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.

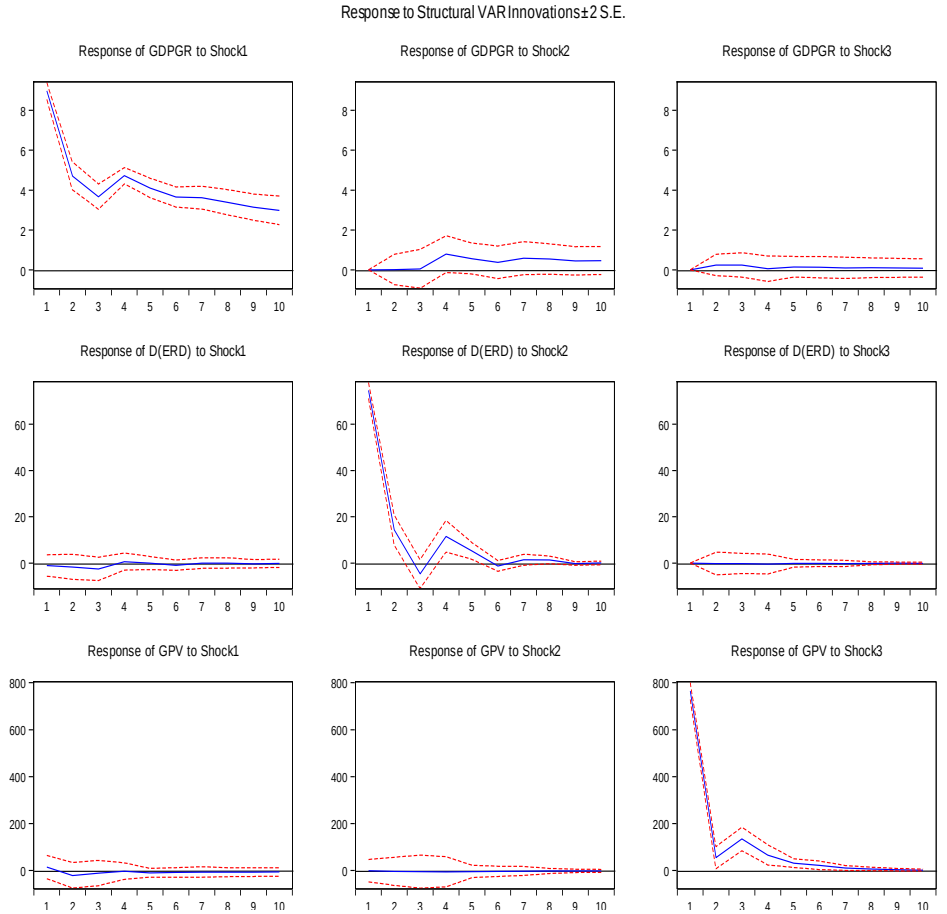

***Figure 1**: Impulse response to SVAR innovations ± 2SE*

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).

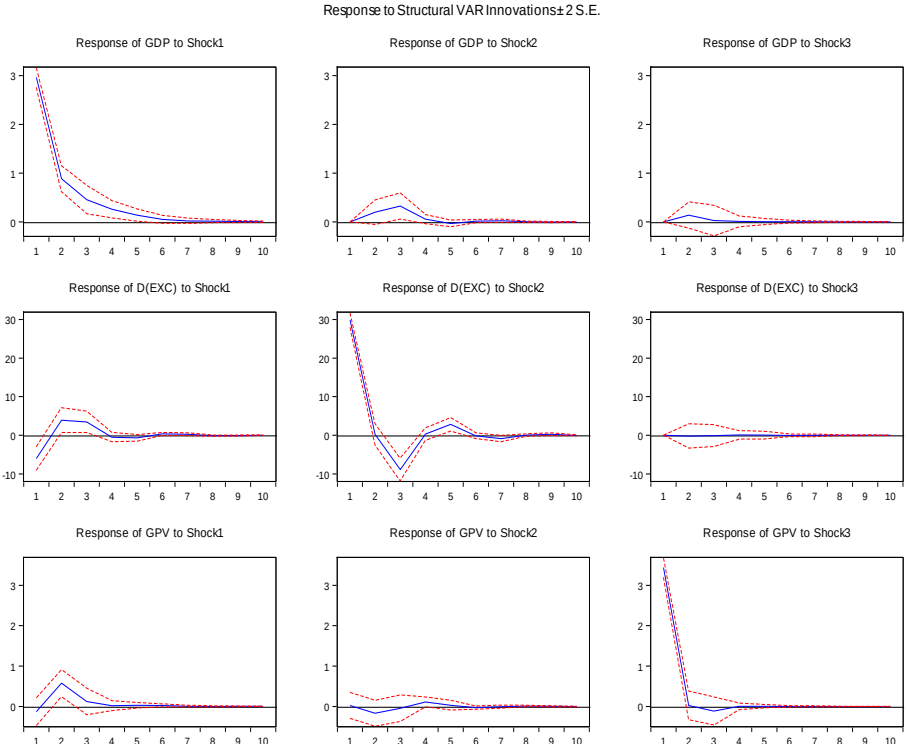

***Figure 2**: Impulse Response functions*

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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