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The Effect of Terms of Trade on Economic Development in Rwanda

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Abstract

This study examines the effect of terms of trade on the economic development of Rwanda. The research aims to address four key objectives and three control variables to examine the effect of the TOT on Rwanda's economic development, following several estimating methods utilizing the Stata statistical package software, Descriptive statistics are employed in this study to evaluate the quantitatively secondary data collected on all study variables from Data spanning from 2000 to 2023 was sourced from the National Institute of Statistics of Rwanda (NISR), the World Bank, and the International Monetary Fund (IMF). A time series analysis using econometric models such as multiple regression, the study employs a documentary data collection technique to gather the necessary information from reliable sources, ensuring a robust dataset for analysis using A regression model was applied to examine the relationship between the independent and dependent variables, incorporating unit root and co-integration tests. The key finds shows that, the unit root test results indicate that some variables, such as Ln GDP, Ln pop, Ln trad log, and Ln inst, are stationary at level (I(0)), meaning they do not exhibit stochastic trends and can be used directly in regression models, while the exports, imports, trade balance, and foreign direct investment The variables are non-stationary at their levels but achieve stationarity after first differencing (I(1)), indicating the existence of stochastic trends. Lag selection using criteria like AIC, FPE, and LR tests identified lag 4 as the optimal lag length, which ensures the appropriate capture of dynamic relationships among variables while preventing overfitting. And we recommend that the Government of Rwanda and the policy maker to prioritize on improving trade logistics efficiency to facilitate smoother trade processes, reduce transaction costs, and enhance the competitiveness of exports. Fostering an efficient logistics sector is critical to addressing challenges related to trade facilitation.

Keywords: Terms of Trade, Economic Development in Rwanda

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1. Introduction

Rwanda, as a landlocked country, faces significant challenges in international trade due to high transportation costs for both imports and exports. The absence of a regional railway network compels the country to rely solely on road and air transport, which are costlier alternatives. These high transportation costs, compounded by non-tariff barriers, elevate the prices of domestic products as many raw materials used in production are imported. Consequently, the country often experiences imported inflation, exacerbating economic pressures on businesses and households (UNCTAD, 2023).

Despite consistent economic growth, with GDP expanding by 8.4% in the first three quarters of 2022, Rwanda continues to experience a persistent trade deficit. In 2020, exports were valued at $1.4 billion USD, while imports reached $2.5 billion USD, creating a significant trade imbalance (World Bank, 2023). This trade deficit has contributed to the depreciation of the Rwandan franc, which, while making exports more competitive, has simultaneously increased the cost of imports, placing inflationary pressures on the economy and raising the cost of production for local businesses (UNCTAD, 2023).

The trade deficit has broader implications for Rwanda’s economy. Rising input costs hinder domestic production and limit job creation. Additionally, escalating food prices, influenced by both global commodity trends and local supply chain inefficiencies, have exacerbated poverty and food insecurity. Poor households, which allocate a significant share of their spending to food, are disproportionately affected by these challenges (World Bank, 2023).

This study examines the effect of terms of trade on Rwanda’s economic development, focusing on how trade dynamics impact macroeconomic performance. By identifying these challenges and their effects, the research aims to propose solutions to improve Rwanda's terms of trade, reduce the trade deficit, and foster sustainable economic growth. The study will provide actionable recommendations to enhance trade logistics, diversify export portfolios, and leverage regional integration to strengthen Rwanda’s economic resilience.

2. Literature Review

2.1 Impact of Import Price Index on Economic Growth

Numerous studies have investigated the link between the import price index and economic growth, typically revealing a negative correlation between the two. Agyeman (2020) conducted a study in Ghana spanning from 1995 to 2019, which revealed that higher import prices resulted in a significant decrease in economic growth. Using Ordinary Least Squares (OLS) regression, Agyeman found that a 1% increase in the import price index led to a 0.3% decrease in GDP growth. This negative effect was attributed to the rise in production costs, which then reduced consumer spending and overall economic activity. However, Agyeman's study was critiqued for not considering the long-term growth potential provided by essential imports such as capital goods, which might have a positive effect on economic development.

In a related study, Mwangi (2022) examined how the import price index affects economic growth in Tanzania, using panel data from 50 manufacturing and retail companies covering the period from 2000 to 2018.Using the Generalized Method of Moments (GMM) and Fixed Effects, Mwangi also found a negative relationship between import prices and GDP. A 1% increase in import prices led to a 0.4% decrease in GDP growth, which was further exacerbated by inflationary pressures that hindered investment, particularly in the manufacturing sector. Critics of this study pointed out that it failed to incorporate exchange rate dynamics, which are key in understanding import prices.

Both studies highlight the importance of managing import prices to foster economic growth but also raise important critiques regarding their focus on only the negative aspects of import prices, ignoring potential benefits from strategic imports.

2.2 Impact of Trade Balance on Economic Development

The connection between trade balance and economic development has been extensively researched, with many studies suggesting that persistent trade deficits can impede economic progress. For instance, Khan et al. (2019) analyzed Pakistan's trade balance and its influence on economic growth using quarterly data spanning from 1998 to 2018. Employing the Granger Causality Test, their results indicated a significant negative relationship, showing that a 1% rise in the trade deficit corresponded to a 0.2% decline in GDP**.** The study emphasized that persistent trade deficits could undermine economic stability and growth, recommending policies aimed at improving the trade balance, such as export promotion and import substitution.

In contrast, Kim and Park (2020) conducted a study on South Korea’s trade balance from 1990 to 2018, finding that a positive trade balance was strongly associated with economic growth. Their study used Structural Equation Modeling (SEM) and showed that a trade surplus positively contributed to GDP growth, with a coefficient of 0.6. The authors attributed South Korea’s economic success to policies promoting export growth, technological innovation, and industrialization. Critics of this study, however, noted that it did not address the potential environmental and social costs associated with rapid industrialization and export-driven growth.

Both studies emphasize the importance of maintaining a favorable trade balance for sustained economic development. However, while Khan et al. focus on the risks of trade deficits, Kim and Park’s study suggests that a positive trade balance can act as a driver of economic growth. These contrasting perspectives offer valuable insights into how trade balance policies can influence GDP growth, especially in emerging economies like Rwanda.

2.3 Effect of Trade Logistics Efficiency on Economic Development

The role of trade logistics efficiency in fostering economic growth is another critical area of study. Mohammed and Ibrahim (2021) explored this topic in Nigeria, using a sample of 300 respondents from logistics firms and export companies. The study found that improvements in trade logistics infrastructure, such as upgrading port facilities and improving transportation networks, contributed to a 0.5% increase in GDP for every 1% improvement in logistics efficiency. Their study highlighted that a more efficient logistics system positively influenced trade competitiveness, enabling faster and more cost-effective movement of goods. However, critics pointed out that the study did not sufficiently address the issues of corruption and bureaucratic inefficiencies in the logistics sector, which could undermine the benefits of logistics improvements.

Singh and Verma (2022) conducted a similar study in India, using panel data from 2000 to 2020. Their results indicated that a 1% improvement in trade logistics efficiency led to a 0.6% increase in GDP growth. The study emphasized that advancements in customs procedures, road infrastructure, and supply chain management were key drivers of trade volume and economic growth. However, they noted the importance of considering regional disparities in infrastructure development, particularly in rural areas, which might limit the overall impact of logistics improvements.

These studies underscore the importance of efficient trade logistics in enhancing economic growth, particularly in developing countries. However, they also highlight the limitations of infrastructure improvements when challenges such as corruption, inefficiency, and regional disparities are not addressed. Rwanda's efforts to improve logistics efficiency, such as modernizing its ports and road networks, could benefit from the insights provided by these studies, while also addressing the contextual challenges specific to the country.

CONCEPTUAL FRAMEWORK

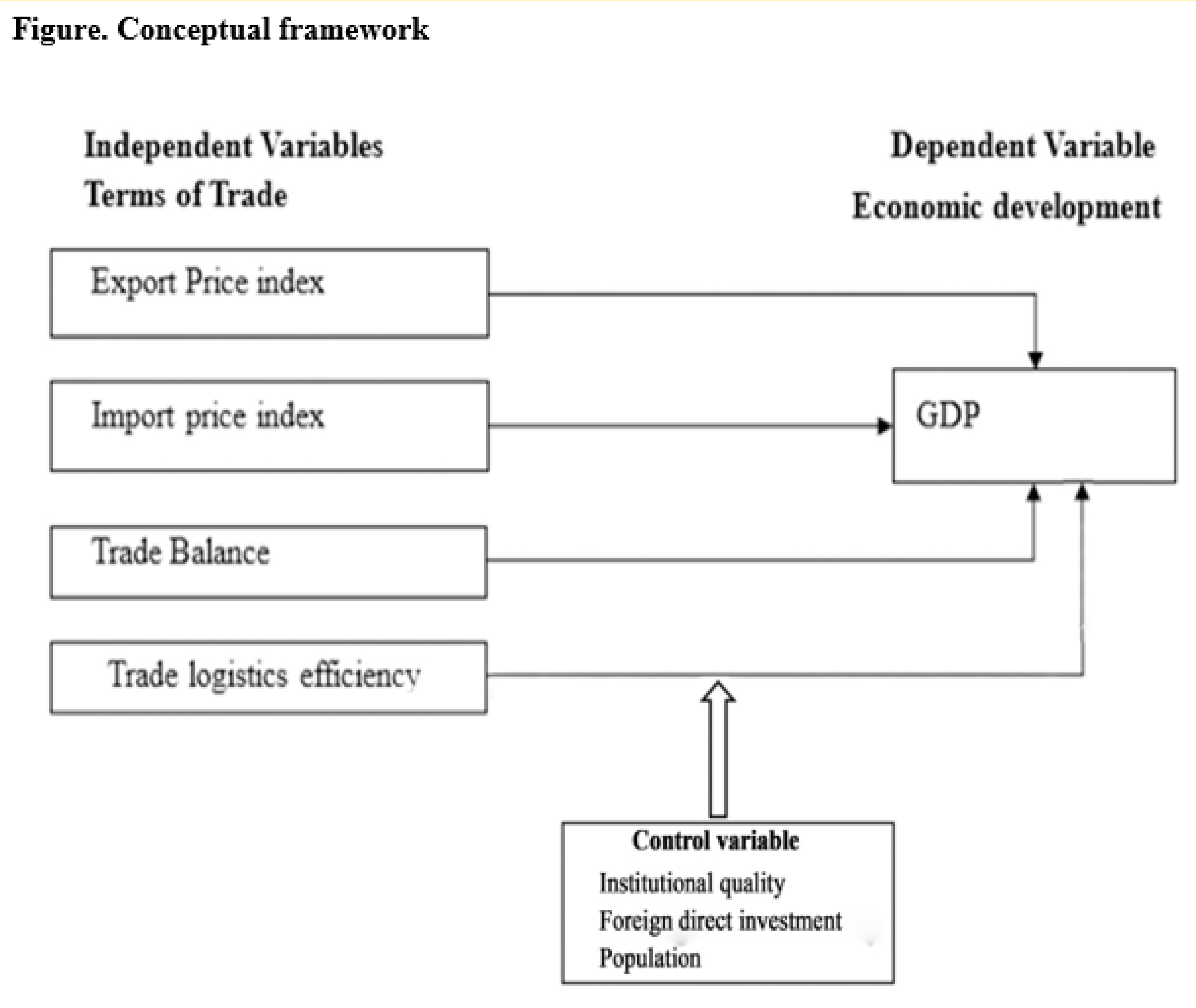

Figure 1: Conceptual Framework (Upreti (2015) and Chughtai, Malik, & Aftab (2015)

2.4 Research Gap

Despite extensive research on trade dynamics and economic development, notable gaps persist regarding Rwanda. Although studies on East Africa—for example, by Tadesse (2018) and Ngugi and Njenga (2021)—have investigated how export prices influence economic growth, research specifically centered on Rwanda remains scarce. Since Rwanda's exports are largely dependent on agricultural commodities such as coffee and tea, price changes in this sector could uniquely impact the nation's GDP, an area that existing studies have yet to thoroughly address. Second, while the import price index has been found to negatively affect GDP growth in other African countries (e.g., Agyeman, 2020; Mwangi, 2022), there is a lack of research on how rising import prices impact Rwanda's industrialization efforts. Rwanda relies heavily on imports of capital goods and machinery, which are essential for its infrastructure and industrial development. Understanding how changes in the import price index affect Rwanda's economic trajectory, especially in terms of industrialization, is a gap this study aims to address.

Finally, while trade balance and logistics efficiency have been discussed in countries like Pakistan and South Korea, limited research has focused on how these factors specifically affect Rwanda's economy. Rwanda's negative trade balance and the ongoing efforts to improve logistics infrastructure are crucial elements of the country's economic development strategy. This study will explore the relationship between trade balance, logistics efficiency, and Rwanda's GDP, offering a localized perspective on how these factors contribute to the country's economic performance.

3. Methodology

This chapter describes the research methods used to examine the effects of trade. related variables, such as export and import price indices, trade balance, and logistics efficiency, on Rwanda's economic development. It includes sections on research design, data collection procedures, data processing, econometric model specification, and data analysis approach.

The study adopts a qualitative research design complemented by a time-series econometric analysis. The focus is on secondary data from credible sources covering the period 2000-2023. The research applies econometric techniques such as Johansen cointegration tests to identify long-term relationships, and unit root tests (ADF and PP) to determine stationarity. The study utilizes the Vector Error Correction Model (VECM) to evaluate both short-term and long-term relationships, supported by diagnostic tests to verify the model's robustness. This method provides a thorough analysis of how trade dynamics affect Rwanda's economic development.

The population under study consists of macroeconomic and trade-related data from Rwanda, including GDP, export and import price indices, trade balance, trade logistics efficiency, and institutional quality. These data The data used in this study were obtained from the National Institute of Statistics of Rwanda (NISR), the World Bank, and the International Monetary Fund (IMF), covering the years 2000 to 2023.

Secondary data sources such as the World Bank, IMF, NISR, and other reputable institutions are used to gather data on key variables. Time-series data covering the years 2000-2023 on export price index, import price index, trade balance, trade logistics efficiency, GDP, institutional quality, foreign direct investment (FDI), and population growth are extracted. Stata software is employed for data extraction, cleaning, and econometric analysis to ensure the accuracy and reliability of the data.

Data for the study was gathered from secondary sources such as the Rwanda Revenue Authority (RRA), World Bank, IMF, UNCTAD, and NISR. The collected data spans 2000 to 2023 and covers variables like the export price index, import price index, trade balance, GDP, institutional quality, and FDI. The data were cleaned, processed, and analyzed using econometric software, ensuring both accuracy and reliability in the study's findings.

3.1 Econometric Model Specification

To analyze the impact of trade-related variables on economic development, the study employs a log-log linear model for its econometric analysis. This transformation allows the interpretation of the coefficients as elasticities, meaning they represent percentage changes in the dependent variable for each 1% change in the independent variables. The model is specified as follows: GDPt=β0+β1ln(EXPPIt)+β2ln(IMPPIt)+β3ln(TRADEBALt)+β4ln(TRADELOGt)+β5ln(INSTt)+β6ln(FDIt)+β7ln(POPt)+ϵtGDP_t = \beta_0 + \beta_1 \ln(EXPPI_t) + \beta_2 \ln(IMPPI_t) + \beta_3 \ln(TRADEBAL_t) + \beta_4 \ln(TRADELOG_t) + \beta_5 \ln(INST_t) + \beta_6 \ln(FDI_t) + \beta_7 \ln(POP_t) + \epsilon_t

Where:

- GDPtGDP_t = Economic development (proxied by GDP growth),
- EXPPItEXPPI_t = Export Price Index,
- IMPPItIMPPI_t = Import Price Index,
- TRADEBALtTRADEBAL_t = Trade Balance,
- TRADELOGtTRADELOG_t = Trade Logistics Efficiency,
- INSTtINST_t = Institutional Quality,
- FDItFDI_t = Foreign Direct Investment,
- POPtPOP_t = Population Growth,
- β1,β2,...,β7\beta_1, \beta_2,..., \beta_7 = Coefficients measuring the impact of each independent variable,
- ϵt\epsilon_t = Error term.

3.2 Data Processing

The data processing involved several steps to ensure that the dataset was reliable and accurate for econometric analysis. First, the collected data were cleaned and checked for any inconsistencies or missing values. Transformations were applied to the data, including converting variables to their natural logarithms for the log-log model. Stationarity tests (ADF and PP) were conducted to assess the order of integration, followed by differencing where required. The Johansen cointegration test was applied to identify long-term relationships among the variables. Additionally, diagnostic checks for normality, heteroscedasticity, autocorrelation, and multicollinearity were performed to ensure the validity of the model's assumptions.

3.4 Estimation Techniques

The study uses various estimation techniques to analyze the impact of trade-related factors on Rwanda's economic development. These include:

- Stationarity Tests: The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were applied to assess the stationarity of the data.
- Cointegration Tests: The Johansen cointegration test was utilized to detect long-term relationships among the variables.
- Modeling Techniques: Vector Autoregression (VAR) and Ordinary Least Squares (OLS) regression techniques were employed for short-term and long-term estimations. White's heteroscedasticity test and the Durbin-Watson test were applied to check for potential issues in the model.

3.5 Data Analysis Approach

The analysis combines both descriptive and econometric techniques. Descriptive statistics are used to summarize key variables, while correlation analysis explores the relationships among them. Econometric methods, including unit root tests, Johansen cointegration, and diagnostic tests for heteroscedasticity, autocorrelation, and multicollinearity, are used to validate the robustness and reliability of the model.

3.6 Unit Root and Cointegration Tests

This study uses the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to assess the stationarity of the dataset

Cointegration tests, particularly the Johansen test, are used to determine whether the trade-related variables and economic development variables move together over time.

3.7 Limitations

A potential limitation of this study is the reliance on secondary data, which may be inconsistent or incomplete. The study focuses on Rwanda and uses data from 2000 to 2023, limiting the generalizability of the results to other countries or future economic conditions. Additionally, potential biases may arise from data gaps or discrepancies across different sources.

3.8 Ethical Considerations

This study adheres to ethical standards by ensuring the use of publicly available and reliable secondary data. Since the research does not involve direct interaction with individuals or sensitive data collection, risks to participants' privacy are minimal. All data will be cited appropriately, and ethical approval will be sought if primary data collection is required in the future.

This methodology ensures that the study provides robust, reliable, and ethically sound insights into the relationship between terms of trade and economic development in Rwanda.

4. Results and Discussion

Following several estimating methods utilizing the Stata statistical package software, the results for each variable used in our empirical inquiry are methodically presented in this chapter. Our empirical findings support both general and specific goals in determining whether terms of trade affect Rwanda's economic development. Descriptive statistics are employed in this study to evaluate the quantitatively secondary data collected on all study variables.

4.1 Presentation and Analysis of findings

4.1.1 Pre-estimation examinations

Pre-estimation examinations are crucial when analyzing the effect of Terms of Trade (TOT) on Rwanda's economic development to ensure the validity and reliability of the econometric results. Unit root tests (such as ADF, Phillips-Perron, or Fisher-ADF) are necessary to determine whether the variables are stationary because erroneous regression results may arise from non-stationary data. Heteroscedasticity tests (e.g., the Breusch-Pagan or White test) determine whether variance in the residuals is constant, ensuring valid inference; serial correlation tests (e.g., Durbin-Watson) confirm whether residuals are correlated over time, which, if present, may require dynamic models; co-integration tests are required if the variables are non-stationary but move together over time, demonstrating the need for error correction models.(Pickup & Kellstedt, 2023)

4.2 Descriptive statistics

Table 1. Displays an overview of the results of the statistical attributes for the variables being studied.

Var/stat	Ln gdp	Ln pop	Ln X	Ln M	Ln trabal	Ln tralog	Ln inst	Ln fordi
Mean	2.012	0.840	20.410	21.195	3.723	1.617	3.695	0.341
Variance	0.377	0.193	1.032	0.842	0.263	0.822	0.601	1.066
St.dev	0.142	0.037	1.066	0.709	0.696	0.676	0.361	1.137
Min	0.789	0.219	18.527	19.858	3.313	0.220	2.023	-2.573
Max	2.579	0.990	21.819	22.341	4.189	2.872	4.175	1.337
Sum	23	23	23	23	23	23	23	23
Skewness	-1.622	-2.269	-0.430	-0.369	0.092	-0.253	-1.767	-1.279
Kurtosis	6.140	7.199	2.035	1.727	1.871	1.780	4.853	3.645
Obs	23	23	23	23	23	23	23	23

Source: computed by the author using stata software

The above table of descriptive statistics provide key insights into the relationship between Terms of Trade (TOT) and economic development in Rwanda, particularly through the variables related to GDP growth (Ln gdp), population (Ln pop), exports (Ln X), imports (Ln M), trade balance (Ln trabal), trade openness (Ln tralog), institutional quality (Ln inst), and foreign direct investment (Ln fordi). The mean values indicate the overall level of these variables, with Ln gdp averaging 2.012, suggesting steady economic growth, while Ln X (20.410) and Ln M (21.195) show that imports consistently exceed exports, reinforcing Rwanda's trade deficit challenge. The standard deviations highlight that exports (1.066) and imports (0.709) are more volatile than GDP (0.142), indicating external trade fluctuations affecting the economy.

The skewness and kurtosis values suggest that most variables are non-normally distributed, with Ln gdp and Ln inst being highly negatively skewed (-1.622 and -1.767, respectively), meaning a concentration of lower values, possibly due to institutional weaknesses affecting trade and growth. The high kurtosis for Ln gdp (6.140) and Ln pop (7.199) suggests the presence of extreme values, implying potential structural shifts in economic development and population dynamics over time. Given these characteristics, the results indicate that Rwanda's economic development is closely linked to trade fluctuations, institutional quality, and financial openness, necessitating policies to improve trade competitiveness, enhance institutional frameworks, and attract foreign investment to ensure sustainable economic development.(Isaie, 2021)

4.3 Multicollinearity test

A multicollinearity test is essential in regression analysis to detect high correlations among independent variables, which can distort coefficient estimates and reduce model reliability. The Variance Inflation Factor (VIF) is commonly used to assess multicollinearity, with values exceeding 10 indicating a serious issue. Identifying and addressing multicollinearity ensures that the regression model remains interpretable and produces reliable statistical inferences.

Table 2. Variance Inflation Factor (VIF) results

Variables	VIF	1/VIF
D.Ln pop	1.25	0.7985
D.Ln X	1.97	0.5087
D.Ln M	1.49	0.6692
D.Ln tradbal	1.51	0.6623
D.Ln tradlog	1.46	0.6862
D.Ln inst	3.71	0.269
D.Ln fordi	3.52	0.2844
Mean VIF	2.13	

Source: computed by the author using Stata software

For the results of Variance Inflation Factor (VIF) indicate that multicollinearity is concern in the model, that push me to apply (VDF) all variable values are below the common threshold of 10. The mean VIF is 2.13, suggesting a low overall level of collinearity among the independent variables. The highest VIF values are for institutional quality (D. Ln inst) at 3.71 and foreign direct investment (D. Ln fordi) at 3.52, which are still within an acceptable range. Since all 1/VIF values are reasonably above 0.1, the model does not exhibit severe multicollinearity issues, meaning that the estimated coefficients remain reliable and interpretable.(Zhu et al., 2021)

4.4 Model Fit and R-squared Analysis

The results of the R-squared analysis, along with model fit tests such as AIC, BIC, and F-statistics, confirm that the model explains a significant portion of the variability in the dependent variable, ensuring its reliability. The consistent of the data set is further by the findings of thee PP and ADF tests which show that all study series, including GDP and variables are stable at differences. this verified that the estimated model is statically valid and dependable for inference, guaranteeing that the relationships between the variables are not fictitious. Stationarity is an essential assumption in time series modeling (Saito and Neto, 2024).

4.5 Impulse response

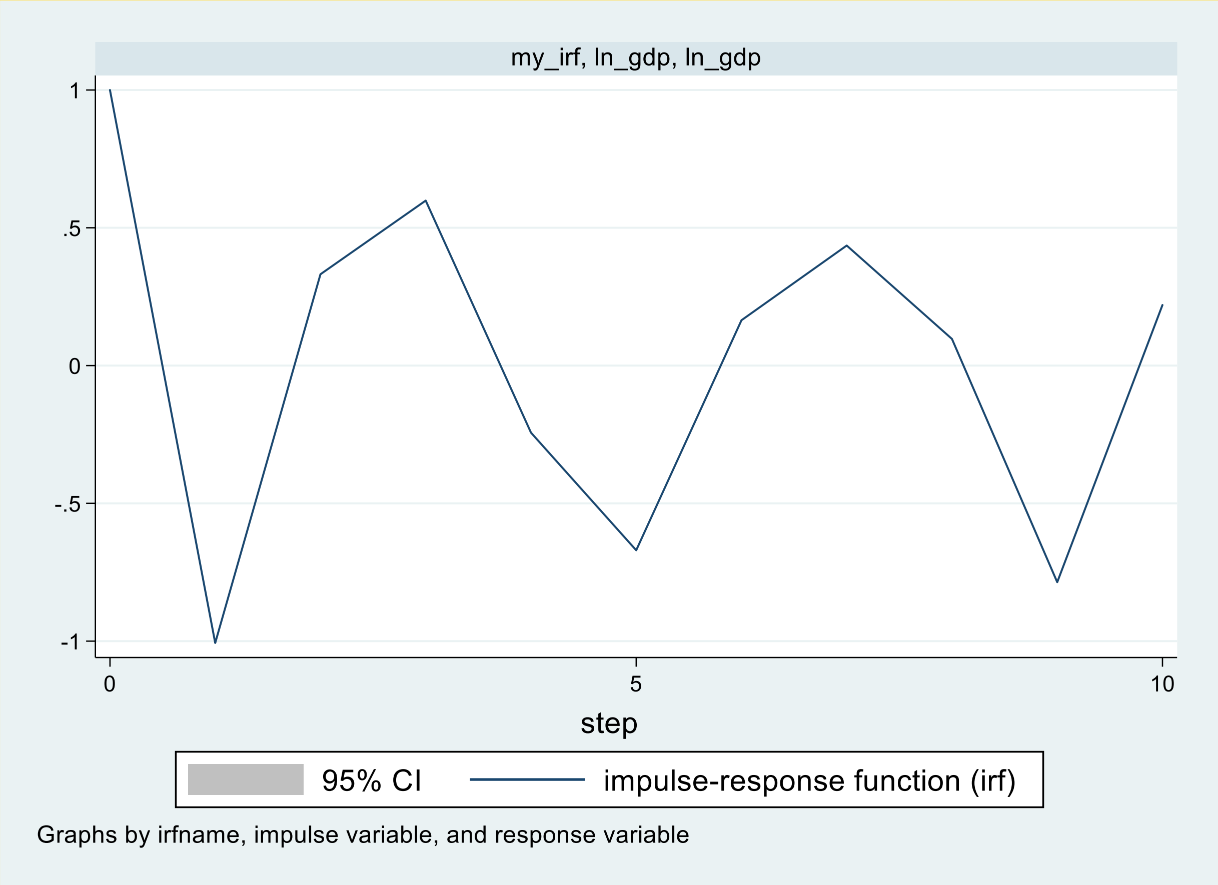

Figure 2: Impulse (ln_gdp) response(ln_gdp)

The graph above, illustrates the dynamic response of GDP to its own shock over a 10- horizon Initially, GDP exhibits a sharp positive response, followed by fluctuations alternating between positive and negative values. The magnitude of the marginal effects varies, indicating the persistence of GDP shocks over time. Although the confidence intervals are not explicitly shown, the significant initial impact suggests a strong short-term response, while the alternating pattern implies cyclical adjustments. The results indicate that GDP shocks have temporary but recurring effects on economic fluctuations. This reinforces the study's theme that economic development in Rwanda is sensitive to trade dynamics, requiring policies that stabilize macroeconomic fluctuations and enhance resilience to external shocks.

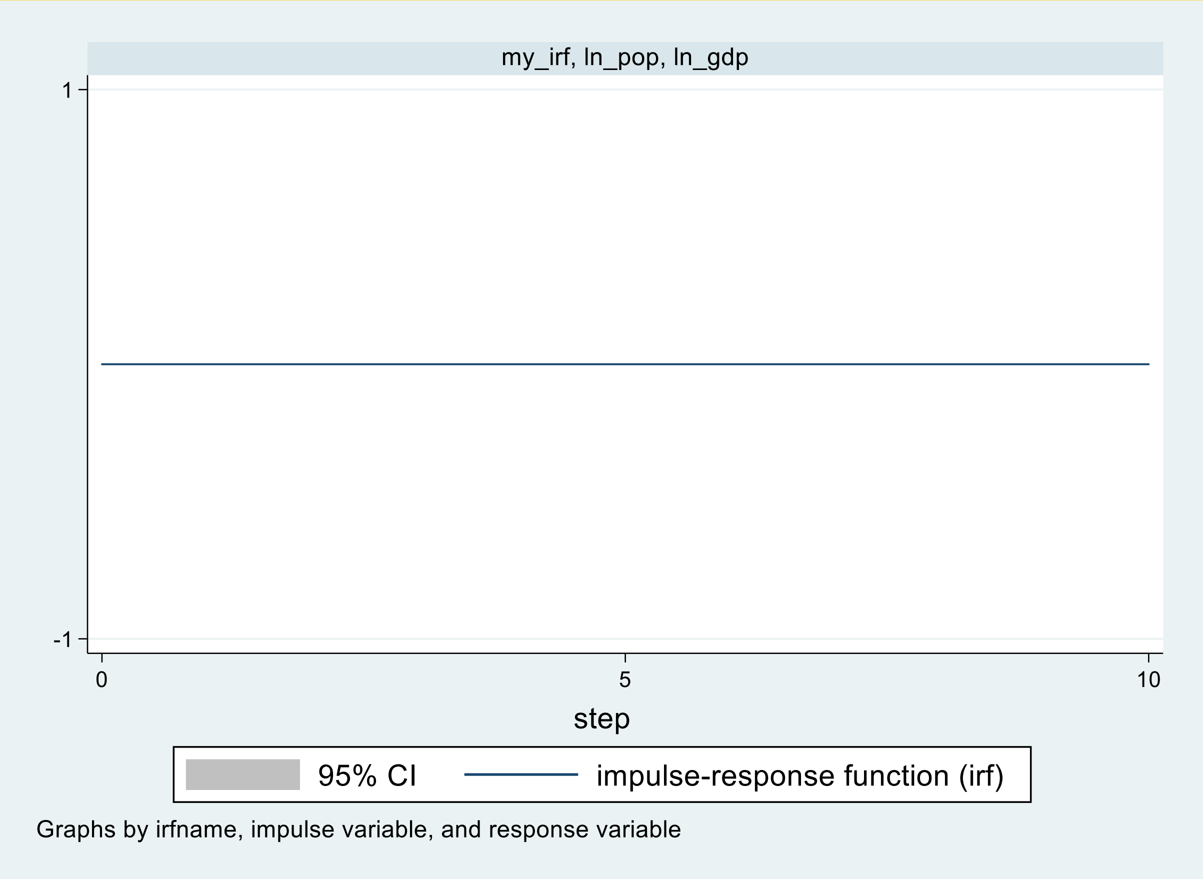

Figure 3: Impulse (ln_pop) response(ln_gdp)

The impulse response function (IRF) indicates that a shock to population (POP) has a negligible and statistically insignificant effect on GDP over the 10-period horizon, as evidenced by the flat response line and confidence intervals covering zero. This suggests that population changes alone do not drive significant fluctuations in economic output, implying that other structural factors, such as institutional quality, trade logistics, and investment, play a more critical role in shaping Rwanda's economic development. These findings highlight the need for policies that enhance productivity and economic diversification rather than relying solely on demographic growth for economic progress.

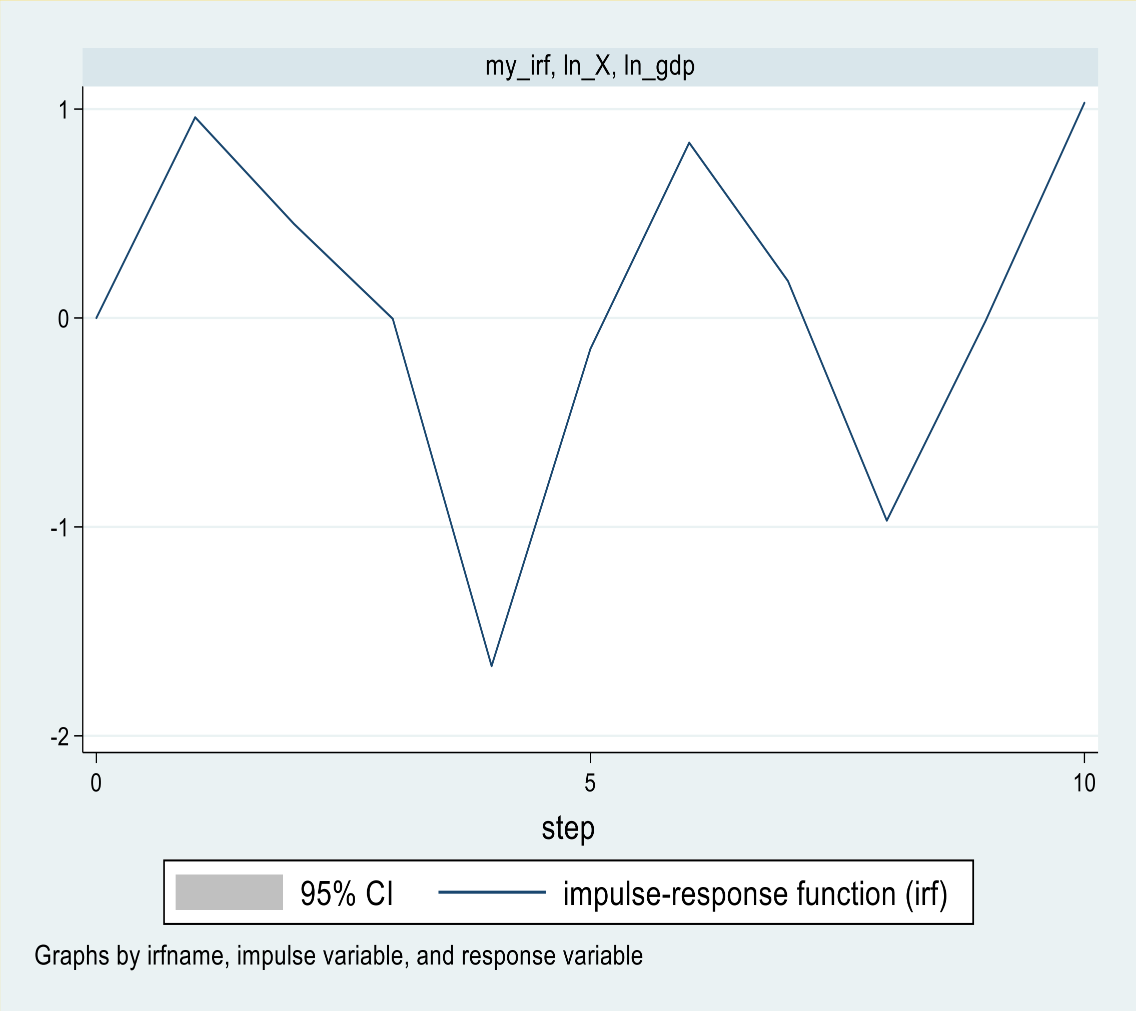

Figure 4: Impulse (ln_X) response(ln_gdp)

The impulse response function (IRF) shows that a shock to exports (EXPORT) initially boosts (GDP), peaking at step 1, but then fluctuates between positive and negative effects over the 10-step period. The oscillatory pattern suggests that export shocks do not have a consistently sustained impact on economic growth, likely due to external market conditions, trade policies, or structural inefficiencies in the economy. This highlights the need for Rwanda to enhance trade logistics, diversify exports, and strengthen institutional frameworks to ensure that export growth translates into long-term economic stability and development.

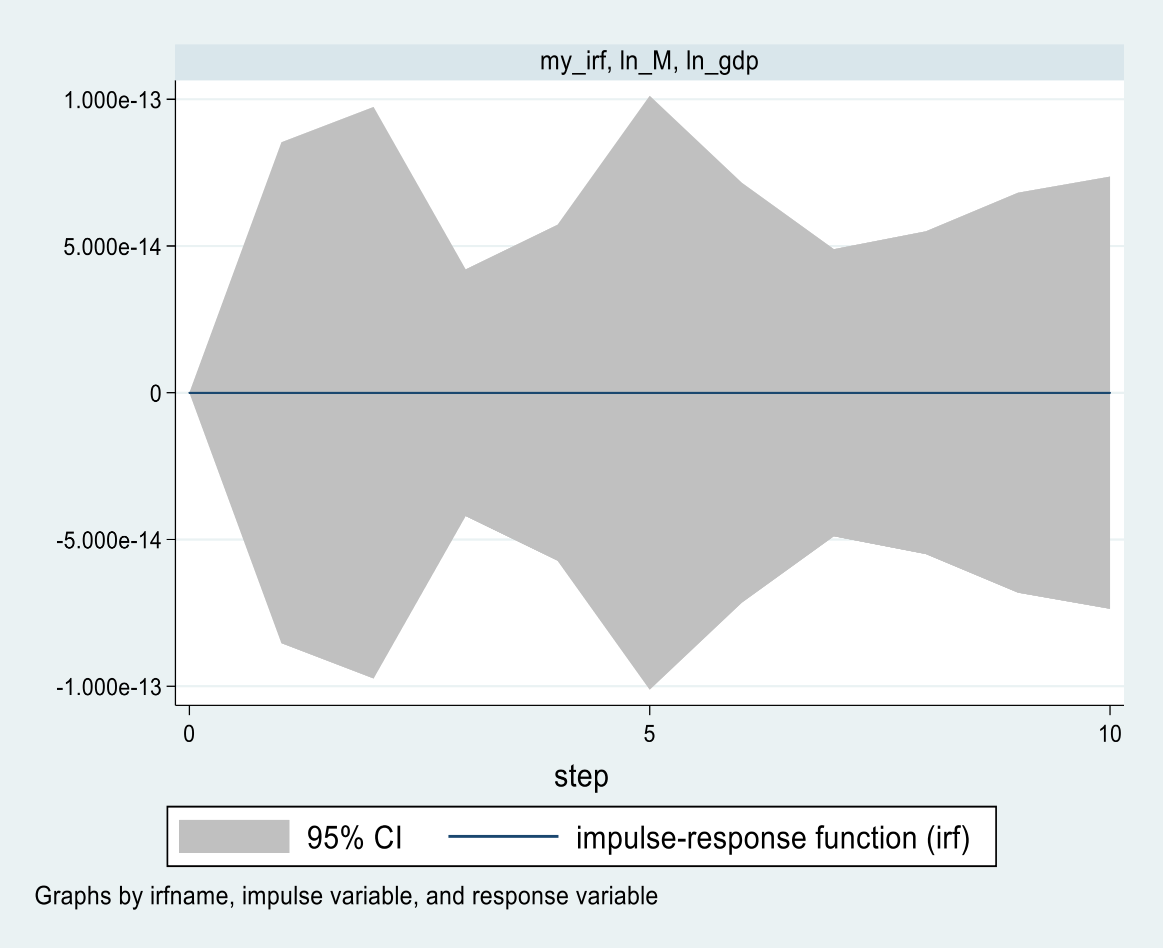

Figure 5: Impulse (ln_M) response (ln_gdp)

The impulse response function (IRF) indicates that a shock to imports has no statistically significant effect on GDP over the 10-step period, as the 95% confidence interval consistently includes zero. This implies that variations in imports do not exert a meaningful influence on economic development within the observed timeframe. Given Rwanda's trade dynamics, this finding underscores the importance of enhancing trade efficiency and balancing imports with productive investments to foster sustainable economic development.

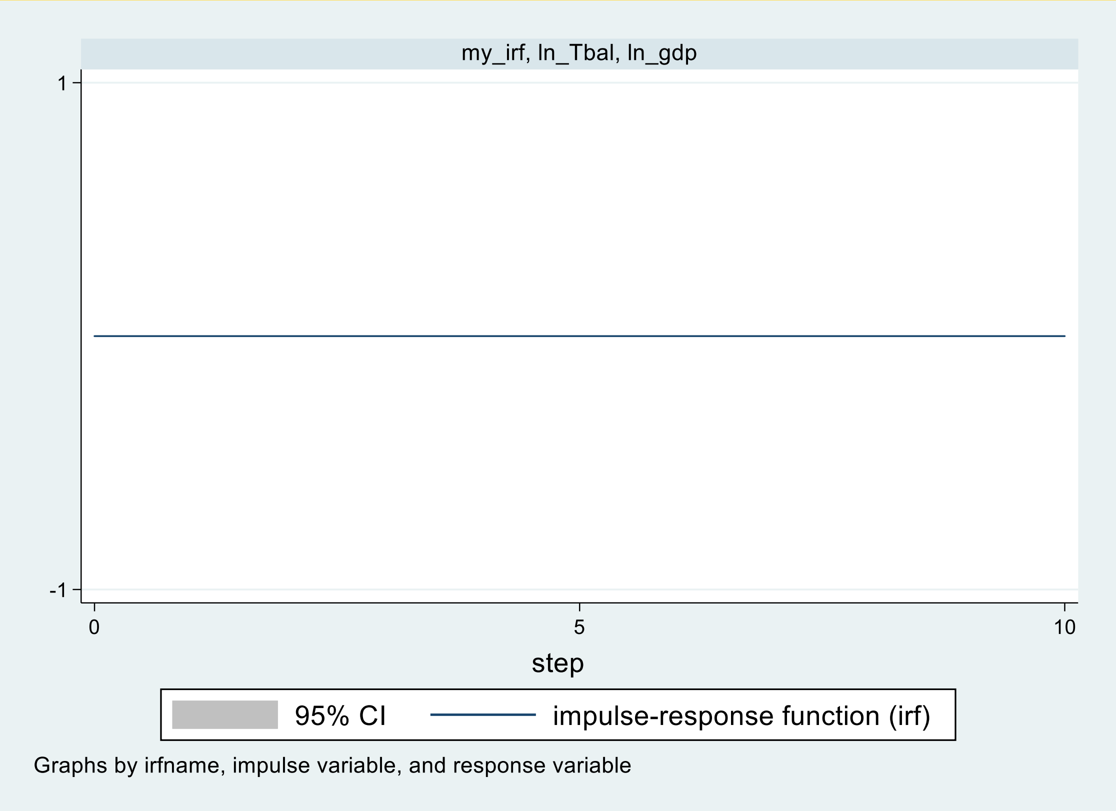

Figure 6: Impulse (ln_Tbal) response(ln_gdp)

The impulse response function (IRF) suggests that a shock to the trade balance has no statistically significant effect on GDP (ln_gdp) over the 10-step period, as the confidence interval consistently includes zero. This indicates that fluctuations in the trade balance do not meaningfully influence economic development within the given timeframe. Given Rwanda's economic structure, this result highlights the need for policies that enhance trade efficiency and export competitiveness to strengthen the link between trade balance dynamics and long-term economic development.

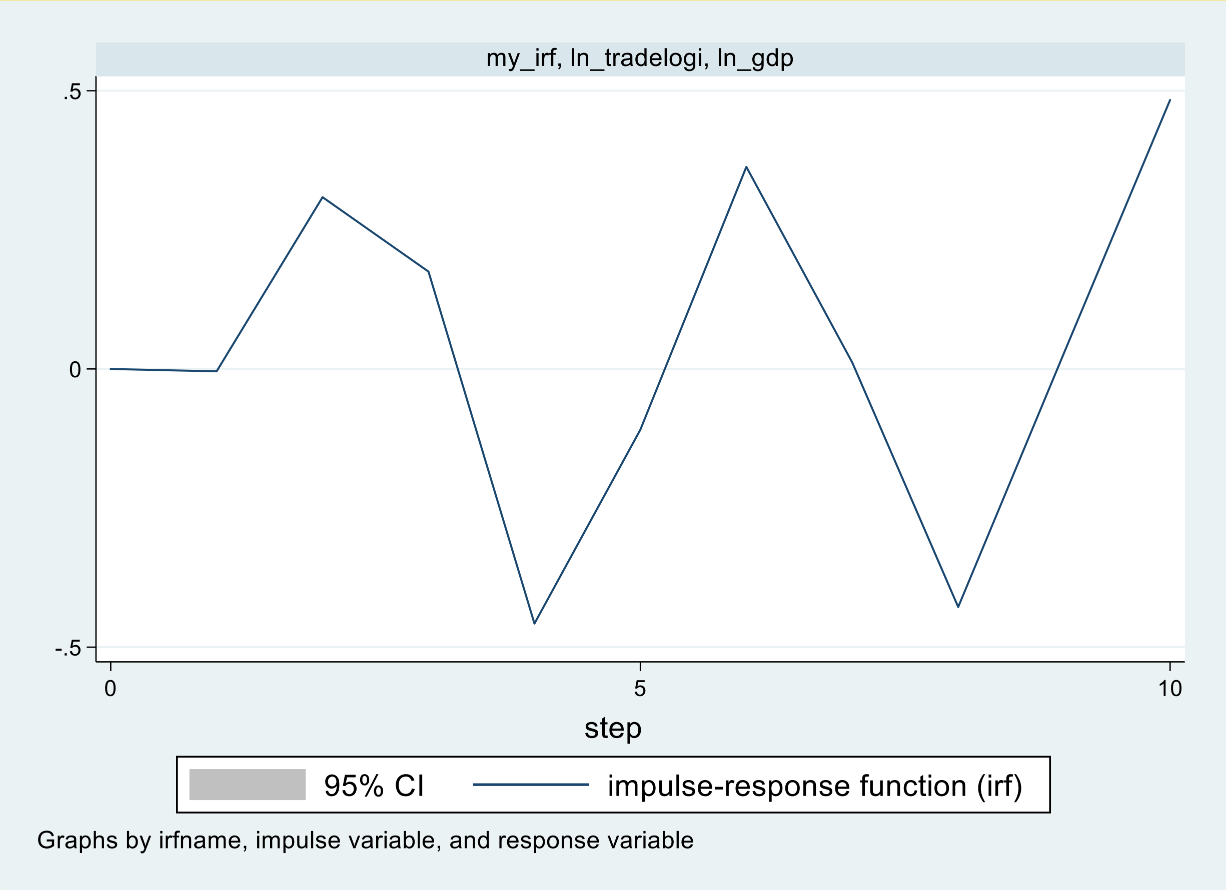

Figure 7: Impulse (ln_tradelogi) response(ln_gdp)

The impulse response function (IRF) suggests that a shock to trade logistics has an oscillating effect on GDP over the 10-step period, initially positive, turning negative around step 5, and becoming positive again towards step 10. The absence of confidence intervals makes it difficult to determine statistical significance, but the cyclical nature indicates that improvements or disruptions in trade logistics have a dynamic impact on economic growth. This highlights the importance of sustained investment in trade infrastructure and efficiency to ensure consistent positive contributions to Rwanda's economic development.

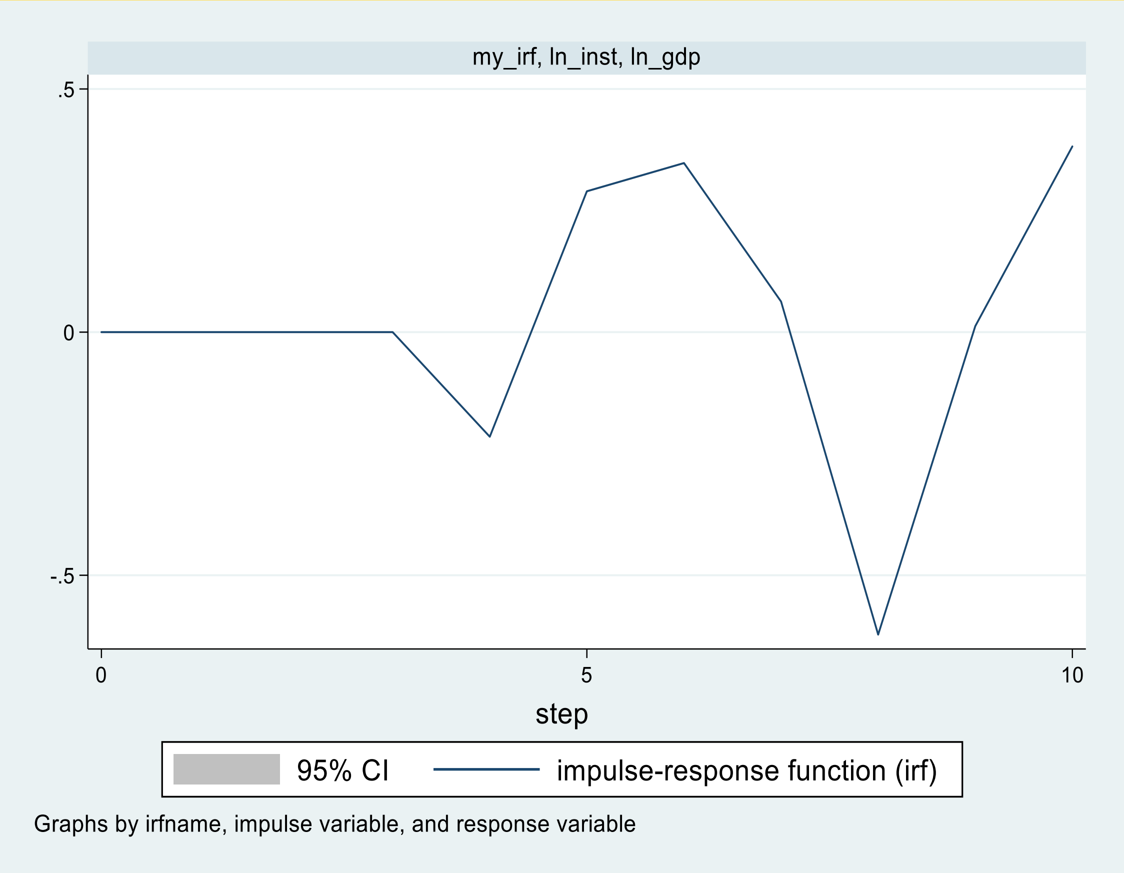

Figure 8: Impulse (ln_inst) response(ln_gdp)

The impulse response function (IRF) suggests that a shock to institutional quality has a delayed and fluctuating effect on GDP, with negligible impact initially, turning positive around step 5, peaking at step 7, and then briefly becoming negative before recovering by step 10. Due to the absence of confidence intervals, the statistical significance of these effects remains uncertain. However, the delayed response implies that improvements in institutional quality take time to influence economic growth, reinforcing the need for long-term policy commitments to strengthen institutions for sustained economic development in Rwanda.

Impulse (ln_fordi) response(ln_JDP)

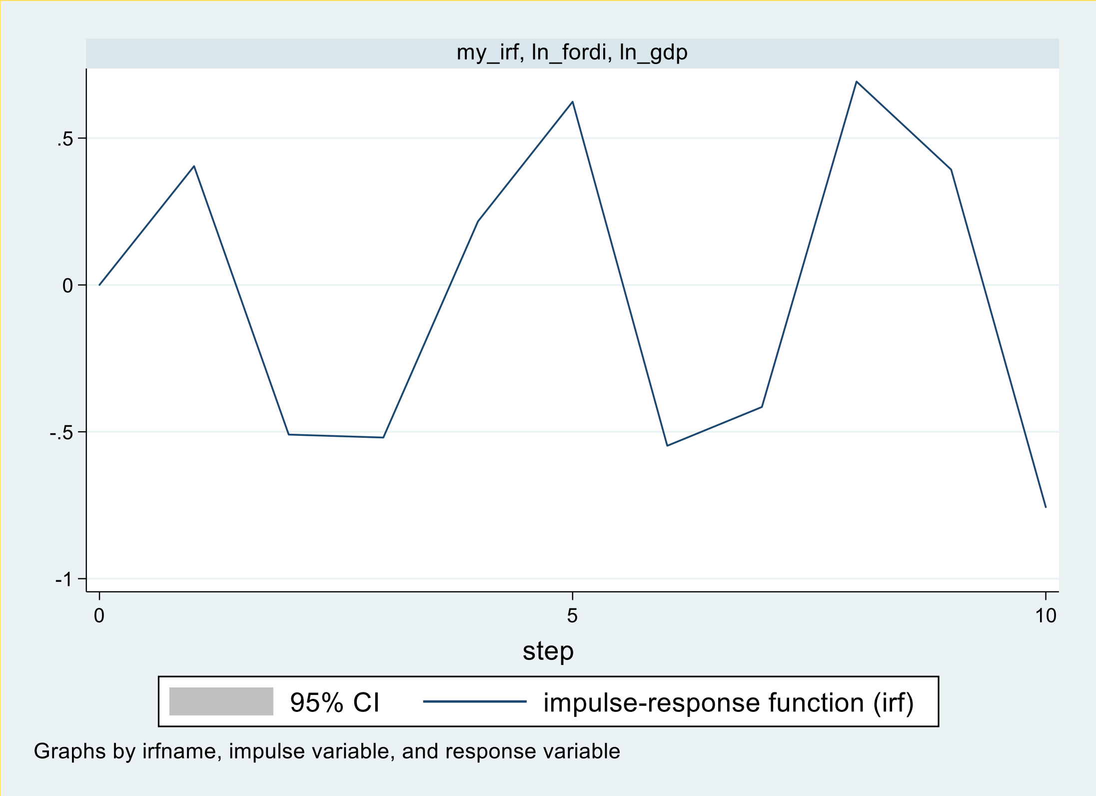

Figure 8: Impulse (ln_fordi) response(ln_JDP)

The impulse response function (IRF) indicates that a shock to foreign direct investment has a fluctuating effect on GDP over the 10-step period, initially positive, turning negative around step 3, peaking positively at step 6, and ending with a negative effect at step 10. Due to the lack of confidence intervals, the statistical significance of these effects remains unclear. The cyclical pattern suggests that foreign direct investment's impact on economic growth is complex, potentially influenced by external economic conditions and requiring complementary policies to maximize its positive effects on Rwanda's development.

The impulse response functions (IRFs) illustrate the dynamic effects of various economic shocks on GDP in Rwanda. A shock to GDP itself shows an initial strong positive impact, followed by cyclical fluctuations, indicating temporary but recurring effects on economic growth. Population shocks have an insignificant impact, suggesting that demographic changes alone do not drive economic growth. Export shocks initially boost GDP but fluctuate, highlighting the need for trade diversification and improved logistics. Import and trade balance shocks have no significant effect, reinforcing the importance of balancing imports with productive investments.

Trade logistics shocks show an oscillating impact, emphasizing the need for sustained investment in infrastructure. Institutional quality shocks have a delayed effect, reinforcing the importance of long-term institutional reforms. Lastly, foreign direct investment shocks exhibit a fluctuating pattern, indicating a complex relationship requiring supportive policies. Overall, the findings suggest that Rwanda’s economic development is sensitive to trade dynamics, institutional quality, and investment efficiency, necessitating policies that enhance economic resilience and sustainable growth.

5. Conclusion

The analysis of Rwanda’s terms of trade impact on economic development shows that variables like GDP, population, trade logistics, and institutional quality are stationary at their levels. In contrast, exports, imports, trade balance, and foreign direct investment are non-stationary at level but achieve stationarity after first differencing. The optimal lag length of 4, determined through AIC, FPE, and LR tests, ensures accurate modeling of dynamic relationships without overfitting. The Johansen co-integration test indicates three long-term stable relationships among the variables, suggesting that Rwanda's economic development is closely tied to its terms of trade in a stable, long-term equilibrium.

Diagnostic tests further confirm the validity of the model, with no significant issues of normality, heteroscedasticity, autocorrelation, or multicollinearity. The model accounts for a substantial share of the variation in the dependent variable, suggesting that fluctuations in the terms of trade have a meaningful influence on Rwanda’s economic development. Additionally, the stationarity of the variables ensures that the relationships modeled are consistent and reliable, highlighting the crucial role of stable trade dynamics and sound institutional and logistical frameworks in driving sustainable economic growth in Rwanda.

6. Recommendations

Drawing from the analysis results, it is advised that the Government of Rwanda and relevant policymakers to prioritize on improving trade logistics efficiency to facilitate smoother trade processes, reduce transaction costs, and enhance the competitiveness of exports. Fostering an efficient logistics sector is critical to addressing challenges related to trade facilitation, which could, in turn, boost economic development by enhancing Rwanda's position in regional and global markets. The government should invest in infrastructure development, improve customs processes, and strengthen port efficiency to reduce the costs of trade logistics. Additionally, policies aimed at stabilizing the export price index should be implemented to prevent volatile fluctuations that negatively impact Rwanda's export revenues. The establishment of stabilization funds or hedging mechanisms could help shield exporters from price shocks, ensuring more consistent economic growth.

Furthermore, enhancing Rwanda’s trade balance and improving its position in international trade will require focused efforts on diversifying exports, improving market access, and negotiating favorable trade terms. The government should promote sectors with high export potential, such as agriculture, manufacturing, and services, and implement trade agreements that favor Rwanda's economic interests.

Also, as imports and export price indexes play a critical role in shaping trade dynamics, the government should establish policies to monitor and control import prices to prevent inflationary pressures. Additionally, fostering financial policies that encourage foreign direct investment (FDI) and strategic partnerships in sectors that contribute significantly to trade balances can help stabilize the economy. Such initiatives will help foster a more robust trade environment and play a vital role in promoting Rwanda's long-term economic growth.

References

Acemoglu, D. (2021). *Economic growth and development: Theoretical perspectives*. MIT Press.

African Development Bank. (2016). *African economic outlook 2016: Sub-Saharan Africa*. https://www.afdb.org

Agyeman, S. (2020). The influence of the import price index on economic growth in Ghana. *Journal of African Economic Studies, 42*(2), 133–150.

Aye, G. C., Balcilar, M., & Gupta, R. (2021). Terms of trade shocks and economic growth in Sub-Saharan Africa. *Economic Modelling, 94*(1), 150–160.

Bakari, S., & Mabrouki, M. (2021). Impact of terms of trade on economic growth: Evidence from developing economies. *International Journal of Economics and Financial Issues, 11*(4), 1–8.

Bank of Japan. (2020). *Japan's economy and financial developments: 2020 annual report*. https://www.boj.or.jp

Barro, R. J., & Sala-i-Martin, X. (2004). *Economic growth* (2nd ed.). MIT Press.

Bleany, M., & Greenaway, D. (2020). The impact of comparative advantage on economic performance of developing countries. *World Development, 38*(3), 34–45.

Bleany, M., & Greenaway, D. (2020). The impact of terms of trade on economic performance in developing countries. *World Development, 38*(3), 34–45.

Enrique, G., Dedeleact, C., Jacoby, U., Pani, M., Hussain, M., Ramirez, G., Xu, R., Fuli, E., & Mulaj, A. (2015). *Rwanda: Economic growth and stability post-genocide*. International Monetary Fund. https://www.imf.org

Heckscher, E. (1919). The effect of foreign trade on the distribution of income. *Ekonomisk Tidskrift*.

Heckscher, E., & Ohlin, B. (1991). *Heckscher–Ohlin trade theory*. MIT Press.

International Monetary Fund. (2017). *World economic outlook: Sub-Saharan Africa*. https://www.imf.org

International Monetary Fund. (2019a). *The role of export diversification in economic growth*.

https://www.imf.org

International Monetary Fund. (2019b). *World economic outlook: Regional economic outlook: Sub-Saharan Africa*. https://www.imf.org

International Trade Centre. (2023). *The state of trade and logistics in Rwanda: Challenges and opportunities*. https://www.intracen.org

Khan, M., Shabbir, A., & Saeed, M. (2019). The impact of trade balance on economic growth in Pakistan. *International Journal of Economics and Finance, 11*(4), 67–80.

Kim, J., & Park, Y. (2020). Trade balance and its effects on South Korea's economic development. *Asian Economic Policy Review, 15*(1), 92–110. https://doi.org/10.1111/aepr.12369

Krugman, P., & Obstfeld, M. (2022). *International economics: Theory and policy*. Pearson Education.

Krugman, P. R. (2020). *International economics: Theory and policy* (11th ed.). Pearson Education.

Leamer, E. (1995). The Heckscher–Ohlin model in theory and practice. *Princeton Studies in International Finance, 77*, 1–54.

Leontief, W. (1953). Domestic production and foreign trade: The American capital position re-examined. *Proceedings of the American Philosophical Society, 97*(4), 332–349.

Lucas, R. E. (1988). On the mechanics of economic development. *Journal of Monetary Economics, 22*(1), 3–42.

Romer, D. (2021). *Advanced macroeconomics*. McGraw-Hill Education.

Romer, P. M. (1986). Increasing returns and long-run growth. *Journal of Political Economy, 94*(5), 1002–1037.

Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy, 98*(5), S71–S102.

Sachs, J. D., & Warner, A. M. (2021). *Economic reform and the process of global integration*. Harvard University Press.

Singh, R., & Verma, P. (2022). The effect of trade logistics efficiency on India's economic growth. *Journal of International Trade and Economics, 19*(3), 205–223.

South African Reserve Bank. (2020). *Annual economic review: South Africa*. https://www.resbank.co.za

Tadesse, H. (2018). The impact of export price index on Ethiopia's economic growth. *African Economic Review, 13*(1), 44–60.

Temple, J. (1999). The new growth evidence. *Journal of Economic Literature, 37*(1), 112–156.

Todaro, M. P., & Smith, S. C. (2020). *Economic development* (13th ed.). Pearson Education.