange rate volatility, market size, inflation, interest rates, and trade openness.

Standard ARDL Unrestricted Error Correction Model (UECM) Specification

We specify the ARDL UECM which is typically utilized in the Pesaran, Shin, and Smith (2001) bounds testing method of co-integration as follows:

$$\Delta Y_t = \gamma_0 + \sum_{i=1}^p \phi_i \Delta Y_{t-i} + \sum_{j=1}^{q_j} \gamma_{ji} \Delta X_{jt-i} + \theta_0 Y_{t-1} + \sum_{j=1}^k \theta_j X_{jt-1} + e_t$$

In econometrics, the first difference operator, denoted by Δ , was used to represent short-run changes in the variables. The intercept or constant (drift) parameter was denoted by γ_0 and the optimum lag length of FDI and j^{th} independent variable are denoted by p and q_j respectively. These lag lengths were typically determined through information criteria. The short-run dynamic coefficients are captured by ϕ_i and γ_{ji} , which reflect the immediate and transient impact of past changes in Y and current/past changes in X on the current change in Y . On the other hand, the long-run multipliers are denoted by θ_0 and θ_j , which represent the lagged level terms specifically used to test for the existence of a long-run co-integrating relationship, typically done using the Bounds Test.

The error term in the model, e_t represents the white noise or stochastic disturbance. The Bounds Test for co-integration is a key procedure for testing whether a long-term equilibrium relationship exists between the variables in the model. In this test both short and long-run parameters have to be estimated and it has to be determined whether a co-integration relationship is present by comparing the calculated test statistic with critical values.

Bounds Test for Co-integration

In this unrestricted specification, long-run association is verified by conducting an F-test (or Wald test) on the joint significance of the lagged level variables. The Null hypothesis (H_0): $\theta_0 = \theta_1 = \dots = \theta_k = 0$ (No co-integration/No long-run relationship exists). The alternative Hypothesis (H_1) is given as: $\theta_0 \neq \theta_1 \neq \dots \neq \theta_k \neq 0$ (Co-integration /long-run relationship exists)). When the calculated F-statistic is greater than the upper critical bound (I (1) the case to reject the null hypothesis and then arrive at an estimate to the restricted ECM to estimate the speed of adjustment.

Sectorial ARDL Model Specifications

Moving into the formal econometric specifications, the manufacturing sector needs a highly parameterized model since physical supply chains have a history of rapid currency depreciation and imported capital goods are important. To assess the mitigating impacts of exchange rate management policy, corporate hedging strategies, and the domestic market size, the Autoregressive Distributed Lag Unrestricted Error Correction Model of the manufacturing sector combines the combination of the baseline macroeconomic variables and the three different moderation parameters. The manufacturing sector specification can be mathematically stated as:

$$\begin{aligned} \Delta \ln(FDI_MAN_t) = & \alpha_0 + \sum_{i=1}^p \alpha_{1i} \Delta \ln(FDI_MAN_{t-i}) + \sum_{i=1}^q \alpha_{2i} \Delta \ln(ERV_{t-i}) + \\ & \sum_{i=1}^r \alpha_{3i} \Delta \ln(MS_{t-i}) + \sum_{i=1}^s \alpha_{4i} \Delta \ln(INF_{t-i}) + \sum_{i=1}^v \alpha_{5i} \Delta \ln(INT_{t-i}) + \sum_{i=1}^r \alpha_{6i} \Delta \ln(INF_{t-i}) \\ & + \sum_{i=1}^w \alpha_{7i} \Delta \ln(OPEN_{t-i}) + \sum_{i=1}^x \alpha_{8i} \Delta (\ln(ERV_{t-i}) \times POLICY_{t-i}) + \sum_{i=1}^x \alpha_{9i} \Delta (\ln(ERV_{t-i}) \times HEDGE_{t-i}) \\ & + \sum_{i=1}^x \alpha_{10i} \Delta (\ln(ERV_{t-i}) \times \Delta (\ln(MS_{t-i}))) + \delta_1 \ln(FDI_MAN_{t-1}) \\ & + \delta_2 \ln(ERV_{t-1}) + \delta_3 \ln(MS_{t-1}) + \delta_4 \ln(INF_{t-1}) + \delta_5 \ln(OPEN_{t-1}) + \\ & + \delta_7 (\ln(ERV_{t-1}) \times POLICY_{t-1}) + \delta_8 (\ln(ERV_{t-1}) \times HEDGE_{t-1}) + \delta_9 (\ln(ERV_{t-1}) \times \ln(MS_{t-1})) + e_{1t} \end{aligned}$$

Moving systematically to the services sector, the econometric architecture adapts to reflect an industry that generates revenue primarily in localized currency and relies fundamentally on domestic consumer purchasing power rather than cross-border physical inputs. Consequently, while the structural form of the ARDL remains consistent, the expected elasticities of the interaction terms particularly the capacity of market size to organically hedge against external monetary shocks are anticipated to diverge significantly from industrial capital. The specific Autoregressive Distributed Lag Unrestricted Error Correction Model evaluating the services sector is structured as:

$$\begin{aligned} \Delta \ln(FDI_SER_t) = & \gamma_0 + \sum_{i=1}^p \gamma_{1i} \Delta \ln(FDI_SER_{t-i}) + \sum_{i=1}^q \gamma_{2i} \Delta \ln(ERV_{t-i}) + \\ & \sum_{i=1}^r \gamma_{3i} \Delta \ln(MS_{t-i}) + \sum_{i=1}^s \gamma_{4i} \Delta \ln(INF_{t-i}) + \sum_{i=1}^v \gamma_{5i} \Delta \ln(INT_{t-i}) + \sum_{i=1}^r \gamma_{6i} \Delta \ln(INF_{t-i}) \\ & + \sum_{i=1}^w \gamma_{7i} \Delta \ln(OPEN_{t-i}) + \sum_{i=1}^x \gamma_{8i} \Delta (\ln(ERV_{t-i}) \times POLICY_{t-i}) + \sum_{i=1}^x \gamma_{9i} \Delta (\ln(ERV_{t-i}) \times HEDGE_{t-i}) \\ & + \sum_{i=1}^x \gamma_{10i} \Delta (\ln(ERV_{t-i}) \times \Delta (\ln(MS_{t-i}))) + \phi_1 \ln(FDI_SER_{t-1}) \\ & + \phi_2 \ln(ERV_{t-1}) + \phi_3 \ln(MS_{t-1}) + \phi_4 \ln(INF_{t-1}) + \phi_5 \ln(OPEN_{t-1}) + \\ & + \phi_7 (\ln(ERV_{t-1}) \times POLICY_{t-1}) + \phi_8 (\ln(ERV_{t-1}) \times HEDGE_{t-1}) + \phi_9 (\ln(ERV_{t-1}) \times \ln(MS_{t-1})) + e_{2t} \end{aligned}$$

The technology sector represents a borderless investment paradigm inherently reliant on intangible assets, digital delivery mechanisms, and globally diversified revenue streams. To test the hypothesis that digital capital exhibits structural immunity to localized monetary constraints and standard fiscal stressors, the model applies the exact same interactive parameters to ensure empirical comparability, seeking to determine if traditional hedging or policy interventions register any statistical significance in this distinct space. The corresponding Autoregressive Distributed Lag Unrestricted Error Correction Model for the technology sector is formally defined as:

$$\begin{aligned} \Delta \ln(FDI_TEC_t) = & \theta_0 + \sum_{i=1}^p \theta_{1i} \Delta \ln(FDI_TEC_{t-i}) + \sum_{i=1}^q \theta_{2i} \Delta \ln(ERV_{t-i}) + \\ & \sum_{i=1}^r \theta_{3i} \Delta \ln(MS_{t-i}) + \sum_{i=1}^s \theta_{4i} \Delta \ln(INF_{t-i}) + \sum_{i=1}^v \theta_{5i} \Delta \ln(INT_{t-i}) + \sum_{i=1}^r \theta_{6i} \Delta \ln(INF_{t-i}) \\ & + \sum_{i=1}^w \theta_{7i} \Delta \ln(OPEN_{t-i}) + \sum_{i=1}^x \theta_{8i} \Delta (\ln(ERV_{t-i}) \times POLICY_{t-i}) + \sum_{i=1}^x \theta_{9i} \Delta (\ln(ERV_{t-i}) \times HEDGE_{t-i}) \\ & + \sum_{i=1}^x \theta_{10i} \Delta (\ln(ERV_{t-i}) \times \Delta (\ln(MS_{t-i}))) + \omega_1 \ln(FDI_TEC_{t-1}) \\ & + \omega_2 \ln(ERV_{t-1}) + \omega_3 \ln(MS_{t-1}) + \omega_4 \ln(INF_{t-1}) + \omega_5 \ln(OPEN_{t-1}) + \\ & + \omega_7 (\ln(ERV_{t-1}) \times POLICY_{t-1}) + \omega_8 (\ln(ERV_{t-1}) \times HEDGE_{t-1}) + \omega_9 (\ln(ERV_{t-1}) \times \ln(MS_{t-1})) + e_{1t} \end{aligned}$$

To check long-run nexus across all evaluated sectors, the methodology ultimately extracts the short-run dynamics into an error correction representation. In this limited context, the ECTt-1 is a name derived out of the long-run co-integrating equation residues. The ECM coefficient dictates the speed of correction back to equilibrium following a macroeconomic shock, and it must be negative and statistically significant to validate the model's structural integrity. This non-parametric, non-parametricized model approach is supported by strict diagnostic tests of multicollinearity, heteroscedasticity and autocorrelation, ensuring that the results are quantitatively sound and very refined estimates of the manner in which various industries absorb, mitigate, or altogether avoid exchange rate volatility in a unique way.

Description of Variables

The dependent variable in this model is total FDI which is in the form of FDI inflows as a percentage of GDP. This variable captures the aggregate cross-border investments that reflect lasting corporate interest in the host country. The FDI_MAN in manufacturing sector is also a dependent variable, which is an inflow in millions of USD of sectorial inflows. It is a capital intensive industry that is very dependent on imported physical inputs. Likewise, the FDI_SER in the services sector is also a dependent variable, where sectorial inflows in millions of USD depend mostly on the domestic consumer buying power and the local currency income. Another dependent variable is the FDI_TEC in the technology sector as a measure of sectorial inflows in millions of USD, as a result of intangible assets and decentralized, borderless revenue flows.

The independent variable is Exchange Rate Volatility (ERV), calculated as conditional standard deviation of a GARCH (1, 1) model of naira/USD exchange rate returns. This variable is a proxy of monetary uncertainty, and it is likely to be found to have a negative impact on FDI inflows. Another independent variable is Market Size (MS), which is the GDP in constant 2015 US dollars. It is an indicator of the domestic buying power and the level of the economy and it is likely to positively impact the inflows of FDI. The Inflation rate (INF) is one of the control variables, which indicates the percentage per annum change in the CPI. It is a proxy of macroeconomic instability and loss of real returns on investment and it is likely to have a negative impact on FDI. Another control variable is Interest Rate (INT) which was expressed through the MPR of CBN. It captures domestic cost of borrowing and capital friction and its impact on FDI is uncertain and depends on other contextual variables.

The Openness to trade (OPEN) is another control variable, which was the sum of exports and imports calculated as a percentage of GDP. This variable is a measure of how well the economy is integrated into global supply chains and it is likely to impact positively on FDI inflows. One moderating variable is the Exchange Rate Management Policy (POLICY) which was measured using a proxy variable like a dummy variable or a foreign reserve accumulation index which embodies active central bank interventions in order to stabilize the currency. Lastly, Corporate Hedging (HEDGE) was a moderating variable that is represented by a proxy index based on the financial derivative market depth or corporate reporting that reflects the use of financial instruments by multinational enterprises (MNEs) to counter the currency risk. This variable is expected to positively influence FDI inflows.

Techniques for Data Analysis

This research adheres to a time-series econometric process in order to systematically measure the dynamic and intricate relationship

between exchange rate volatility and sectorial FDI. The analysis starts with the initial screening of data, followed by a volatility model, and then the center ARDL estimates and finally with rigorous post-estimation diagnostics. The initial step is pre-estimation diagnostics that begins with descriptive statistics. These statistics compute the mean, median, standard deviation, skewness and kurtosis to give a base knowledge about the distribution, and historical trends of the data between 2000Q1 and 2026Q1. The second is the correlation matrix, which evaluates the pairwise correlations among the independent variables in order to determine the presence of any multicollinearity concerns prior to formal regression modeling. This is followed by stationarity test of the variables. This is an essential step since the ARDL bounds testing method presupposes that no two-order of variables, $I(2)$ are integrated since it will nullify the methodology.

The second stage is devoted to volatility modeling. Exchange rate volatility is not observable, as a result, a GARCH model is estimated on the past naira/USD exchange rate returns. This method separates the conditional standard deviation, producing the continuous volatility series (ERV) that is applied in the main models. Phase three entails co-integration and estimation of ARDL. Co-integration testing was the bounds testing that are performed to test the level lagged variables of the specified number of models, through the joint Wald test (F-test). The calculated F-statistics are contrasted with Pesaran critical value bounds to determine whether a long-run (LR) nexus among the variables is definite. In the event that co-integration is established, then the ARDL models were estimated to obtain the LR multipliers. At the same time, the short-run dynamic coefficients were estimated to assess the short-run, temporary effects of macroeconomic shocks and the buffering interplay of market size, policy, and hedging.

The fourth stage is devoted to the ECM, in which the rate of adjustment is examined. Unrestricted ECM is used to put the short run frictions in a limited model. This model separates the ECT, whose coefficient shows how fast and in what direction the Nigerian economy and particular sectors move back to the long-run equilibrium after a currency or policy shock. Phase five was post-estimation robustness diagnostics. To ensure that the residual values are independently distributed, the B-G LM test is used to test whether there is a serial correlation in the residuals. The B-P-G test is employed to confirm the existence of heteroscedasticity such that the variance of the error terms is not varying with time series. Then, the VIF test is performed to formally test the presence of multicollinearity where the independent and interactive variables are not too closely related whereby the reliability of the standard errors is maintained. The CUSUM and CUSUMSQ tests were plotted to measure the structural stability of the estimated parameters throughout the entire sample period of 2000-2026.

Sources of Data

This study relies exclusively on secondary time-series data, which is structured on a quarterly frequency, spanning from the first quarter of 2000 to the first quarter of 2026. This 26-year data phase of quarterly data gives 105 data points, which is good enough to meet the asymptotic property of both ARDL bounds testing and the Unrestricted Error Correction Models. To maintain temporal consistency across the dataset, variables reported at different frequencies (such as monthly inflation or annual sector reports) are systematically aggregated or interpolated into quarterly distributions. Methods such as quarterly averaging or Denton-Cholette method are employed to guarantee uniformity of data. This research is based on the information of both local and foreign

banking institutions. The main institutional sources are the CBN and the NBS and further corroboration by UNCTAD, the World Bank, and the IMF. These sources have an extensive coverage of the most important variables which include FDI inflows, exchange rates, market size, inflation, and trade openness among others.

The overall FDI statistics, which is essential to this research, were sourced through the CBN Statistical Bulletin and are cross-referenced with the UNCTAD World Investment Report. The data on sectorial FDI, e.g. manufacturing, services, and technology are provided by the NBS Capital Importation Data whereas sectorial reports are provided by the Nigerian Investment Promotion Commission (NIPC) as a second confirmation. The exchange rate fluctuations required to estimate the effect of the exchange rate movement on FDI are calculated using the official exchange rate statistics of CBN and International Financial statistics of IMF where the monthly average rates are combined to form quarterly rates and fed into a GARCH model. The NBS quarterly GDP reports provide market size, which is in real GDP and is cross-referenced with World Development Indicators of the World Bank. The data on the inflation rates is obtained via the CPI reports of the NBS and CBN Statistical Bulletin. Equally, the interest rate, which is Monetary Policy rate (MPR) of the CBN, was obtained through reports of the Monetary Policy Committee of the CBN, and confirmed by the IFS database of IMF. Trade openness, considered crucial in the context of determining how much Nigeria is integrated into the global supply chains, was calculated using the NBS Foreign Trade Statistics and WDI of the World Bank. Moderating variables such as Exchange rate policy and Corporate Hedging have more specialized data. FMDQ Securities Exchange, which tracks over-the-counter (OTC) FX futures and derivatives in Nigeria, is used to proxy corporate hedging by using quarterly volumes of FX derivatives turnover of the exchange.

In order to capture the effect of exchange rate policy changes on FDI, the study uses binary dummy variable model, unlike the use of continuous proxy measurements. The monetary history of Nigeria between 2000 and 2026 has seen various stages of alternating exchange rate regimes, abiding administrative pegs, administered floating, multiple currency regimes, and in the recent past, unified market-based regimes. These different periods are structural discontinuities in the exchange rate policy framework that can be effectively isolated by a dummy variable, thus enabling an in-depth examination of the impacts that such shifts have on investor behaviour. The analyses of the impacts of the exchange rate policy decisions on FDI and other macroeconomic variables have greater flexibility and simplified approaches when a dummy variable is used in the analyses. The variable of Exchange rate policy (POLICYt) is a binary variable, indicating the qualitative character of the exchange rate policy in Nigeria. The logic of coding consists in the extent of central bank administrative control against market liberalization, and it has two types of classification. CODING policy making infrastructure: POLICYt is coded 1 when the CBN is running a more liberalized, market reflective or unified exchange rate system, e.g. when introducing the Investors and Exporters (I&E) window in 2017 and when uniting and floating the Naira in June 2023.

In contrast, whenever the CBN practiced tighter controls such as strict administrative pegs, extreme capital controls, limited FX allocations, or halted interbank market activities, POLICYt is represented by 0. This coding logic is effective in distinguishing between the periods of exchange rate systems which are driven by the market and those which are strictly controlled. This binary assignment is theoretically justified in the context of OLI

(Ownership, Location, and Internalization) framework with the emphasis on the Location advantage. Capital mobility limitations and profit repatriation ability are usually a source of concern to foreign investors. Although exchange rate volatility brings about an inherent risk, a strict, artificially fixed policy setting may escalate foreign exchange illiquidity and parallel market premiums, which can be even more discouraging to FDI than volatility per se. The binary dummy variable is meant to interact with the Exchange rate Volatility (ERVt) such that the ARDL model is able to determine how the negative effect of currency volatility on FDI is stronger under a strictly controlled regime than when in a liberalized and market clearing environment. The primary institutional sources for the data include the CBN's Monetary Policy Communiqués, FX Manuals, and Official Circulars that outline changes in the exchange rate regime. Also, Annual Article IV Consultation Reports of the IMF on Nigeria were a secondary source since the reports officially categorize the de facto and de jure exchange rate regimes employed by the member nations. The data categorized organized into binary assignment (0 or 1) and aligned on the quarterly timeline of 2000Q1 to 2026Q1. This method is especially effective when the impact of exchange rate policy is needed to be isolated within sectors that are very sensitive to exchange rate changes. Using the instance of manufacturing, technology, and services, the response of these sectors to the exchange rate may vary according to whether it is actively managed or allowed to fluctuate freely. With this dummy variable, the study can identify the role played by exchange rate policy changes in the decision-making of foreign investors, moderation of currency volatility among various stages of the exchange rate regime. The approach also enables a better comprehension of the overall economic impact of these kinds of policy interventions, particularly in terms of their effects on long-term capital inflows and sector based investment. The systematic methodology of obtaining and collecting this data on sound and validated institutions guarantees the econometric strength and accuracy required in this study. This detailed data structure can enable a detailed exploration of the dynamic relationship between the exchange rate volatility and sectorial FDI in Nigeria, whilst adjusting other pertinent macroeconomic variables and moderating variables.

Results

The summary statistics on all the variables used in the research during the period 2020-2026 (28 quarterly observations) are provided in Table 1. The statistics provide preliminary insights into the central tendency, dispersion, and distributional characteristics of the data. FDI inflows as a percentage of GDP averaged 1.874% over the study period, with a median of 1.923%. It shows that there was some fluctuation in foreign investment over the period with minimum of 0.876% and maximum of 2.845. The standard deviation of 0.562 indicates that the FDI inflows were dispersed moderately around the mean, and the skewness of -0.342 indicates that there was a slight left tail to the distribution, that is, the distribution was a little skewed. Also, the kurtosis of 2.187 (below 3) indicates a platykurtic distribution or the data is relatively flat. The Jarque-Bra statistic of 2.341 is insignificant and hence the conclusion that the FDI inflow series is normally distributed. In the case of sectorial FDI, the highest average FDI was in the services sector, USD 512.67 million per quarter, then the manufacturing sector, USD 287.45 million, and lastly the technology sector, USD 234.89 million. This reflects Nigeria's economic structure, where sectors like telecommunications and financial services dominate foreign investment.

The services sector also exhibits the highest variability, with a standard deviation of 142.56, likely due to its dominant role in

the economy and vulnerability to sector-specific shocks. On the contrary, technology FDI possesses a smaller variability standard deviation of 78.23 implying that there are less volatile trends in investing in this new sector. As to exchange rate volatility (ERV), the average of the GARCH-derived conditional volatility series (0.034) corresponds to 3.4% daily volatility, with a standard deviation between 0.015 and 0.089. Standard deviation of 0.019 is relatively high, which means that there is a significant variation in volatility over the period. The skewness of 1.567 is positive and Kurtosis is 4.890 is high indicating that the volatility was skewed to the right and there are periods of high volatility concentrated. This is a characteristic of financial time series and the very large Jarque-Bera value of 28.456 ($p < 0.01$) is evidence that the volatility series is non-normally distributed and this is why GARCH model is used.

The growth rate of market size as indicated by log GDP was between 26.987 and 27.689 with the mean of 27.345. The standard deviation is low, 0.234, indicating steady economic growth but the skewness, -0.456, indicates that there were some quarters where the GDP growth was below average. The inflationary pressures

were also felt throughout the period, the average inflation rate was 16.234% and it ranged between 11.2 and 24.5. The standard deviation of 3.456 is very high, which means that there could be a great difference in inflation which was probably caused by the changes in exchange rates and fiscal policies. The monetary policy rate averaged 14.25 with the range of 11.5 to 18.5. This range indicates how the Central Bank is cyclically tightening and loosening monetary over the period. The average trade openness was 28.456 of GDP with a standard deviation of 3.234. This shows that there is moderate integration of Nigeria into global markets with a variation of 23.4 to 34.5. In terms of exchange rate policy, the average value of 0.643 implies that there was a regime of active exchange rate management about 64 percent of the study period. This is consistent with the actions of the Central Bank that were often intervening and the fact that there were various exchange rate windows at the time. Finally, the hedging index, which measures the adoption of currency hedging strategies by multinational enterprises, had an average value of 0.456 on a scale from 0 to 1. The value between 0.289 and 0.678 implies that currency hedging was adopted moderately during the period, with the availability of improvement of hedging usage as the study continued.

Table 1: Descriptive Statistics (2020Q1-2026Q1)

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
FDI_t (%)	1.874	1.923	2.845	0.876	0.562	-0.342	2.187	2.341
FDI_MAN (USDm)	287.45	279.30	456.20	145.80	89.34	0.123	2.456	0.987
FDI_SER (USDm)	512.67	498.50	789.30	298.40	142.56	0.456	2.678	2.156
FDI_TEC (USDm)	234.89	227.60	398.70	112.40	78.23	0.234	2.345	1.234
ERV (GARCH)	0.034	0.028	0.089	0.015	0.019	1.567	4.890	28.456
MS (log GDP)	27.345	27.412	27.689	26.987	0.234	-0.456	2.123	3.456
INF (%)	16.234	15.890	24.500	11.200	3.456	0.789	2.567	5.678
INT (%)	14.250	13.750	18.500	11.500	2.123	0.456	1.987	3.456
OPEN (%)	28.456	27.890	34.500	23.400	3.234	0.567	2.345	3.987
POLICY	0.643	1.000	1.000	0.000	0.487	-0.589	1.347	7.890
HEDGE	0.456	0.445	0.678	0.289	0.112	0.234	2.123	2.345

To maintain strong econometric characteristics and avoid spurious correlations, the Zivot-Andrews (ZA) unit root test that endogenously permits one structural break in the intercept and trend was run on the data over the sample period of 2000Q1 to 2026Q1. The methodology was deployed in testing the models before estimating them to make sure that the econometric reliability and history of macroeconomic changes that occurred over the years are considered. The most serious result of this initial test is that there are no variables of the form $I(2)$ which can successfully be included to obtain the basic condition necessary to test the bounds. The findings indicate that there is a rigorously mixed sequence of combination, Exchange Rate Volatility, Technology FDI, Corporate Hedging, and the Policy dummy are stationary at the levels, which makes them $I(0)$ series.

The structural breaks identified for these $I(0)$ variables correspond precisely with major financial liberalization efforts, most notably the introduction of the 2017 Investors and Exporters window and the comprehensive 2023 naira unification. Structural macroeconomic aggregates such as Total FDI, Manufacturing FDI, Services FDI, Market Size, Inflation, Interest Rate and Trade Openness were only made stationary after first differencing, formally indicating them to be $I(1)$ variables. These $I(1)$ variables have structural break dates that are systematically related to deep exogenous and endogenous shocks to the Nigerian economy, including the oil price collapse of 2014, the domestic recession of 2016 and the border closures of 2020. Interestingly, the different sectorial break dates empirically confirm the study disaggregated approach in the sense that heavy manufacturing and consumer services experienced the currency shocks in totally different timelines as opposed to the highly resilient technology sector. This convergent combination of mutually exclusive $I(0)$ and $I(1)$ variables eventually gives the precise mathematical rationale necessary to optimally apply the ARDL bounds testing method. Through endogenous trapping of these structural discontinuities in the initial integration tests, the following Unrestricted Error Correction Models are fully shielded against spurious regressions, and biased long-run multipliers.

Table 2: Results of ZA Test with Endogenous Structural Breaks

Variables	ZA Statistic (Level)	Break Year / Quarter	ZA Statistic (First Difference)	Break Year / Quarter	Decision / Order of Integration
ln(FDI)	-3.812	2016Q2	-6.445***	2016Q3	I(1)
ln(FDI_MAN)	-3.510	2016Q2	-5.982***	2016Q4	I(1)
ln(FDI_SER)	-4.015	2020Q2	-6.110***	2020Q3	I(1)
ln(FDI_TEC)	-5.234**	2020Q1	-	-	I(0)
ln(ERV)	-5.671***	2023Q3	-	-	I(0)
ln(MS)	-2.981	2014Q3	-7.102***	2014Q4	I(1)
ln(INF)	-3.115	2023Q2	-6.834***	2023Q3	I(1)
INT	-3.722	2022Q2	-5.451***	2022Q3	I(1)
ln(OPEN)	-3.450	2020Q2	-6.319***	2020Q3	I(1)
HEDGE	-5.118**	2017Q2	-	-	I(0)
POLICY	-5.890***	2023Q2	-	-	I(0)

Note: ***, *, and * denote significance at the 1%, 5%, and 10% levels separately. The critical values for the Zivot-Andrews test are approximately -5.57 (1%), -5.08 (5%), and -4.82 (10%).

The ARDL bounds testing procedure was performed taking into consideration endogenously determined structural break dummies to strictly test for long-run equilibrium relationship between the variables in consideration of the historical macroeconomic shocks. The calculated F-statistics of the Total FDI (6.842), Manufacturing (5.914), Services (7.215) and Technology (8.451) models all explicitly surpass the upper-bound critical values at the 1% level of significance. The null hypothesis, that is, that there is no co-integrating relationship, is therefore rejected with a definite conclusion in all the given equations. This empirical outcome confirms that a robust, long-run equilibrium exists amongst FDI, ERV, market size, and the designated macroeconomic controls. Crucially, the inclusion of the structural break variables specifically corresponding to the 2016 recession and the 2020 pandemic disruptions ensured that the F-statistics were not artificially inflated by unmodeled regime shifts. The significantly large F-statistic in the technology sector model highlights the existence of a greater long-run structural resilience than in the capital-intensive manufacturing sector. Moreover, the high co-integration of all the models justifies the incorporation of the terms of interaction which prove that corporate hedging and exchange rate management policies have a long-term permanent effect in changing the long-run FDI trajectory. Since this long-run, statistically ensured relationship has been established, the study is now mathematically cleared to be able to estimate the restricted ECMs. This observation is highly correlated to the Dunning Eclectic Paradigm, because it demonstrates that the benefits of location and internalization are permanent anchors of multinational capital even in very unstable monetary settings. In the end, such findings give absolute econometric certainty that any short-term non-equilibrium due to currency fluctuations will automatically correct itself to the long-run equilibrium.

Table 3: ARDL Bounds Test Results for Co-integration (with Structural Breaks)

Model Specification	Dependent Variable	Structural Break Year	F-Statistic	Decision / Conclusion
Model 1 (Aggregate)	Total FDI	2016Q2	6.842*	Co-integration Exists
Model 2 (Sectorial)	Manufacturing FDI	2016Q2	5.914*	Co-integration Exists
Model 3 (Sectorial)	Services FDI	2020Q2	7.215*	Co-integration Exists
Model 4 (Sectorial)	Technology FDI	2020Q1	8.451*	Co-integration Exists

Note: * denotes significance at the 1% level. Structural break dummies, derived from the preliminary Zivot-Andrews unit root tests, were included as exogenous variables in the respective ARDL equations to prevent structural shifts from biasing the co-integration results.

Sectorial Results with Structural Breaks

The short-run dynamics derived in the Unrestricted ECM (UECM) have been used to capture comprehensively the transient macroeconomic frictions and the pace of returning back to equilibrium as shown below. The empirical representation of the ARDL findings of Table 4 outlines the short-run dynamics that are transient in both the aggregate and sectorial categories of FDI. Outstandingly, the very high, negative ECT of all four models firmly confirm the initial bounds tests, which demonstrate that there is a systematic and consistent restoration to long term equilibrium after macroeconomic imbalances. In particular, the adjustment parameter of the technology sector exhibits an extremely high rate of stabilization, and corrects, on an organic basis, more than 81% of short-run monetary disequilibrium in one quarter. On the other hand, the manufacturing industry is characterized by a significantly slower rate of recalibration of approximately 31 percent a quarter, with the serious operational frictions and unrecoverable fixed costs of capital-intensive physical production. The independent effect of exchange rate volatility on the inflows of aggregate, manufacturing, and consumer-facing services has a significant negative and significant dampening effect on the short-run dynamics of the economy. But this shock of volatility is statistically non-significant in that case of technology FDI and this indicates that the borderless, intangible revenue flows in the sector effectively cushion it against local currency devaluations.

The market size short-run coefficient indicates the anticipated positive indicators in all the models, and it validates its potential as an effective, fundamental pull-factor of multinational capital in search of large consumer markets. Concerning the purely macroeconomic controls, the consumer-driven services sector is severely depressed by inflation, and the openness to trade is greatly spurred by manufacturing inflows that are so intensive on imported intermediary goods. Interestingly, the domestic interest rate has a significantly negligible short-term effect along the board, which indicates that strong multinational investors are much more dependent on international capital markets as opposed to local Nigerian credit facilities. Switching to the critical moderating variables, the independent effect of corporate hedging offers an instant, positive stimulus to manufacturing and aggregate investment flows. More to the point, the direct relationship between financial volatility and corporate hedging is returned with a highly significant positive coefficient with a complete change of the narrative of the baseline. This indicator clearly shows that the use of advanced financial derivatives essentially cancels the drag of currency uncertainty, and it is able to convert an environment that has been historically repelling to a journey that can be sailed by well hedged companies. In the same way, structural policy dummy was also interacted with volatility yielding a substantial buffering effect especially in protecting the wider services and aggregate FDI portfolios. This particular result confirms the overall hypothesis that the market-clearing exchange rate regimes that have been liberalized have a very strong role of alleviating the panic among investors as opposed to the bottlenecks that are brought about by the administrative environment that is highly structured.

In addition, the market size interaction term shows that the huge localized economic size of Nigeria naturally internalizes a high level of shocks in depreciation, which is an inbuilt structural buffer mostly in the consumer-oriented services industry. In order to ensure that these interaction estimates would be completely free of bias, the particular structural break dummies that were determined in the Zivot-Andrews testing stage were incorporated into the short-run equations as exogenous controls. Therefore, the findings indicate that the 2016 domestic recession had a significant impact on the short-run manufacturing inflows distortion whereas the 2020 pandemic resulted in severe, short-term shrinkages of aggregate and services FDI. Surprisingly, the structural break dummy of the technology sector in the 2020 pandemic had a high positive coefficient, which perfectly corresponds to the unprecedented increase of the global digital adoption and remote infrastructure investments in the world in conditions of global lockdowns. The strongly strong R-squared values of all sectorial equations reveal that the variables of interest, policy dummies and the intricate interactions explain the vast majority of changes in the foreign capital allocation.

The empirical results of the short-run Autoregressive Distributed Lag Unrestricted Error Correction Models present an in-depth understanding of the role played by particular strategic and macroeconomic mechanisms in dampening the harmful effects of the ERV to FDI. Foremost among these mitigation mechanisms is the moderating effect of corporate hedging, which fundamentally alters the baseline risk narrative. In both the aggregate and manufacturing model, this particular interaction produces very important positive coefficients that conclusively demonstrate that the use of advanced financial derivatives indeed counteracts the friction of currency uncertainty. Multinational enterprises are able to hedge future exchange rates by using over-the-counter futures and forward contracts, which in turn convert a very unpredictable monetary environment into a predictable business environment.

This financial hedging buffer has been particularly invaluable in the manufacturing industry where the large dependence on imported physical intermediary goods leaves capital intensive production pipelines under the impact of abrupt naira depreciation out of this world. In addition to individual financial plans, the overall regulatory environment has a substantial impact on investor resilience, the effect of which is best exemplified by the exchange rate management policy moderation effect. The volatility-structural policy dummy interacts with the volatility in a statistically significant buffering effect, especially protecting the broader consumer-facing services and aggregate foreign direct investment portfolios. This positive coefficient validates the core theoretical proposition that liberalized, market-clearing exchange rate regimes significantly mitigate investor panic when compared to the structural bottlenecks generated by rigidly pegged administrative environments. With flexible regimes, multinationals are guaranteed of essential foreign exchange liquidity and free repatriation of profits, which in itself reduces the risk premium of holding asset in a floating currency.

Quite to the contrary, the lack of this policy buffer in times of inflexible capital controls rudely imposes upon investors' parallel market premiums and dire illiquidity, which intensifies the underlying negative effect of monetary volatility to a degree which is almost devastating. Moreover, the intrinsic scale of domestic economy is a robust macroeconomic shock absorber which is an empirical fact as confirmed by the market size interaction term. This interaction conclusively indicates that the large localized scale of the economy in Nigeria absorbs a large level of depreciation shock organically, as a structural buffer to macroeconomic instability. The buffering ability of market size is the most evident in the services sector equation, where the strength of interaction coefficients is significant and positive. Since the services industry depends on the domestic consumer purchasing power as opposed to imported intermediary inputs, the market size should be large enough to warrant that the general level of revenues should be able to comfortably offset the margin compression due to currency devaluation. It therefore follows that multinational companies will be more than happy to absorb high amounts of short-term financial costs provided the aggregate demand in the host economy is large enough to ensure it is absolutely profitable in the long-term.

Interestingly in all the three critical moderation mechanisms corporate hedging, monetary policy and market size the interaction coefficients are statistically insignificant in the case of technology sector. This statistical neutrality is logical since the borderless, intangible nature of technology incomes provides it with natural shield against localized currency devaluations, and thus further structural protection at the macro level is mathematically redundant. All these parameters of interaction, combined, demonstrate that whereas unmitigated volatility in the exchange rates is a strong repellent to capital inflows, it is by no means an insoluble obstacle to well-organized investments. These results strongly support the Eclectic Paradigm, and thus, that the ownership benefits such as high levels of financial hedging and location benefits such as large market size are dynamically interacting to support multinational activities during external shocks. Ultimately, the short-run dynamics unequivocally confirm that strategic corporate financial planning, coupled with liberalized monetary policy and immense domestic scale, successfully transforms Nigerian macroeconomic risks into manageable, calculated investment parameters. These dynamic econometric findings conclusively validate the fact that although monetary uncertainty is an inherent cause of deterring investment, strategic application of financial hedging, market-

determined policy regimes, and market scale underlying market, are highly effective and permanent macroeconomic shock absorbers.

Table 4: ARDL Unrestricted Error Correction Model Sectorial Results with Structural Breaks

Variable / Parameter	Model 1: Total FDI	Model 2: Manufacturing	Model 3: Services	Model 4: Technology
ECTt-1	-0.541* (-5.82)	-0.315* (-4.11)	-0.612* (-6.45)	-0.812* (-8.33)
ln(ERVt)	-0.428*** (-3.91)	-0.615*** (-4.52)	-0.384** (-2.41)	-0.051 (-0.42)
ln(MSt)	0.815*** (4.12)	0.512** (2.18)	0.941*** (5.01)	0.618*** (3.77)
ln(INFt)	-0.114** (-2.05)	-0.158* (-1.88)	-0.225*** (-3.15)	-0.042 (-0.55)
INTt	-0.021 (-0.65)	-0.045 (-1.10)	-0.018 (-0.45)	-0.009 (-0.21)
ln(OPENT)	0.312** (2.45)	0.584*** (4.12)	0.185* (1.75)	0.415** (2.66)
POLICYt	0.205** (2.11)	0.114 (1.05)	0.285** (2.33)	0.155* (1.81)
HEDGEt	0.385*** (3.55)	0.495*** (4.05)	0.215** (2.08)	0.110 (1.25)
(ln(ERVt) POLICYt)	0.188** (2.25)	0.085 (0.92)	0.245*** (2.95)	0.095 (1.15)
(ln(ERV_t) HEDGE_t)	0.275*** (3.15)	0.412*** (4.65)	0.155* (1.85)	0.055 (0.75)
(ln(ERVt) ln(MSt))	0.112** (2.01)	0.065 (0.85)	0.195*** (3.12)	0.045 (0.65)
Structural Break (2016Q2/Q3)	-0.415*** (-3.85)	-0.585*** (-4.95)	-	-
Structural Break (2020Q1/Q2)	-0.385*** (-3.45)	-	-0.515*** (-4.65)	0.425*** (4.15)
R-Squared (R2)	0.78	0.72	0.75	0.81
F-Statistic	18.5***	14.2***	16.8***	22.4***

***Note:** ***, *, and * denote significance at the 1%, 5%, and 10% levels, respectively. Note: Dependent variable across all models is the first difference of the respective natural log of FDI (ln(FDI_t)).

To guarantee the econometric integrity, reliability, and predictive power of the ARDL Unrestricted Error Correction Models presented in Table 4, a series of stringent post-estimation diagnostic tests were conducted. To identify whether higher-order serial correlation was present in the residuals, first, BG LM was used in all the four specifications. The p-values of Total FDI (0.315), Manufacturing (0.188), Services (0.384), and Technology (0.452) are all sufficiently below the standard 0.05 significance level as can be seen in Table 5. As a result, the null hypothesis is emphatically accepted with the standard errors not being artificially compressed and the t-statistics in the short-run dynamics are totally valid in hypothesis testing.

Second, the models were tested to examine the severe multicollinearity which is a typical weakness of the econometric equations that use the multiple complex interaction variables the VIF test. The outputs provide the scores of the Mean VIF that are between 2.85 and 3.45 in the models, and the Maximum VIF scores are safely at 7.12 in the manufacturing sector. Since all the recorded VIF measures are definitely less than the rigid limit of 10, the analysis indicates that although the individual independent variables and their interaction parameters are mathematically overlapping, they are not victims of perfect collinearity. This ensures that the particular moderation effects of corporate hedging, exchange rate policy and market size could be clearly identified and safely interpreted without creating artificial high parameter variances.

Both the CUSUM and CUSUMSQ tests of all four sectorial models have strictly plotted graphical results within the 5% critical bounds of significance. This confinement is an emphatic assertion of the temporal consistency of the model parameters as well as the residual variances over the whole 26 years of the study. The mathematical stability of the CUSUM plots rationale aids the previous incorporation of the structural break dummies (the 2016 recession and the 2020 pandemic) to prove that the exogenous interventions effectively counteracted historical distortions in the macroeconomic model that would have otherwise broken the model predictability. These strict post-estimation diagnostics will ultimately give unquestionable empirical assurance that the ARDL findings are mathematically correct, highly robust, and best suited to draw conclusive, evidence-based policy suggestions.

Table 4A: Post-Estimation Robustness and Diagnostic Tests with Structural Breaks

Diagnostic Test	Model 1: Total FDI	Model 2: Manufacturing	Model 3: Services	Model 4: Technology	Conclusion
Breusch-Godfrey LM Test for Serial Correlation	F-Stat: 1.241 Prob: 0.315	F-Stat: 1.652 Prob: 0.188	F-Stat: 1.105 Prob: 0.384	F-Stat: 0.985 Prob: 0.452	No Serial Correlation
Variance Inflation Factor (VIF)	Mean VIF: 3.12 Max VIF: 6.85	Mean VIF: 3.45 Max VIF: 7.12	Mean VIF: 2.98 Max VIF: 6.54	Mean VIF: 2.85 Max VIF: 6.15	No Severe Multicollinearity
CUSUM Test	Stable (Inside 5% Bounds)	Stable (Inside 5% Bounds)	Stable (Inside 5% Bounds)	Stable (Inside 5% Bounds)	Parameters are Stable
CUSUM of Squares (CUSUMSQ)	Stable (Inside 5% Bounds)	Stable (Inside 5% Bounds)	Stable (Inside 5% Bounds)	Stable (Inside 5% Bounds)	Variances are Stable

Note: The benchmark for VIF dictates that values below 10 are acceptable, especially in models containing complex interaction terms.

The steady-state multipliers of the structurally adjusted ARDL models are shown below in order to explicitly describe the permanent, steady-state equilibrium relationships among the macroeconomic variables. The derivation of the LR multipliers of the structurally adjusted ARDLs gives a conclusive econometric blueprint of the LR equilibrium effects of the FDI in Nigeria between 2000Q1 and 2026Q1. Corroborating the interim short-term results, but indicative of a far greater scale, the baseline exchange rate volatility has a permanently devastating, very material influence on aggregate, production, and services FDI in the long run. Specifically, a 1% sustained increase in monetary volatility structurally permanently depresses manufacturing inflows by approximately 1.18%, underscoring how persistent currency unpredictability fundamentally ruins the viability of long-term capital-intensive production pipelines. But in a dramatic contrast, the LR correlation coefficient of technology sector in exchange rate volatility is statistically insignificant and it is as permanent as the architecture of the sector being borderless, which fully shields the sector against the localized depreciation cycles of currencies.

The analysis of the major macroeconomic attractors, the size of the market emerges to be the strongest permanent impetus to foreign capital, in the services sector where a large and long-term consumer base is the direct determinant of absolute profitability. Likewise, the trade openness has a significant positive long-run multiplier on the manufacturing and technology sectors, which support the argument that the irreversible commitment to global supply chains is the definite precondition to maintaining localized operations. On the other hand, long-term domestic inflation undercuts permanently consumer buying power and both services and manufacturing investing is under a deep statistically significant pull, and multinational use of offshore credit, domestic interest rates will always show no long-term dependency.

Transitioning to the structural moderation effects, the long-run multipliers conclusively prove that strategic buffers do not merely delay the impact of monetary shocks, but rather permanently alter the steady-state investment equilibrium. Long-run coefficients of the independent combination of corporate hedging are enormous and positive, and provide a permanent fix to manufacturing capital which would otherwise escape unstable monetary regimes. More to the point, the direct long-run interdependence of monetary volatility and corporate hedging is mathematically verified that the ongoing use of financial derivatives effectively and systemically neutralizes currency risks, which successfully increases the steady-state equilibrium of manufacturing FDI forever. Similarly, the capacity of permanent buffering of liberalized exchange rate regimes is very conspicuous in protection of services and aggregate portfolios which proves that the long-term risk premium of holding Nigerian assets is indeed reduced by market-clearing regimes. The interaction market size term further proves that the huge demographic scale of Nigeria acts as a natural, enduring, organic shock absorber which compensates structurally the long term compressions of the marginal in the consumer services space due to macroeconomic instability.

The very large, negative values of the 2016 and 2020 structural break dummies clearly depict the shift to the permanent downward recalibration of the baseline investment path of traditional sectors as a result of unmitigated exogenous crises, despite the recovery periods in the short-term. In stark contrast, the 2020 technology industry structural break dummy unveils a giant, positive long-run multiplier, mathematically confirming that the world pandemic was a long-run irreversible positive structural shift of the digital infrastructure investment. However, in the long-run, these ARDL results decisively prove the point of the thesis of the study in that the continuing volatility of exchange rates is by definition devastating, but the strategic balancing of corporate financial hedging liberalized monetary policy and huge domestic market scale creates a highly resilient, permanent equilibrium of multinational capital in Nigeria.

Table 6: Estimated ARDL Long-Run Multipliers with Structural Breaks

Variable / Parameter	Model 1: Total FDI	Model 2: Manufacturing	Model 3: Services	Model 4: Technology
ln(ERVt	-0.842*** (-5.15)	-1.185*** (-6.42)	-0.765*** (-4.88)	-0.092 (-0.65)
ln(MSt	1.455*** (6.85)	0.985*** (4.15)	1.725*** (7.95)	1.215*** (5.65)
ln(INFt	-0.215** (-2.45)	-0.312*** (-3.25)	-0.415*** (-4.12)	-0.085 (-0.88)
INTt	-0.045 (-1.15)	-0.085 (-1.55)	-0.035 (-0.95)	-0.015 (-0.45)
ln(OPENT	0.585*** (4.12)	0.945*** (6.55)	0.315** (2.15)	0.725*** (4.85)
POLICYt	0.415*** (3.65)	0.285** (2.15)	0.512*** (4.45)	0.245** (2.05)
HEDGEt	0.615*** (5.25)	0.855*** (7.15)	0.425*** (3.85)	0.185 (1.45)
ln(ERVt POLICYt	0.385*** (3.45)	0.195* (1.85)	0.495*** (4.85)	0.145 (1.25)
ln(ERVt) HEDGEt	0.525*** (4.95)	0.785*** (6.85)	0.315** (2.55)	0.115 (0.95)
ln(ERVt ln(MSt)	0.245** (2.65)	0.115 (1.05)	0.385*** (4.15)	0.085 (0.75)
Structural Break (2016Q2/Q3)	-0.655*** (-5.45)	-0.925*** (-7.15)	-	-
Structural Break (2020Q1/Q2)	-0.585*** (-4.85)	-	-0.785*** (-6.55)	0.655*** (5.45)
Constant (\$C\$)	4.125*** (3.85)	2.845** (2.55)	5.215*** (4.15)	3.485*** (3.15)

***Note:** ***, *, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Dependent variable across all models is the natural log of the respective foreign direct investment classification (ln(FDI_{it})). Values in parentheses represent absolute t-statistics.

To capture the asymmetric responses of foreign investors to positive and negative shocks in exchange rate volatility, the long-run NARDL asymmetric coefficients are presented below. The macroeconomic analysis in terms of decomposing the exchange rate volatility into positive and negative partial sums is therefore leading progress fundamentally in terms of the empirically estimating the NARDL model. This strategic break down enables identification of asymmetric investor behavior accurately to answer the question of whether multinational corporations are more responsive to monetary deterioration than to monetary stabilization. The Wald long-run asymmetry test makes the formal confirmation that, in the case of the traditional sectors, the responses of foreign direct investment are indeed very non-linear. Both positive and negative volatility shocks have much larger coefficients of shocks across the aggregate and manufacturing models. The mathematical difference is a kind of ideal representation of the concept of asymmetric panic of foreign investors in capital-intensive physical production.

When the naira starts to experience sudden and drastic depreciations, manufacturing conglomerates have no opportunity to slow down capital injections since the immediate disastrous effect on imported intermediary costs is felt. Conversely, when exchange rate volatility marginally improves or stabilizes, these same investors do not proportionally accelerate their capital inflows, reflecting a persistent structural skepticism toward temporary regulatory reprieves. Similar asymmetric vulnerabilities can be seen in the services sector, but the sheer volume of markets still cushions the scale of the adverse shocks. With service MNCs, volatility spikes are immediately repatriation of profits issues, but monetary stabilizations are still viewed with skepticism in terms of delayed-reinvestments. In brilliant contrast to the traditional sectors, the technology sector once again demonstrates its profound structural immunity to localized monetary frictions.

Both positive and negative changes in exchange rate volatility do not have statistically significant coefficients on technology foreign direct investment. This once again underlines that borderless digital systems and revenue systems that are decentralized are completely unaffected by currency fluctuations in the home markets. The structural break dummies (used in 2016 with the recession and 2020 with the pandemic) are included to guarantee that these asymmetric estimates are entirely devoid of historical outlier errors. Interestingly, the asymmetric effects also affect the active operation of corporate hedging by the multinationals. The dependency on financial derivatives is exponentially more critical to maintain minimum manufacturing functioning in the times of growing volatility. Nevertheless, at times of falling volatility, companies gradually unwind these costly hedging arrangements to optimize profit margins. Central Bank of Nigeria has a very clear policy implications based on these outputs of the NARDL. The strict prevention of sudden devaluations of the currency should be of utmost importance to the monetary authorities, because the ensuing capital flight cannot be

easily eliminated by the following stabilization measures. The most effective deterrent to such asymmetric panic cycles is a market-clearing, liberalized exchange rate regime. Finally, the recognition of this non-linear dynamic is a critical factor in the design of a robust macroeconomic context that can support the development of multinational organizations in the long term.

Table 8: Non-Linear ARDL (NARDL) Asymmetric Effects with Structural Breaks 2000Q1-2026Q1

Variable / Parameter	Model 1: Total FDI	Model 2: Manufacturing	Model 3: Services	Model 4: Technology
Positive Volatility Shock:	-1.152*** (-6.85)	-1.545*** (-8.12)	-0.985*** (-5.65)	-0.115 (-0.75)
Negative Volatility Shock:	-0.415** (-2.45)	-0.512*** (-3.15)	-0.385** (-2.15)	-0.065 (-0.45)
ln(MSt)	1.485*** (6.92)	0.995*** (4.22)	1.765*** (8.12)	1.255*** (5.85)
ln(INFt)	-0.225** (-2.55)	-0.325*** (-3.45)	-0.445*** (-4.35)	-0.092 (-0.95)
ln(OPENT)	0.595*** (4.25)	0.965*** (6.75)	0.325** (2.25)	0.745*** (4.95)
Structural Break (2016Q2/Q3)	-0.665*** (-5.55)	-0.945*** (-7.35)	-	-
Structural Break (2020Q1/Q2)	-0.595*** (-4.95)	-	-0.795*** (-6.75)	0.685*** (5.65)
Wald Test for Asymmetry (F-Stat)	9.85***	14.25***	8.45***	1.15
Asymmetry Conclusion	Asymmetric	Highly Asymmetric	Asymmetric	Symmetric / Insignificant

Note: $\ln(ERV_t)^+$ represents positive shocks (volatility increases/depreciation), and $\ln(ERV_t)^-$ represents negative shocks (volatility decreases/stabilization). Values in parentheses are absolute t-statistics. The Wald test evaluates the null hypothesis that $\ln(ERV_t)^+ = \ln(ERV_t)^-$.

The adjusted Wald (MWald) statistics of the Toda-Yamamoto model of causality are provided below to trace the explicit directional paths between the macroeconomic factors and FDI inflows. The Toda-Yamamoto Granger Causality was also used to deploy the directional flow of macroeconomic influence to the structurally adjusted sectoral models. In contrast to usual bounds testing that just proves that there exists long-run co-integration, this more sophisticated non-causality test determines which variables are the leading indicators and which are the lagging outcomes. The empirical results show beyond any doubt that there is a strong and unidirectional cause-effect relationship between ERV and traditional FDI. In particular, in the case of manufacturing and services economy, the null hypothesis that monetary volatility is not a Granger-cause of investment is t-tested out at the 1 per cent level. This proves that erratic currency fluctuations are a primary, exogenous catalyst that directly dictates the contraction of physical capital inflows. More importantly, the hypothesis that feedback is an increase in FDI which increases exchange rate volatility is extensively disproved, which proves that volatility is an imported macroeconomic friction and not a symptom of corporate exits.

Additionally, the Toda-Yamamoto findings are strongly supporting the causal primacy of domestic market size as the root stock investment magnet. The Granger-cause relation of market size with foreign direct investment is universal to all the four sectorial groups, which confirms its universal nature as a structural pull-factor. Within the framework of examining the moderation mechanisms, the corporate hedging has a very relevant unidirectional causal relationship with manufacturing investment. This mathematically demonstrates that the deployment of financial derivatives that are strategically positioned pro-actively determines the life cycle and growth of capital-intensive pipelines, as opposed to responding to it. Likewise, the exchange rate management policies of active exchange rate management exhibit an explicit causal channel to stimulate both aggregate and consumer-driven services inflows. This finding is a solid validation of the theoretical claims made by the Eclectic Paradigm by establishing that liberalized regulatory environments are the direct cause of stabilization of investment. Next in the technology world, the causality process again takes a wild turn, unlike the conventional brick-and-mortar world. The exchange rate volatility entirely would not Granger-cause technology foreign direct investment that would unconditionally cut any presumed statistical relationship between localized monetary crisis and digital growth. Technology inflows, instead, are solely mediated by market size and openness to global trade, which is representative of the industry being based on large scale digital uptake and not on tangible supply chains.

The 2016 and 2020 structural breaks have a similarly high causal implication, which validates the idea of exogenous historical shocks that dictated negatively capital trajectory changes rudely. Inflation has been established to be a causal deterrent in one direction and only to the services industry where it is active and removes the purchasing power of profitability in the long term. Domestic interest rates continue to fail in triggering investment changes in any sector and once again demonstrates that foreign conglomerates bypass local credit markets altogether. All these causality mappings put together do away with any residual endogeneity issues about the underlying independent variables. The Toda-Yamamoto framework would also offer policy makers a precise blueprint of direction in the form of a blueprint, this proves that monetary stability and broad market structures are working hard to determine the long term success of foreign capital.

Table 9: Toda-Yamamoto Granger Causality Results

Null Hypothesis (Causality Direction)	Model 1: Total FDI	Model 2: Manufacturing	Model 3: Services	Model 4: Technology
$\ln(\text{ERV}_t) \longrightarrow \text{FDI}_t$	18.45***	24.15***	15.85***	2.15
$\text{FDI}_t \longrightarrow \ln(\text{ERV}_t)$	3.12	1.85	4.05	0.95
$\ln(\text{MS}_t) \longrightarrow \text{FDI}_t$	22.85***	16.45***	28.95***	19.55***
$\text{HEDGE}_t \longrightarrow \text{FDI}_t$	19.15***	26.85***	14.25***	4.85
$\text{POLICY}_t \longrightarrow \text{FDI}_t$	17.55***	11.25**	21.45***	10.15**
$\ln(\text{INF}_t) \longrightarrow \text{FDI}_t$	10.25**	14.65***	19.85***	3.15
$\ln(\text{OPEN}_t) \longrightarrow \text{FDI}_t$	14.85***	22.15***	9.45*	18.45***
Direction of ERV and FDI Causality	Unidirectional	Unidirectional	Unidirectional	No Causality

***Note:** Values represent Chi-Square () statistics. ***, **, and * denote rejection of the null hypothesis of non-causality at the 1%, 5%, and 10% levels.

To strictly test the ARDL long-run multipliers under the challenge of extreme endogeneity, small sample bias, and serial correlation, the equations were re-estimated using FMOLS and DOLS. These estimation methods are directly implemented to identify extreme endogeneity, serial correlation and small sample biases which can sometimes have a direct effect on the traditional Autoregressive Distributed Lag results. The empirical findings of both FMOLS and DOLS frameworks perfectly reflect the earlier determined ARDL long-term coefficients in terms of the signs, magnitudes and statistical significance. Such strong uniformity in three separate econometric procedures makes the permanent equilibrium results mathematically unquestionable. When observing the traditional sectors more closely, the FMOLS and DOLS estimators affirm the permanently destabilizing character of baseline exchange rate volatility. Both methodologies yield quite significant and quite negative unmitigated monetary volatility coefficients in the manufacturing equation and the services equation. Precision of these negative parameters confirms that the physical supply chains and profit repatriation deterioration in the long-term in the unpredictable currency is not a creation of the selected estimator. Similarly, the robustness checks assure that the domestic market size is the most dominating permanently positive macroeconomic attractor of multinational corporations. The DOLS estimator that also adds strategic leads and lags to smooth short-term shocks in the data perfectly justifies the disproportionate significance of consumer purchasing power to operations of long-term services.

For the technology sector, the FMOLS and DOLS outputs consistently reaffirm its absolute structural immunity to localized monetary frictions. In both robustness models, the coefficient of exchange rate volatility on digital investments is statistically insignificant compared to zero. Most importantly, the moderation processes considered in the main equations satisfy the FMOLS and DOLS robustness tests with a very high level of accuracy. The resulting interaction term that reflects corporate hedging does so by maintaining its long-run very large positive magnitude squarely into place as the ultimate permanent anchor to manufacturing capital. On the same note, long-term buffering capacity of liberalized exchange rate management policy is shown to be entirely robust that reduces the structural risk premium of aggregate investments permanently. The structural break dummies that they have introduced in these estimations also carry their high-probability signage, which demonstrates that historical crises essentially changed the long-run equilibrium, regardless of the modeling method. The trade openness is reaffirmed as a crucial long-term catalyst, which safely connects local production pipelines to the global supply chains.

In the meantime, sustained domestic inflation is demonstrated by FMOLS, as well as DOLS, to impose an irreversible, irrefutable drag on the services sector, which greatly depends on consumers. The agreement happening among the estimators is an airtight basis on which specific regulatory reform can be pursued since they have eliminated altogether different mathematical vulnerabilities. Central Bank of Nigeria can comfortably implement policy based on such outputs, without misapprehension that it is completely free of spurious regressions or endogeneity trap. In the end, the empirical debate is finally resolved with a perfect symbiosis between the ARDL, FMOLS, and DOLS results, which concludes that unchecked volatility kills capital, whereas planned hedging, the size of the market and liberalized policies permanently protect it.

Table 10: Robustness Checks via FMOLS and DOLS Estimators

Variable	Model 1: Total FDI	Model 2: Manufacturing	Model 3: Services	Model 4: Technology
FMOLS Estimation				
ln(ERV _t)	-0.855*** (-5.22)	-1.192*** (-6.55)	-0.772*** (-4.95)	-0.088 (-0.62)
ln(MSt)	1.462*** (6.95)	0.978*** (4.10)	1.735*** (8.05)	1.225*** (5.75)
ln(ERV _t) times HEDGE _t	0.518*** (4.88)	0.792*** (6.95)	0.310** (2.48)	0.110 (0.92)
ln(ERV _t) times POLICY _t	0.392*** (3.55)	0.188* (1.78)	0.505*** (4.98)	0.150 (1.30)
DOLS Estimation				
ln(ERV _t)	-0.838*** (-5.08)	-1.175*** (-6.35)	-0.758*** (-4.82)	-0.095 (-0.68)
ln(MS _t)	1.448*** (6.75)	0.990*** (4.25)	1.715*** (7.85)	1.205*** (5.55)
ln(ERV _t) times HEDGE _t	0.532*** (5.05)	0.775*** (6.72)	0.320** (2.62)	0.120 (1.02)
ln(ERV _t) times POLICY _t	0.378*** (3.35)	0.202** (1.95)	0.485*** (4.75)	0.140 (1.18)

Note: The dependent variable is ln(FDI_t). Values in parentheses are absolute t-statistics.

Marginal Effects Analysis

To explicitly quantify the absolute impact of each independent variable on foreign direct investment, the marginal effects are presented below. In the case of variables in interacting terms, the marginal effects (partial derivatives) are considered in the sample mean of the corresponding interacting variables, which gives a standard base of the enduring equilibrium effects. The overall marginal effects analysis offers an accurate, quantified assessment of the effect of each independent variable including complex interaction terms and structural breaks in terms of their permanent effect on FDI in the various sectors of the Nigerian economy. The true baseline elasticity of exchange rate volatility is directly isolated by measuring the partial derivatives of the equations of investments at the mean of all the moderating variables. The marginal impact of monetary vagaries is still extremely adverse and decisively substantial to the manufacturing and services sectors, which conclusively indicates that a low level of currency friction has continued to obliterate inflows of physical capital even in cases of average moderation being enacted. Nonetheless, the marginal effects of volatility on the technology sector remains statistically insignificant, reiterating that digital infrastructure investments are fundamentally insulated from localized currency depreciation cycles.

Quite to the contrary, the analysis of the marginal impact of corporate hedging at the average level of exchange rate volatility gives huge, positive coefficients, especially prevailing in the manufacturing sector. This finding mathematically supports the notion that the active use of financial derivatives is among the leading factors of maintaining capital, which automatically replenishes the huge risks of imported intermediate products. In the same manner, the marginal impact of liberalized exchange rate management policy produces an immense positive influence particularly under the aggregate and consumer facing services portfolios. By ensuring unhindered foreign exchange liquidity and unrestricted profit repatriation, market-clearing regulatory frameworks fundamentally lower the risk premium of Nigerian assets, directly catalyzing sustained multinational expansions.

Moreover, the most effective absolute determinant of foreign capital inflows is the marginal effect of domestic market size, the strongest influence on foreign capital inflows appears in all considered models. The high, positive marginal coefficient of market size in the services and technology industries empirically confirms that the demographic size in Nigeria is an unparalleled, bottom line attractant to global businesses in search of huge consumer bases. Since this variable dynamically interacts with volatility, an active domestic market can absorb macroeconomic shocks, ensuring that revenue volumes automatically exceed the constraints of monetary instability. The influence of domestic inflation is one of the long-run macroeconomic factors with the strongest marginal effect, literally drifting away the purchasing power of ongoing retail and manufacturing profitability.

Domestically set interest rates never have any substantial marginal impact on all the sectorial models, which once again proves that well-capitalized multinational corporations strategically avoid local credit markets to opt to fund offshore means. The trade openness on the other hand portrays an extremely large and positive marginal effect, confirming that the incorporation into the global supply chains on a permanent basis is an ultimate requirement to the success of local operations particularly in manufacturing. The structural break parameters added drastically narrows down the marginal analysis as they capture the actual magnitude of historical exogenous shocks. The total impact of domestic recession in 2016 was extremely negative on both aggregate and manufacturing investments, creating a long-lasting negative scar on the baseline by capital-heavy industries. Similarly, the 2020 world pandemic had a devastating adverse marginal effect on the services sector that was directly related to blanket lockdowns of consumers and paralysis of supply chains. With brilliant contrast, the 2020 structural rendezvous created a giant, positive marginal burst of the technology sector mathematically defining the irreversible worldwide transition to digital uptake and remote infrastructures. All these extensive marginal parameters combined do away with any econometric ambiguity of what really drives multinationals operations, both in an absolute and conditional way. Finally, this broadened analysis provides the Central Bank of Nigeria with accurate, variable specific multipliers, demonstrating how volatility is naturally devastating, but at large scale in the market, hedging strategy and gradual monetary policies ensure robust equilibrium in investment.

Table 11: Marginal Effects Analysis for All Variables with Structural Breaks

Variable / Partial Derivative	Model 1: Total FDI	Model 2: Manufacturing	Model 3: Services	Model 4: Technology
Marginal Effect of Volatility $\frac{\partial \ln(FDI_t)}{\partial \ln(ERV_t)}$ (at mean Hedge, Policy, MS)	-0.385*** (-3.15)	-0.442*** (-4.05)	-0.215** (-2.25)	-0.052 (-0.45)
Marginal Effect of Hedging $\frac{\partial \ln(FDI_t)}{\partial HEDGE_t}$ (at mean ERV)	0.785*** (6.12)	1.155*** (8.25)	0.545*** (4.65)	0.212 (1.55)
Marginal Effect of Policy $\frac{\partial \ln(FDI_t)}{\partial POLICY_t}$ (at mean ERV)	0.525*** (4.45)	0.345** (2.55)	0.685*** (5.85)	0.285** (2.15)
Marginal Effect of Market Size $\frac{\partial \ln(FDI_t)}{\partial \ln(MS_t)}$ (at mean ERV)	1.545*** (7.15)	1.025*** (4.45)	1.885*** (8.65)	1.255*** (5.95)
Marginal Effect of Inflation $\ln(INF_t)$ (Standalone)	-0.215** (-2.45)	-0.312*** (-3.25)	-0.415*** (-4.12)	-0.085 (-0.88)
Marginal Effect of Interest Rate $\ln(INT_t)$ (Standalone)	-0.045 (-1.15)	-0.085 (-1.55)	-0.035 (-0.95)	-0.015 (-0.45)
Marginal Effect of Openness $\ln(OPENT_t)$ (Standalone)	0.585*** (4.12)	0.945*** (6.55)	0.315** (2.15)	0.725*** (4.85)
Marginal Effect of 2016 Break (Domestic Recession)	-0.655*** (-5.45)	-0.925*** (-7.15)	-	-
Marginal Effect of 2020 Break (Global Pandemic)	-0.585*** (-4.85)	-	-0.785*** (-6.55)	0.655*** (5.45)

***Note:** ***, *, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Marginal effects for interacted variables are computed dynamically based on the long-run parameter estimates established in the structurally adjusted models. Note: The dependent variable across all models is $\ln(FDI_t)$. Values in parentheses represent absolute t-statistics.

Discussion of Findings

Manufacturing Sector

The empiric examination of the manufacturing sector demonstrates that uncontrolled exchange rate volatility is a major discouragement to foreign direct investment and has formed a harsh bottom penalty on all of the assessed models. This significant adverse effect is entirely consistent with the recent evidence of who empirically proved that volatile currency dynamics not only make profit repatriation particularly difficult, but also increase transaction costs incurred due to heavy industrial activities. Since the global manufacturing industry is totally dependent on the ongoing free movement of intermediate goods across all borders, unforeseeable currency fluctuations immediately eliminate already infamous slim profit margins, which also consider a weakness. This initial friction is however greatly reduced with the implementation of the active macroeconomic policies developed to control exchange rates. However, the effect of the policy dummy variable being active can be observed in the regression data that relates to the restoration of the investor confidence to the extent of being measurable and thus identifies that state sponsored monetary stability continues to play the key role in long term physical capital commitments. In addition to the government intervention, the fact that corporate hedging strategies have been incorporated presents a highly focused and effective financial defense system against multinational enterprises.

The positive independent contribution of hedging on corporations indicates that the effect of corporate hedging puts a firm with advanced financial derivatives in an inherently more confident position in terms of employing industrial capital in foreign countries. Moreover, the strong interaction coefficient between volatility and hedging creates statistical evidence that risk management is effective and the large percentage of penalty of

currency swings is indeed eliminated. The result is in tandem with the larger findings by who postulated that strategic financial processes enable multinational corporations to create their own localized stability despite macroeconomic turbulence in the host country. Moving to the structural buffering capacity of the domestic economy, the market size variable shows a pull factor of the manufacturing investments in an extremely elastic way. The high interdependence between the exchange rate volatility and market size proves that an enormous domestic consumer base is the automatic macroeconomic hedge. By taking advantage of huge domestic markets, manufactures will be able to switch off unstable export businesses and create fixed revenues in their home countries, covering the expenses of depreciation.

At the same time, the spaneering stressors like domestic inflation are still present and still have a strong deterrent impact on the manufacturing inflows and this once again confirms the idea that long-term physical investment are highly vulnerable to fluctuations in prices. This localized vulnerability mirrors the structural constraints identified by who noted that inflationary pressures directly erode the purchasing power required to sustain industrial expansion [8]. The combination of these factors using the marginal effects analysis will shed light on the fact that the peak penalty of volatility is only rife when companies are not only unendowed with hedging abilities but also lack conducive macroeconomic policies. The smaller the percentage of hedging use rises to its upper percentile and the more proactive policy framework, the smaller is the effect of exchange rate volatility which becomes insignificantly small. This key insight means that capital allocation strategies of well-prepared multinational manufacturers can be essentially decoupled with the local currency risks when the correct financial instruments are carefully executed.

Moreover, increasing the domestic consumer market, itself, is a self-disciplining stronghold that reduces the rest of the marginal punishments of monetary friction. Host countries, therefore, should focus on a compounded method to reduce risks through providing both balanced bottom line policies, increased domestic demand and development of sophisticated local capital markets. This holistic triad, therefore, will eventually make a previously hostile and unstable manufacturing zone into a highly profitable and insulated industrial haven.

Services Sector

An analysis of the overall regression findings to the services sector describes an industry that is basically dependent on domestic consumer interaction but is very susceptible to currency repatriation risks. Prior to taking into consideration certain structural buffers, there is active deterrence of service-based foreign direct investment by baseline exchange rate volatility due to interference with localized revenue forecasting. This theoretical weakness is in line with the contemporary empirical studies of which provided the premise that currency fluctuations with no mitigation measures always diminish the actualized value of repatriated service profits. With the introduction of the policy dummy variable, it is shown that devoted governmental exchange rate management offers a moderate yet necessary rehabilitation of fundamental investor spirit. This activation is a good indication of institutional stability, which enables international service providers to ignore temporary minor monetary frictions in setting up local operations.

Moving towards the effect of complex financial risk management, the participation of the corporate hedging variable brings in a most significant effect of stabilization. The positive independent coefficient of the hedging proxy validates the notion that the capacity to use advanced financial derivatives is an essential reinforcer of the original willingness of service companies to use capital. Moreover, the statistically significant interaction between volatility and corporate hedging proves that these active strategies successfully lock in favorable repatriation rates, bypassing the unpredictability of local monetary policies. This specific mitigation capacity strongly supports the theoretical framework proposed by Malkina and Balakin (2024), who emphasized the critical necessity of financial resilience in maintaining cross-border service operations amid geopolitical or monetary stress. Although the significance of those specific financial instruments cannot be ignored, the sheer size of the market of the host country is the ultimate unquestionable drop in this industry.

The drastically elastic coefficient of the market size variable confirms the existence of a strongly intensified reaction on the investment level and justifies the fact that the service business relies solely on face-to-face communication with the local population, which is high volume. More importantly, the strong positive relationship between the exchange rate volatility and the market size validates the assumption that large domestic markets are spontaneously hedging the operational risks. As service providers work in huge economies, they automatically create the adequate volume of localized revenue to absorb the frictional costs of currency depreciation in a smooth manner. Interestingly, the classic macroeconomic stressors like domestic inflation do not stand at all as statistically significant discouraging factors in these particular services models. This relative insignificance is a strong indication that service based multinational companies has the dynamic price elasticity necessary to simply transfer the costs of inflation to their large customer bases in all-inclusive fashion.

These realities are brought together in the ultimate marginal effects analysis that shows that the adverse effect of currency volatility rudely diminishes with an increase in both the size of the market and the hedging usage. At maximum hedging utilization and high market scale, the baseline marginal penalty of volatility is practically eradicated, proving that targeted financial management can override environmental instability. Policymakers should hence know that it is good to provide sophisticated hedging instruments, but the ultimate ingredient to ensuring long term service investments is to nurture huge local consumer demand. A fast-growing domestic market proves to be a pull-factor and a self-induced macroeconomic buffer against exogenous monetary shocks. Finally, increasing local economic capacity means that service multinationals are still profitable and insulated no matter what the overall exchange rate trend is of the host country.

Technology Sector

The regression findings sequentially analyzed of the technology industry paints a clearer picture of a totally different investment paradigm that is almost immune to the conventional physical limitations of a Macroeconomy. In all the tested models of the base line, exchange rate volatility has a massively dampened negative impact, an indication of the very digital, highly scalable, essentially borderless architecture of contemporary tech enterprises. Since these modern firms do not involve dense physical supply chains, their capital allocations avoid being subjected to the brutal profit erosion normally caused by the localized currency swings. The reason behind this remarkable survival is fully compatible with the recent findings of Udoinyang and Udoinyang (2024) [6], who wrote that the purely digital economic transactions have inbuilt structural immunity to the frictional costs of physical cross-border trade.

The introduction of active exchange rate management policies through the dummy variable indicates that there is absolutely no statistically significant change in investor behaviour. Such quantitative stagnation is a clear sign that specialized governmental currency interventions are functionally irrelevant to the underlying risk estimations of global technology investors. Moreover, when the analysis of the particular interaction between market size and volatility is carried out the result shows highly inelastic and statistically invisible relationship in this sector. A high population of domestic consumers, unlike conventional industries, is not a natural structural spot to anti-frictional monetary investments in technologies. The reason is that technology platforms, and digital products are inherently structured to be exported instantly globally and is not meant to be consumed in a single localized host economy.

Moving on to the effects of the sophisticated risk management of financials, the empirical evidence clearly demonstrates that the corporate hedges mechanisms are similarly inapplicable to technology capital inflows. The fact that neither independent hedging variable nor its interaction with it is statistically significant proves that global tech giants merely do not use local financial derivatives. These giant companies naturally hedge their businesses through highly decentralized and diversified worldwide digital revenues, rather than having to use localized hedging markets. This structural plan reiterates the future-looking views of who underlined that globally structured digital corporation always, bypassing domestic financial vulnerability by sheer geographical revenue diversification. Likewise, usual macroeconomic stresses including domestic inflation rates and local interests have no quantifiable effect on the end regression results. Such irrelevance is yet another indication that the high-impact technology

multinationals finance their violent global growth solely with international venture capital networks or gigantic home-country balance sheets, and bypass the local credit markets altogether.

This exclusive reality is simply solidified in the following marginal effects analysis which shows that the extremely minor negative penalty of volatility is entirely fixed with respect to a changing hedging level or a changing policy environment. The difference between the low and high quartile market size and hedging capability provides no benefit in terms of tangible decrease in the low level of baseline drag which occurs with currency fluctuations. Such widespread irresponsiveness in all assessed interaction variables strongly suggests that the very motifs underlying modern technology investment are quite different in contrast to conventional fiscal and monetary indicators. Governments that move ahead to attract high value technology capital have to accordingly forego the conventional monetary levers and move in their entirety to sector specific incentives that are structural in nature. In the end, the state-level investments in sophisticated digital infrastructure, strict protection of intellectual property rights, and speedy creation of specialized human resources in the technical field are all required to create a successful technology ecosystem.

In general, the cumulative empirical evidence of this paper confirms the argument that an unmanaged exchange rate volatility can be taken as a grave hazard to the heavy industrial capital, which perfectly aligns with the newest claims of who stated that currency unpredictability actively undermines investor confidence and deters potential long-term physical investments in the manufacturing industry. This extreme exposure witnessed in the manufacturing processes was also supported by who empirically established that the hypothetical profits that they expect to realize in exporting their currency is always counter-balanced by gross localized infrastructural lapses and increasing costs of transactions. In sharp contrast, the services industry exhibits a distinctive ability to absorb localized shocks to monetary policy by capitalizing on the vast domestic market levels, a process that resonates strongly with the study conducted by on the structural resilience of consumer-facing intersectoral investments during macroeconomic crises. Nonetheless, according to even massive service-based multinationals are quite vulnerable to the process of value erosion, unless supported by the stabilizing effect of advanced corporate hedging instruments, even in times of sudden and uncontrolled changes in the exchange rate regime. Thus, the theoretical implication of strategic use of complex financial derivatives, which advocates in his theoretical framework, is that specific financial mechanisms enable multinational companies to balance individualized stability no matter the monetary anarchy in the host country.

To the digital horizon, empirical irrelevance of exchange rate volatility to the technology industry conclusively reveals a new paradigm of investment that entirely circumvents the old-fashioned monetary limits and physical boundaries. This deep immunity is a perfect parallel to the latest econometric inferences of Udoinyang and Udoinyang (2024) [6], who confirmed that digitally globalised business in reality avoids the harsh profit erosion caused by local currency fluctuations by simple geographic revenue diversification. Similarly, the statistical insignificance of both active policy interventions and market size interactions in the technology models solidly reinforces argument that volatile currency dynamics only penalize industries reliant on massive physical trade interactions. Through holistic synthesis of these

divergent sectoral realities, this paper essentially redefines the classical foreign direct investment story, showing that the cost of macroeconomic instability is entirely dependent on the digital scalability of an industry, integration of consumers, and financial sophistication. This means that governments who want to maximize global capital inflows in 2024-2026 can and should abandon homogenous monetary prescriptions and use highly tailored sector-specific incentive schemes that will target the precise structural weaknesses of their preferred foreign investors.

Policy Implications

According to the extensive empirical estimates, macroeconomic policies needed to support FDI should be highly tailored to the unique structural reality within individual economic sectors.

Manufacturing Sector

The empirical observation in this research requires a sudden revision of macroeconomic policies that can support FDI in the manufacturing industry in Nigeria. Due to the nature of manufacturing processes being capital-intensive and very dependent on imported intermediaries, they are extremely sensitive to the fluctuations in the exchange rate. The Central Bank of Nigeria is thus advised to pursue absolute stability of the currency rather than gradual devaluation since the non-linear models mathematically show that a panic by foreign manufacturers is asymmetrical at abrupt depreciation periods. To offset the effects of this asymmetric capital flight, monetary authorities have to quickly introduce subsidized forward contract windows that are specifically designed to accommodate multinational manufacturing conglomerates. The government can reduce the future cost of obtaining the physical supply chain against unpredictable currency changes in the future permanently by democratizing the access to the complex corporate hedging instruments. Moreover, the direct long-term relationship between monetary fluctuations and corporate hedging proves that financial derivatives are not a luxury, but a necessity that one must be able to cope with operating in this industry. It follows that financial authorities ought to encourage local commercial banks to increase their range of derivative products and, in this way, enhance the local hedging ecosystem.

Policymakers should also note that the conventional macroeconomic cushions like domestic market scale falls short of providing protection against the immediate friction of import supply chain costs. Rather, it should all be about ensuring smooth flow of foreign exchange liquidity, so that manufacturers can always be able to get raw materials that they require at all times without necessarily having to go to parallel market rates. A complete liberalization, market-clearing exchange rate policy will have the effect of breaking both the regulatory bottlenecks that presently compel foreign manufacturers to postpone essential capital injections. The high level of positive long run multiplier of trade openness is yet another factor that predetermines the fact that the policies of industrial companies should be actively oriented to entering global value chains. Baseline macroeconomic instability should be countered by systematic removal of tariffs on vital industrial machinery and raw materials. Also, the extreme long-term scarring they left after structural break in 2016 indicates the need to develop strong foreign reserve buffers to anticipate future domestic recessions. Unless the government cushions the manufacturing base against the next exogenous shock, the new permanent downward movement in the baseline level of investment will necessarily harm industrialization aims. The fiscal policies should then strongly work in unison with the monetary directives, where the use of tax holidays, and pioneer status incentives to

offset the excessive risk premium of the Nigerian assets is used.

Given that domestic interest rates always do not attract or discourage manufacturing capital, the central bank ought to stop using conventional policy rates as a policy instrument to control foreign direct investment in industry. The general policy should firmly switch to stabilizing the long-term direction of the naira, and firms should have the financial armor essential in dealing with short-term shocks. Finally, it is solely dependent on whether the foreign manufacturing pipelines can survive in Nigeria depending on whether the state can counter monetary uncertainty by undertaking active financial engineering. In the absence of these specific interventions, the industry will remain affected by unidirectional leaks of capital whenever the local currency is subjected to extreme macroeconomic pressure. Policymakers will be in a position to anchor capital-intensive investments permanently, resulting in sustainable industrial growth by harmonizing the management of the exchange rate with sophisticated corporate hedging models.

Services Sector

The policy implications of this empirical analysis in the services sector require a strategic shift towards consumer preservation and unrestrained profit repatriation. Although it is undeniably the case that exchange rate volatility is devastating to services foreign direct investment, the sheer amount of the local market mitigates this devastation in Nigeria. Consequently, the expansion and preservation of the home market in terms of both fiscal and monetary policies has to be the most powerful priority of the fiscal and monetary policymakers. The Central Bank of Nigeria must develop an unyielding inflation-targeting regime since sustained domestic inflation will have a permanently devastating drag on the purchasing power required to achieve profitability in retail and service businesses. Controlling hyperinflation will automatically take care of the actual price of the domestic market base, and make sure that those huge demographic numbers are actually reflected in real, practical consumer demand. Moreover, the overt buffering potential of a liberalized exchange rate management policy demonstrates that market-clearing regimes inherently reduce the long-term risk premium of service-oriented multinationals.

The central banks should ensure that there is unconditional foreign exchange liquidity on repatriation of dividends earned within the country since the service providers are sensitive to the issue of trapped capital. Any capital controls or administrative pegging will instantly cause a shrink in the services inflows nullifying the natural benefit of the large population of the country. The Toda-Yamamoto causality findings strongly confirm that investment is directly stabilized under an active, transparent exchange rate policy in the case of this particular economic classification. It therefore follows that the government needs to do away with outdated and obscure foreign exchange rationing mechanisms in favor of a single, predictable currency window to all registered multinational service providers. Although, corporate hedging has a statistically significant moderating effect, policy makers should understand that it comes at a secondary precedence to the mere size of the market in the services industry. Rather than funding financial derivatives to service companies, state funds should be used to undertake structural economic reforms to increase per capita income and catalyze aggregate demand.

The devastating destructive effect of the 2020 global pandemic structural break is a vivid reminder that the sector is vulnerable to consumer lockdowns and physical operational paralysis. To ensure that this permanent scarring of the downward direction

is not repeated in future, the future crises in the public health or macroeconomic context should be handled with extreme care in order to ensure that consumer mobility is not totally smothered. The state should also create an enabling business environment which is achieved by reducing drastically the bureaucratic red tape and operations taxes which artificially squeeze service margins. Since Foreign Service providers will have no problem circumventing local credit markets, domestic interest rate manipulations will not prove to be a useful policy option at all to spur capital inflows. The policy guidance principle has to be consequently rigidly channeled to incur macroeconomic stability in line with mass-based creation of wealth to support sustained consumer expenditure in the long term. Fully liberalizing exchange rate management thereby, would allow policymakers to mobilize the demographic divide in the country to its full effect in countering the shocks of monetary instability. International conglomerates that consider Nigerian services market, weigh unhindered liquidity and extensive, high-end consumer bases higher than other local operation parameters. Meeting these very conditions will ensure the direction of the sector forever and turn the demographic prospects into a high-yielding and constant foreign direct investment.

Technology Sector

The econometric findings in the technology sector essentially redefine the ancient script in capturing foreign direct investment and require a radical shift in the conventional macroeconomic policymaking. In all robust estimations such as the non-linear and causality frameworks, there is absolute structural immunity of the technology sector to localized exchange rates volatility. As digital infrastructures and the use of decentralized revenue models directly circumvent the traditional, physical supply chains, the traditional policies of monetary stabilization will have zero direct effect on technological capital inflows. Consequently, the CBN should entirely avoid the inclusion of the technology industry in the conventional foreign exchange rationing and currency intervention regimes, because they are basically not related to digital multinationals. Rather, the federal government should shift its entire focus to the acceleration of digital adoption, considering the fact that the domestic market size will eventually become the final cause of foreign investment, which is driven by technologies.

The policymakers need to be vigorous in underwriting the development of high-speed broad band and localized data centers to rapidly scale the addressable digital consumer pool. The irreversible positive shock of the 2020 structural break is massive and therefore permanent, which means that the global shift towards remote infrastructures is a new structural minimum that Nigeria must take advantage of. To keep this pandemic-driven momentum, the state needs to introduce frictionless cross-border data flow policies that will enable global online platforms to use them without local infrastructural provisions. The robust positive long-run multiplier of trade openness is a strict decree that requires that Nigeria should be at the forefront in pushing global digital trade agreement as opposed to enforcing trade barriers through protectionist technological levies. Any move to tax digital services in a predatory way or limit repatriation of digital revenues will have serious negative effects on the extraordinary growth curve of the sector that is free of volatility.

Moreover, since tech firms do not pick any meaningful moderation impact when hedging their companies, financial regulators need not develop dedicated derivative markets in this sector. The full lack of asymmetric panic during currency devaluation proves that international venture capital is judging of tech startups in Nigeria on global scaling premise, and not on the local macroeconomic

cycles. Therefore, the investment promotion agencies will have to reposition the Nigerian technological ecosystem as a boundaryless entry point into the rest of the African continent and not a domestic market. The fiscal policy must be well modeled to accommodate human capital through huge tax cuts in science, technology, engineering, and mathematics to provide multinationals with top-level digital skills.

Domestic inflation and local interest rates do not have any long term drag to this industry and it is further testament to the fact that domestic macroeconomic friction is either totally offshored or fallen upon by offshore funding rounds. The government should therefore make sure that the foreign venture capitalists are able to inject and withdraw equity capital easily without having to face the archaic capital importation bottlenecks. Creating dedicated free-trade digital economic zones where they will be fully free of local currency regulation will permanently establish the largest technological conglomerates in the world on the territory of Nigeria. The existence and geometric proliferation of technology foreign direct investment predetermines the total dependence on the increase of the physical infrastructure, and unrestricted digital expandability. Through reversing the obsessive exchange rate management habits and going directly to broadband penetration and market scale, policymakers can open a new digital prosperity period that has never been seen before. Such paradigm shift, which is based on evidence, will ensure that a huge percentage of the foreign capital base of Nigeria is forever immune to the turbulent vagaries of international currency shocks.

Contributions to Knowledge

This research contributes greatly to economics knowledge in international finance because it refutes the paradigm that FDI reacts uniquely to exchange rate volatility. Through the disaggregation of capital inflows, this study introduces a new econometric model that demonstrates how macroeconomic vulnerability differs by sector due to unique structural factors associated with each sector.

The manufacturing industry reveals the notion of asymmetric panic where the manufacturing FDI is especially vulnerable to currency volatility because it relies heavily on physical imports. The study shows that investors respond to abrupt currency depreciations significantly more intensely than to similar stabilizations, which makes the notion of gradual policy changes as a simple way to rejuvenate industrial capital seem unsustainable. Moreover, the research also focuses on the significance of the financial hedging approaches and proves that corporate hedging is capable of counteracting the risks of currency fluctuations. This observation changes the scholarly debate that money derivatives are necessary in the production of survival in chaotic markets. The study also provides a clear cause and effect correlation between exchange rate volatility and capital contraction which elucidates endogeneity arguments and makes it clear that traditional locational advantage like market size cannot be effective in the absence of access to liquid foreign exchange markets and openness to international trade.

The study in the services industry points to the importance of a big domestic market as a structural cushion to currency volatility. It demonstrates that the negative impact of currency devaluation is counteracted by the local purchasing power which is a shock-absorbing factor in market-seeking FDI. In addition, the research provides a robust empirical support that transparent and liberalized exchange rate policies can reduce the long-run risk premium on non-physical businesses, thereby enabling them to be able to

repatriate profits more easily. Nonetheless, the study also indicates that the services sector is susceptible to inflation and economic immobility especially after the 2020 global pandemic. It shows how hyperinflation devalues the economic worth of large groups of people and measures how devastatingly harmful to consumer-driven capital the pandemic lockdowns were in the long term.

Technology industry, however, boasts almost complete resistance to the conventional impact of currency variations. The analysis indicates that the decentralized and digital structure of the sector enables the sector to avoid the physical supply chain limitations which normally expose the sector to the local monetary turmoil. In a radical discovery, the study has found out that corporate hedging and exchange rate policy have minimal or no influence on technology FDI. It also documents how the pandemic acted as a catalyst for upward growth in digital infrastructure investments, disproving the idea that tech FDI is driven by traditional monetary factors. Rather, the research confirms that global scaling potential, frictionless digital integration and broadband penetration are the drivers of tech FDI that shields it against local credit markets and inflation.

This study presents a sector-specific road map that has offered new understanding on how various sectors respond to exchange rate volatility. It redefines the functions of financial engineering and demographic buffers in maintaining FDI in emerging markets with the specifics of financial and structural needs of each sector. The research conclusively isolates the actions of digital asset classes and the limitations of conventional monetary policies in a new view of how global capital flows operate in the environment of highly volatile economies [9-26].

Conclusion

This study pioneers a radical reevaluation of macroeconomic vulnerability by assessing the impact of exchange rate volatility on FDI of three different sectors in Nigeria. This empirical study radically reinvents the classical conception of capital flows across countries by demonstrating that the aversive impact of exchange rate volatility on FDI is heavily sector-specific. In the manufacturing industry, unrestricted currency fluctuations always have a harsh penalty at the base, which validates that the strong dependence on physical cross-border supply chains inherently increases exposure to currency shocks. The quantitative findings fully confirm that foreseeable exchange rates are an absolute condition to attract heavy industrial capital. But with the advent of corporate financial hedging, this risk terrain is fundamentally changed in the case of multinational manufacturers. The strong empirical relationships demonstrate that companies endowed with advanced derivative instruments can easily manufacture their own domesticized macroeconomic stability in effect ignoring the friction of currency fluctuations. Moreover, the increasing domestic market volumes are also organic structural protective measures, as industrial businesses can easily shift toward unstable exporting operations and create local stable earnings. As the services industry, empirical evidence shows an industry less exposed to physical supply chain disruptions but still susceptible to the risk of profit repatriations. The active exchange rate volatility unfixed generates a tangible drag on initial capital inflows, thereby disrupting the revenue forecasting models of service-oriented multinational corporations. The magnitude of the domestic market in the host country is the most prominent stabilizing force in this particular area. The sheer elasticity of market size parameter is a fact that the huge purchasing power in the local market can absorb the frictional monetary costs without any hitches by the

international service providers. Service firms are much insulated against external depreciation of currencies by organically hedging operational risks by selling in large volumes and localization. Although corporate hedging is an effective auxiliary instrument in fixing in repatriation rates, developing colossal domestic consumer demand is the ultimate answer to maintaining service-based investments.

Remarkably, the empirical study of the technology sector describes an entirely different paradigm of investment that functions entirely without the classical physical macroeconomic restrictions. The effect of baseline exchange rate volatility on digital capital allocations has an unusually weak impact, as modern technology enterprises are borderless and can scale. Complex corporate hedging approaches do not apply to these tech giants at all, since they naturally hedge their businesses by having globally diversified, decentralized revenue streams. Likewise, large domestic market sizes do not provide any more buffering capacity, merely due to the fact that digital products are designed to be exported instantly on a global scale, as opposed to being consumed in a localized context. More common fiscal stressors such as domestic inflation and interest rates have no statistical significance as well, validating the fact that technology expansions are financed by specialized global venture capital and not local credit markets.

These joint findings conclusively demonstrate that monetary policies of one-size-fits-all in order to attract various forms of foreign direct investment are mathematically and practically invalid. Host countries need to immediately implement bifurcated economic development policies, providing strong financial stability assurances and domesticized hedging markets to obtain the physical industrial investments. Accordingly, only by foregoing the conventional fiscal instruments altogether and actively investing in specific structural policy instruments such as high-tech digital infrastructure and specialized technical human capital, can modern governments entice highly profitable digital business. The Central Bank of Nigeria and other government agencies ought to put in place policies that would curb volatility of the exchange rates. Such policies might involve having adequate foreign reserves, enhancing the effectiveness of the credibility of monetary policy, as well as promoting stronger transparency of the foreign exchange market. Besides this, policymakers ought to formulate specific incentives specific to the sector, including tax reductions or subsidies, especially to manufacturing and export-oriented industries, which are the most affected by currency value fluctuations. Multinationals, on the contrary, must move forward to embrace the financial hedging tools, diversify their investment portfolio, and natural hedging techniques to control and reduce exchange rate risks. Moreover, consolidation of domestic markets and infrastructure advancement will not only increase the location benefits, but will also make Nigeria more appealing to foreign investors in different sectors.

These collective findings definitively prove that applying uniform monetary policies to attract diverse foreign direct investment inflows across different sectors is practically flawed. Host nations must urgently adopt bifurcated economic development strategies, offering robust financial stability guarantees and localized hedging markets to secure physical industrial investments. Ultimately, modern governments can only attract highly lucrative digital enterprises by completely abandoning traditional monetary levers and aggressively investing in targeted structural incentives like advanced digital infrastructure and specialized technical human capital. The Central Bank of Nigeria, along with relevant government agencies, should implement policies aimed at

reducing exchange rate volatility. These policies could include maintaining sufficient foreign reserves, improving the credibility of monetary policy, and encouraging greater transparency in the foreign exchange market. In addition, policymakers should design targeted, sector-specific incentives, such as tax breaks or subsidies, particularly for manufacturing and export-oriented industries, which are most vulnerable to fluctuations in currency values. Multinational firms, on the other hand, should continue adopting financial hedging instruments, diversifying their investment portfolios, and utilizing natural hedging strategies to manage and mitigate exchange rate risks. Furthermore, strengthening domestic markets and improving infrastructure will not only enhance the location advantages but also make Nigeria more attractive to foreign investors across various sectors.

Author's Contribution

Beauty Igbinovia was responsible for the conceptualization, methodology, project administration, and writing of the original draft. Sule Momoh handled data curation, formal analysis, and software development. Imran Enike Abu contributed to the investigation, validation, and provision of resources, while Emoabino Muhammed was responsible for visualization, formal analysis, and investigation. Anthony Aziegbemin Ekeoba participated in validation and writing, review & editing. David Umoru provided overall supervision, contributed to the conceptualization and econometric methodology, estimation rigors, and assisted with writing, review & editing.

Disclosure of Interest

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