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Article

Macroeconomic Volatility, Security Allocations, and Maternal Mortality in Nigeria: A Vector Error Correction Approach

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Abstract: The intersection of fiscal reallocations driven by internal security threats and open-economy monetary shocks presents a profound policy challenge for resource-dependent developing nations. While traditional public health literature focuses heavily on clinical or micro-level institutional determinants of maternal death, it frequently overlooks the macro-fiscal and monetary transmission channels that dictate real health-resource efficacy. This study empirically investigates the extent to which exchange rate depreciation mediates or exacerbates the relationship between military expenditure and maternal mortality in Nigeria. Utilizing annual time-series data spanning from 2000 to 2024, the study employs a rigorous Vector Error Correction Model (VECM) under the Johansen cointegration framework to separate long-run structural equilibria from short-run dynamic innovations among uniformly integrated I (1) series. The long-run normalized structural equation reveals a stark dual-threat mechanism affecting maternal health. First, military expenditure exhibits a statistically significant positive elasticity (β= 0.245), validating the Samuelsonian "Guns versus Butter" hypothesis where rising security funding systematically crowds out nominal social budgets. Second, exchange rate depreciation exerts a significant positive effect on the maternal mortality ratio (β= 0.188), confirming an intense import-dependence pass-through mechanism. Because Nigeria relies on imports for over 70% of its medical inputs, currency devaluation functions as a severe cost-push supply shock that prices vulnerable demographics out of obstetric care. The Error Correction Term (ECTt-1 = -0.385) indicates that while the system maintains long-run stability, short-run shocks to defense and currency values take approximately 2.6 years to resolve, leaving pregnant populations highly exposed in the interim. To mitigate these macro-structural hazards, Nigeria must establish ring-fenced fiscal buffers for maternal healthcare that are legally insulated from defense reallocations. Additionally, policymakers should deploy targeted counter-cyclical foreign exchange subsidies for essential medical imports and aggressively incentivize vertically integrated domestic pharmaceutical manufacturing to decouple human capital survival from external monetary volatility.

Keywords: Maternal mortality; military expenditure; exchange rate depreciation; import dependence; vector error correction model (vecm); public health financing; Nigeria

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1. Introduction

Macroeconomic structure of resource-rich economies is highly vulnerable to external shocks, structural fiscal irregularities and the volatility of their currencies. When structural import dependence is high, as in non-discretionary sectors such as public health care, in countries with such characteristics exchange rate management becomes more than a tool for monetary equilibrium. It then becomes an important structural factor for the survival of human capital. If the life-saving pharmaceuticals and clinical medical equipment are mostly imported, life-saving goods are highly affected by domestic currency depreciation, which serves as a big and non-linear supply-side shock to health

delivery networks. It is a complex problem if in a state, there is a dual scenario of macroeconomic instability at the same time as acute internal security issues.

Rather, in Nigeria, the structural depreciation of the domestic currency (Naira) vis-à-vis foreign reserve currencies, which has been happening since 2015, has been the catalyst of a severe transmission mechanism of inflation. This volatility directly affects the microeconomic realities of how healthcare products are delivered, and multiplies the domestic landed cost of all Active Pharmaceutical Ingredients (APIs), special diagnostic medical machines, emergency obstetric equipment and essential clinical consumables. [1]

The conventional public health literature is largely concerned with clinical or micro-level determinants of maternal death within institutional settings, but often fails to take into account the macro-fiscal/monetary transmission channels shaping the effectiveness of health resources. This study empirically explores this important issue by investigating the effect of exchange rate depreciation on the correlation between military spending and maternal deaths in an open economy context. The present paper has three contributions to the empirical literature [2][3]:

Firstly, it contributes to the growing body of literature that transcend the conventional bivariate studies to produce the first extensive and single-country analysis of the relationship between exchange rate and maternal mortality in Nigeria as the vital connection in the defense spending–maternal mortality link. This thus includes actual limitations in an open economy. Secondly, it adopts a stringent Vector Error Correction Model (VECM) within the Johansen cointegration framework where it is uniquely able to remove the long-run equilibrium characteristics from short-run dynamic shocks of uniformly integrated I (1) time-series pipelines. Thirdly, it provides up-to-date and context-specific empirical data for policy making in a macroeconomic environment that has been so volatile in recent years, as a result of the country's currency unification and liberalization measures. The paper is structure as follows: the theoretical and empirical literature is reviewed in Section 2, Section 3 presents the methodology, Section 4 discusses the empirical results, and Section 6 offers policy implications [4][5][6].

Theoretical Framework and Literature Review

Theoretical Framework.

The structural macro-linkages explored in this study are theoretically grounded in three intersecting paradigms: Samuelson's Guns-versus-Butter Theory [8], Import Dependence Theory, and Human Capital Theory [7][8][9], [10].

The Fiscal Crowding-Out Channel

According to Samuelson's argument [8], when facing a typographical budget constraint, sovereign states are constrained by a binding zero-sum budget constraint and must allocate the limited social funds between military defence ("guns") and social infrastructure/civilian welfare ("butter"). A nation state where there are continuing threats of insecurities and in a developing economy, this institutional trade-off becomes acute. Significant resources are spent in the security sector that are systematically displacing resources that are needed for development outside of the military. In this context, an increase in defence spending reduces nominal fiscal space demanded for increased basic clinical assets, resulting in sub-optimal operational capacities of public health facilities and consequently increased maternal mortality.

The Monetary Pass-Through Channel

This baseline framework needs to be combined with the Import Dependence Theory in order to reflect the realities of an open economy. It is not possible to talk about the real purchasing power of a health budget without considering how sustainable the valuation of the domestic currency has been, in an economy where more than 70% of the clinical consumables are imported from abroad [3]. In the face of depreciating exchange rates in secular currency, the cost of the lifesaving maternal health inputs like oxytocin, magnesium sulfate and blood transfusion kits increase by using the exchange rate pass-throughs mechanism [2]. A compounding hazard arises when direct defense budget lines

are explicitly budgeted to take up the entire nominal budget and at the same time the exchange rate drops, thereby reducing the real power of the leftover funds allocated to maternal care.

The Demand-Side Buffer Channel

In addition to all above, Human Capital Theory [9], [10] starts to explain the macro level mitigation pathways: the macro level economic expansions (as measured by real GDP per capita) increase the sovereign tax base as well as raise household real income. A higher per capita income provides a cushion on the demand side, allowing vulnerable populations that are pregnant to navigate the institutional public health system failures by obtaining quality health care services on private out-of-pocket platforms [11].

Empirical Literature

The Defense Spending-Social Sector Nexus

In recent years, empirical studies on military spending have become more common, and their findings are becoming increasingly evident of the structural crowding out effects that military spending has on human development indices. Fan et al. [12] found a positive association between increased defence spending and reduced fiscal elasticity of social spending in a global measure. This is an asymmetric and more pronounced effect in times of volatile macroeconomic conditions, as Ikegami and Wang [3] found in structurally financially constrained developing countries under chronic inflations.

In the African sub-continent, recent work by Badmus [13] and Raifu et al. [11] discusses how maternal deaths tends to be negatively related to defense spending, and that the relationship between the two is exacerbated in the long-run, depending on the quality of the institutions, the accountability of governance, and the growth rate of the economy.

Empirically, Umar and Sanusi [14] confirm this fiscal crowding-out in Nigeria, noting a systematic reduction of the baseline for domestic health ministries in the short run whenever there is an increase in military allocation and in the long term, olayiwola and Oloruntuyi [15] emphasize the negative effects of the structural diversion of funds for the defence sector on the growth indices for general welfare.

Exchange Rate Volatility and Health Infrastructure

Studies conducted in the Nigeria context have in the past strongly pointed to the structural distortions engendered by the instability of open economy money. Awoyemi et al. [2] give empirical evidence supporting its direct supply side impact on the health sector, increasing the cost of health care and degrading basic mortality indicators with the continuous depreciation of the Naira. Likewise, Ogunleye and Adeyemi [4] demonstrated that exchange rate volatility has a significant negative impact on the MEPE of public expenditure on health and welfare services, implying that increases to the budget accounts are not necessarily effective in improving welfare as the exchange rate falls. George-Anokwuru et al. [16] showed that nominal increases in public healthcare expenditure have a long-run negative effect on maternal mortality rates, but that systematic shocks to the structure of inflation and fiscal constraints are effective at impeding the corrective mechanism.

From method point, Akanni and Osinubi [17] used a Vector Error Correction Model (VECM) to establish that currency depreciation in Nigeria is a direct supply-side shock which negatively affects household out-of-pocket medical expenditure, as the Nigerian pharmaceuticals supply pipeline is highly import-dependent.

Synthesis of Open-Economy Vulnerabilities in Fragile States

There is broad international evidence that the defense-welfare relationship changes when a market economy becomes "open. Empirical models monitoring the economical situation of Egypt [18] and also larger groups of SSA governments [19] reveal that military spending has a very strong positive relationship with infant and maternal mortality in governments that experience economic instability at the same time. Dinga et al. [20] found that external debt servicing and exchange rate pass-through are strong macro economic

moderators in the Southern African Development Community (SADC) which reduce the effectiveness of state interventions in reducing the maternal mortality rate. In addition, Sharma and co-authors [21] found that, in fragile jurisdictions, security operations and macroeconomic shocks continue to result in significantly higher maternal risks indices.

Identification of the Empirical Literature Gap

There is a large amount of work looking at the separate effects of fiscal crowding-out and exchange rate volatility, but there is a lack of empirical work. Past research normally considers these two phenomena separately, as parallel issues. There is no major study that models exchange rate depreciation as an intervening transmission mechanism that operates as an active agent devaluing the residual health budget left over from defense enhancement, especially at the single country level such as in Nigeria.

Additionally, previous studies have often been using small samples and modelling procedures without ensuring integration consistency. This study overcomes this gap by utilizing a unified Vector Error Correction Model (VECM) of variables that are uniformly integrated of order one (I (1)) to give a clear picture of the effect of a monetary shock and a fiscal trade-off on human capital survival.

2. Materials and Method

Model Specification

The structural functional relationship is formalized as follows:

$\ln(MMR)_t = \beta_0 + \beta_1 \ln(ME)t + \beta_2 \ln(GDPPC)t + \beta_3 \ln(EXR)t + \beta_4 \ln(PHE)t + \beta_5 \ln(IQ)t$…… **(1)**

Where: MMR= Maternal Mortality Ratio; ME = Military Expenditure; GDPPC = Real GDP per Capita; EXR= Official Exchange Rate; PHE = Public Health Expenditure; IQ = Institutional Quality Index

All variables are transformed into natural logarithms to reduce heteroscedasticity and allow for elasticity interpretation.

Estimation Technique: Vector Error Correction Model (VECM)

The Johansen, 1988; Johansen & Juselius, 1990 based Vector Error Correction Model (VECM) is used in this study. The analysis is most appropriate using VECM since they can be used to study short-run dynamics and long-run equilibrium relations between non-stationary, cointegrated variables. It clearly exhibits the adjustment of the economy to long-run equilibrium through the error correction mechanism. It allows for estimating the direction of influence between the variables as well as creates a robust test for small sample sizes with using a proper lag selection criterion. The joint nature between the short and long run is reflected in the following VECM specification: $\Delta Y_t = \Pi Y_{t-1} + \Sigma_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t$ …… **(2)**

where

Y_t is a vector of the variables (MMR, ME, GDPPC, EXR, PHE, IQ)

$\Pi = \alpha\beta'$ represents the matrix of long-run adjustment.

α represents the vector of the speed of adjustment

β' represents the long-run cointegrating vectors

Γ_i captures short-run dynamics

ε_t is the white noise error term

Data and Variable Description

Annual time series data from 2000 to 2024 (25 observations) were used. Data sources include:

1. Maternal mortality rate: WHO and World Bank World Development Indicators
2. Military expenditure: Stockholm International Peace Research Institute (SIPRI)
3. Real GDP per capita and exchange rate: Central Bank of Nigeria and World Bank
4. Public health expenditure: World Bank and WHO
5. Institutional quality: World Bank Worldwide Governance Indicators

Diagnostic Tests

To ensure model reliability, the following diagnostic tests were conducted:

Breusch-Godfrey test for serial correlation

Breusch-Pagan-Godfrey test for heteroskedasticity

Jarque-Bera test for normality of residuals

Ramsey RESET test for model specification

CUSUM and CUSUM of Squares tests for parameter stability

Unit Root Testing (ADF and PP)

To establish the integration order, all variables are evaluated in their log-levels (ln) and first-differences (Δ).

Table 1: Unit Root Diagnostic Matrix:

All variables were evaluated using Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) criteria to confirm structural integration.

Variable	ADF (Levels)	PP (Levels)	ADF(Δ)	PP (Δ)	Inference
In(MMR)	-1.14	-1.02	-4.12**	-4.26**	I(1)
In(ME)	-0.89	-0.76	-3.98**	-4.05**	I(1)
In(GDPPC)	-1.45	-1.31	-3.81**	-3.88**	I(1)
In(EXR)	-0.52	-0.44	-5.11**	-5.23**	I(1)
In(PHE)	-1.61	-1.55	-4.39**	-4.42**	I(1)
In(IQ)	-1.20	-1.11	-3.91**	-4.01**	I(1)

Source: Author's computation using EViews 12

*Note: *** indicates statistical significance and stationarity at the 1% level.*

From table 1 above all variables are non-stationary at levels but become stationary after first differencing. They are integrated of order one, I (1), satisfying the prerequisite for Johansen Cointegration.

Lag Length Selection

Using an initial Vector Autoregression (VAR) framework, the optimal lag length criteria for a small sample are computed:

1. AIC (Akaike Information Criterion): Recommends p = 2
2. SBC/BIC (Schwarz Bayesian Criterion): Recommends p = 1

In order to balance parameter conservation with neutralizing residual serial correlation, Lag 1 is chosen for the VECM specification (first-difference lags), corresponding to Lag 2 in the underlying VAR levels.

Cointegration and VECM Estimation Results

Johansen Cointegration Results

Using the Trace (λ_{trace}) and Maximum Eigenvalue (λ_{max}) statistics, we evaluate the rank of the long-run adjustment matrix Π.

Table 2. Johansen Cointegration Performance Bounds.

Hypothesized no. of CE(s)	Trace statistics	0.05 Critical Values	Max-Eigen Statistics	0.05 Critical Value
None (r=0)*	108.45	95.75	46.21	40.07
At most 1 (r ≤1)	62.24	69.81	25.14	33.87

* denotes rejection of the hypothesis at the 0.05 level.

Source: Author's computation using EViews 12.

Johansen cointegration test was used to find if there was a long-run equilibrium relationship between maternal mortality, military expenditure, real GDP per capita,

exchange rate, public health expenditure and institutional quality. Table 2 shows that both Trace statistic (108.45) and Maximum Eigenvalue statistic (46.21) are greater than the critical values (95.75 and 40.07) at 5% significance level and hence the null hypothesis of cointegrating vector of rank zero is rejected. On the other hand, the test does not reject the hypothesis of 'at most one' cointegrating vector (r ≤1)'. This means that there is only one cointegrating equation in the long-run of the variables that are stable and unique, which then validates VECM estimation.

Long-Run Normalized Structural Equation

Normalizing the cointegrating vector with respect to ln(MMR) yields the long-run equilibrium properties (standard errors in parentheses):

$\ln(MMR)_t = 0.245\ln ME_t + 0.412\ \ln GDPPC_t + 0.188\ln EXR_t - 0.334\ln PHE_t - 0.142\ln IQ_t$…..... **(3)**

(0.084) (0.115) (0.031) (0.072) (0.095)

Interpretation of Coefficients

i. InEXR (0.188):

This implies that a 1% depreciation of the exchange rate increases maternal mortality by 0.188% which confirms with the import-dependence pass-through mechanism, where a weaker currency raises the domestic cost of lifesaving obstetric care inputs.

ii. InME (0.245):

A 1% increase in the share of military spending is associated with a 0.245% increase in maternal mortality over the long run. This supports the fiscal crowding-out hypothesis.

iii. lnPHE (-0.334) & InGDPPC (-0.412):

these co-efficient signifies that public health allocations and economic growth play strong protective roles, significantly reducing the maternal mortality ratio.

Short-Run Error Correction Model (VECM Outputs).

The dynamic short-run coefficients capture immediate reactions to macroeconomic shocks, while the Error Correction Term ECT_{t-1} tracks the speed of adjustment back to long-run equilibrium.

$\Delta\ln MMR = -0.385\ ECT_{t-1} + 0.092\Delta\ln ME_{t-1} - 0.154\Delta\ln GDPPC_{t-1} + 0.076\ln EXR_{t-1} + 0.112\Delta\ln PHE_{t-1} - 0.031\Delta\ln IQt\text{-}1$…… **(4)**

Table 3: Parsimonious Short-run Correction

Regressor	Coefficient	t-Statistic	P-Value	Status
ECT_{t-1}	-0.385	-3.92	0.001	Significant
$\Delta\ln ME_{t-1}$	0.092	2.14	0.044	Significant
$\Delta\ln EXR_{t-1}$	0.076	2.89	0.011	Significant
$\Delta\ln PHE_{t-1}$	-0.112	-2.45	0.023	Significant

Source: Author's computation

Speed of Adjustment ECT_{t-1}= **-**0.385 implies that the coefficient is negative and highly statistically significant ($p < 0.01$). This indicates that approximately 38.5% of any short-run deviation from the equilibrium path is corrected within the following year.

Post-Estimation Diagnostic Tests.

Table 4: Diagnostic Validation Matrix.

Test Target	Statistical Test	Value (F/χ^2)	p-Value	Diagnostic Verdict
Serial Correlation	Breusch-Godfrey LM Test	$F(2,14)$= 1.12	0.354	No Serial Correlation

Heteroskedasticity	Breusch-Pagan-Godfrey	F(7,15) = 0.94	0.491	Homoskedastic Residuals
Normality	Jarque-Bera Test	$\chi^2(2)$= 1.48	0.477	Residuals are normal
Functional Form	Ramsey RESET Test	F(1,15) = 2.04	0.173	Correctly Specified
Parameter Stability	CUSUM & CUSUM of Squares	Within Bounds	-	Parameters are Stable

3. Result and Discussion

Empirical Results and Discussion

Unit Root Test Results

The time series characteristics of the endogenous variables (InMMR, InME, InGDPPC, InEXR, InPHE and InIQ were determined by the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) stationarity tests were used to prevent the issue of spurious regression and to establish the proper modeling approach. Results of the above tests are summarized in Table 1, which is empirical, and both log-level and first difference tests were performed. From the test statistics indicated in Table 1, none of the variables are stationary in their levels as the null hypothesis of a unit root could not be rejected at conventional levels of significance. But once the series are transformed in first order differences (Δ), the unit root hypothesis is rejected at the 1% significance level. This uniform convergence to stationarity confirms that the variables are of order one integrated variables, or I (1), which is the base line mathematical condition of Johansen cointegration framework.

Lag Length selection & Cointegration analysis.

First, an autoregressive model (VAR) was estimated to decide on the best lag length, before the structural parameters of the long run are estimated. Two criteria, the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC) were used. According to the AIC, the optimum lag is equal to p=2; the SBC that takes into account the over-parameterization more severely, suggested the optimum lag as p=1. Being short in length of the time series (N=25), and sensitive to the loss of the degrees of freedom in the six variables specification, at the same time, the Lag 1 case of the specification was taken for the VECM.

Cointegration Test Output

Johansen's multivariate cointegration test is applied to the series, and the results in Table 2 show that the series have been structurally interconnected in the long run. Both the Trace statistic (λtrace = 108.45 > critical value of 95.75), and the Maximum Eigenvalue statistic (λmax = 46.21 > critical value of 40.07) reject the null hypothesis that there is no cointegrating relationship between B and r (no cointegration relationship).

Interpretation of the Long-Run Structural Vector.

The long-run structural elasticities are now calculated as the ratios of the normalizing variables that are considered as the single cointegrating vector and the variable of maternal death (InMMR). The long run structural equation (3) brings out some important aspects of the macro-economic variables that influence maternal health tracking in Nigeria:

a. The Exchange Rate which is the Pass-Through Channel (InEXR = 0.188):

The real exchange rate coefficient is positive and is highly statistically significant at 1% level. This means that all else being equal, a long term increase of 1% in the depreciation of the Nigerian Naira will have a 0.188% long term increase in the Maternal

Mortality Ration (MMR). This empirical connection lends support to the import dependency transmission hypothesis. Thus, currency depreciation directly leads to a rise in the cost of lifesaving medical inputs such as medical supplies and pharmaceuticals which are imported into Nigeria, resulting in a direct cost-push inflationary effect on the Nigerian health system. This economic shock can force low-income pregnant women to use alternate less desirable delivery methods, such as home births or some less than optimal options.

b. Fiscal Crowding-Out Channel (InME = 0.245):

The coefficient for military spending is positive and significant at the 95% level. An increase in the defense spending share of GDP of 1% results in an increase in long run maternal mortality of 0.245%. This outcome is empirical evidence of the crowding out phenomenon under the resource constraint of the state. An ever-increasing focus on the defense budget's resources to mitigate internal asymmetric security threats has further constrained financial resources for safeguarding the social infrastructure budget.

c. The Protective Welfare Vectors (InPHE = -0.334 and InGDPPC = -0.412):

Good structural counter-weights are public health spending and real per capita income. Medical funding can be increased by 1% and the MMR reduced by 0.334%, which is a substantial return on investment for the targeted medical funding. Likewise, rising income per capita means greater purchasing power for people, which also helps them better cope with out-of-pocket health shocks.

d. Institutional Quality (InIQ = -0.142):

The maternal mortality rate in the institutions shows a very strong and negative correlation with the improvement of institutional governance, suggesting that the better the institutions' governance, with greater transparency of the administration and delivery of healthcare care, the better utilised of the healthcare resources.

The Parsimonious Short –run Diagnostic Profile.

The short-run dynamic parameters of the VECM were mapped out to study the short-run structural adjustments, fluctuations and the overall systemic adjustments to the long-run equilibrium. The change in the maternal mortality function (lnMMR) is detailed in Table 3 and is an output of the parsimonious model. The short-run diagnostic profile provides two very important inferences:

a. The Speed of Adjustment Vector (ECTt-1):

The Error Correction Term (ECTt-1) is statistically significant at 1% and with a negative sign (-0.385, t = -3.92). This result meets the theoretical demands of a systemic. This indicates that the exogenous macroeconomic shock (here, currency devaluation) brings a short running deviation from long run equilibrium and then realigns with a deviation of 38.5% restored and re-aligned within each annual cycle. The system takes around 2.6 years to completely counterbalance an emergency structure disturbance.

b. Short-Run Impact Elasticities:

The current upturns in exchange rates (ΔInEXRt-1 = 0.076) and military spending (ΔMEt-1 = 0.092) statistically significantly push up the maternal mortality rates in the short run. That suggests that the shock channel of fluctuations in currency values and changes in defence spending affects people with less structural resilience in the economy with little delay and that this has an enhanced effect before policy reactions can offset it.

The military expenditure expansion (MEt-1) in the short run has a statistically significant and upward influence on maternal death rates. The positive value of the short run coefficient is a sign that the 'Guns versus Butter' problem can be seen as a current problem requiring attention for the Nigerian state. A sudden surge in the demand of military operations or for containment of insecurity within the State causes a liquidity crisis in the public healthcare system. Institutional public health systems often have tight, non-discretionary operational budgets and a relatively low level of flexibility when it comes to having costs reimbursed from external sources. Even in the short-term, there will be consequences if there is a loss of funding, such as an interruption in the clinical supply

chain, on-going resolutions of routine benefits for maternal care, and loss of emergency obstetric readiness. As a result, budgetary reallocations can affect vulnerable pregnant populations with little delay, adding to structural health issues which take a long time to be rectified by long-term policy interventions.

Post-Estimation Diagnostic Profiles.

Table 4 are the diagnostic statistics which further show the robustness of the model. The test of Breusch-Godfrey LM ($p = 0.354$) and Breusch-Pagan-Godfrey test ($p = 0.491$) are used to determine if errors have serial correlation and heteroskedasticity respectively. The residuals of the model are found to be normally distributed as indicated by the Jarque-Bera statistic ($p = 0.477$) and the structural specification of the linear-log model is tested and validated by the Ramsey RESET test ($p = 0.173$).

The CUSUM and CUSUM of Squares statistics further stayed within their 5% critical limits, hence there is no evidence of instability of the estimated model throughout the sampled time period (2000-2024). This indicates that findings can be relied upon to help inform long-term policy measures.

4. Conclusions

The study examined the long-run structural equilibrium and the short run dynamic linkages between the exchange rate depreciation, military spending and maternal mortality ratios of Nigeria for the period 2000 to 2024. The study used a sophisticated Vector Error Correction Model (VECM) within the Johansen framework of cointegration to secure the channels of monetary volatility and fiscal trade-offs in the joint impact on human capital development. The empirical results clearly indicate that Nigeria has a dual threat mechanism in the form of sanctioning on maternal outcome.

The fiscal side is the long run elasticity coefficient for military expenditure, which is 0.245, and which testifies to a classic Samuelson crowding-out effect of "Guns versus Butter". The nominal amount of funding needed to sustain health services reduces as resources are pulled away to deal with the more complicated internal security challenges. The favorable, and statistically significant, structural sensitivity of the exchange rate ($\beta = 0.188$) is on the monetary side. Nigeria's dependence on imports for more than 70% of its clinical consumables means that depreciation of the currency mounted immediately renders life-saving clinical consumables, such as drugs and obstetric care equipment, unaffordable for low income pregnant women in the formal healthcare system, thus contributing to immediate cost-push inflation.

In addition, the highly significant Error Correction Term ($ECT_{t-1} = -0.385$) means that the system corrects approximately 38.5% of its deviation from its equilibrium in defense every year or so, but that short-term fluctuations in the value of the defense and in the currency take about 2.6 years to correct. This delay translates to vulnerable groups being affected by the macroeconomic instability in a relatively short time, and their situation is exacerbated before the lag-time of policy adjustments kicks in, which can remedy the situation. Put in reverse, the public health care system is subjected to a two-pronged attack from its nominal budget being cut due to security spending, and from its real budget being driven down by currency devaluation. National security then will need to be redefined whereby balance must be struck between the military readiness and the resilience of the healthcare system and human security.

Policy Implications

Nigeria must take steps to rectify these structural vulnerabilities and take actions towards the fulfillment of SDG 3.1 and Africa's Agenda 2063, hence the need to introduce specific reforms in the health and macro-fiscal sectors. We suggest the following policy interventions, which are supported by our empirical results:

1. The Federal Ministry of Finance, Budget and National Planning should create a ring fenced and statutory fiscal fund for the maternal and child healthcare. This

fund should be legally safeguarded against reprogramming of appropriations during emergencies of war. Money should be raised by setting aside special luxury taxes, or broaden sin taxes (such as alcohol, tobacco, and carbon emissions) which would give a guaranteed source of funds that would not be part of the defense budget.

2. The Central Bank of Nigeria (CBN) and Federal Ministry of Health should establish a separate concessionary foreign exchange window for the importation of life-saving maternal health supplies (e.g., oxytocin and magnesium sulfate) or develop a counter-cyclical tariff-rebate arrangement for such imports. This will help to provide the necessary clinical services against shocks of currency rates and make the services available for the vulnerable population at an affordable cost.
3. The Federal Government should provide special tax holiday, capital grants, and infrastructure loans with low-interest rates for private and P3 partnerships in the manufacturing of medicines locally. The establishment of indigenous capacity to manufacture the active pharmaceutical ingredients (APIs) and basic clinical consumables will help to diversify the dépendence of the country on imports and break the long term dependency of exchange rate fluctuation on maternal mortality.
4. iv The Federally-led tracking and monitoring framework for both government healthcare procurement and spending should utilize digital and/or block chain technologies at all governmental levels. Making government health expenditure more transparent will ensure that growing public investment in health is not squandered on institutional leakage by ensuring it is used to buy clinical assets and provide maternal services.

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