DEVALUATION, GOODS PRICE VARIATION, AND GDP GROWTH

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Abstract

The study evaluates how changes in prices of goods and services and currency rates have affected growth rate of GDP in a sample of thirty-two (32) developing countries across Africa, Asia, Latin America, and Europe and fifteen (15) developed countries from Europe, Asia, and North America. The methodologies adopted in analyzing the data collected in this research work were the panel GARCH, panel NARDL, and panel SVAR. For developing countries, positive devaluation shock induced a 0.641% decrease in GDP growth rate, while a decrease in devaluation shock stimulated a 0.286% increase in GDP growth rate. A positive variation in goods price led to a 0.496% decrease in GDP growth rate, while a 0.23% decline in GDP growth rate related to a percentage decline in price variation. For the developed countries, positive variation in goods prices stimulated a 0.00554 increase in GDP growth rate whereas 0.068% rise was induced owing a negative price variation. The major research outcome is that devaluation negatively impacted GDP growth rate in the developing countries while it favorably impacted GDP growth rate of developed countries. The observed shocks from devaluation and price variations to the growth rate of GDP are highly persistent for the developing nations. For the developed nations, shocks are symmetric, temporary and will die out with time. Economic managers of the developing countries should guide against devaluing their currency because it produces adverse consequences for their economies due to low productivity. Rather, policies should be implemented to stabilize variation in commodities prices in developing economies to prevent smuggling of goods as well as, price racketeering by producers.

Key Words: Exchange Rate Devaluation, Price Variation, GDP Growth Rate, Panel GARCH, Developing Countries, Developed Countries

JEL Classification: E40, F20, D30

1. INTRODUCTION

It is attention-grabbing to observe that the majority of currency devaluations occur in developing nations. Additionally, it has been noted that IMF and World

Bank officials are the main proponents of devaluation policies in developing nations because they are the policy influencers who champion the devaluation policy as an economic strategy that member states must implement (Umoru, 2022, Bouvet et al. 2022). Umoru (2022) noted that exchange rate devaluation refers to the officially sanctioned decline in a nation's local currency's value compare to other world currencies. Devaluation may improve a country's BOT positing by raising the competitiveness of goods produced within the country in foreign markets while reducing the competitiveness of overseas commodities in the domestic market by making their prices to be very high. These are just a few benefits that are typically given by the IMF and World Bank for countries to devalue their currencies. If the devaluation has been significant enough, the overall effect will be to lessen or completely stop the central bank's previous net outflow of foreign currency reserves making it possible to sustain the new exchange rate without further depleting foreign currency reserves. A volatile currency may come from improper management of governmental policies, especially if its value is steadily declining. This may have an impact on trade flows between nations either directly or indirectly (Asaleye et al. 2021).

Under the current International Monetary Fund (IMF) rules outlined in their fund's articles of agreement, BoP disequilibrium is cited as a case for devaluation. Nevertheless, one may note that exchange rate devaluation still ranks among the most dramatic and traumatic economic policy actions a government may take because it almost always sparks protests and calls for government officials involved in such policy to resign. Due to this, empirical researchers have been interested in the policy and results that come with it (Umoru 2020, Umoru and Isedu 2018). The widely held belief that higher exports as a result of exchange rate devaluation will increase aggregate demand, which in turn raises output growth rate, stems from the fact that suppliers now face higher import prices, which prompt manufacturers to raise cost prices and market prices as well (Rodrick, 2008). This theory explains the relationship between devaluation and GDP growth rate. However, Missio et al (2018) found that maintaining competitive exchange rate devaluation had a positive effect on the gross domestic product growth rate through an increase in the income elasticity of the demand for exports.

The GDP growth rate is among the most important indicators of an economy in good shape. The nation's economy grows more productive as a consequence of the expanding GDP, which adds to employment opportunities. As a result, both the nation's wealth and population grow. This growth can assist in reducing the budget deficit as well (Zhu et al. 2022). According to the IMF report (2022), the GDP of sub-Saharan African countries is calculated at 4% in 2021 up from a contraction in economic activities of 2% in 2020. In particular, the SSA region's GDP growth rate was slow until 2020, when it decreased by 1.99% mostly as a result of the COVID-19 pandemic, fresh economic shocks, high volatility, and economic concerns. Hence, in this study, the dynamics of exchange rate management and how it affects international transactions, which in turn has a commensurate or disproportional impact on GDP growth rates, are further explored by looking at the effects of

exchange rate devaluation and changes in the price of goods on GDP growth rates in both developing and developed countries.

Goods price variations are the differences in prices of items from estimated and actual executed price by an order. The economics of the responsiveness of good price variation in the determination of the growth rate of GDP can be guided by two assumptions. First, the high price level stimulates more export of goods and services. This contributes to the increase of export revenue and hence, the growth rate of GDP. Secondly, a higher exchange rate compared to the currencies of other countries makes goods more expensive to the importing nations thereby decreasing the flow of export revenue and GDP growth rate could be adversely affected. There is a theoretical position that differences in prices of goods and services between nations may not be sustainable over the long term because market forces will eventually equalize such price differences and engineer a change in the nation's exchange rate based on the law of one price (purchasing power parity). This theoretical stand assumed a complete exchange rate pass-through (CERPT). However, research by Kassi et al. (2019) has reported that CERPT is unfeasible in both developed and developing countries. The reason is that when the size and level of trade openness is taken into cognizance, ERPT would differ for each country. Moving further therefore, the relevant research question includes the following: What is the influence of exchange rate devaluation and goods price variation on the gross domestic product growth rate in developing and developed countries? The research, therefore, has as an objective to evaluate how changes in prices of goods and services and currency rates have affected the growth rate of GDP in selected countries in the world between 1990 and 2023.

The study is particularly crucial for importers and exporters in rich and em erging nations who must plan and carry out their investment, import, and export op erations while keeping track of the dynamic relationship between exchange rate de valuation and goods price variation. As well, the study is significant to economic researchers because it takes into consideration the shortcomings of previous research by introducing interactive influence between the variables under study as well as expanding the scope under which the study is being investigated and compared the results from both developed and developing countries. This study contributed to knowledge in the area of additional empirical results for policymakers in both developing and developed countries. This is because empirical result especially panel data analysis is not common among previous research. The inclusion of the concept of goods price variation is novel in the analysis of the impact of GDP growth rate and trade flow in both developing and developed countries. Finally, this study has extended the frontier of research on devaluation and goods price variation on GDP growth rate and trade flow. This is because the study deliberately adopted samples of developing countries from all the different continents. The same approach was adopted in the case of the developed economies. This approach has given the study a robust outlook devoid of sample selection bias, a scenario some previous studies have contended with. Finally, the study adds to the existing stock of literature on the relationship between exchange rate devaluation and goods price variation on

gross domestic product growth rate having implemented different analytical techniques simultaneously within a single analysis. Section two reviews both theoretical literature and previous research while section three deals with the research methods. A discussion of the results is contained in section four. Section five contains policy findings and conclusion.

2. LITERATURE REVIEW

The elasticity theory, the Marshal-Lerner condition, the J-curve theory, the absorption theory, and the expenditure switching theory are the five theories of exchange rate devaluation policy listed by Umoru (2022). According to the elasticity theory of currency devaluation, exchange rate depreciation will not reduce balance of payment (BOP) deficits if the export demand of the depreciating economy is smaller than unity. In line with the J-curve effect theory, currency devaluation gets worse over time. But in the short run because of a delay in shifting consumption away from more expensive imported goods, and then boosts BoP in the long run when exports would have been more affordable. As reported by Umoru's (2022) citation of Alexander's (1952) absorption theory, devaluation improves trade balance if aggregate absorption is less than unity, worsens it if aggregate absorption is greater than unity, and has no effect if aggregate absorption is equal to unity. Aggregate absorption is the total government expenditure, investment, and domestic consumption. The expenditure switching theory posits that a devaluation strategy only boosts the BoP when consumers move their spending from imported items to domestically produced goods. The underlying theory is to shift from both domestic and international spending to domestic output rather than to reduce either.

To the Keynesian School, output is positively impacted by exchange rate devaluation, whereas, the monetarist upheld the belief that the advantages of devaluation can only be seen in the short term and that any potential long-term consequences may be insignificant. According to the proponents of this thesis, developing continents shouldn't consistently put pressure on their domestic currencies (Rafindadi and Yusof, 2014). By the Marshal-Lerner requirements, export and import demand must be sensitive to changes in goods prices for exchange rates to have an impact on trade balances. The second is that there may be significant lags between changes in trade balances and exchange rate movement. As import prices rise after devaluation, trade balances may even worsen. They only become better as exports grow given lesser imports. Since adjustments frequently take a long time, an improvement in the trade balance may not occur for up to two years (Franvois et al. 2020; Suleimon et al. 2017). Countries with floating exchange rates are not completely indifferent to significant changes in currency rates, even though they typically do not intervene in the forex (Serrano, et al. 2021). Other models of economic growth emphasize additional sources of economic growth according to Pettinger (2019). These include the following; i. Mercantilist hypothesis, which holds that a country's prosperity is determined by the accumulation of gold and its ongoing trade surplus, as one of the main explanations for economic progress, Classical theory, whose main proponent Adam Smith stressed the importance of

economies of scale and specialization; iii. Neo-classical theory, which bases growth on supply-side factors like labor productivity, etc., and the endogenous growth theories, upholds the significance of technological innovation and human capital development.

The relationship between exchange rate depreciation and GDP has recently been the subject of numerous research, including those by Morina et al. (2020) and Batrancea, et al. (2020). To Morina et al. (2020), exchange rate hikes by reducing imports of investment products, intermediate goods, and raw materials, negatively impact economic growth. This is the reason why some industrialized countries benefit from the devaluation policy while emerging nations suffers detrimental effects on their economies' growth (Bruno and Shin, 2018). Besides, it has been claimed that imports have an impact on growth in poorer nations by bringing in new information or technology. Therefore, imports have an impact on economic growth in emerging nations by boosting domestic technological capabilities in addition to providing production input. The distribution of new technology among nations creates routes from imported machinery and intermediary items. As a result, imports influence the progress of developing nations by enhancing their economies' technological capabilities and transferring new information. The significant part that imports play in the spread of technology has been well-recognized in the literature (UNESCAP, 2018). As a result, structural economists have evolved several viewpoints on emerging economies that cause them to reach divergent conclusions. Nasir and Redmond (2020) created a long-run growth model for a significant oil-exporting country and established parameters that measure the beneficial impact of resource abundance on growth. For example, by lowering both productions input and knowledge transfer, the rising exchange rate, which results in restricted imports in emerging countries, lowers economic growth. Rahim et al. (2021), among others, emphasize the physical capital accumulation channel and contend that resource abundance causes physical capital investment to decline, which in turn slows GDP development.

Regarding the Nexus between Exchange Rate Devaluation and Growth Rate of GDP, panel co-integration was utilized by Bahmani-Oskooee and Miteza (2006), mentioned in Ojuolape (2021), to determine whether devaluation is contractionary or not. Using Panel Unit Root with Annual Data, the study looked at 42 nations, including 18 OECD (Organization for Economic Co-operation and Development) economies and 24 non-OECD economies. Techniques for panel co-integration were also used. The study went further than past studies by using the bilateral exchange rate to analyze the paper to reflect the scenario where a currency appreciates regarding the currency of one country but depreciates about the currency of another. The study made use of data pooling and categorized the nations into developed and less developed. In contrast to OECD economies, where most of the results were sensitive to the model's specification, the study indicated that devaluation tends to be contractionary in the long run for non-OECD economies. Jakob (2015) examined the economic development and exchange rate policies for 74 countries. He

discovered a strong association between an exchange rate that is pegged and rising gross domestic output.

Additionally, it was stated in Ramops-Herrera (2022), and Nkemdilim and Azuka (2021) that an undervalued RER can encourage exports and employment, and subsequently higher economic growth because higher capacity utilization can result in higher profitability of traded goods sectors, which in turn can stimulate private investment. Ito & Kruegar (2007), referenced in Eita et al. (2021), examined the Balassa-Samuelson hypothesis by looking at the connection between the pace of gross domestic product growth and changes in exchange rates in APEC nations. The B-S hypothesis' foundational link between the rate of GDP growth and currency appreciation, which is found in Japan, is positive. Even though the devaluation or depreciation of the exchange rate was relatively mild, Thailand and Malaysia nonetheless achieved significant growth rates.

Chen (2012) agreed with the Balassa-Samuelson theory that exchange rates have a favorable impact on economic growth. To Ambaw et al. (2022), currency overvaluations are linked to decreased growth and this finding corroborates conventional theory of exchange rates. In addition, Vieira and MacDonald (2012), who were cited by Ramops-Herrera (2022), assert that an undervalued RER can encourage exports and employment, and subsequently higher economic growth because higher capacity utilization can result in higher profitability of traded goods sectors, which in turn can stimulate private investment. Jausaud and Rey (2012) further supported the conventional wisdom by finding that as the value of the yen increased, exports from Japan to China and the United States decreased. Consequently, growth was significantly impacted. According to Vieira and MacDonald (2010), long-term growth is aided (harmed) by a more depreciated (valued) real exchange rate. Despite the lack of agreement, numerous researchers have found that overvaluations of currencies are linked to slower growth.

The relationship between Brazil's economic development and real exchange rate misalignment was also studied by Toulaboe (2017) using yearly data from 1980 to 2005. The outcome of the OLS approach revealed a conflict between Brazil's exchange rate and economic expansion. Equally, Jaussand and Rey (2012) relying on Generalized ARCH (GARCH) and Autoregressive Conditional Heteroskedasticity (ARCH) models established that the ERD and GDP had an impact on Japanese sectoral exports to China and the United States. In general, ERD and GDP had the anticipated negative consequences; in particular, an increase in uncertainty and the appreciation of the 'yen' have decreased Japanese exports. The outcomes confirmed currency depreciation enhances. The empirical research from industrialized countries reveals conflicting findings about the influence of real exchange rates on economic growth. For instance, Chen (2022) agreed with the Balassa-Samuelson theory that exchange rates had a favorable impact on economic growth. According to Vieira and MacDonald (2010), long-term growth is aided (harmed) by a more depreciated (valued) real exchange rate.

By analyzing the effects of exchange rate devaluations on GDP, Habib et al. (2017) found that devaluations increased annual GDPGR. But structuralism

economists contend that an increasing exchange rate restrains economic progress, particularly in developing nations. Exchange rate hikes have a detrimental effect on economic growth because they have a restricting influence on the imported inputs that are a major component of the production structure in emerging nations. Therefore, by reducing imports of investment products, intermediate goods, and raw materials, exchange rate hikes harm economic growth. Due to this, some industrialized countries benefit from the devaluation policy while emerging nations suffer detrimental effects on their economies' growth (Dzanan and Masih, 2017). While some contend that economic growth in an economy is driven by exchange rate instability (Ozeelebi 2018). According to some (Barguellil et al. 2018), it inhibits the growth process. Ngondo and Khobai (2018) concluded that output is negatively impacted by exchange rate instability in South Africa. However, Katsuiime, Agbola, and Shamsuddin (2016) used the ARDL model for Uganda and claimed that GDP was positively impacted by exchange rate shocks.

On the Nexus between Goods Price Variation and, Growth Rate of GDP, Breinlich et al. (2018) concentrated on welfare impacts inside EU member states, whereas Flash and Graf (2019) focused on pricing effects for global export flows, covering developed and developing countries. This may be significant, especially for the quality channel. Additionally, Goldberg and Pavenik (2016) pointed out that "the role of international trade in developing countries' growth and development continues to be one of the most interesting and policy-relevant questions" and that "developing countries are still significantly less liberalized than developed countries. Alessandria and Kaboski (2011) found that pricing for the majority of items varied significantly among nations. Additionally, there is a positive correlation between these pricing differences and income inequalities, meaning that people in high-income countries typically pay more for the same commodities than people in low-income ones. For a variety of reasons, prices of particular items may not be comparable between nations. If these departures from the law of one price (LOP) are systemic, that is what we want to know. Checking to determine if these little price discrepancies disappear when we purchase a large assortment of things is one method for doing this. However, which basket should we contrast? The consumer price index in the US calculates the cost of the typical American consumer's basket of items. Similar to this, several nations gauge the cost of a selection of commodities that their citizens buy. The price-income relationship shown in Figure 1 is typically attributed by economists to either differences in the prices of tradable (items that can be traded easily or frequently) or differences in the prices of non-tradable, or items that are expensive and rarely traded internationally.

According to most findings (Gali, 2007), the US, Japan, and other major oil importers see substantially less of an impact from changes in oil prices on GDP growth rates than does the PRC, an emerging country. Contrarily, compared to the two advanced countries, the PRC's CPI inflation is less affected by increased crude oil prices. Because of the larger forward shift in aggregate supply that arises from the PRC's higher economic growth rate, substantial price spikes following shocks to the oil price are avoided. The difference in the methodology employed, study

periods, proxies used to quantify the explanatory variables, and features of the many nations that were researched can all be blamed for the disparity in results found by different researchers. Moreover, the majority of research altered the income variable by breaking it down into its constituent parts. A greater proportion of the assessments favored a negative correlation between GDP and exchange rate instability. According to Ha, Stocher, and Yilmazkuday (2019), this kind of interaction has cross-over consequences on local economic activities. Ribeiro, (2020); McCombe, Lima Habib et al. (2017), and Aman (2017) reported both positive and negative associations between exchange rates and economic growth. In particular, Ribeiro et al. (2020) claimed that ERD raises the cost of imported items while lowering the relative prices of local goods, giving domestic producers an incentive to increase local output, which boosts GDP.

GAPS IN LITERATURE REVIEWED

The review of literature undertaken in this study so far has shown a multiplicity of empirical relationship between exchange rate devaluation, and GDP growth rate. Since some authors found a positive association between exchange rate devaluation and GDP growth rate, while others found a negative relationship, it is healthier to see this relationship as being inconclusive. Researchers' findings may have differed because of data usage, methodology, the time frame of the study, and country-specific characteristics (Phiri 2018). The present study covers the methodology gap since the method of analysis in this work is remarkably different from previous studies reviewed so far because this study utilized a combination of General Autoregressive Conditional Heteroscedasticity (GARCH), Panel structural Autoregressive (PSVAR), and Non-linear Autoregressive Distributed lag (NARDL) as well as carrying out a Monte-Carlo simulation for all our models. This has not been the case for previous studies. However, all previous studies were based on partial equilibrium analysis. This analysis combined the three variables of exchange rate devaluation; goods price variation, and gross domestic product growth rate at the same time in a single analysis. Equally, the most recent empirical results are included in this study.

3. METHODOLOGY/ESTIMATION TECHNIQUES

The GARCH model was estimated in this study. The GARCH model was chosen due to its sensitivity to outliers, clusters of volatility, and the built-in mechanism of a mean equation and variance equation. As a starting point, a Generalized Autoregressive Conditional Heteroscedastic GARCH (0, 1) was utilized to capture the Autoregressive Conditional Heteroscedastic (ARCH) effect. The model set-up for the GARCH is expressed thus;

$$GARCH\ (p,q): \gamma_t = \rho + \sum_{k=1}^{p} \partial_k \gamma 2_{t-k} + \sum_{k=1}^{p} \partial_k \gamma 2_{t-k} \qquad (1)$$

Where; p lagged terms of the conditional variance (h) and, q = lagged terms of the squared error(u^2). This study also used a panel non-linear Autoregressive

Distribution Lag (P-NARDL) model following the application of Sanusi (2020) and Bechmann et al. (2017). The NARDL specification is given as follows.

$$GDPGR = \beta_o + \beta_1 EXDV + \beta_2 GPVAR + e_1 \quad (2)$$

The co-integration test is used to show the long-term association between the variables, thereby extending the model as shown in equation (3).

$$\Delta GDPGR = \omega_o + \sum_{i=1}^{r} \omega 1\, \Delta GDPGRt - 1 + \sum_{i=1}^{r} \omega 2 \Delta EXDVt - 1 + \sum_{i=1}^{r} \omega 3 \Delta GPVARt - 1 \quad (3)$$

To analyze the asymmetric effects of goods price variation and exchange rate devaluation on the GDP growth rate, we divide all explanatory factors into positive and negative shocks as shown with the (pos) and (neg) signs attached to the variables. Hence, equation (4) is the bond test suggested by Pesaran et al (2001) to test the asymmetric association between variables.

$$\Delta GDPGR_t = \omega_o + \sum_{i=1}^{p} \omega_1 \Delta GDPGR + \sum_{i=1}^{p} \omega_2 \Delta EXDV^{pos}_{t-1} + \sum_{i=1}^{p} \omega_3 \Delta EXDV^{neg}_{t-1} + \sum_{i=1}^{p} \omega_4 \Delta GPVAR^{pos}_{t-1} + \sum_{i=1}^{p} \omega_5 \Delta GPVAR^{neg} + u_1 \quad (4)$$

In the equation above, the dependent variable is GDPGR, while the independent variables are exchange rate devaluation and GPVAR which are split into positive and negative shocks. The Panel SVAR methodology was additionally utilized in the study. For PSVAR analysis, the following model is formulated for exchange rate devaluation, goods price variation and GDP growth rate as follows. Hence, equations (9) and (10) are represented as follows:

$$Y_t = (GDPGR, EXDV, GPVAR) \quad (5)$$

A structural Var(p) process is then defined as

$$YAZ_+ = (A_0 + C(L)_{t-1} + \omega_{\sum t}) \quad (6)$$

where A is:

$$\begin{bmatrix} Variables \\ GDPGR_t \\ EXDV_t \\ GPVAR_t \end{bmatrix} \begin{bmatrix} GDPGR & EXDV & GPVAR \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} Error\ term \\ U_t \\ U_t \\ U_t \end{bmatrix}$$

The structural VAR estimates on the short-run matrix and the long-run matrix of the relevant variables are thus specified.

$$\begin{bmatrix} Variables \\ GDPGR_t \\ EXDV_t \\ GPVAR_t \end{bmatrix} \begin{bmatrix} GDPGR & EXDV & GPVAR \\ \omega 11 & 0 & 0 \\ 0 & \omega 12 & 0 \\ 0 & 0 & \omega 13 \end{bmatrix} = \begin{bmatrix} GDPGR & EXDV & GPVAR \\ C_1 & 0 & 0 \\ 0 & C_2 & 0 \\ 0 & 0 & C_3 \end{bmatrix} \quad (7)$$

These matrices are however computed and also used to calculate the structural impulse response functions which are used to determine and get the path of the effect of the structural shocks of the variables under consideration. The World Bank database at www.wbdt remains the major source of research data for our study.

These data sets were sourced from various 1990 – 2023 and a sample of 32 developing and 15 developed countries was used.

4. DISCUSSION OF RESULTS

This section of the paper presents and analyzes the results of the study. We begin with the descriptive analysis of data.

***Table 1**: Country by Country Descriptive Statistics for Goods Price Variation of Developing Economies*

Country	Mean	Max	Min.	Std. Dev.	Skew.	Kurt.
Angola	-0.633333	0.780000	-17.91000	3.144382	-5.246484	29.37722
Belarus	-0.629394	0.850000	-12.46000	2.240166	-4.658929	25.10551
Botswana	7.711818	16.17000	0.450000	3.595861	0.149003	2.749799
CAF	3.779394	24.57000	-2.920000	5.924181	1.958552	7.000552
Cameroon	-0.718485	4.740000	-17.31000	3.409025	-3.547322	18.40513
Chad	3.517879	41.72000	-8.970000	8.877897	2.310133	11.51904
Chile	-0.762424	0.750000	-23.69000	4.143419	-5.366051	30.21753
DR Congo	1054.346	23773.10	0.030000	4165.252	5.151007	28.53528
Equatorial Guinea	4.870000	31.84000	-4.280000	6.360258	2.628338	11.69505
Ethiopia	10.94061	44.36000	-8.480000	11.57560	1.026734	4.144436
Gabon	2.495152	36.12000	-11.69000	7.206220	2.862727	16.06303
Ghana	-0.544848	0.880000	-10.00000	1.881474	-4.099121	20.77818
India	-0.069091	0.460000	-1.830000	0.429915	-2.223404	9.766096
Ivory Coast	3.300606	26.08000	-1.110000	4.904123	3.456993	15.88546
Kenya	11.08545	45.98000	0.210000	9.418343	1.975045	7.179299
Lesotho	7.437273	33.81000	-9.620000	6.695477	1.576350	9.528080
Madagascar	10.94333	49.08000	-1.700000	9.755436	2.509397	9.943568
Malaysia	-0.280606	1.580000	-8.330000	1.668219	-3.662122	17.95716
Mexico	-0.099394	0.800000	-0.750000	0.341942	0.368673	3.175564
Morocco	-0.461818	0.790000	-4.950000	1.400992	-1.541547	4.762194
Mozambique	16.10364	63.12000	0.420000	17.00184	1.341668	3.551194
Namibia	7.591818	21.60000	0.430000	4.235481	1.041370	4.809800
Niger	2.652121	36.04000	-7.800000	7.096983	3.233182	16.13302
Nigeria	-0.127879	0.710000	-2.430000	0.632672	-1.836889	6.935317
Pakistan	-0.053333	0.630000	-1.840000	0.451308	-1.823523	8.790412
Poland	-0.890909	1.320000	-17.43000	3.260482	-4.258599	21.62407
Rwanda	9.143333	48.25000	-2.410000	11.14948	2.532072	9.471882
Senegal	1.437576	45.95000	-14.95000	8.672251	4.087555	22.80256
South Africa	0.283636	9.210000	-0.760000	1.647991	5.021943	27.75881
Tanzania	11.45970	35.83000	0.150000	9.585365	1.221673	3.335069
Thailand	-0.140000	7.470000	-27.08000	5.142584	-4.398662	24.48877
Zambia	32.15364	183.3100	1.000000	43.58200	2.427310	7.999247

Source; Author computation using E-views 10 econometric package (2023)

***Table 2**: Country-by-Country Descriptive Statistics for GDP Growth Rate of Developing countries*

Country	Mean	Max	Min.	Std. Dev.	Skew.	Kurt.
Angola	3.650303	15.03000	-23.98000	7.711545	-1.120659	6.186994

Belarus	2.520909	11.45000	-11.70000	6.145150	-0.679638	2.916019
Botswana	4.348182	11.36000	-8.730000	4.676274	-1.224471	4.568413
CAF	1.324242	8.590000	-36.39000	7.626280	-3.824614	19.39854
Cameroon	2.835455	7.050000	-7.930000	3.354362	-1.923064	6.023946
Chad	4.637879	33.63000	-15.71000	8.302416	0.946359	6.468461
Chile	4.388788	11.67000	-5.980000	3.452358	-0.463769	4.318952
DR Congo	1.715152	9.470000	-13.47000	6.137919	-0.841204	2.625064
Equatorial Guinea	15.80939	149.9700	-9.110000	30.40811	2.884899	12.76280
Ethiopia	6.694242	13.57000	-8.670000	5.643795	-1.175035	3.800258
Gabon	2.241212	7.090000	-8.930000	3.565222	-1.046326	4.130559
Ghana	2.786667	11.30000	-1.540000	2.389809	1.423518	6.236667
India	5.955758	8.850000	-6.600000	2.944593	-2.509146	11.10332
Ivory Coast	3.506970	10.76000	-5.370000	4.295565	-0.281352	2.083690
Kenya	3.669394	8.060000	-0.800000	2.317809	-0.253763	2.275049
Lesotho	2.868788	6.970000	-7.560000	3.049880	-1.359379	5.528741
Madagascar	2.388788	9.780000	-12.41000	4.297589	-1.740835	6.380939
Malaysia	5.457273	10.00000	-7.360000	4.010638	-1.645401	5.826301
Mexico	2.312424	6.850000	-7.990000	3.367246	-1.571606	5.366023
Morocco	4.034848	19.05000	-7.190000	4.854353	0.440110	4.951630
Mozambique	6.032121	12.09000	-6.120000	4.005603	-0.829030	3.925353
Namibia	3.247576	12.27000	-7.870000	3.500163	-0.493522	5.275404
Niger	3.915758	10.55000	-1.310000	3.278237	0.188638	2.031718
Nigeria	4.283939	15.33000	-2.040000	3.959967	0.467769	3.386981
Pakistan	70.96970	162.9100	8.130000	40.29404	0.705148	2.856701
Poland	3.364242	7.100000	-9.350000	3.577171	-2.147369	7.775729
Rwanda	5.707879	35.22000	-50.25000	12.20635	-2.653839	15.42910
Senegal	3.647576	7.390000	-0.750000	2.138307	-0.181360	2.130220
South Africa	2.047879	5.600000	-6.340000	2.467582	-1.220537	5.320999
Tanzania	5.158788	7.670000	0.580000	1.973035	-0.789656	2.619379
Thailand	3.948485	11.17000	-7.630000	4.081770	-1.015337	4.195015
Zambia	4.062424	10.30000	-8.630000	3.873250	-1.149213	4.853184

Source; Author computation using E-views econometric package (2023)

***Table 3**: Country-by-Country Descriptive Statistics for Exchange Rate Devaluation of Developing countries*

Country	Mean	Max	Min.	Std. Dev.	Skewness	Kurtosis
Angola	117.4309	631.4400	0.000000	162.8220	2.013642	6.183123
Belarus	0.697273	2.630000	0.000000	0.889920	1.089866	2.584532
Botswana	6.485758	12.82000	1.860000	3.162962	0.288409	1.980601
CAF	523.3185	732.4000	264.6900	114.9305	-0.784159	3.599619
Cameroon	523.3185	732.4000	264.6900	114.9305	-0.784159	3.599619
Chad	524.2942	732.4000	264.6900	115.9434	-0.762472	3.538286
Chile	552.7209	919.3100	304.9000	138.7203	0.461689	2.957105
DR Congo	604.2488	1989.390	0.000000	598.8262	0.767093	2.623888
Equatorial Guinea	524.6509	732.4000	264.6900	116.3789	-0.749794	3.516537
Ethiopia	14.67848	52.91000	2.070000	12.00296	1.563207	5.082931
Gabon	524.6509	732.4000	264.6900	116.3789	-0.749794	3.516537
Ghana	1.706667	5.810000	0.030000	1.805827	1.032441	2.726191
India	48.56152	81.93000	17.50000	15.81734	0.215286	2.425745

Ivory Coast	523.4618	732.4000	264.6900	115.0627	-0.782119	3.590845
Kenya	76.22545	121.6000	22.91000	23.28118	-0.393091	2.941800
Lesotho	8.342727	16.46000	2.590000	4.149938	0.467419	2.125326
Madagascar	1904.206	4217.980	298.8300	1106.095	0.409914	2.239947
Malaysia	3.482424	4.750000	2.500000	0.613367	-0.144179	2.012205
Mexico	11.57788	21.49000	2.810000	5.423840	0.126472	2.261842
Morocco	9.178485	11.30000	7.750000	0.888644	0.705988	2.928420
Mozambique	28.62242	69.47000	0.930000	21.07599	0.685522	2.313294
Namibia	8.401818	17.75000	2.590000	4.259652	0.544551	2.302281
Niger	523.3103	732.4000	264.6900	114.9231	-0.784264	3.600114
Nigeria	147.2518	439.6800	8.040000	118.3269	0.889158	3.071705
Pakistan	77.43545	221.5000	21.71000	46.53173	1.184286	4.240311
Poland	3.180000	4.680000	0.950000	0.914324	-0.900817	3.281033
Rwanda	531.2988	1035.740	83.70000	264.7797	0.059143	2.195154
Senegal	523.3103	732.4000	264.6900	114.9231	-0.784264	3.600114
South Africa	8.393333	17.75000	2.590000	4.256063	0.549115	2.310949
Tanzania	1253.493	2331.730	195.0600	686.9819	0.230214	1.851172
Thailand	33.29727	44.43000	24.92000	5.666958	0.155798	2.158679
Zambia	5.260000	20.02000	0.030000	4.820517	1.518404	5.146250

Source; Author computation using E-views 10 econometric package (2023)

***Table 4**: Country by Country Descriptive Statistics for Exchange Rate Devaluation of Developed countries*

Country	Mean	Max	Min.	Std. Dev.	Skew.	Kurt.
Australia	1.355864	1.933400	0.965800	0.215570	0.612183	3.838154
Austria	102.4347	110.8560	98.31760	2.803606	0.854580	4.219411
Canada	1.265961	1.570300	0.989300	0.160306	-0.016897	2.163821
Denmark	6.328515	8.322800	5.098100	0.762430	0.851502	3.604552
Finland	1.135291	1.563000	0.898100	0.167458	0.441200	2.644187
France	101.1503	111.1130	92.04500	5.755469	0.060750	1.711257
Germany	2.250773	4.000000	1.071800	0.758525	0.841351	2.853130
Iceland	93.07814	135.4220	57.54590	27.44261	0.195098	1.392640
Ireland	95.34852	113.2020	78.60480	8.120109	0.082860	2.440751
Japan	111.1694	144.7920	79.79050	14.64283	-0.118613	3.156359
Korea Rep	1063.252	1403.180	707.7660	181.9375	-0.502845	2.324304
Norway	7.196633	9.616100	5.604600	1.184127	0.472684	1.967135
Spain	98.89738	150.6230	88.44410	10.61531	3.598396	18.31717
Sweden	7.808752	10.86000	5.823800	1.253218	0.518459	2.720606
UK	0.644352	0.811500	0.499800	0.078814	0.421167	2.502022

Source; Author computation using E-views 10 econometric package (2023)

***Table 5**: Country by Country Descriptive Statistics for GDP Growth Rate of Developed countries*

Country	Mean	Max	Min.	Std. Dev.	Skew.	Kurt.
Australia	2.909542	4.956300	-0.383100	1.245299	-0.902463	3.674364
Austria	1.881397	4.556900	-6.454000	2.178502	-2.122898	8.651931
Canada	1.952485	5.177600	-5.233000	1.998177	-1.554677	7.140127
Denmark	1.784855	5.332500	-4.906500	1.954325	-1.148015	5.694047

Finland	1.651436	6.333800	-8.074400	3.219534	-1.160869	4.365347
France	1.533618	6.816600	-7.784600	2.288821	-1.916666	10.33062
Germany	1.507494	5.255000	-5.693800	2.178516	-1.208403	5.707281
Iceland	2.700818	8.454900	-7.663800	3.950003	-1.098492	3.853772
Ireland	6.060545	24.37040	-5.095800	5.427593	0.759759	5.581892
Japan	0.929367	4.840900	-5.693200	2.092416	-1.188270	5.515874
Korea Rep	4.898121	11.46690	-5.129400	3.477772	-0.311609	3.658305
Norway	2.283397	5.284600	-1.727000	1.596716	-0.194714	3.008287
Spain	1.918406	5.519600	-11.32540	3.289715	-2.224633	9.155509
Sweden	2.104912	5.952100	-4.339800	2.403123	-0.790852	3.098300
UK	1.770682	7.524900	-11.03090	2.988556	-2.526836	12.01260

Source; Author computation using E-views e10 econometric package (2023)

***Table 6**: Country by Country Descriptive Statistics for Goods Price Variation of Developed countries*

Country	Mean	Max	Min.	Std. Dev.	Skew.	Kurt.
Australia	-0.42605	0.738500	-10.62970	1.951128	-4.522191	24.15058
Austria	-0.22598	0.757300	-5.351800	1.029122	-3.846130	19.97743
Canada	-0.59584	0.922900	-10.26510	2.222633	-3.319765	13.71022
Denmark	-0.15385	0.782100	-2.038900	0.617510	-1.055425	4.582687
Finland	0.080597	6.007500	-3.689200	1.447531	1.450247	10.95256
France	-1.37459	0.942800	-31.10280	5.791193	-4.501510	22.82816
Germany	-0.28734	0.838800	-7.404400	1.398479	-4.160847	21.72180
Iceland	-0.12125	0.651600	-1.603800	0.600755	-1.112845	3.401837
Ireland	1.15689	35.89850	-3.856400	6.366902	5.127731	28.58884
Japan	0.05989	19.75420	-28.92300	6.634145	-1.766042	14.33233
Korea Rep	-0.33438	0.784900	-8.242300	1.563772	-4.184414	21.32248
Norway	-0.27569	0.810200	-4.473800	1.011537	-2.381393	10.28818
Spain	0.869179	15.15970	-1.469700	3.222442	3.532848	14.88424
Sweden	0.719788	21.05690	-4.153500	4.228178	3.545099	17.67987
UK	-0.11965	0.760200	-2.942800	0.662624	-2.303557	11.05100

Source; Author computation using E-views 10 econometric package (2023)

The results of the panel unit root test for our analysis are presented in Table 7 and Table 8 for both the developing countries and the developed countries, respectively.

***Table 7**: Summary of Panel Unit Root Results for Developing Countries*

Variable	Order	ADF Test	PP Test	LLC Test	IPS Test	Bruting Test	5% Critical Value	Conclusion
GPVAR	1(0)	742.470 (0.0000)	973.910 (0.0000)	45.8840 (1.0000)*	-25.6604 (0.0000)	-5.4871 (0.0000)	"	Stationary
GDPGR	1(0)	359.101 (0.0000)	681.332 (0.0000)	-14.8413 (0.0000)	-15.9726 (0.0000)	-6.31527 (0.0000)	"	Stationary
D(EXDV)	1(1)	343.854 (0.0000)	327.682 (0.0000)	-10.9188 (0.0000)	-15.2852 (0.0000)	1.65993 (0.9515)*	"	Stationary

**Not Stationary at 5%.*

From Table 7 above, one may notice that all our variables are individually stationary at level except ERD which is stationary at first difference. Table 8 shows a summary of panel unit roots for developed countries.

***Table 8**: Summary of Panel Unit Root Results for Developed Countries*

Variable	Order	ADF Test	PP Test	LLC Test	IPS Test	Bruting Test	5% Critical Value	Conclusion
GPVAR	1(0)	282.030 (0.0000)	365.122 (0.0000)	-20.4844 (1.0000)	-18.3357 (0.0000)	-15.0684 (0.0000)	"	Stationary
GDPGR	1(0)	163.114 (0.0000)	571.302 (0.0000)	-11.9849 (0.0000)	-11.1162 (0.0000)	-3.02501 (0.0012)	"	Stationary
D(EXDV)	1(1)	133.131 (0.0000)	133.927 (0.0000)	-11.0822 (0.0000)	-9.08880 (0.0000)	-1.985787 (0.0235)	"	Stationary

**Not Stationary at 5%.*

From Table 8, one can see that two of our variable that is goods price variation and GDP growth rate are variables that are individually stationary at levels while exchange rate devaluation is stationary at first difference. The results of the co-integration test for both the developing as well as the developed countries are presented in Table 9 and Table 10 below. The Pedroni residual co-integration test was adopted.

***Table 9**: Analysis of Panel Co-integration Result for Developing Countries*

Common AR Coefs. (within-dimension)				
Measures	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	12.74416	0.0000	-1.371947	0.9150
Panel rho-Statistic	-9.972418	0.0000	-4.877406	0.0000
Panel PP-Statistic	-8.982598	0.0000	-11.33416	0.0000
Panel ADF-Statistic	-11.56173	0.0000	-12.96328	0.0000
Individual AR coefs. (between-dimension)				
Measures	Statistic	Prob.		
Group rho-Statistic	-3.771970	0.0001		
Group PP-Statistic	-12.54671	0.0000		
Group ADF-Statistic	-13.71023	0.0000		
Cross-section-specific results				
Phillips-Peron results (non-parametric)				
Cross ID	AR(1)	Variance	HAC	Bandwidth
Angola	0.455	2526.117	574.1546	13.00
Belarus	0.264	0.018048	0.018254	1.00
Botswana	0.159	0.272799	0.076045	9.00
CAF	-0.062	3557.805	3336.489	2.00
Cameroon	-0.094	3909.994	3534.083	2.00
Chad	-0.049	2480.854	2458.238	1.00
Chile	0.483	756.7470	267.1611	30.00
DR Congo	-0.270	70255.94	68468.11	1.00
Equatorial Guinea	-0.267	2726.323	1369.012	5.00
Ethiopia	0.702	2.314800	2.519374	1.00
Gabon	0.052	2890.610	2877.643	1.00

Ghana	0.124	0.069898	0.081792	3.00
India	-0.069	5.860283	5.370368	3.00
Ivory Coast	-0.089	3002.218	2243.069	3.00
Kenya	-0.096	27.99842	17.03945	6.00
Lesotho	0.105	1.270500	0.495458	10.00
Madagascar	0.011	33682.22	26564.15	11.00
Malaysia	0.075	0.056414	0.042558	4.00
Mexico	0.286	0.691581	0.637213	3.00
Morocco	0.092	0.401726	0.332938	3.00
Mozambique	0.170	21.94827	3.889472	13.00
Namibia	-0.150	1.303602	0.176493	13.00
Niger	0.033	2727.682	2727.682	0.00
Nigeria	0.126	323.9699	158.2490	12.00
Pakistan	0.120	76.70634	69.98294	2.00
Poland	0.246	0.100686	0.117364	4.00
Rwanda	0.452	414.0210	451.2327	1.00
Senegal	-0.062	3657.727	3562.876	1.00
South Africa	-0.011	1.254132	0.590134	7.00
Tanzania	0.202	4375.902	487.3945	26.00
Thailand	0.411	3.396852	3.515422	3.00
Zambia	-0.033	7.474168	2.371747	14.00
Augmented Dickey-Fuller Results (Parametric)				
Cross ID	AR(1)	Variance	Lag	Max lag
Angola	-0.433	1331.513	2	6
Belarus	0.264	0.018048	0	6
Botswana	-1.307	0.183730	4	6
CAF	-0.062	3557.805	0	6
Cameroon	-0.094	3909.994	0	6
Chad	-0.049	2480.854	0	6
Chile	0.264	639.2440	1	6
DR Congo	-0.210	33696.20	5	6
Equatorial Guinea	-0.267	2726.323	0	6
Ethiopia	0.702	2.314800	0	6
Gabon	0.052	2890.610	0	6
Ghana	0.124	0.069898	0	6
India	-0.069	5.860283	0	6
Ivory Coast	-0.089	3002.218	0	6
Kenya	-0.096	27.99842	0	6
Lesotho	0.105	1.270500	0	6
Madagascar	0.011	33682.22	0	6
Malaysia	0.075	0.056414	0	6
Mexico	0.286	0.691581	0	6
Morocco	0.092	0.401726	0	6
Mozambique	-0.192	18.87545	1	6
Namibia	-0.150	1.303602	0	6
Niger	0.033	2727.682	0	6
Nigeria	-0.149	304.6913	1	6
Pakistan	-0.450	50.36947	4	6

Poland	0.246	0.100686	0	6
Rwanda	0.452	414.0210	0	6
Senegal	-0.062	3657.727	0	6
South Africa	-0.011	1.254132	0	6
Tanzania	0.202	4375.902	0	6
Thailand	0.411	3.396852	0	6
Zambia	0.308	2.628691	4	6

Source; Author computation using E-views econometric package (2023)

For the common AR coefficients (within dimension) the Panel v-statistics, Panel rho-statistics, Panel PP-statistics and Panel ADF statistics exhibit a probability of 0.000 under the weighted statistics which is less than 5% which indicates a high degree of co-integration except Panel v-statistics with a probability value of 0.9150 which exhibit a no co-integration status. Under the individual AR coefficient (between dimension) all the test statistics, that is, Group rho-statistics, Group PP-statistics, and group ADF-statistics which all have a probability of 0.0000 indicate a high degree of co-integration because all the probabilities are less than 0.05. In all, the variables are co-integrated.

***Table 10**: Panel Co-integration Test Results for Developed Countries*

Common AR coefs. (within-dimension)				
			Weighted	
Measures	Statistic	p-values	Statistic	Prob.
Panel v-Statistic	-0.155557	0.5618	-9.91288	0.0002
Panel rho-Statistic	-8.298413	0.0000	-28.11796	0.0000
Panel PP-Statistic	-10.64261	0.0000	-21.15652	0.0000
Panel ADF-Statistic	-10.77728	0.0000	-31.27505	0.0000
Individual AR coefs. (between-dimension)				
Measures	Statistic	Prob.		
Group rho-Statistic	-6.668485	0.0000		
Group PP-Statistic	-13.48806	0.0000		
Group ADF-Statistic	-12.45466	0.0000		

Source; Author computation using E-views econometric package (2023)

In Table 10, the common AR coefficient measures all reported a probability of 0.000 under the weighted statistics which is less than 5% which indicates a high degree of co-integration except Panel v-statistics with a probability value of 0.9762 which exhibit a no co-integration status. Under the individual AR coefficient (between dimensions) all the test statistics, have a zero probability, namely, 0.0000 and this indicates a high degree of co-integration because all the probabilities are less than 0.05. The results of the P-NARDL estimations are presented in Table 11 and Table 12 below.

***Table 11**: Non-linear ARDL results for Developing Countries*

GDPGR	Coefficient	[95% Conf. Interval	
erdvincrease	0.00607	-0.00033	0.001543
erdvdecrease	-0.01238	0.000539	0.004095

gpvincrease	-0.00239	-0.00486	0.009789
gpvdecrease	-0.01031	-0.05272	0.031963
ecterm	-0.70128	-0.81284	-0.58959
erdvincrease	-0.6419	-1.29698	0.014519
erdvdecrease	0.2855	-1.34354	-0.0282
gpvincrease	-0.4927	-0.99215	0.000959
gpvdecrease	-0.2304	-0.53684	0.075962
_cons	2.9932	2.293698	3.702767

Source; Author computation using E-views econometric package (2023)

From Table 11 which depicts the estimated output of the impact of exchange rate devaluation and goods price variation on GDP growth rate in developing countries, it can be inferred from the probability of the Z-value, that the negative value of exchange rate devaluation is significant at 5%. This means that on the long-run a one percent decrease in exchange rate devaluation leads to a 0.0123% decrease in GDP growth rate. By intuition and theory, if a country is operating an import-oriented economy, devaluation increases the cost of imports which leads to the reduction of the growth rate of that economy in the long-run. The other independent variable which is goods price variation is significant for both the positive and negative outcome. In the short run, negative devaluation and positive goods price variation are statistically significant at 5%, while devaluation positive is significant at 1%. Accordingly, a 1% positive devaluation shock induced a -0.641% decrease in GDP growth rate, while a 1% decrease in devaluation (negative) led to a 0.286% increase in GDP growth rate within the period under review. Finally, a 1% increase in goods price variation leads to a 0.496 increase in GDP growth rate while a decrease in price variation induced 0.23% decline in GDP growth rate within the period under review. From the above analysis on the short-run, it can be seen that when there is currency devaluation the country suffers significantly from GDPGR, whereas when there is a positive increase in GPV, it is accompanied by an increase in GDPGR. This could be pointing to the fact that an increase in the prices of goods encourages further investment and production within the economy. This finding supports theoretical postulations of Porteous (2019). The error correction value of -0.701 indicates that seventy percent disequilibrium in GDP growth rate following destabilizing effects of devaluation and variations in goods prices was reset to equilibrium in the long run.

The non-linear ARDL estimated for the developed is presented in Table 12 with GDP growth rate as the dependent variable, respectively. Table 12 depicts that exchange rate devaluation (negative) is significant at 5% while exchange rate devaluation (positive) is statistically significant at 1%. From the analysis, a one 1% increase in exchange rate devaluation led to 0.0085 decreases in GDP growth rate within the period under review. Whereas, a 1% decrease in exchange rate devaluation led to 0.011% increase in GDP growth rate. The result from the developed countries' perspective is clear, giving credence to the point made by both the IMF and World Bank that ERD leads to GDPGR among the developed countries who are mostly exporters of goods and services. In effect, devaluation stimulates more investment which leads to more production. This is in line with economic theory in the long run (Karahan (2020). For goods price variation, neither positive

nor negative did not exert any significant effect on the GDP growth rate within the period under review in the long run.

Nonetheless, in the short-run, both devaluation (positive) and devaluation (negative) are significant at 5% while goods price variation (positive) is significant at 1%. This means that a percentage rise in exchange rate devaluation led to a -0.018 decrease in GDP growth rate while a percentage decrease in exchange rate devaluation led to a 0.117 increase in GDP growth rate within the period under review. In the case of goods price variation (positive), it means that a 1% increase in goods price variation stimulated a 0.0055 increase in GDP growth rate while it generated 0.068% increase in GDP growth rate within the period under review. The results are the same with the long-run situation because these economies are already in a steady state of development, and little is expected to affect their current situation hence what obtains in the short-run will prevail in the long-run. The error correction value of -0.7458 strongly supports this realization because it takes less than two years for the economies to arrive at equilibrium if there is any destabilizing action. The error correction value of -0.7458894 indicates that it will approximately (1⅓) years to arrive at equilibrium if there is a destabilizing effect following variations in devaluation and prices of goods in the economy.

***Table12**: Non-linear ARDL results for Developed Countries*

GDPGR	Coefficients	p-values	[95% Conf. Interval	
exdvincrease	0.0089	0.000	-0.0172	0.000234
exdvdecrease	0.1103	0.009	-0.01765	-0.00252
gpvarincrease	0.1467	0.161	-0.35063	0.058286
gpvardecrease	0.0872	0.467	-0.11781	0.293538
ecterm	-0.74543	0.000	-0.83605	-0.65572
exdvarincrease	-0.0183	0.004	-0.0319	-0.00603
exdvdecrease	0. 11701	0.006	-0.03079	-0.00501
gpvarincrease	0.0055	0.5302	-0.20535	0.006229
gpvardecrease	0.0687	0.3324	-0.03803	0.175603
_cons	2.64872	0.000	1.854658	3.442906

Source; Author computation using E-views econometric package (2023)

Table 13 presents the panel GARCH (1,1) and Table 14 presents the Glosten, Jangannathan, and Runkle GARCH estimation for the GDP growth rate for the developing countries.

***Table 13**: Panel-GARCH Results for Developing Countries with GDP Growth Rate as the Dependent Variable*

Sample: 1990 - 2023				
Distribution: Gaussian		Wald chi2(2) = 3.61		
Log-likelihood = -3270.12		Prob > chi2 = 0.1645		
	Coefficients	p-values	[95% Conf. Interval]	
exdv	-0.1348	0.000	-0.000718	0.0000221
gpvar	-0.0068	0.000	-0.002425	0.001488
_cons	3.7058	0.000	3.441873	3.976643
arch_1	0.61865	0.000	0.546726	0.690580
garch_1	0.16611	0.000	0.118969	0.203216

_cons	9.8176	0.000	8.999446	10.69011

Source; Author computation using E-views econometric package (2023)

From the Panel GARCH result presented in Table 13 for the developing countries it can be observed from the mean equation which is represented by the upper part of the Table that, both price variation and devaluation are significant at a 1% threshold indicating that, at best, a one percentage increase (positive shock) in exchange rate devaluation leads to a -0.1348% decrease (negative shock) in GDP growth rate. This again confirms our earlier findings that exchange rate devaluation stimulated a decrease in GDP growth rate because the developing countries who continue to buy both consumer and capital goods will be left with less money to maximize their utilities. This is following the policy finding of (Ozeelebi, 2018). In the lower part of the Table 13 which represents the variance equation, it can be observed that the shocks from ERDV and GDV to GDPGR is highly persistent and large that is, the addition of the values of ARCH L1 and GARCH L1 which are $0.61865 + 0.166110 \approx 0.78$ is not up-to one (1). Equally, the p-values of ARCH L1 and GARCH L1 are highly significant at less than 1%. We may also note that both the ARCH and GARCH values are positive, this means that the model is symmetric.

***Table 14**: Panel-GJR-GARCH Results for Developing Countries*

Sample: 1990 - 2023				
Distribution: Gaussian		Wald chi2(3) = 3.90		
Log likelihood = -3269.39		Prob > chi2 = 0.1421		
	Coefficient	p-values	[95% Conf. Interval]	
exdv	-0.0359	0.000	-0.0007246	8.79E-06
gpvar	-0.0411	0.000	-0.0023063	0.0013644
_cons	3.7506	0.000	3.438027	4.062309
Arch_1	0.4980	0.000	0.4304885	0.5656084
Tarch_1	0.1299	0.000	0.0016753	0.2582324
Garch_1	0.1960	0.000	0.1519773	0.2400931
_cons	9.4037	0.000	8.464197	10.34318

Source; Author computation using E-views econometric package (2023)

From the GJR estimation presented in Table 14 above, one can also note that exchange rate devaluation is significant at 1% while goods price variation was also significant at 1%. Hence, a 1% positive shock in currency devaluation and price variations induced a -0.03579% decrease (negative shock) and infinitesimal increase of just about 0.004% rise in GDP growth rate within the period under review. The GJR GARCH also confirms the exact position of the GARCH (1,1) output, which indicates that our analysis is adequate for the developing countries.

Also, in the lower part of Table 14 which represents the variance equation, it can be observed that shocks from exchange rate devaluation and goods price variation are persistent and large. This is because of the addition of the ARCH + TARCH + GARCH (0.4980 + 0.1299 + 0.1960 = 0.8239). Again, the p-value of ARCH, TGARCH, and GARCH are highly significant at less than 1% for ARCH and GARCH while it is significant at 5% for TGARCH. By implication, shocks are

symmetric. Table 15 presents the panel GARCH (1,1) while Table 16 presents the GJR-GARCH estimation for GDP growth rate for the developed countries. From Table 15 which presents the panel GARCH (1,1) in the case of developed countries, it can be seen that currency devaluation is significant at 5%, indicating that 1% increase (positive shock) in exchange rate devaluation led to a 0.1241% increase (positive shock) in GDP growth rate while goods price variation is insignificant at the 1% level. Hence, 1% rise in price variation led to 0.02% increase in GDP growth rate. Again, one may notice that similar to the results from the P-NARDL exchange rate devaluation led to an increase in GDP growth rate because a reduction in the exchange rate will enable the developed countries to be able to export more since the prices of their exports will become cheaper in the international market and this will lead to more production and greater investment which will eventually lead to the higher GDP growth rate. This position has always been canvassed by the World Bank and IMF. However, the impact of goods price variation is not significant because the rate of inflation in the developed countries is very stable hence; the problem of goods price variation is negligible. From the variance equation, the p-values of both ARCH and GARCH are low, that is, (0.4056 + 0.1473 = 0.5529) which means that the shocks are persistent and will not die out speedily with time. However, the model is symmetric because both values of ARCH and GARCH are positive.

***Table 15**: Panel-GARCH Results for Developed Countries*

Sample: 1990 - 2023				
Distribution: Gaussian		Wald chi2(3) = 8.57		
Log-likelihood = -1220.74		Prob > chi2 = 0.0138		
variables	Coefficient	p-values	[95% Conf. Interval]	
exdv	0.1241	0.000	0.000352	0.00213
gpvar	0.0241	0.034	-0.02875	0.078436
_cons	1.9218	0.000	1.577605	2.266073
arch_1	0.4056	0.000	0.3151	0.502053
garch_1	0.1473	0.000	0.015795	0.27987
_cons	4.6495	0.000	3.763138	5.534912

Source; Author computation using E-views econometric package (2023)

***Table 16**: Panel-GJR-GARCH Results for Developed Countries*

Sample: 1990 - 2023, but with gaps				
Distribution: Gaussian		Wald chi2(3) = 9.16		
Log-likelihood = -1213.07		Prob > chi2 = 0.003		
Variables	Coefficient	p-values	[95% Conf. Interval]	
exdv	0.0154	0.003	0.000496	0.002511
gpvar	0.0061	0.490	-0.03094	0.064604
_cons	1.8152	0.000	1.558138	2.214166
Arch_1	0.04516	0.282	-0.03651	0.125542
Tarch_1	0.1342	0.000	0.245811	0.52269
Garch_1	0.1272	0.000	0.262257	0.583088

_cons	3.1594	0.000	2.185329	4.116859

Source; Author computation using E-views econometric package (2023)

For the GJR-GARCH, estimates presented in Table 16, it can be seen that only devaluation passes significance at 5% among the two independent variables used in this analysis. This suggests that a 1% rise (positive shock) in devaluation generated a 0.0154 increase (positive shock) in GDP growth rate within the period under review. The position of the GJR-GARCH again shows a convergent with the GARCH (1, 1) in respect of both exchange rate devaluation and goods price variation because while exchange rate devaluation is significant, goods price variation is not significant indicating again, that the stability of the economies of the developed countries has made it difficult for difference in prices to prevail (Idrisov, Kazakova, & Publin, 2015). From the variance equation, one may notice that only the p-values of TARCH and GARCH are statistically significant at a 5% threshold while ARCH is not significant, hence, we only add the value of TARCH and GARCH that is (0.1342 + 0.1272 = 0.2614). This denotes that the shocks are highly persistent. It can also be seen that the shock is symmetric because both values of TARCH and GARCH which are the only significant value are both positive. From Table 17 which shows the lag selection criteria, it is very evident that the correct lag to be selected is lag two (2).

***Table 17**: VAR Lag Order Selection for Developing Countries*

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-10702.60	NA	4793614.	23.89643	23.91249	23.90256
1	-10525.7	352.1491	3295600.	23.52173	23.58599	23.54628
2	-10355.5	338.1013	2298741.	23.16150	23.27395	23.20447
3	-10314.9	79.8313*	2143307.*	23.09149*	23.25213*	23.15287*
4	-10312.81	4.283331	2176225.0	23.10673	23.31557	23.18652

Source; Author computation using E-views econometric package (2023)

The result of the P-SVAR for our analysis for both the developing as well as developed countries is presented below. The necessary test statistically to determine the stability of the outcome of our models is also presented below. Table 18 which presents the structural factorization, shows the model specification A and diagonal B, we may notice the parameter estimates which are the coefficient of C(1) to C(6) and the specific representations of the values, that is, the estimated (A matrix, B matrix, S matrix, and F matrix) matrices and the likelihood value of -161149 which indicates that we can accept the identifying restrictions. The estimated A matrix with values 1.0000, 0.113711, and -1.618301 respectively shows the effect of GDP growth rate on itself, the shock of exchange rate devaluation on GDP growth rate, and the shocks of goods price variation on GDP growth rate. The PSVAR is just-identified.

***Table 18**: Structural VAR estimates for Developing Countries*

Model: Ae = Bu where E[uu']=I				
A-Matrix				
1	0	0	-	-

C(1)	1	0	-	-
C(2)	C(3)	1	-	-
B-Matrix				
C(4)	0	0	-	-
0	C(5)	0	-	-
0	0	C(6)	-	-
	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	0.113711	0.272684	0.417007	0.6767
C(2)	-1.618301	2.798928	-0.578186	0.5631
C(3)	0.012615	0.336913	0.037442	0.9701
C(4)	8.974668	0.208319	43.08131	0.0000
C(5)	74.55065	1.730464	43.08131	0.0000
C(6)	765.1444	17.76047	43.08131	0.0000
Log likelihood	-16149.77		-	-
Estimated A matrix:				
1.000000	0.000000	0.000000	-	-
0.113711	1.000000	0.000000	-	-
-1.618301	0.012615	1.000000	-	-
Estimated B matrix:				
8.974668	0.000000	0.000000	-	-
0.000000	74.55065	0.000000	-	-
0.000000	0.000000	765.1444	-	-
Estimated S matrix:				
8.974668	0.000000	0.000000	-	-
-1.020518	74.55065	0.000000	-	-
14.53658	-0.940438	765.1444	-	-
Estimated F matrix:				
90.67959	11.30351	2.628777	-	-
-6.871580	102.9022	-1.093748	-	-
-164.1038	-47.36378	1095.919	-	-

Source; Author computation using E-views econometric package (2023)

The estimates and interpretation of the variance decomposition of GDP growth rate on both exchange rate devaluation and goods price variation are presented below in Table 19. From Table 19 which shows different variance decomposition of GDP growth rate on shock 1, 2 and 3, it can be noticed that in the case of GDP growth rate on own shock (1), within the short-run, it accounted for approximately 99.9% while exchange rate devaluation and goods price variation (shock 2 and shock 3) respectively accounted for below 1% shock on GDP growth rate. But on the long-run GDP growth rate account for approximated 98.9% while exchange rate devaluation and goods price variation (shock 2 and shock 3 respectively) accounted for about 1.1% in the total shock in GDP growth rate within the period under review. From the variance decomposition of exchange rate devaluation which is represented as the first difference D(EXDV)one may observe that on the short-run exchange rate devaluation accounted for about 99.9% of the total shock on itself while about 0.1% is accounted for by shock 1 and shock 3 which is GDP growth rate and goods price variation. As well, on the long-run D(EXDV) again contributed about 99.8% of the total shock on itself, while GDP growth rate and goods price variation (shock 1 and shock 3) contributed about 0.2% of the total shock on GDP growth rate within the period wider review. Goods price variation which represents shock 3 contributed about 99.9% of the total shock on itself on the short-run while GDP growth rate and exchange rate devaluation (shock 1 and shock 2)

contributed about 0.1% to the total shock on GDP growth rate within the period under review. On the long-run goods price variation (shock 3) contributed about 99.7% of the total shock on itself while GDP growth rate and exchange rate devaluation (shock 1 and 2) contributed about 0.3% of the total shock on goods price variation within the period under review. It is seen that the effect of shocks 2 and 3, that is, exchange rate devaluation and goods price variation are not significant throughout the horizon of our analysis. Equally, shock 3 had the least impact on the GDP growth rate; the result confirms that exchange rate devaluation had a negative impact on the GDP growth rate in line with the findings of Karahan (2020). This means that, when developing countries devalue their currencies, it leads to little funds for investment in capital goods, imports, and other investment activities which translates to a fall in GDP growth rate.

***Table 19**: Variance Decomposition for Developing Countries*

Variance Decomposition of GDP growth rate:				
Period	S.E.	Shock1	Shock2	Shock3
1	8.974668	100.0000	0.000000	0.000000
2	10.13592	99.94329	0.000219	0.056491
3	10.78268	99.89679	0.002634	0.100575
4	11.79766	99.46868	0.445022	0.086299
5	12.50306	99.30954	0.599863	0.090595
6	13.03159	99.27122	0.634921	0.093864
7	13.53775	99.13444	0.773420	0.092144
8	13.96576	99.02889	0.879037	0.092077
9	14.32176	98.97566	0.932050	0.092285
10	14.63648	98.91544	0.992603	0.091955
Variance Decomposition of D(EXDV):				
Period	S.E.	Shock1	Shock2	Shock3
1	72.55763	0.018735	99.98126	0.000000
2	75.94343	0.061987	99.93767	0.000342
3	76.12486	0.170590	99.82867	0.000744
4	77.00518	0.174031	99.82287	0.003101
5	77.18327	0.173284	99.82343	0.003288
6	77.19829	0.187775	99.80892	0.003304
7	77.21260	0.187707	99.80873	0.003562
8	77.22515	0.187754	99.80864	0.003606
9	77.22583	0.188968	99.80742	0.003607
10	77.22598	0.189134	99.80724	0.003622
Variance Decomposition of goods price variation:				
Period	S.E.	Shock1	Shock2	Shock3
1	765.2831	0.036081	0.000151	99.96377
2	767.5405	0.110906	0.002195	99.88690
3	779.3408	0.128623	0.006449	99.86493
4	782.1442	0.128827	0.011807	99.85937
5	782.8469	0.144626	0.015068	99.84031
6	783.2018	0.155360	0.017217	99.82742
7	783.3063	0.162203	0.018098	99.81970
8	783.3672	0.170322	0.018876	99.81080
9	783.4056	0.177494	0.019423	99.80308
10	783.4323	0.183458	0.019692	99.79685

Factorization: Structural		

Source; Author computation using E-views econometric package (2023)

From Figure 1(i) below it can be observed that the response of the GDP growth rate to shock 1 which is its own shock is positive and above the mean line all through. Specifically, it started above 8 units on the vertical line in period one and decelerated to 4 units in period 2, it went further down in period this, and it moved up slightly in period 4 and finally decreased to 3 units till period 10. From Figure 1(ii) which is the response of GDP growth rate to shock 2 D(EXDV), it can be seen that the variance line merged with the mean line up-till period 3 before slightly moving up till period 4. It again decelerated although still above the mean line till period 6 and virtually stayed like that till period 10. From Figure 1(iii), it can be seen that the variance line rested on the mean line throughout with a very slight positive divergence. From Figure 1(iv) which represents shock 2 D(EXDV) on GDP growth rate devaluation and goods price variation, it is noticed that in the short-run exchange rate devaluation had zero effect on GDP growth rate while in the long-run, it had a marginal positive response to shock from devaluation, this is in line with studies by Kumar, Began and Nardis (2019).

In Figure 1(v) which represents own shock, that is, the response of D(EXDV) to shock 2, it can be seen that from period 1 to 3 the variance started positive and above 60 units on the vertical line, it rapidly decelerated until it became negative briefly in period 3. It moved up slightly in periods 4 to 6 before resting on the mean line up-till period 10. From Figure 1(vi) which represents the response of shock 2 D(EXDV) to shock 3 (goods price variation), it can be observed that the variance line rested on the mean line indicating no meaningful response of shock 2 to shock 3. The response of devaluation to shocks from the GDP growth rate and goods price variation indicates that the GDP growth rate exhibited a negative shock initially in the short run before converging on the mean line. On the hand, goods price variation exhibited minimal shock on currency devaluation which further supports the findings by Tarasenko (2021).

In Figure 1(vii), one may notice that the response of shock 3 (goods price variation) to shock 1 (GDP growth rate) started slightly above the mean line but became negative in period 2. It stayed negative in periods 2 to 5 where it rested on the mean line up-till period 10. From Figure 1(viii) which represents the response goods price variation to shock 2 D(EXDV), it can be observed that the variance line rested on the mean line all through. Finally, in Figure 1(ix) which is the own response, we can observe that it started from 800 units above the mean line on the vertical line but sharply decelerated to above 100 units, still on the vertical still above the mean line in period 2. It moved slightly up in period 3 but again decelerated to the mean line in period 6 before resting on the mean line through to period 10. The response of goods price variation to shocks from GDP growth rate and exchange rate devaluation shows a negative shock from periods 1 to 3 after which the shocks dies-out in the long run. There is no significant response to shock from exchange rate devaluation because the variance line rested on the mean line from the onset.

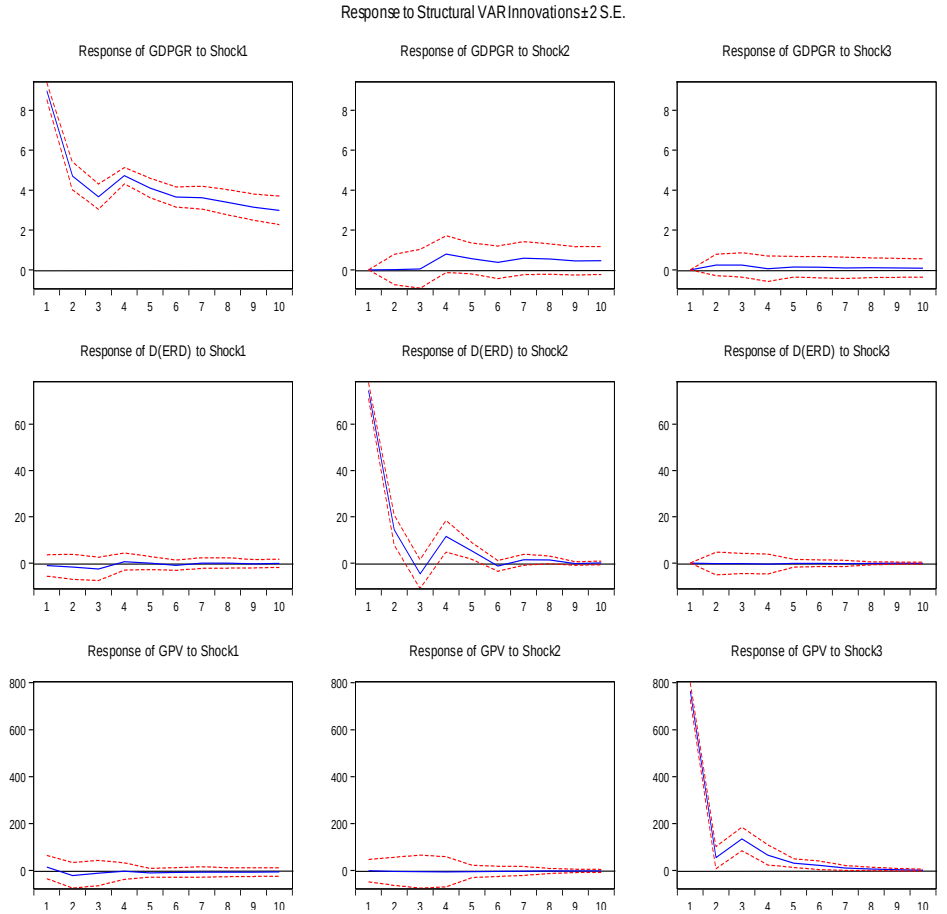

***Figure 1**: Impulse response to SVAR innovations ± 2SE*

The panel structural vector autoregressive **(PSVAR)** results for developed countries are reported below. From Table 20 which shows the VAR lag selection criteria, it can be noticed that the appropriate lag to be selected is again lag 2. This is because the LR, FPE, AIC, and HQ have the same minimum value.

***Table 20**: VAR Lag Order Selection for Developed Countries*

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-4268.34	NA	136769.6	20.33968	20.36854	20.35109
1	-4230.06	75.82526	118971.5	20.2027	20.3157*	20.24589
2	-4208.32	42.7406*	111973*	20.1396*	20.34165	20.21948*
3	-4199.95	16.34394	112311.0	20.14263	20.43122	20.25670
4	-4191.22	16.91027	112461.7	20.14394	20.51911	20.29222

Source; Author computation using E-views econometric package (2023)

***Table 21**: Structural VAR Estimation for Developed Countries*

Structural VAR Estimates
Model: e = Su where E[uu']=I

S -Matrix				
C(1)	0	0	-	-
C(2)	C(4)	0	-	-
C(3)	C(5)	C(6)	-	-
	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	2.963688	0.098790	30.00000	0.0000
C(2)	-6.010210	1.421615	-4.227733	0.0000
C(3)	-0.128640	0.162130	-0.793435	0.4275
C(4)	29.85606	0.995202	30.00000	0.0000
C(5)	0.024931	0.162072	0.153825	0.8777
C(6)	3.438011	0.114600	30.00000	0.0000
Log-likelihood	-4488.539		-	-
Estimated S matrix:				
2.963688	0.000000	0.000000	-	-
-6.010210	29.85606	0.000000	-	-
-0.128640	0.024931	3.438011	-	-
Estimated F matrix:				
4.802750	0.588121	0.188237	-	-
0.802963	23.70313	-0.099161	-	-
0.652312	-0.070206	3.356853	-	-

Source; Author computation using E-views econometric package (2023)

Table 21 depicts the structural factorization for developed nations. The likelihood value of -4488.539 is noticeable from the Table and it is indication of just identified structural VAR system. From Table 22 below which represents the variance decomposition of GDP growth rate on shock 1 (own shock), shock2 D(EXDV), and shock 3 (goods price variation) it can be noticed that in the short-run, shock 1 (own stock) contribute about 99.4% of the total shock on itself while D(EXDV) and goods price variation (shock 2 and 3) only contributed about 0.6%. Equally, in the long run, the own shock still accounted for about 98.3% of the total shock while D(EXDV) and goods price variation only accounted for about 1.7% of the total shock in GDP growth rate within the period under study.

From the variance decomposition of D(EXDV), it can be seen that in the short-run D(ERD) contributed about 94.5% shock (own shock) to the total shock in D(EXDV) while shock 1 (GDP growth rate) contributed about 5.5%. Goods price variation's (shock 3) contribution is negligible. However, in the long run, the GDP growth rate (shock 1) contributed about 6.2% to the total shock in D(EXDV) while shock 2 (own shock) contributed about 93.8%. Again, goods price variation (shock 3)'s contribution is negligible. From the variance decomposition of goods price variation (shock 3), it can be seen that the own shock (goods price variation) contributed about 99.55% to the total shock on itself in the short-run while both GDP growth rate and D(EXDV) contributed approximately 0.15% to the total shock in goods price variation. However, in the long run the value of the own shock decreased to 96.6% while both GDP growth rate and D(EXDV) (shock 1 and 2) only contributed about 3.4%.

To summarize the analysis of the variance decomposition of the response of the shock from exchange rate devaluation and goods price variation, it can be seen that initially, the GDP growth rate had approximately 99.4% on its shock which reduced to 98.4% in the second period. The contribution of EXDV increased in period 1 to 1.5% in period 2, it continues to grow from period 3 all through to period 10. This indicates that when there is a currency devaluation GDP growth rate increases. This is because currency devaluation could stimulate sales of their finished products will lead to more production and more investment. This disposition is similar to the findings by Karahan (2020). On the other hand, it could be seen that GPVAR had insignificant shocks to the GDP growth rate within the period under review which is largely due to the relative stability in their economies.

***Table 22**: Variance Decomposition Results for Developed Countries*

Variance Decomposition of GDP growth rate:				
Period	S.E.	Shock1	Shock2	Shock3
1	2.963688	100.0000	0.000000	0.000000
2	3.102538	99.38092	0.417133	0.201944
3	3.152832	98.33689	1.460650	0.202465
4	3.163902	98.31576	1.482166	0.202075
5	3.167062	98.30700	1.491024	0.201980
6	3.167517	98.30508	1.492847	0.202072
7	3.167698	98.29863	1.499288	0.202081
8	3.167736	98.29862	1.499301	0.202079
9	3.167750	98.29844	1.499482	0.202078
10	3.167751	98.29843	1.499495	0.202079
Variance Decomposition of D(EXDV):				
Period	S.E.	Shock1	Shock2	Shock3
1	30.45500	3.894593	96.10541	0.000000
2	30.70825	5.462690	94.53443	0.002885
3	32.14699	6.149720	93.84719	0.003091
4	32.15225	6.169643	93.82612	0.004235
5	32.28349	6.161785	93.83380	0.004420
6	32.28570	6.173235	93.82229	0.004476
7	32.29827	6.176568	93.81895	0.004480
8	32.29843	6.177009	93.81850	0.004491
9	32.29961	6.176982	93.81853	0.004492
10	32.29963	6.177086	93.81842	0.004492
Variance Decomposition of goods price variation:				
Period	S.E.	Shock1	Shock2	Shock3
1	3.440507	0.139800	0.005251	99.85495
2	3.492711	2.863957	0.238800	96.89724
3	3.496988	2.977161	0.255282	96.76756
4	3.498843	2.976616	0.358405	96.66498
5	3.499097	2.983178	0.365579	96.65124
6	3.499307	2.988253	0.372132	96.63962
7	3.499316	2.988540	0.372330	96.63913
8	3.499333	2.988513	0.373274	96.63821

9	3.499334	2.988540	0.373312	96.63815
10	3.499336	2.988565	0.373383	96.63805
Factorization: Structural				

Source; Author computation using E-views econometric package (2023)

From Figure 2(i) below, the response of the GDP growth rate to shock 1 which is its own shock started positively in period one but decelerated continuously up-till period 6 where it rested on the mean line. Also, in Figure 2(ii), one may notice that the response of GDP growth rate to shock 2 D(EXDV) exhibited a slightly positive disposition from period 1 to 4 before resting on the mean line from period 4 to 10. Again in Figure 2(iii) which represents the response of the GDP growth rate to shock 3(goods price variation), it can be observed that the variance line increased marginally from period 1 to 2 and then decelerated negatively to the mean line in period 3 before resting on the mean line from period 3 to 10. This shows that the initial response of GDP growth rate EXDV shocks indicates a rise from the mean line from period 1 to period 3 before resting on the mean line in the long run. GPVAR also initially rise from period 1 before falling back to the mean line in period 3 where it rested on the mean line throughout.

Figure 2(iv) depicts the response of D(EXDV) to shock 1 (GDP growth rate). From the diagram, it can be seen that the variance line initially started from a negative position in period 1, but accelerated above the mean line in period 2 before decelerating back to the mean line in period 4 before finally resting on the mean line from period 6 to 10. From Figure 4(v), it can be seen that the variance line started in the positive region but steadily decelerated from periods 1 to 2 where it entered the negative region in periods 2 to 3. It subsequently accelerated positively from period 3 to 4 where it coincided with the mean line and later exhibited a marginal positive outlook. It, however, hovered around the mean line from period 7 to 10. From the above analysis, it is clear that there is a positive response by exchange rate devaluation to shock in the GDP growth rate starting from a negative position in the first period, moving positively until it became positive in the second period. The interesting thing here is that, after a positive position in period two, it flattened out until period three where it decreased to slightly below the mean line however, in the long run, GDP growth rate shock to exchange rate devaluation rested on the mean line. This supports the evidence of a positive connection between devaluation and GDP growth rate as reported by Kumar, Begn, and Nardis, (2019).

In Figure 2(vi), it will be noticed that the response of D(EXDV) to shocks from goods price variation is negligible, showing that the variance line rested on the mean line all though. From Figure 2(vii), it can be seen that the response of goods price variation to GDP growth rate started marginally negative from period 1 but accelerated to a positive position in period 2 before decreasing to the mean line in period 4 where it rested on the mean line till period10. As well, figure 2(viii) shows the response of goods price variation to shock 2 D(EXDV). From the diagram, one may see that the variance line was neutral in period 1 but marginally became negative in period 2 before accelerating positively up till period 5 where it hovered around the mean line up to period 6 a trade flower which it rested on the mean line till end

of the period 10. Finally, in Figure 2(ix) which shows the response of goods price variation to its own shock, it can be seen that the variance line started positively from period 1 and decelerated steeply to period 2 where it exhibited a marginal negative position in period 3 before resting on the mean line from period 4 to 10. This again supports the proposition that there is GPV initially had a positive effect on the GDP growth rate but this positive reaction of GPV to shocks in the GDP growth rate immediately evaporates and gives way to stability from period 4 through to the last period in the horizon of analysis (Porteous, 2019).

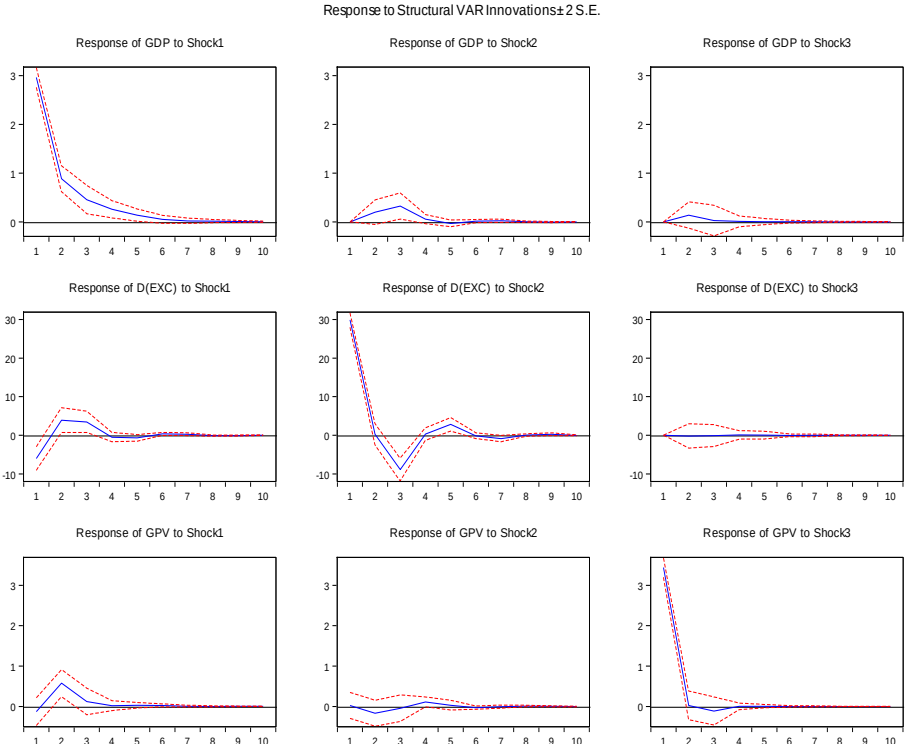

***Figure 2**: Impulse Response functions*

Starting with the result of the GARCH (1, 1) estimates, it can be seen that only exchange rate devaluation was marginally significant at 10% while goods price variation was not significant. However, both variables had a negative impact on the GDP growth rate. Also, both the ARCH and GARCH estimates indicated a persistent impact on GDP growth rate. Equally, using the GJR GARCH, again we can see that exchange rate devaluation was statistically significant at 10% but exerted a negative impact on the GDP growth rate. This is in line with similar studies by Dessie et al (2020) and Awel & Desalgn (2018). Using the panel NARDL to test the outcome of hypothesis three from Table 11 earlier presented, it is discovered that only exchange rate devaluation (negative) is statistically significant, again signally a decrease in GDP growth rate if there is a decrease in exchange rate devaluation on the long-run. In the short-run, devaluation (negative) and goods price variation^{+} were statistically significant at 5% while exchange rate devaluation (+) is significant at 10%. The analysis showed a mixed outcome because while exchange rate devaluation+ is

exhibiting a positive influence, both exchange rate devaluation (negative) and goods price variation (positive) are exerting a positive influence on the GDP growth rate. This is in line with Abass et al (2020) and Ndou (201). Finally, we look at the outcome of hypothesis three using the PSVAR. From the result, it showed that the response of the GDP growth rate to shock 2 (D(ERD) is marginally positive but with negligible influence. Equally, the response of the GDP growth rate to shock 3(goods price variation) exhibited a marginal positive but insignificant influence on the GDP growth rate. In conclusion, we observe that the outcome of hypothesis three is mixed. This supports the evidence propounded by Dung and Okereke (2022) and Idrisov, Kazakova, and Publin (2015).

From the estimates adopted from Panel GARCH(1.1) earlier presented in Table 15, it can be observed that only devaluation passes the significance test at 5% and also exerts a positive influence on the GDP growth rate. From the variance equation both the ARCH and GARCH estimate shows that the shocks are not persistent. Also using the GJR GARCH, we again observe that only one of our independent variables exchange rate devaluation is statistically significant and also depicts a positive influence on the GDP growth rate. The variance equation again showed that the shocks are persistent. This is in line with similar findings by Janus and Riera-Grichton (2015) and Ozeelebi (2018). We use the PSVAR to conclude our hypothesis four. From the estimate using P-SVAR, it can be seen that the response of the GDP growth rate to shocks from exchange rate devaluation is marginally positive as well, and the response of the GDP growth rate to shock 3 (goods price variation) is also marginally positive. This further confirms the outcome of similar research by Eita et al. (2021) and Hoang et al (2020). In conclusion, we may reject the null hypothesis because, from our entire test statistic, there is a unanimous agreement of a positive influence of devaluation and goods price variation on GDP growth rate. Table 23 shows the comparative evidence based on the research hypotheses.

***Table 23**: Comparative of Results for both Developing and Developed Countries*

Method	Variables	Impact	Significance Level	Conclusion
Developing Countries				
GARCH (1.1)	EXDV	Neg	1%	Negative
	GPVAR	Neg	N.S	indeterminate
GJR GARCH	EXDV	Neg	1%	Negative
	GPVAR	Neg	N.S	Indeterminate
P-NARD (L-R)				
	$EXDV^{+}$	Neg	1%	Negative
	$EXDV^{-}$	Pos	1%	Negative
	$GPVAR^{+}$	Neg	1%	Negative
	$GPVAR^{-}$	Neg	1%	Negative
P-NARD (S.R)				
	$EXDV^{+}$	Neg	1%	Negative
	$EXDV^{-}$	Pos	5%	Positive
	$GPVAR^{+}$	Neg	1%	Negative
	$GPVAR^{-}$	Neg	1%	Negative

P-SVAR	EXDV	Neg	5%	Positive
	GPVAR	Neg	N.S	Inconclusive
Developed Countries				
GARCH (1.1)	EXDV	Pos	5%	Positive
	GPVAR	Pos	N.S	Inconclusive
GJR GARCH	EXDV	Pos	5%	Positive
	GPVAR	Pos	N.S	Inconclusive
P-NARDL L.R				
	$EXDV^{+}$	Neg	10%	Negative
	$EXDV^{-}$	Pos	5%	Positive
	$GPVAR^{+}$	Pos	N.S	Inconclusive
	$GPVAR^{-}$	Pos	N.S	Inconclusive
P-NARDL S.R				
	$EXDV^{+}$	Neg	5%	Negative
	$EXDV^{-}$	Pos	5%	Positive
	$GPVAR^{+}$	Pos	N.S	Inconclusive
	$GPVAR^{-}$	Pos	N.S	Inconclusive
PSVAR				
	EXDV	Pos	1%	Indeterminate
	GPVAR	Pos	N.S	indeterminate
N.S = not significant, S.R. = short-run, L. R = long-run				

Source; Author computation using E-views econometric package (2023)

From Table 23 above, it can be noticed that using the GARCH models for the developing countries the outcome exhibited a negative relation between devaluation and GDP growth rate while in the case of developed countries, the outcome exhibited a positive link between devaluation and GDP growth rate. In the case of P-NARDL, the outcome was mixed in both the developing and the developed countries. Finally, using the PSVAR estimates it is discovered that the outcome was indeterminate in the developing countries while there was a marginally positive association between devaluation and GDP growth rate.

Policy Implications/Findings of the Research

In the case of the effect of devaluation on GDP growth rate in developing countries, it has been seen that there is a negative relationship. This implies that currency devaluation in a largely import-dependent country will lead to higher prices for imports and other investment goods, and higher prices of imports may lead to leads to higher prices and this may lead to consumers' inability to pay. Consumers' inability to pay will result in lower production which goes back to a lower GDP growth rate. This is because, for largely import-dependent countries, devaluation in their exchange rate increases the cost of investment which will in turn reduces productivity thereby leading to a reduction in the GDP growth rate. The policy implication is that the economic managers of the developing countries should guild against devaluing their currency because it will result in adverse consequences for their economies through low productivity, since the import of capital equipment and machinery may become too expensive. It also reduces citizens' purchasing power which leads to a reduction in consumer satisfaction and welfare. This is in line with recent findings by Umoru (2022) and Awel and Desalgn (2018).

Likewise, for the developing nations, a positive increase in goods price variation led to a negative impact on GDP growth rate. This means that a persistent goods price variation will likely lead to smuggling and other negative economic practices by investors and this ultimately leads to a reduction in the GDP growth rate. This is in line with similar studies by Muhammed and Ghulam (2017). In effect, when there is a reduction in goods price variation, there will be an increase in GDP growth rate through an increase in private consumption expenditure, which will lead to more investment and finally an increase in production. Again, policymakers should ensure there is not much variation in commodities prices in their economies to prevent smuggling of goods as well as, price racketeering by producers.

The policy implication with regard to the developed world could be explained thus. In the case of the effect of devaluation on GDP growth rate in developed countries, it has been noticed that there is again a positive nexus between devaluation and GDP growth rate. This is because a slight reduction in the value of their currency will boast export trade; stimulating more production as well as increased investment and ultimately boast their GDP growth rate Ozeelebi (2018). This goes to indicate that when developed countries reduce the value of their currency, there is an increase in GDP growth rate. The policy implication is that the developed countries adopt a systematic devaluation that will enable them to further attract more investment, which will lead to a significant increase in production and GDP growth rate. Finally, the impact of goods price variation on GDP growth rate among the developed countries indicated an insignificant positive outcome, however in the short run using the P-NARDL it is discovered that an increase in goods price variation with result in a marginal positive increase in GDP growth rate. This is because variations in prices may serve the interest of the producers especially when there is a complete pass-through rate in commodities with low substitution or competitiveness (Yukata, 2015).

5. CONCLUSION

This research examined the impact of exchange rate devaluation and goods price variation on GDP growth rates in both developed and developing countries. The study was designed to assist economic policymakers in formulating and implementing policies that will enable their economies to achieve the maximum benefits of currency devaluation and price variation as it impacts on GDP growth rate. The study contributed to the methodology of analyzing the association between exchange rate devaluation and goods price variation on GDP growth rate having utilized three different methods of analysis in simultaneously examining the stated variables of this study. Hence, with the aid of vigorous analytical tools, our analysis is robust, and the research conclusions are reliable. The main outcome of this study is that devaluation exhibited a negative impact on GDP growth rate in the developing countries while it favorably impacted GDP growth rate of developed countries. Policymakers, especially monetary policy authorities such as the apex Banks of various countries should evolve various economic instruments that will help in reducing the prices of bonds and rising interest rates. This induces a drop in

consumption expenditure which in turn leads to a fall or slow-down in inflation. With a slowdown in inflation, the problem of goods price variation will be reduced because the incidence of goods price variation is hinged on the level of inflation in an economy as a starting point.

Despite the contributions of the present research to knowledge, there are needs for further research in line with the limitations arising from this study. The first identified limitation of this research is the issue of confounding variables. There are other variables not mentioned in this work that may also have some level of effect on the dependent variables. Accordingly, it is accepted that other independent variables such as interest rate, financing deepening, trade openness, etc. may have a significant impact on GDP growth rate. In the same vein, one may accept the fact that variables such as trade competitiveness, level of productivity within a country, educational attainment, and level of security directly or indirectly impacts on GDP growth rate. Hence, further studies should incorporate some of these variables. We make bold to recommend that higher frequency data should be adopted in subsequent studies. This insight was arrived at because; in using GARCH analysis high-frequency data are usually better. Another problem with data in this study arises from the fact that most data in developing countries usually exhibit wide variation from year to year especially data on the independent variables. This problem was, however, resolved by ensuring the stationarity of our data before proceeding to analysis.

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