Trade Openness, Monetary Policy Shocks, and Welfare in Malawi: A Structural VAR Approach.

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Abstract

Small open economies face complex interactions between external trade dynamics and domestic monetary policy. For Malawi, persistent inflation, exchange rate instability, and dependence on primary commodity exports raise important questions about the relative roles of trade openness and monetary policy in shaping welfare outcomes. This study examines how trade and monetary shocks affect welfare, proxied by GDP per capita, and identifies which source of disturbance dominates welfare fluctuations. Using annual data from 1981–2024 sourced from the World Bank's World Development Indicators, the study employs a Structural Vector Autoregression (SVAR) framework. Variables include trade openness, inflation, real interest rates, and log GDP per capita. Stationarity is tested using Clemente-Montañés-Reyes and Augmented Dickey-Fuller procedures. A VAR (1) model is selected based on information criteria, and identification restrictions follow a recursive structure in which trade openness is treated as the most exogenous variable. Impulse response functions and forecast error variance decomposition (FEVD) are used to evaluate dynamic effects. The results show that trade openness shocks generate an initial positive response in welfare growth, followed by a short-lived negative adjustment before convergence to equilibrium. Monetary policy shocks exhibit negligible and statistically insignificant effects on welfare across horizons. Variance decomposition shows that trade shocks explain approximately 15-20% of welfare fluctuations, while monetary policy shocks account for less than 5%. In conclusion welfare dynamics in Malawi are predominantly driven by external trade disturbances rather than domestic monetary innovations. Strengthening export diversification and structural resilience may therefore yield greater welfare gains than reliance on conventional monetary policy tools alone.

Keywords: Trade openness; Monetary policy shocks; Structural vector auto regression (SVAR); Welfare; Malawi; Impulse response functions.

Background

Welfare outcomes in developing economies are continuously shaped by a complex interplay of external and domestic macroeconomic forces. Among these, trade openness and monetary policy hold central positions in both theoretical and policy discourse(1). For small open economies in Sub-Saharan Africa, these forces operate within environments defined by commodity dependence, underdeveloped financial systems, and recurring macroeconomic instability, conditions that fundamentally alter how trade and monetary shocks are transmitted to household welfare. With a narrow export base dominated by tobacco, tea, and sugar, chronic inflation, and a shallow financial sector, Malawi exemplifies the structural constraints that define small open economies (2,3). However, such evidence has not yet been established for the country. As such, Malawi presents a fitting case for examining these dynamics. Therefore, this study uses a Structural Vector Autoregression (SVAR) framework to determine which source of disturbance, trade openness or monetary policy, plays a greater role in driving welfare fluctuations in Malawi from 1981 to 2024.

The theoretical relationship between trade openness and welfare is well established (4). principle of comparative advantage posits that countries benefit from specialisation, thereby raising aggregate consumption beyond the limits of domestic production. This foundational argument is extended by (5), who demonstrate that openness can raise long-run productivity through technology diffusion and international competition. (6) provide empirical support, finding

consistent positive growth effects of trade liberalisation across developing countries, a finding more recently corroborated in emerging market contexts (7). On this basis, greater trade integration would be expected to raise welfare.

However, the gains from trade are neither automatic nor permanent, particularly for commodity-exporting economies. (8) argues that without parallel development in productive capacity and institutions, trade liberalisation can expose fragile economies to debilitating terms-of-trade volatility. Contemporary research continues to highlight these risks. (9) demonstrate a strong link between trade openness and economic volatility, a finding that resonates in Malawi. The prolonged fall in global tobacco demand since the early 2000s compressed export earnings, reduced foreign exchange inflows, and contributed to sustained currency depreciation and import cost inflation (10). By contrast, the experience of Vietnam, which deliberately diversified its export base following the 1986 Doi Moi reforms, illustrates that durable welfare gains from trade require broad-based productive transformation, not openness alone (11). Other studies have also explored the nuanced, and sometimes negative, effects of trade on inequality (12) and its complex relationship with environmental outcomes (13), underscoring that the welfare implications of trade are multi-faceted.

The relationship between monetary policy and welfare operates through distinct but related channels, such as interest rate, credit, and exchange rate mechanisms (14). In advanced economies with deep financial markets, these channels function with reasonable predictability (15). In low-income Sub-Saharan African economies, however, these channels are systematically weakened. Recent research by (16) confirms that monetary transmission in emerging and low-income countries is indeed different, often hampered by structural factors. (17) further investigated this by analysing the nexus between financial structure and monetary policy in the region, finding that shallow financial systems significantly blunt the impact of policy impulses.

For Malawi specifically, a body of evidence confirms this pattern. (18) find the bank lending channel is non-functional, with commercial banks holding excess reserves and maintaining wide interest rate margins irrespective of policy rate movements. (19) document the failure of the asset price channel owing to thin equity markets. (20) shows that fiscal dominance, combined with sectoral asymmetries, insulates key parts of the economy, like agriculture, from interest rate changes. Similarly, (21) finds a limited and uneven effect of monetary policy on industrial activity, while (2,22) highlights the dominant role of supply-side factors and fiscal pressures in driving inflation, further constraining the central bank's influence. These structural conditions raise serious questions about the capacity of monetary policy to generate meaningful and broad-based welfare outcomes in Malawi.

Despite the acknowledged importance of both trade openness and monetary policy, the existing literature often addresses them separately. Studies on trade and growth in Malawi, including (23) and (24), primarily focus on the real sector without deeply integrating monetary shocks into their frameworks. Conversely, the monetary policy literature, represented by the works cited above, concentrates on transmission channels without situating monetary disturbances within the broader context of trade-driven welfare dynamics. No study to date employs a structural identification strategy to compare the relative importance of these two forces simultaneously. This is a consequential omission for policy prioritisation in a resource-constrained environment: if trade shocks account for the bulk of welfare variance, policy should focus on export diversification and

external sector resilience; if monetary shocks carry more weight, the priority shifts to financial sector reform and strengthening transmission.

This study fills that gap. Using annual data on trade openness, inflation, real interest rates, and GDP per capita, a SVAR model is estimated with a recursive identification scheme. In this scheme, trade openness is treated as the most exogenous variable, consistent with Malawi's position as a price-taker in global commodity markets. Impulse response functions and forecast error variance decomposition are then used to trace the dynamic effects of each structural shock on welfare and to quantify their relative contributions, thereby offering an evidence-based foundation for policy prioritisation.

Methodology

This study employs a structural vector autoregression (SVAR) framework to analyze the effects of trade openness and monetary policy shocks on economic growth and welfare (GDP per capita) in Malawi. The empirical model is specified as follows;

$$Ay_t = A_1 y_{t-1} + \varepsilon_t$$

Where y_t is a vector of Trade openness, inflation, real interest rates, and GDP per capita growth (welfare proxy) and A is a restriction matrix and ε_t is the error-term.

The methodology proceeds in several stages: stationarity tests, lag length selection, reduced-form VAR estimation, diagnostic checks, SVAR identification, impulse response analysis, and forecast error variance decomposition.

Table 1: Variable description and data source

Variable	Description	Data source
Inflation	Inflation, this is measured using the GDP deflator, which is calculated as the ratio of GDP in current local currency to GDP in constant local currency and reflects the annual growth rate of price change across the entire economy	World Bank, 2025
Real Interest Rate	This represents the cost of borrowing, the amount that the owner of certain financial assets charges, expressed as a percentage of the principal, and in this case, nominal interest rates adjusted for inflation using the GDP deflator are the real interest rates	World Bank, 2025
Trade Openness	Trade openness is calculated by adding exports and imports, dividing the sum by nominal GDP, and then	World Bank, 2025

GDP per Capita Growth	multiplying by 100 to express the result as a percentage GDP per capita growth is a welfare proxy. Measured as the percentage increase in a country's economic output per person	World Bank, 2025

Stationarity Tests

Time series data often exhibit non-stationarity. Estimating VAR models with non-stationary variables can lead to spurious regressions (28). Given Malawi's history of macroeconomic reforms and structural shocks such as currency devaluations and policy reforms, structural breaks are likely to occur. Thus, the study first employs the Clemente-Montañés-Reyes (CMR) as traditional unit root tests may infer biased results because they don't account for structural breaks (29)and then a traditional unit root test will be employed to investigate stationarity in the various series with no break points, in this case, Augmented Dickey-Fuller (ADF) test. The Clemente-Montañés-Reyes test considers the presence of endogenous structural breaks in the mean of the series (30). The (31) test under the additive outlier (AO) model, where the null hypothesis is that the series contains a unit root with structural breaks (ρ=1), is specified as follows:

$$y_t = \Sigma\omega_{i1}DTB_{1t-1} + \Sigma\omega_{i2}DTB_{2t-1} + \rho y_{t-1} + \Sigma c_i \Delta y_{t-1} + e_t$$

where DTB_{it-1} are dummy variables capturing structural breaks, and ρ tests for unit root.

Lag Length Selection

The optimal lag length for the VAR model is determined using information criteria: Akaike Information Criterion (AIC), Schwarz Bayesian Information Criterion (SBIC), Hannan-Quinn Criterion (HQIC), and Final Prediction Error (FPE). Given Malawi's relatively small sample size and the annual frequency of the data, most criteria suggest a VAR model of order 1, which preserves degrees of freedom and avoids over-parameterization (32).

$$VAR(1): y_t = c + A_1 y_{t-1} + u_t$$

where y_t is a k × 1 vector of endogenous variables, A_1 is a k × k matrix of lag coefficients, and u_t is the vector of reduced-form residuals (32).

Reduced-Form VAR Model

The vector autoregressive (VAR) framework proposed by (33) treats all variables as endogenous, allowing each variable to respond to its own lags and the lags of other variables. They account for Sims' critique that the exogeneity assumption of some variables in simultaneous equations is ad hoc and often not backed by fully developed theories (34). According to (35), the reduced-form VAR(p) is specified as:

$$y_t = \mu + \Gamma_1 y_{t-1} + \Gamma_2 y_{t-2} + \ldots + \Gamma_t y_{t-t} + \varepsilon_t$$

where μ is an (n × 1) vector of intercepts, and Γ_i are (n × n) coefficient matrices. In the case of a VAR (1), the compact matrix form is:

$$y_t = \mu + \Gamma_1 y_{t-1} + \varepsilon_t, \qquad \varepsilon_t \sim (0, \Sigma_\varepsilon)$$

Let the vector of endogenous variables be:

$$y_t = \begin{bmatrix} Trade\ Openness \\ Inflation \\ Real\ interest\ rates \\ Welfare(GDP\ per\ Capita\ growth\ rate) \end{bmatrix}$$

The extended matrix form is therefore specified as:

$$\begin{bmatrix} TRADE_t \\ INF_t \\ RIR_t \\ WEL_t \end{bmatrix} = \begin{bmatrix} \mu_1 \\ \mu_2 \\ \mu_3 \\ \mu_4 \end{bmatrix} + \begin{bmatrix} a_{11}\ a_{12}\ a_{13}\ a_{14} \\ a_{21}\ a_{22}\ a_{23}\ a_{24} \\ a_{31}\ a_{32}\ a_{33}\ a_{34} \\ a_{41}\ a_{42}\ a_{43}\ a_{44} \end{bmatrix} + \begin{bmatrix} TRADE_{t-1} \\ INF_{t-1} \\ RIR_{t-1} \\ WEL_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{t1} \\ \varepsilon_{t2} \\ \varepsilon_{t3} \\ \varepsilon_{t4} \end{bmatrix}$$

Diagnostic Checks

We evaluate the VAR model with several diagnostic tests:

Stability Condition. A necessary condition for a valid VAR(p) model is stability. Stability requires $|\lambda_i| < 1$ for all i, where λ_i are the eigenvalues of the companion matrix. If this condition holds, the VAR has a stationary representation and impulse responses are well-defined (Lütkepohl, 2005).

Serial Correlation Test. Residual serial correlation is tested using the multivariate Lagrange Multiplier (LM) test proposed by Breusch (1978) and extended to VAR systems.

Wald Lag Exclusion Test. This tests the joint significance of the lags that were included in the VAR model.

Normality Test. The study uses the Jarque-Bera test to check whether the residuals are normally distributed. This test computes the skewness and kurtosis; for a normally distributed variable, S = 0 and K = 3. The JB statistic is:

$$JB = n\left(\frac{s^2}{6}\right) + \frac{(k-3)^2}{24}$$

Structural Vector Autoregression (SVAR)

While impulse response functions and forecast error variance decompositions are central tools in VAR analysis, their interpretation is limited because reduced-form innovations are not structurally identified. Since these shocks are typically correlated, they do not correspond to distinct economic disturbances. Identifying economically meaningful shocks requires the imposition of theory-based restrictions. SVAR models provide a framework for incorporating such identifying assumptions, enabling the analysis of structural innovations (shocks) and their dynamic effects within the system (37,38).

$$Ay_t = A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_t y_{t-t} + \varepsilon_t$$

In this case, for a VAR (1) model, the equation collapses to:

$$Ay_t = A_1 y_{t-1} + \varepsilon_t$$

For identification, we impose economic theory-based restrictions: Trade openness is exogenous (first variable), Inflation responds contemporaneously to trade shocks, Real interest rate responds to inflation, Welfare responds to trade, inflation, and interest rates. The structural matrix A is lower-triangular:

$$A = \begin{bmatrix} 1 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 \\ a_{41} & a_{42} & a_{43} & 1 \end{bmatrix}$$

Impulse Response Functions

In the reduced-form VAR, impulses or shocks enter through the residual vector u_t. If the stability condition holds, we can invert the VAR model to a vector moving average to derive the impulse response functions, which track the effect of a one-unit structural shock on all variables over time (34). Because the u_t are just 1-step forecast errors, these IRFs are sometimes called forecast error impulse responses (32). The transformation is as follows:

$$y_t = A(L)^{-1} u_t = \Phi(L) u_t = \sum_{i=0}^{\infty} \Phi_j u_{t-j}$$

where $\Phi(L) = \Sigma\, \Phi_j L^j = A(L)^{-1}$. The element Φ_j represents the responses to u_t shocks.

Forecast Error Variance Decomposition

This is another way of investing the impacts of shocks in the VAR models, is does that by measuring the relative importance of each shock in explaining the fluctuations in an endogenous variable over different time horizon. In terms of the structural residuals, the h-step forecast error is specified as Lütkepohl (2013);

$$y_{T+h} - y_{T+h|T} = \psi_0 v_{T+h} + \psi_1 v_{T+h-1} + \ldots + \psi_{h-1} v_{T+1}$$

While the forecast error variance of the kth component in y_{T+h} at horizon h, using $\sum_v = I_K$, is given by;

$$\sigma_k^2(h) = \sum_{j=0}^{h-1} \left(\psi_{k1,j}^2 + \ldots + \psi_{kK,0}^2 \right) = \sum_{j=1}^{K} \left(\psi_{kj,0}^2 + \ldots + \psi_{kj,h-1}^2 \right)$$

Where the quantity $\sum_{j=1}^{K} \left(\psi_{kj,0}^2 + \ldots + \psi_{kj,h-1}^2 \right)$ represents the contribution of the jth shock to the h-step forecast error variance of the variable k(34).

Results

Inflation has a mean of 21.18% with a standard deviation of 19.26, indicating substantial volatility over the sample period (see table 2). The minimum value of 4.1% contrasts sharply with a maximum of 112.69%, suggesting episodes of severe macroeconomic instability, as shown in the inflation figure below. Real interest rate on the other hand, has an average of 10.05% with a standard deviation of 11.25. The minimum value of –29.22% indicates periods of negative real returns, likely associated with high inflation episodes. The maximum value of 34.95% suggests periods of strong monetary tightening. Trade openness has a mean of 43.75% of GDP with a relatively low standard deviation of 6.66. The minimum and maximum values are 25.90% and 60.01% respectively, indicate moderate variation compared to inflation and interest rates. GDP per capita growth averages .655%, with a standard deviation of 4.645. From the graph below, between 1980 and 2024, GDP per capita growth in Malawi has been characterized by significant volatility, marked by distinct episodes of both expansion and contraction.

Tables 2. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Inflation	44	21.177	19.264	4.1	112.694
Real Interest Rate	44	10.045	11.247	-29.221	34.954
Trade Openness	44	43.753	6.662	25.899	60.008
GDP per Capita Growth	44	.655	4.645	-9.992	16.899

Figure 1: Time series plots

Source: World Bank

Unit Root Test

Unit root tests were carried out on the variables to determine their order of integration. Firstly, the study used the Clemente, Montañés, and Reyes approach for testing for stationarity, which allows for two endogenous structural breaks in the mean of the series (39), and the null hypothesis is that there is the presence of two structural breaks. Where results lead to rejection of the hypothesis of the presence of two break dates, the same test, which allows for one endogenous structural break, is applied. If one structural break is also insignificant, the ADF test is applied.

Tables 3. Clemente-Montañés-Reyes tests for stationarity

Level	IO-model t-Statistics BD1	IO-model t-Statistics BD2	BD1	BD2	Result
Trade Openness	-2.588 **	3.314 **	1999	2009	Stationary
Inflation	2.614**	-2.424*	1993	2000	NO SB
Real Interest Rates	1.890*	0.113	1997	2000	NO SB

GDP per Capita Growth	2.708**	-1.327	1992	2003	ONE SB

Note: ***, **, * indicate $p < 0.001$ $p < 0.05$, and $p < 0.10$ respectively, BD = Break Date,

SB = Structural Break, IO = Innovative Outlier

The results in the Table 2 indicate that at a 5% significance level, the t-statistics for trade openness have p-values of less than 0.05; therefore, we reject the null hypothesis of a unit root with structural breaks. In addition to that, the variable is stationary at the level as the critical value is more negative than t-statistics at both break points, therefore it is an $I(0)$ series or series integrated of order 0 given by the IO model. While variables: inflation, real interest rates, and GDP per capita growth were found not to have two structural breaks, as one or both t-statistics for the break dates were found to be insignificant at 5%. And since the structural breaks were insignificant, the Augmented Dickey-Fuller Tests come in to test the stationarity properties of the variables, and the results are given in the Table 3.

Table 4. Augmented Dickey-Fuller Test

	Optimal lags	**Test statistic**	**5% CV**	**10% CV**	**Result**	**Order of integration**
Level						
Inflation	1	-3.573**	-2.952	-2.610	Stationary	I (0)
Real interest rate	1	-3.118**	-2.952	-2.610	Stationary	I (0)
GDP per Capita Growth	1	-3.902***	-2.952	-2.610	stationary	I (0)

Note: **, * indicate levels of significance of 5% and 10%, respectively

The approach used Test statistics to test the null hypotheses of a unit root in the series. Table results indicate that all variables are stationary at level, as the value of their test-statistics are more negative than their critical values. The stationarity results indicate that all variables are stationary at level, satisfying the condition for VAR modelling that variables have to be integrated of the same order.

Reduced-Form VAR

Prior to estimating the VAR model, the optimal lag length was determine using information criteria: Schwarz Bayesian Information Criterion (SBIC), Hannan–Quinn Criterion (HQIC). In this study, the criteria mentioned above selected a lag length of 1. Therefore, a VAR (1) model was estimated. The table below reports the estimated coefficients from the reduced-form VAR (1) model including trade openness, inflation, real interest rate, and welfare proxied by GDP per capita growth.

Table 5. Reduced-Form VAR Estimates

Variables (lag 1)	**Trade Openness**	**Inflation**	**Real interest rate**	**GDP per Capita Growth**
Trade Openness (-1)	.3700**	1.2399	-.5594*	.1491

Inflation (-1)	-.1077	.5026**	.25195 *	.0471
Real interest rate (-1)	-.1547	.4603	.5129**	.0431
GDP per Capita Growth (-1)	.3071	-1.2511**	.4603	-.1659

Note: ***, **, * indicate $p < 0.001$ $p < 0.05$, and $p < 0.10$ respectively D =differenced

First, in the trade openness equation, the lag of trade openness is positive and statistically significant (0.37**), indicating persistence in trade dynamics. This suggests that higher trade openness in the previous period tends to increase trade openness in the current period. In other words, Malawi's trade integration follows a gradual and persistent adjustment process over time. Inflation (-.108) and real interest rates (-.1547) have negative but statistically insignificant effects on trade openness, implying that short-run macroeconomic conditions do not significantly influence trade flows. Similarly, GDP per capita growth (.3071) is positive but statistically insignificant, suggesting that welfare improvements do not strongly drive changes in trade openness in the short run. Overall, these results imply that Malawi's trade dynamics may be more strongly influenced by external conditions such as global demand, commodity prices, and regional trade integration rather than domestic macroeconomic variables.

Second, the inflation equation shows evidence of strong inflation persistence. The coefficient on lagged inflation is positive and statistically significant (.5026), indicating that inflation in Malawi exhibits inertia, where past inflation significantly influences current inflation levels. Trade openness has a positive but statistically insignificant coefficient (1.24), suggesting that trade dynamics do not have a clear short-run impact on domestic price movements. The real interest rate also has a positive but insignificant coefficient (0.46), implying that short-term monetary conditions may not immediately influence inflation dynamics. However, GDP per capita growth has a negative and statistically significant coefficient (-1.251**), suggesting that improvements in economic welfare and productivity may help reduce inflationary pressures in the economy.

Third, the real interest rate equation indicates moderate persistence in monetary conditions. The lagged real interest rate has a positive and statistically significant coefficient (0.513**), implying that real interest rates adjust gradually over time rather than experiencing abrupt fluctuations. Trade openness has a positive and statistically significant effect on real interest rates (-0.559*), suggesting that increased integration into international trade may influence domestic financial conditions and the cost of capital. Inflation also has a positive and weakly significant effect (0.252*), indicating that monetary authorities may respond to rising inflation by tightening monetary policy through higher real interest rates. GDP per capita growth has a positive but statistically insignificant coefficient (0.46), suggesting that short-run welfare changes do not significantly affect monetary policy conditions.

Finally, the GDP per capita growth equation, which represents welfare dynamics in the model, shows that all explanatory variables: trade openness, inflation, and real interest rates are statistically insignificant. This suggests that, within the reduced-form VAR framework, none of the macroeconomic variables directly explain short-run fluctuations in welfare growth in Malawi. The lack of statistical significance may reflect the complexity of welfare dynamics, which are

influenced by a wide range of structural factors such as productivity, institutional quality, investment, and external economic conditions.

The reduced-form VAR results reveal persistence in trade openness, inflation, and real interest rates, while the welfare equation shows weak short-run relationships with the included macroeconomic variables. These findings highlight the importance of examining the dynamic transmission of macroeconomic shocks rather than relying solely on reduced-form coefficients. Consequently, a Structural Vector Autoregression (SVAR) framework is employed to identify exogenous trade and monetary policy shocks and to analyze their dynamic effects on welfare through impulse response functions and forecast error variance decomposition.

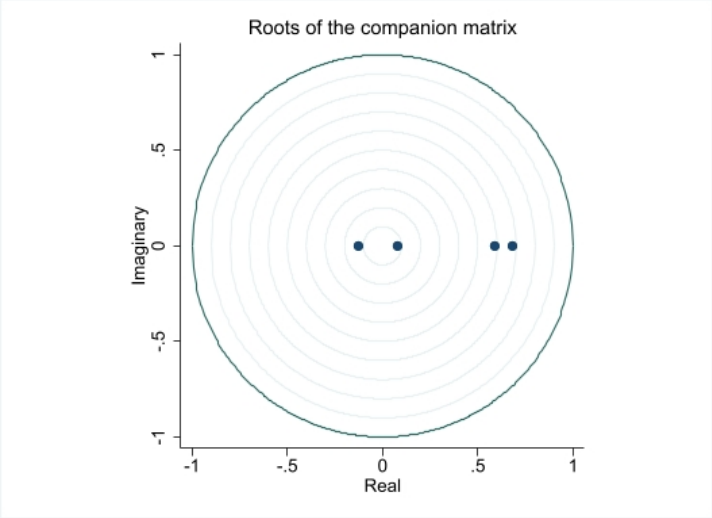
Diagnostic Test of the VAR (1) MODEL

We further present the results of the diagnostic tests that were conducted. The study tested for serial correlation, heteroscedasticity, model stability, and normality.

Table 6. Eigenvalue stability condition

Eigenvalue	Modulus
.6811809	.681181
.5877734	.587773
-.127308	.127308
.07794274	.077943

Figure 2: Roots of the companion matrix



All eigenvalues lie inside the unit circle; as such, the VAR satisfies the stability condition.

Table 7. Residual diagnostic test

Diagnostic Test	Null Hypothesis	P-Value
Wald Lag Exclusion test	Lags jointly equal to 0	0.000
Lagrange-Multiplier TEST	No serial correlation	0.15034
Jarque-Bera test	Normality	0.000

The results from the Lagrange-Multiplier -test fail to reject the null hypothesis, implying no serial correlation. The Jarque-Bera normality test was another test that was conducted, and the results indicate that residuals from all equations except the inflation equation, deviate from normality at 5% confidence interval, the joint test rejects the null hypothesis of normality. This makes sense as inflation for instance, is likely to spike after a trade or monetary shock. Lastly, the Wald Lag Exclusion(WLE) test indicates that the included lags are jointly significant at 1% no less, in other words, we reject the null hypothesis that the lags are jointly equal to zero.

Figure 3: welfare response to trade openness shock

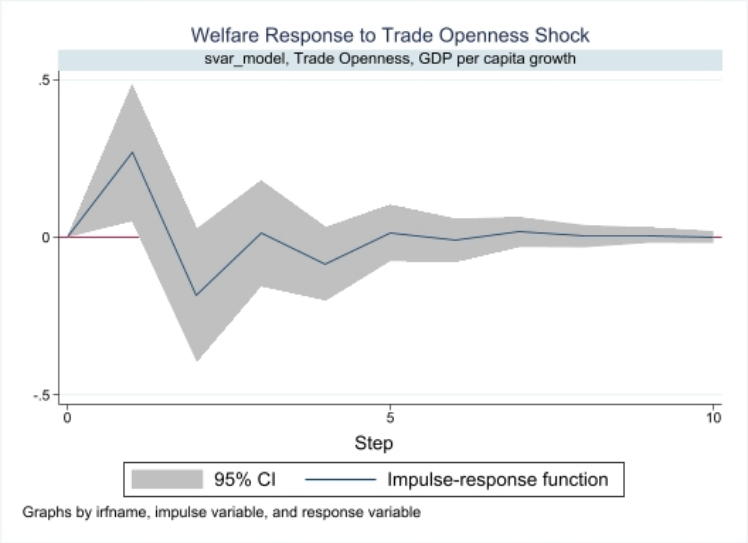
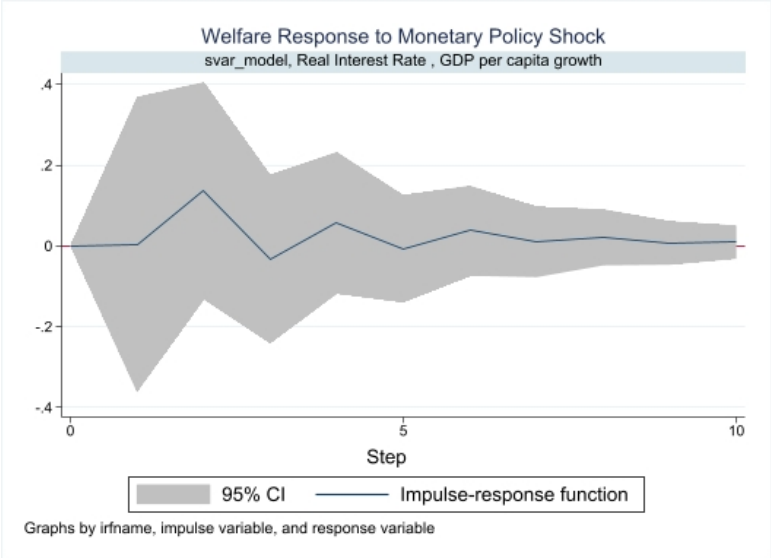


Figure 4: welfare response to monetary policy shock



IMPULSE RESPONSE ANALYSIS

Response of Welfare to Trade Openness Shock

The figure 3 illustrates the impulse response of welfare growth (Δ GDP per capita growth) to a one-standard-deviation structural shock in trade openness. The results indicate that a positive trade openness shock generates a modest increase in welfare growth during the first period. However, this effect is short-lived, as the response turns negative in the subsequent period before gradually converging back to its long-run equilibrium. Over time, the magnitude of the response declines and stabilizes around zero.

The initial positive response suggests that increased trade openness may stimulate economic activity through export expansion, improved resource allocation, and enhanced market access. This finding aligns with classical trade theory, which posits that openness enhances efficiency and growth through comparative advantage and productivity gains (4,5). However, the subsequent negative correction may reflect structural vulnerabilities in developing economies such as Malawi. Increased openness can expose domestic industries to external competition, terms-of-trade volatility, and import surges, potentially dampening welfare gains in the short to medium term (8). The convergence of the response toward zero in later periods suggests that trade shocks do not exert permanent effects on welfare growth, consistent with standard growth theory, where temporary shocks dissipate over time.

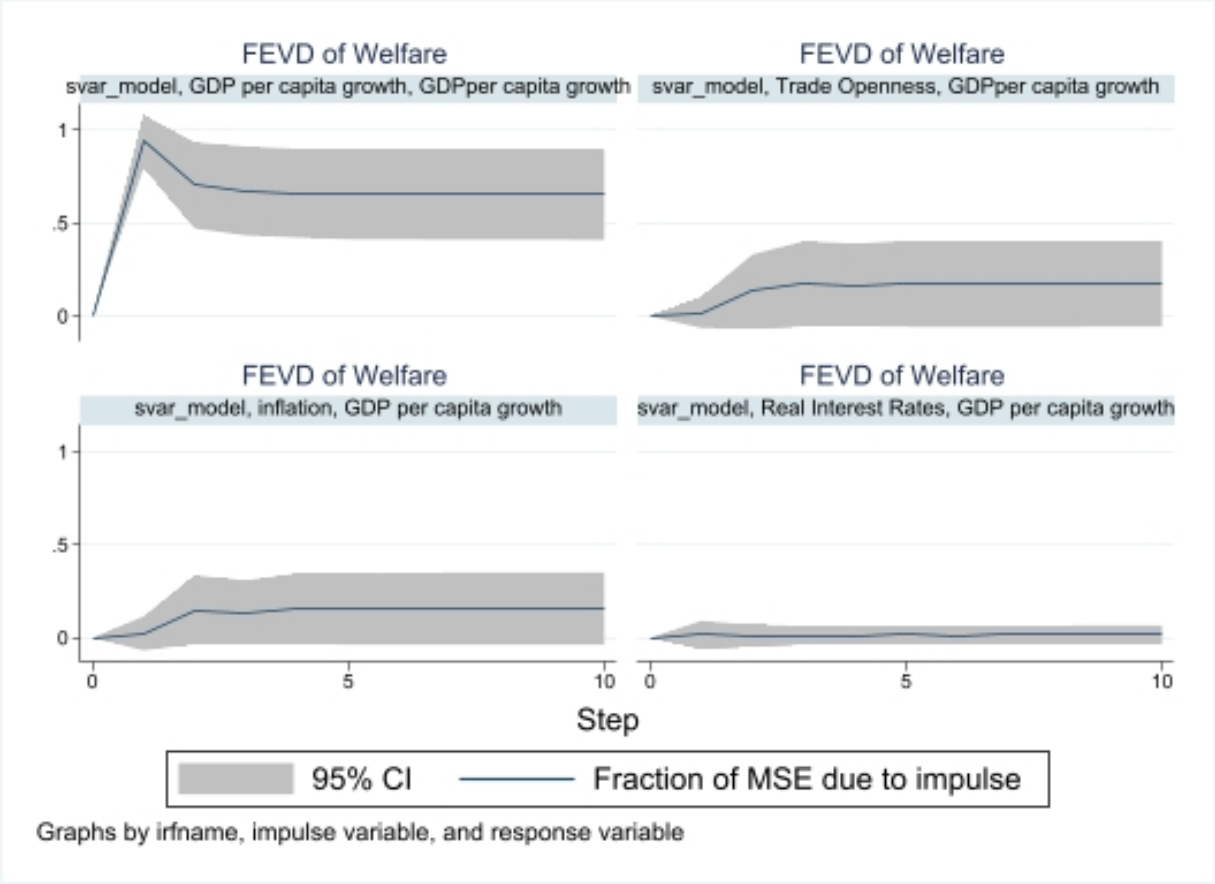
Importantly, the confidence intervals encompass zero beyond the initial period, indicating that the response is not statistically significant at conventional levels over most horizons. This suggests that while trade openness is influential, its dynamic effect on welfare growth is not persistently strong.

Response of Welfare to a Monetary Policy Shock

Figure 4 shows the response of welfare growth to a structural monetary policy shock, proxied by innovations in the real interest rate. The results indicate that welfare growth initially exhibits a small positive response following the shock. However, this effect quickly diminishes and oscillates slightly around zero before stabilizing in the long run. The magnitude of the response remains relatively small throughout the entire forecast horizon.

This weak transmission suggests that monetary policy shocks in Malawi have a limited influence on welfare growth. One plausible explanation is the underdeveloped financial sector and weak credit transmission mechanisms characteristic of many low-income economies (14). In such settings, changes in policy rates may not effectively translate into investment, consumption, or output adjustments. The limited impact of monetary shocks may also reflect structural constraints, such as shallow financial markets, limited private-sector borrowing, and fiscal dominance. These findings are consistent with empirical studies showing weak monetary transmission mechanisms in Sub-Saharan Africa (40).

Figure 5: Forecast Error Variance Decomposition of welfare



Forecast Error Variance Decomposition (FEVD)

The forecast error variance decomposition (figure 5) provides insight into the relative importance of structural shocks in explaining fluctuations in welfare growth over time. The results indicate that a large proportion of the forecast error variance of welfare growth is explained by its own innovations. In the short run, shocks to GDP per capita growth itself account for nearly all the variations in welfare growth. Although this contribution declines slightly over time, it remains the dominant source of welfare fluctuations even in the medium to long run.

Trade openness shocks contribute a moderate share to the variance of welfare growth, accounting for approximately 15-20 percent of the forecast error variance of welfare growth in the medium to long run. In contrast, inflation shocks explain a modest portion of welfare fluctuation lower than trade openness shocks, contributing roughly around 10-15 percent of welfare fluctuations, while monetary policy shocks proxied by real interest rates account for only a very small share of the variation in welfare growth, approximately less than 5 percent.

Overall, these findings suggest that welfare dynamics in Malawi are primarily driven by internal factors, particularly shocks to GDP per capita growth itself. While external sector dynamics represented by trade openness play a secondary role, monetary policy shocks appear to contribute only marginally to fluctuations in welfare growth.

As a small open economy heavily reliant on agricultural exports and imports of essential goods, fluctuations in global demand, commodity prices, and trade conditions are likely to exert substantial influence on domestic welfare outcomes (41). The modest contribution of monetary policy shocks reinforces the impulse response findings, indicating that domestic interest rate innovations play a limited role in driving welfare growth. This suggests that external sector dynamics dominate over internal monetary disturbances in shaping welfare outcomes.

Discussion

The structural VAR results reveal that trade shocks account for 15-20% of welfare fluctuations in Malawi while monetary policy innovations explain less than 5%. This stark asymmetry provides important insights into macroeconomic dynamics in small, commodity-dependent economies.

Trade Openness Effects

The impulse response shows welfare rises initially after a trade shock but then turns negative before returning to equilibrium. This non-monotonic pattern contrasts with standard trade theory predictions of sustained efficiency gains (5). (23)document similar patterns in Malawi, attributing the lack of persistence to weak productive capacity and limited export diversification. (10) reinforces this, showing that agricultural exports (tobacco, tea, sugar) generate limited spillovers due to concentration in low-value primary commodities. The negative correction likely reflects Dutch disease effects and terms of trade deterioration. (8) demonstrates that trade liberalization in Sub-Saharan Africa often exposes economies to volatility without capacity building. (24) show that under AfCFTA, import surges could crowd out domestic producers since Malawi lacks the manufacturing base to compete effectively. (42) adds distributional nuance, showing export booms benefit large farmers but harm smallholders through exchange rate appreciation and input cost increases. The confidence intervals encompassing zero beyond the first period suggest these heterogeneous effects offset at the aggregate level. (43) documents that when global food and fuel prices spike, gains from agricultural exports are eroded by rising import bills. This creates structural vulnerability where trade shocks drive welfare fluctuations more powerfully than domestic policy interventions.

Monetary Policy Transmission Breakdown

The near-zero welfare response to monetary shocks contrasts sharply with advanced economies where monetary policy accounts for 20-40% of output variance (1,44). Multiple transmission channels have been broken down. (21) finds interest rate changes have minimal impact on industrial activity because credit constraints bind tighter than interest costs. (18)confirm the bank lending channel is nonfunctional, with banks holding excess reserves and maintaining high margins regardless of policy rates. (19) show the asset price channel is inoperative due to thin equity markets and limited mortgage finance. (45) identifies the underdeveloped interbank market as a critical gap preventing policy rate transmission. (3) documents fiscal dominance, where government borrowing crowds out private credit and overrides monetary signals. In is subsequent work (20) shows monetary policy effects are highly uneven across sectors, with agriculture and informal sectors (majority of employment and output) essentially insulated from policy rate changes. (46) demonstrates that inflation responds primarily to supply-side shocks (rainfall, fuel prices, exchange rates) rather than demand pressures. When inflation is cost-push, interest rate

adjustments become ineffective. (2,22) provides historical perspective, showing policy effectiveness has declined as macroeconomic imbalances intensified and credibility eroded.

Regional Context

Weak monetary transmission reflects broader structural features of low-income African economies. (40)find similar patterns across the East African Community, attributing this to shallow financial markets (credit to GDP below 25%), large informal sectors, and fiscal pressures. However, heterogeneity exists. (47) find monetary shocks account for 25-30% of South African output variance due to deeper financial markets (credit to GDP above 60%). (17) show monetary effectiveness increases nonlinearly with financial depth across 25 Sub-Saharan African countries. Countries below 20% credit to GDP (including Malawi) exhibit essentially zero transmission, while those above 40% show meaningful effects. (48) documents similar patterns in Zambia, where trade shocks dominate while monetary policy plays a limited role. (11) find trade openness promotes growth in developing countries, but effects depend on complementary factors like infrastructure and diversification that Malawi lacks.

Conclusion

This study set out to understand whether welfare dynamics in Malawi are driven more by external trade conditions or domestic monetary policy. The results point clearly in one direction: welfare outcomes are shaped primarily by forces in the external sector, while monetary policy plays a limited role. The pattern that emerges is important. Trade-related shocks appear to generate only short-lived improvements in welfare, followed by reversals, suggesting that the country is not able to sustain gains from openness. This reflects deeper structural constraints, particularly the narrow export base and limited productive capacity. At the same time, the weak response of welfare to monetary policy signals reinforces long-standing concerns about ineffective transmission mechanisms, linked to shallow financial markets, fiscal pressures, and the limited reach of formal credit.

These findings suggest that policy efforts should be rebalanced. Rather than relying heavily on conventional monetary tools, greater emphasis should be placed on strengthening the structure of the economy itself. This includes diversifying exports beyond traditional commodities, supporting value addition, and building productive sectors that can better absorb and benefit from trade opportunities. Without this, increased openness is likely to continue producing uneven and temporary gains. This does not mean monetary policy is irrelevant, but its effectiveness depends on broader reforms. Improving financial intermediation, easing credit constraints, and addressing fiscal dominance would help create conditions under which policy signals can transmit more meaningfully to the real economy. Until then, monetary policy alone is unlikely to deliver significant welfare improvements.

More broadly, the results highlight the need for a policy framework that prioritizes resilience to external shocks. This includes maintaining macroeconomic stability, managing external vulnerabilities, and investing in sectors that reduce dependence on volatile global markets. In this context, long-term structural transformation, rather than short-term stabilization tools, remains central to improving welfare outcomes in Malawi.

Declarations

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Conflict of Interest

The authors declare that they have no competing financial interests or personal relationships that could have influenced the work reported in this paper.

Data Availability Statement

The data used in this study are publicly available from the World Bank's World Development Indicators (WDI) database. All data are accessible online, and no restrictions apply. The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

References

1. Miranda-Agrippino S, Ricco G. The transmission of monetary policy shocks. Am Econ J Macroecon. 2021;13(3):74–107.

2. Mangani R. Smooth transitioning growth in Malawi: The role of economic policy. African Rev Econ Financ. 2023;15(2):162–77.

3. Mapila SA. Fiscal and monetary policy interactions in Malawi: Evidence from backward-looking and forward-looking approaches. African J Econ Rev. 2024;12(4):75–94.

4. Ricardo D. On the principles of political economy. J. Murray London; 1821.

5. Grossman GM, Helpman E. Innovation and growth in the global economy. MIT press; 1993.

6. Dowrick S, Golley J. Trade openness and growth: who benefits? Oxford Rev Econ policy. 2004;20(1):38–56.

7. Raghutla C. The effect of trade openness on economic growth: Some empirical evidence from emerging market economies. J Public Aff. 2020;20(3):e2081.

8. Rodrik D. Trade policy and economic performance in Sub-Saharan Africa. National Bureau of Economic Research Cambridge, Mass., USA; 1998.

9. Giovanni J di, Levchenko AA. Trade openness and volatility. Rev Econ Stat. 2009;91(3):558–85.

10. Harawa WH. Impact of Agricultural Exports on Economic Growth of Malawi: an Econometric Analysis of Tobacco, Tea, and Sugar. Kenyatta University; 2024.

11. Nam HJ, Ryu D. Does trade openness promote economic growth in developing countries? J Int Financ Mark Institutions Money. 2024;93:101985.

12. Dorn F, Fuest C, Potrafke N. Trade openness and income inequality: New empirical evidence. Econ Inq. 2022;60(1):202–23.

13. Wang Q, Zhang F, Li R. Free trade and carbon emissions revisited: the asymmetric impacts of trade diversification and trade openness. Sustain Dev. 2024;32(1):876–901.

14. Mishkin FS. Housing and the monetary transmission mechanism. National Bureau of Economic Research Cambridge, Mass., USA; 2007.

15. Bu C, Rogers J, Wu W. A unified measure of Fed monetary policy shocks. J Monet Econ. 2021;118:331–49.

16. Bulíř A, Vlček J. Monetary transmission: Are emerging market and low-income countries different? J Policy Model. 2021;43(1):95–108.

17. Al-Tal RM, Makiwa J. Analysing the nexus between financial structure and monetary policy impulses in sub-Saharan Africa. South African J Econ Manag Sci. 2024;27(1):5280.

18. Thula M, Banda M, Mpingasa M, Kamuikeni C. The Bank Lending Channel of Monetary Transmission Mechanism in Malawi: Evidence from Bank Level Panel Data. 2022;

19. Tchereni BHM, Makawa A, Banda F. Effectiveness of the Asset Price Channel as a Monetary Policy Transmission Mechanism in Malawi: Evidence from Time Series Data. Int J Econ Financ Issues. 2022;12(5):160.

20. Mapila SA. Uneven Transmission: Monetary Policy, Sectoral Asymmetries, and the Planning Gap Under Malawi 2063. African J Econ Rev. 2025;13(2):134–58.

21. Matola JU. How monetary policy affects industrial activity in Malawi: Evidence from ARDL and VAR models. Cogent Econ Financ. 2023;11(1):2190643.

22. Mangani R. The effects of monetary policy on prices in Malawi. AERC; 2020.

23. Musila J, Mpekansambo A. Trade openness and growth in a small economy: Evidence from Malawi. World Econ. 2024;47(11):4331–58.

24. Mgomezulu WR, Thangata P, Njiwa D. Embracing the African continental free trade area: unpacking Malawi's economy response to trade liberalization. Res Glob. 2024;9:100252.

25. World Bank. World Bank Open Data: Inflation, GDP Deflator (annual %). 2025.

26. World Bank. World Bank Open Data: Real Interest Rates(%). 2025.

27. World Bank. World Bank Open Data: GDP per Capita. 2025.

28. Granger CWJ, Newbold P, Econom J. Spurious regressions in econometrics. A Companion to Theor Econom Blackwell, Oxford. 2001;557–61.

29. Türsoy T. Causality between stock prices and exchange rates in Turkey: Empirical evidence from the ARDL bounds test and a combined cointegration approach. Int J Financ Stud. 2017;5(1):8.

30. Hoque A, Banerjee R. The stationarity of South Asian real exchange rates allowing for structural breaks. Australas Accounting, Bus Financ J. 2014;8(3):45–54.

31. Clemente J, Montañés A, Reyes M. Testing for a unit root in variables with a double change in the mean. Econ Lett. 1998;59(2):175–82.

32. Lütkepohl H. VAR order selection and checking the model adequacy. In: New introduction to multiple time series analysis. Springer; 2005. p. 135–92.

33. Sims CA. Macroeconomics and reality. Econom J Econom Soc. 1980;1–48.

34. Lütkepohl H. Vector autoregressive models. In: Handbook of research methods and applications in empirical macroeconomics. Edward Elgar Publishing; 2013. p. 139–64.

35. Greene WH. Econometric analysis. Pretence Hall. 2003;

36. Breusch TS. Testing for autocorrelation in dynamic linear models. Aust Econ Pap. 1978;17(31).

37. Greene WH. Econometric analysis 4th edition. Int Ed New Jersey Prentice Hall. 2000;201–15.

38. Lütkepohl H. Structural vector autoregressive analysis for cointegrated variables. All Stat Arch. 2006;90(1):75–88.

39. Montanes A, Reyes M. Testing for a unit root in variables with a double change in the mean. 1998;59:175–82.

40. Davoodi MHR, Dixit MSVS, Pinter G. Monetary transmission mechanism in the East African Community: An empirical investigation. International Monetary Fund; 2013.

41. Sachs JD, Warner A, Åslund A, Fischer S. Economic reform and the process of global integration. Brookings Pap Econ Act. 1995;1995(1):1–118.

42. Kankwamba H. Gendered effects of trade restrictions on labour market outcomes in Malawi. In: Integrating trade and decent work. ILO; 2023. p. 1-online.

43. Singini D. The impact of globalisation on food availability and access in developing countries: a case of Malawi. Stellenbosch: Stellenbosch University; 2020.

44. Wolf CK. Svar (mis) identification and the real effects of monetary policy shocks. Am Econ J Macroecon. 2020;12(4):1–32.

45. Kanyumbu EK. Interbank Market and Effectiveness of Monetary Policy in Malawi. 2021;

46. Ngalawa H. Inflation Dynamics, Output and Monetary Policy in Malawi. Oxford University Press; 2024.

47. Magubane K, Nzimande NP. A structural vector autoregression exploration of South Africa's monetary and macroprudential policy interactions. Economies. 2024;12(10):278.

48. Phiri C. Trade openness and economic growth: The Zambian case. Bursa Uludag University (Turkey); 2021.