TRANSMISSION MECHANISM OF TRADE LIBERALIZATION POLICY ON ECONOMIC GROWTH IN ETHIOPIA: SVAR APPROACH

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Declaration

I, the undersigned, student declare that this research project Transmission Mechanism of Trade Liberalization Policy on Economic Growth in Ethiopia: An SVAR Approach is my original work, which has not been submitted for any award in any other institution, and all sources of information used in the project have been properly recognized.

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This is to certify that the thesis prepared by Shiferaw Gonfa Wakene entitled: Transmission Mechanism of Trade Liberalization Policy on Economic Growth in Ethiopia: SVAR Approach and submitted to in partial fulfillment of the requirements Degree of Master of Science in Economics (Economic Policy Analysis) complies with the regulation of the University and meet the accepted standards with respect to originality and quality.

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3SLS- Three Stage Least Squares

AfCFTA – African Continental Free Trade Area

ARDL- Autoregressive Distributed Lag

ECM- Error Correction Model

FDI – Foreign Direct Investment

FDI- Foreign Direct Investment

FEVD- Forecast Error Variance Decomposition

IFR- Impulse relationship Function

IMF- International Monetary Fund

MFN – Most-Favored Nation

MoTRI – Ministry of Trade and Regional Integration

OLS-Ordinary Least Square

RGDP- Real Gross Domestic Product

SAP- Structural Adjustment Program

SVAR- Structural Vector Autoregression

UNCTAD – United Nations Conference on Trade and Development

UN-United Nation

VEC- Vector Error Correction

WB- World Bank

WITS-World Integrated Trade Solution

WTO – World Trade Organization

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ABSTRACT

Transmission Mechanism of Trade Liberalization Policy on Economic Growth in Ethiopia: SVAR Approach

This study aimed to investigate the transmission mechanism of trade liberalization policy on economic growth in Ethiopia by using Structural Vector Autoregression (SVAR) approach with annual data from 1991 to 2024. The study identifies both direct and indirect channels through which trade liberalization policy effect real GDP via foreign direct investment (FDI), inflation, and exports. The results from impulse response function (IRF), structural coefficient matrices, and forecast error variance decomposition (FEVD) provide robust empirical understandings. The finding of the study reveal strong direct effect with tariff rate shocks explaining approximately 19.1% of real GDP. Among indirect channels, tariff rate induced increases in FDI accounts for 0.85% of real GDP growth variance. In inflation channel, declines following tariff reductions contribute 3.5% to real GDP growth. The export channel remains weak, contributing less than 2% to growth, limited by structural constraints in Ethiopian trade sector. These results underscore that trade liberalization affects economic growth both in short and long run, immediate effects through increased FDI inflows and reduced inflation and over the long run evidenced by IRF and FEVD results that shows positive and sustained increase in real GDP growth.

Keywords: ***Trade Liberalization policy, Economic Growth, SVAR, Ethiopia, Transmission Channels, Tariff Rate, FDI, Inflation, Exports***

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

The core idea of trade liberalization policy has been defined in different ways by different scholars, by emphasizing on different aspects of the policy. Without regard to specific in details, trade liberalization can be defined as the removal and reduction of trade barriers that hinder the facilitation of flow of goods and services across different borders of the countries freely. López (2005) trade liberalization as the process of reducing tariffs, quotas, and using government interventions to enhance international trade and sustain economic growth. Supporting this view, Bhagwati and Krueger (1978) also explain it as any policy measure that can help to reduce the anti-export within economy. In the same way, Acharya (2015) explains trade liberalization as the process of the removal of both tariff and non-tariff barriers in the international trading system. These all definitions collectively spotlight that trade liberalization is the process of more open up of economy for competitive trading environment, which can be considered as catalyst for improved economic performance.

The concept of trade liberalization is not its role as boosting trade volumes and economic output, rather it increasingly evolved as a strategic tools for inclusive development. As Sanjaya (2015) noted in his study; over the past few decades, trade liberalization viewed not only as a macroeconomic growth driver but also as a means of integrating marginalized populations especially the poor countries into global economy.

The outcomes of trade liberalization policy both in developing and developed economies have not always aligned with expectations that it articulated for. Especially over the last half century, in developing countries trade liberalization often implemented with the assumption that it would automatically stimulate growth; but, empirical evidence shows effectiveness these policy remains mixed (Morgan & Wright, 2001). Some countries experienced significant gains, while others continue struggling with uncertainty result and limited structural transformation. Furthermore, as Teshome (2020) notes, many developing countries including Ethiopia, implemented trade liberalization process in line with the policy prescriptions of the Washington Consensus, aiming to open their economies and to promote export competitiveness.

In our country context, trade liberalization process in Ethiopia started during the late of 1980s, following fallen Derg regime and has been growing with through time. From that time government of Ethiopia has adopted many initiatives, reforms and strategies to strengthen the free international trade flows that can expect to boost export sector of the country. For instance government of Ethiopia take reforms including reduction of trade barriers and opening of international trade to foreign competition in 1992 following the structural adjustment program (SAP) with the help of international monetary fund (IMF) and World Bank (WB) even though failed to attain the desired growth (Teshome, 2020). Aredo et al., (2006), also confirm that efforts of trade liberalization in Ethiopia started in 1992 with the re-structuring of the economy through Structural Adjustment Programme (SAP) by reducing tariff and non-tariff barriers.

Generally, Ethiopian trade liberalization policy reform started three decades ago, early 1990s following down fall of Derga regime. And particularly under the Homegrown Economic Reform Agenda (2019) that reflects a strategic shift from state-led protectionism domestic economy to market-oriented, export-driven growth. All these policies reform aimed to enhance trade competitiveness of the country, attract FDI, accelerate WTO membership and AfCFTA integration reforms that focused on reduction tariff, modernization of customs and to strengthen institutional (World Bank, 2022; MoTRI, 2023). Average MFN tariffs remain relatively high (17%), yet there gradual decline, especially capital goods trade are complemented by improved trade facilitation systems like National Single Window and risk-based inspections (WTO, 2023; UNCTAD, 2021).

Despite policy efforts to reduce tariffs, improve trade facilitation, and attract foreign investment, the expected structural transformation and economic growth gains remain limited. This raises critical questions about transmission mechanisms through which trade liberalization impact economic growth in Ethiopian. Understanding these dynamics is very important not only for past policy reforms evaluation, also for informing future policy direction and setting theoretical references. Against this backdrop, the following section outlines the specific problem that this study articulated to address.

1.2 Statement of the Problem

Many Studies concluded that, trade liberalization policy is one of the key strategies of promoting economic growth in many developing countries. It is expected that the removal and reduction of trade barriers like tariffs, quotas and import restrictions are

anticipated to enhance foreign direct investment, stimulate economic growth competition, improve resource allocation and expand access to global markets. However, the relationship between trade liberalization and economic growth is far from straightforward and it's complicated. In some studies empirical evidence shows that the impact of trade liberalization policies on economic growth various across countries and over time, depending on a range of factors such as institutional quality, economic structure, policy sequence, and sectoral dynamics (Winters, McCulloch, & McKay, 2004).

In Ethiopia, since early 1990s, following Derg overthrown, trade liberalization has been considered as central pillar of economic reform. The country has implemented various phases of trade liberalization aim to comprehensive transition to market oriented trade system, including tariff reductions, currency devaluation, and the removal of quantitative trade restrictions. Despite these efforts, the actual impact of trade liberalization policy on Ethiopian economic growth still unclear and up to debate (Hailegiorgis, 2012). While existing studies in the country such as (Zewdu & Minyahil, 2017), Teshome (2020) and Emagne (2017), acknowledge a general relationship between trade openness and growth, they often overlook the underlying transmission mechanisms through which liberalization policies exert their influence.

Specifically, little is known about how trade liberalization affects key macroeconomic variables such as foreign direct investment (FDI), inflation, exchange rates, export and import flows, and the balance of trade and how these variables in turn shape the path of economic growth. Thus lack of relevant studies on trade liberalization policy and how it transmit, leaves researchers and policymakers unsure of how this policy relate to the unique characteristics of the Ethiopian economy, such as its reliance on

agriculture, liability to external shocks and limited industrial capacity. Because of this, it limited knowledge of study on this area and complicates the efforts to formulate effective trade liberalization policy that can promote economic growth and sustainable growth. As a result, the impacts of trade liberalization policy on economic growth are often guessed based on feelings and assumed connections instead of being clearly shown through specific cause and effect relationships and it tramsmission.

Despite growing empirical and theoretical interest in the relationship between trade liberalization and economic growth in Ethiopia, there is no study explored the transmission mechanisms of trade liberalization on economic growth using structural macroeconomic approach. In particular, the Structural Vector Autoregression (SVAR) model, which allows for identification of dynamic interrelationships among macroeconomic variables and policy shocks, has not been applied Ethiopia. This represents a significant gap in the literature and methodological. Without an understanding of these mechanisms policy recommendations risk being misinformed or ineffective.

Therefore, this study aim to address these gap by applying an SVAR model to examine the transmission mechanisms through which trade liberalization policy impact economic growth in Ethiopia. The findings aim to contribute academic in understanding of both empirical and theoretical of trade liberalization policy transmission mechanism on Ethiopian Economic growth.

1.3 Research Questions

- How does trade liberalization policy transmit its effects on economic growth in Ethiopia?

By breaking down this general research question, this study aim to answer the following questions specifically;

I. Through which macroeconomic variables channels trade liberalization policy induced impact on economic growth?

II. Which macroeconomic variable channels are most responsive to trade liberalization policy?

III. What are the causal relationships between trade liberalization and economic growth in Ethiopia both in short-run and long-run?

1.4 Research Objectives

1.4.1 Main Objective

The main objective of this study is to analyze the transmission mechanism of trade liberalization policy on economic growth in Ethiopia, using an SVAR approach.

1.4.2 Specific Objectives

The specific objectives of the study are;

1. To examine direct and indirect variables channels through which trade liberalization policies transmitted to economic growth.
2. To determine which macroeconomic variable channels are most responsive to trade liberalization policy.
3. To identify the causal relationships between trade liberalization policy and economic growth both in short-run and long-run.

1.5 Scope of the study

This study aim to investigate the transmission mechanism of trade liberalization policy on economic growth in Ethiopia, by utilizing a Structural Vector Autoregressive (SVAR) model. The study limited to variables like tariff rate, real GDP, export, import, foreign direct investment, balance of trade, inflation rate and exchange rate data. The investigation seeks to understand how trade liberalization policy impacts economic growth, by identifying channels variables, their short and long run causality and find main responsive variables within the Ethiopian context trade liberalization policy and economic growth.

The time scope of this study covers the period from 1991 to 2024. The selected 34 decades; from 1991 to 2024 provides sufficiently long time span to capture the structural changes that take place in Ethiopia's economic and trade policy variables. In the early 1990s country hosted a major policy shift with the fall of the Derg regime and the introduction of market-oriented reforms, including trade liberalization measures. These selected decades witnessed for gradual deepening of liberalization policies by shifts tariff regimes, and growing integration to global economy. Extending the study up to 2024 allow for the inclusion of the most recent data that provide current status trade openness and how long-term liberalization policies have influenced economic growth. The study exclusively limited to Ethiopia, without comparison to other countries, in order to maintain depth and specificity. By focusing on these particular variables, model, and time span, the study intends to provide novel understandings of Ethiopian trade liberalization policy transmission channel into economic growth.

1.6 Significance of the study

Understanding the transmission mechanism of trade liberalization policy on economic growth in in country fully exploit all alternative in sector to achieve high performance in international trade that help to stimulation of economic growth. Since the paper is new study in country context it uses other researcher as bench mark for their further study. The findings will be valuable to key stakeholders, including policymakers who require evidence-based guidance for designing effective trade reforms, researchers who seek a foundation for further academic inquiry, private-sector actors such as exporters and importers whose competitiveness is shaped by trade policies, and development partners who support national economic strategies. By clearly identifying the channels through which trade liberalization influences economic growth, the study enables these stakeholders to make more informed and strategic decisions.

1.8. Limitation of study

This study conducted by using secondary data collected different sources based on their availably. Thus, since utilized data is secondary data, the study constrained by data availability and quality, as usual our country context, where macroeconomic data may be incomplete, inconsistent, or subject to revisions. The main variables such as trade liberalization, are represented by proxy variables, which is better if it has its own indicators like as that of developed countries. Thus this may not fully capture the broader institutional and policy dimensions of liberalization. Additionally the findings of the study are context-specific and cannot be generalized beyond Ethiopia due to its unique economic structure, policy framework, and institutional behavior.

1.9. Organization of the Paper

This paper organized in five chapters: The first chapter of the study encompasses introductory concepts, statement of the problem, research question and objectives of the study. Chapter two present relevant theoretical and empirical literatures are reviewed briefly along with conceptual framework. In chapter three there is discussion of research methodology data and data sources used in the study. Chapter four deal with result and discussion, which deeply presents estimation and interpretation of results. Finally, Chapter five present the conclusions and policy implication of the study.

CHAPTER TWO

2 LITERATURE REVIEW

In practice, trade liberalization policy has not had a long history, and even though massive liberalization of world trade began in the 1950s, many studies have been conducted on it, models and theories have been developed and yet there are still controversial issues in both theoretical and empirical analysis. The theories and empirical views that are relevant for this study are summarized as follows.

2.1 Theoretical Review

2.1.1. Mercantilist's Theory on Trade

The philosophy of mercantilism is followed by a group of people that includes merchants, philosophers, and government officials. This philosophy gets popular concern through sixteenth to eighteenth centuries, economic doctrine. This economic doctrine is the first dogma that finds out the reason for the existence of foreign trade. Mercantilists believed that a country's prosperity and strength depends on its potential to export more than it is importing. They suggested that a country becomes

prosperous (rich) when its exports exceed its imports. Thus, to promote exports and discourage imports tariff and other measures that hinder imports were taken and exports were subsidized leading to trade surplus, which involve the government intervention. This idea support that as surplus of export over import results in an inflow of bullion and precious metals mainly silver and gold. At that time a country's power and richness was determined by the amount of gold and silver it had (Salvator, 2001 p.32). The classical economists such as Smith (1776) and Ricardo (1821) as well as recent scholars criticized the Mercantilists in many grounds. However, although not widely applied, the Mercantilists doctrine is still practiced especially in the agricultural trade (Angewandte and Humburg, 2009) as cited in (Gebremedhin, 2013).

To sum up, from these conclusion they believe that trade liberalization, which allows for fewer restrictions on imports and exports, could undermine a country's ability to maintain a surplus in its trade balance. Therefore, they would prefer protectionist policies (like tariffs and quotas) to limit imports and ensure a trade surplus.

Contradict to this, while Mercantilist theory emphasizes protectionism and trade surpluses as a measure of national prosperity, Classical and Ricardian perspectives argue that free trade and specialization based on absolute or comparative advantage enhance overall welfare. This contrast highlights a fundamental debate in trade policy: whether restricting imports safeguards domestic wealth (mercantilist view) or whether liberalization maximizes efficiency and growth (classical view). For developing countries, this contrast becomes particularly important, as liberalization may generate growth through comparative advantages but also risks dependency on advanced economies (Tunoy & Shuki, 2006).

2.1.2 Classical Theory and Trade Liberalization Policy

Classical economic theory, particularly the views espoused by economists like Adam Smith and David Ricardo, presents a stark contrast to mercantilism. These group of economists support trade liberalization and emphasize the benefits of free trade between nations by focusing on the concept of absolute advantage and comparative advantage.

I. Absolute Advantage

According to Smith (1776) trade exists between two countries because of absolute advantage. When one nation has absolute advantage (is more efficient) in the production of good 'x' and has absolute disadvantage (is less efficient) in the production of good 'y', the two countries benefit each other by specializing and exchanging part of the commodity in which they have absolute advantage for the commodity they have absolute disadvantage (Carbaugh,2005 pp.29-30).

The process absolute advantage leads to more efficient resource allocation which results in an increased output of both commodities. The gain from specialization relates to such increased output of both commodities which is to be divided between the two nations through trade (Salvator, 2001 p.32). However, in practice, absolute advantage may not always apply perfectly to all situations. The challenge arises when countries have few or no absolute advantages or when industries suffer from increased competition and countries without an absolute advantage in any industry might struggle to benefit from free trade unless they invest in comparative advantages, which brings us to Ricardo's comparative advantage theory, often seen as a more robust argument for trade liberalization.

II. Ricardian Comparative Advantage

After Smith, David Ricardo (1772–1823) articulated theory of comparative advantage in 1817 in Principles of Political Economy and Taxation, they assumed that perfect competition and the full employment of resources in trade creation process. According to this principle countries can reap welfare gains by specializing in the production of those goods with the lowest opportunity cost and trading the surplus of production over with the rest of the word. At this point the trade liberalization policy concept arisen as perfect competition. According to Thirlwall (2002) the trade-creation gains that arise within Customs Unions or Free Trade Areas as the barriers to trade are removed between members, but the gains are once-for-all. This explain that, after tariff barriers are eliminated and no additional resource reallocation occurs the resulting static gains from trade become fully realized for countries.

Within the Ricardian model of comparative advantage, the formulation of trade policy has been a subject of significant debate, particularly in developing and socialist nations. As cited by Tunoy and Shuki (2006), Carchedi (1986) critically examined the applicability of Ricardo's comparative advantage theory to the context of developing countries engaging in trade with developed nations. He also offered a notable critique of how this theory has been employed by advocates of China's 'open-door' policy. The paper explores the application of Ricardo's theory of comparative advantage in the context of developing countries, with a particular focus on China's trade relationships with developed economies.

But the theory criticized for the way the theory has been used to justify China's 'open-door' policy, pointing out the theory's limitations and the complexities involved in its real-world application. The authors highlight the risks developing countries face, such

as exploitation through unequal exchange and technological dependency on advanced capitalist economies, suggesting that these concerns require deeper analysis to fully understand the trade-offs involved in applying the comparative advantage concept in trade policy (Tunoy & Shuki,2006). Thus even though it has limitations and unreliable assumptions, the theory encourages countries to trade liberalization where they have comparative advantages, which can stimulate growth, create jobs, and improve income levels. It can be especially important for developing countries seeking to grow their economies by opening up to international markets.

2.1.3 Heckscher-Ohlin Model and Trade Policy

Heckscher -Ohlin theory was established by and Eli Heckscher (1919) and Bertil Ohlin (1933). They postulated theory state that patterns of international trade are formed by existence of variations in factor of production endowments across countries. Accordingly, nations tend to export products that intensively use their abundant domestic resources and while import goods that require resources which are relatively scarce locally.

Earlier it was shown that the differences in relative commodity prices between two nations as the basis for comparative advantage which again also becomes the basis for the existence of mutually beneficial trade. However, what has caused such differences in relative commodity prices was left unanswered. This question is answered by the Heckler-Ohlin or factor endowment theory. This theory states that differences in indifference curves (tastes) and differences in production frontiers are the causes for the differences for relative commodity prices and comparative advantage between the two nations (Carbaugh,2005 P.63-64).

Over all, in the context of trade liberalization, this model suggests that countries should specialize in the production of goods that intensively use their abundant resources. By reducing trade barriers, countries can take advantage of their comparative advantages, leading to greater economic efficiency, growth, and global welfare ((Mgomezulu et al., 2024). The model suggests that countries should specialize according to factor endowments, emphasizing static efficiency gains from trade. In contrast, Endogenous Growth theory focuses on dynamic gains, such as technological transfer, FDI, and economies of scale. While Heckscher-Ohlin highlights resource-based trade advantages, endogenous growth theory implies that liberalization can stimulate long-term growth even for countries without abundant factors, provided they can attract technology and investment. These contrasting perspectives show that trade liberalization's effects may differ depending on whether a country relies on its factor endowments or seeks growth through innovation and knowledge spillovers.

2.1.4 Endogenous Growth Theory and Trade Policy

The endogenous growth theory offers a more robust and compelling conceptual framework for analyzing the connection between trade policies and economic growth. In contrast to the Solow (1956)–Swan (1956) model, which assumes diminishing returns to capital, endogenous growth models are based on the assumption of non-decreasing returns to reproducible factors of production, such as physical and human capital.

As many tried to mention, in this new generation of growth models, it is possible to establish long-term relationships between trade orientation and economic growth in various ways. First, import liberalization facilitates technology transfer through the

import of advanced capital goods (Grossman and Helpman, 1991). This is from the assumption that, the ability to import technologically superior capital goods is supported by increasing export revenues and greater foreign capital inflows, which depend on the country's capacity to repay using export earnings capacity. Second, an export-oriented development strategy typically leads to higher growth. This is because certain economic factors, such as returns to scale, indivisibilities, and the effects of competition, likely result in better economic performance under an export-oriented strategy compared to import substitution (Krueger, 1978). Third, foreign direct investment (FDI) transfers export technologies from industrial countries to developing nations, as observed in the East Asian economies. Fourth, outward orientation allows for the use of external capital for development without significant challenges in repaying the associated debt (Dollar, 1992). Fifth, opening up an economy boosts economic growth by enabling larger economies of scale in production, driven by the positive spillover effects from technological advancements in industrial countries.

2.2 Empirical Literature Review

As referenced from different academic sources the empirical relationship between trade openness and economic growth is a topic of considerable and interested among scholars of economics and it was source of debate for long time. Some studies report as trade liberalization policy supports economic growth and other report the mix of the result and conclude as refuted the theory. But for both results and conclusion of the study result the methodology and study scope was the matter as it follow different.

From this fact, Harrison (1996) and Edward (1998) study on various group of countries by employ cross section and panel data and suggest that trade liberalization policy boost economic growth at all. Conversely, studies using time series data for

individual countries have reveals mixed findings. For instance, Ahmed and Anoruo (2000) as well as Ferreira and Rossi (2003) found that trade liberalization positively influences economic growth, while Siddiqui and Iqbal (2005) reported a negative relationship between trade openness and growth. For the controversial result raised, Thirlwall and Pacheco (2008) also point out that trade liberalization by itself does not bring higher levels of economic growth, since it requires many strategies and tools that catalyst to move trade policy towards the export of goods with high added value. They argue that trade openness has not yielded the anticipated benefits proposed by orthodox economic theory, as developing countries have encountered competition from other developed nations, which has hindered improvements in productivity and wage growth. Even-though debates and related study result disparity being continued, there are many valuable studies employed by many scholars.

Wacziarg (2001) studied the relationship between trade policy and GDP growth in a panel of 57 countries from 1970 to 1989. He used a fully specified structural model, to assessed six channels through which trade policy could impact growth. Openness that to measure index three trade policy variables such as tariff barriers (import duties as a share of total imports), non-tariff barriers which proxy by unweighted coverage ratio for the pre-Uruguay Round period [1] and dummy variable that indicate liberalization status of countries. The fixed effect OLS results showed that three channel variables FDI inflows as a share of GDP, domestic investment rate, and macroeconomic policy were highly significant. And his study concluded that there is a positive relationship between trade openness and GDP growth.

[1] Trade policy metric used to assess the extent to which a country's imports were subject to trade protection measures—typically tariffs—before the **Uruguay Round** of multilateral trade negotiations under the **General Agreement on Tariffs and Trade (GATT)** (which took place from 1986 to 1994).

By fostering this fact, trade liberalization policies influence countries' economic growth through various transmission mechanisms. These mechanisms are through key macroeconomic variables that can be ranged from enhancing trade volumes, attracting foreign direct investment (FDI), and fostering competitive markets in the rest of the world. On the hand, the impact of trade liberalization on economic growth vary depending on countries' economic structure, institutional development, level of industrial development and complementary other macroeconomic policies. Solomon et al. (2024) carried out a study on the relationship between trade liberalization and economic growth in selected three West African nations; namely Côte d'Ivoire, Ghana, and Nigeria by utilizing secondary data from 1976 to 2023 and Autoregressive Distributed Lag (ARDL) model. By incorporating other relevant macroeconomic variables such as investment, inflow of FDI human capital, net and the exchange rate complement the contribution of trade to economic growth. Furthermore, more the study found that there is long-run positive and significant relationship between trade liberalization and economic growth in Cote d'Ivoire, Ghana, and Nigeria, indicating that as trade liberalization increases, economic growth in these countries also tends to improve.

As state by Wacziarg and Welch (2008), newly compiled dataset on openness indicators and trade liberalization timelines has enabled an extension of the 1995 Sachs and Warner analysis on the link between trade openness and economic growth into the 1990s. This developed study provides new insights into the lines of economic growth, physical capital investment, and openness during periods of trade policy liberalization. Findings from the updated dataset indicate that, between 1950 and 1998, countries that liberalized their trade regimes saw their average annual growth

rates increase by approximately 1.5 percentage points compared to pre-liberalization levels. Additionally, investment rates after liberalization rose by 1.5 to 2.0 percentage points, reinforcing earlier conclusions that trade liberalization promotes growth partly by encouraging greater physical capital accumulation. The average trade-to-GDP ratio also increased by about 5 percentage points, suggesting that liberalization effectively enhanced the degree of openness in liberalizing countries. Nonetheless, these average outcomes conceal significant cross-country variation. In addition, trade liberalization has been shown to foster economic growth, with Wacziarg and Welch (2008) providing new evidence that countries reducing trade barriers experience significant growth over time.

Regarding SVAR methodology in trade liberalization policy, (Shen & Abeysinghe, 2021) utilizes a trade-linked SVAR model to explore international transmission mechanisms affecting the world business cycle, which provide insights into the key macroeconomic variables consequences of trade liberalization policies on economic growth by using SVAR model. By using trade policy and structural vector autoregression (SVAR) model, authors analyzed complex global economic dataset to understand existing dynamic economic and interdependencies among sampled countries. Their findings show that SVAR model effectively captures business cycle fluctuations from trade policy changes offering solid framework for studying how these fluctuations spread internationally. The study also discusses the practical implications of these findings, particularly in evaluation of macroeconomic policy effects on recent trade disputes among major economies and it provide valuable insights for policymakers and economists.

Siddiqui & Iqbal (2010) also investigates how trade openness affects economic growth in Pakistan through intermediary mechanisms, by using 1973 to 2008 using a systematic simultaneous system of equations with the Three Stage Least Squares (3SLS) method. The study result shows that trade openness has positive effect domestic investment, foreign direct investment (FDI), and the Black Market Premium, while negatively impact macroeconomic stability. The study emphasizes on trade policy effect on growth is indirect, operating through transmission channels such as with domestic investment fostering growth, while FDI and the Black Market Premium acting as obstacles to economic performance.

To summarize, the relationship between trade openness and economic growth widely debate for long time as studies shows mixed results. Some studies, like Harrison (1996) and Edward (1998), suggests trade liberalization stimulate economic growth, while others, such as Siddiqui and Iqbal (2005), find shows that there is negative impact of trade liberalization on economic growth. Different from these, Thirlwall and Pacheco (2008) argue that trade liberalization alone is core for growth without complementary strategies. Many studies, including those by Wacziarg (2001) and Solomon et al. (2024), emphasize that trade liberalization influences growth through transmission mechanisms such as increased trade volume, FDI, and competitive markets. Additionally, the SVAR model, as used by Shen and Abeysinghe (2021), helps analyze international transmission mechanisms, capturing dynamic interdependencies among countries and offering insights into the macroeconomic consequences of trade liberalization on economic growth.

Empirical studies on trade liberalization and growth also reveal contrasting outcomes. Harrison (1996) and Edwards (1998) find positive effects of liberalization on

economic growth, supporting classical and Ricardian predictions. Conversely, Siddiqui and Iqbal (2005) report negative impacts in Pakistan, suggesting that liberalization may harm growth without supportive domestic policies. Thirlwall and Pacheco (2008) argue that liberalization alone is insufficient, highlighting the need for complementary strategies. These contrasting findings indicate that the effectiveness of trade liberalization is context-dependent, influenced by factors such as industrial capacity, institutional quality, and policy frameworks.

2.3 Study Conceptual Framework

The study of the transmission mechanism of trade liberalization policy on economic growth examines how the reduction of trade barriers, such as tariffs, affects various macroeconomic variables. Based on theoretical studies trade liberalization is expected to influence the economy by improving the flow of goods, services, and capital.

In this study conceptual framework drawn below aims to sketch key channels through which trade liberalization impact economic growth, focusing on chosen variables. The chosen variables are; tariff rate proxy for trade liberalization policy, exports, imports, foreign direct investment (FDI), real GDP (proxy for economic growth) inflation, exchange rate and trade balance. At the core of the framework there is trade liberalization policy, which refers to government's actions in reducing trade restrictions. As tariffs barriers are reduced, it assumed trade between countries becomes more efficient, leading to increase in both exports and imports of goods and services. This increase in trade flows, as domestic producers expand their markets and consumers gain access to a wider variety of goods at competitive prices it can boost economic activities. The policy primary affects tariff rate, which in turn expected to increases liberalized environment.

After its announcement, trade liberalization assumed to influence foreign direct investment (FDI) immediately. With fewer trade restrictions, foreign investors are more interested to invest in domestic industries, attracted by larger and more opened market. This, in turn, can lead to increased local industry productivity, technology transfers, and job creation. Further it contribute to economic growth. Next to this, in the next stage exchange rate will be affected by changes in trade flows and capital movements. A liberalized trade policy may lead to currency fluctuations as a result of shifting import and export dynamics and changes in capital flows (Balasubramanyam et.al., 1996).

The impact of trade balance is another key considerable variable in this study framework. As trade liberalization leads to high volume of imports due to more accessible foreign goods in the begging, trade balance will initially worsen as exports do not increase at the same rate. However, after sometime, trade liberalization enhance the competitiveness of domestic industries leading to higher exports and it create potential to improve trade balance. The impact on inflation depends on how these changes affect the prices of goods and services, particularly imports. A rise in import volume could lead to price stability or deflation, while exchange rate volatility could contribute to inflationary pressures if it's not managed properly.

Finally, as shown figure of conceptual framework below, trade liberalization policy by using selected variables to stimulate real GDP growth. As exports increase, foreign investment rises, and domestic industries become more efficient and competitive and import become cheap, real GDP expected to grow. The following figure present this idea in details.

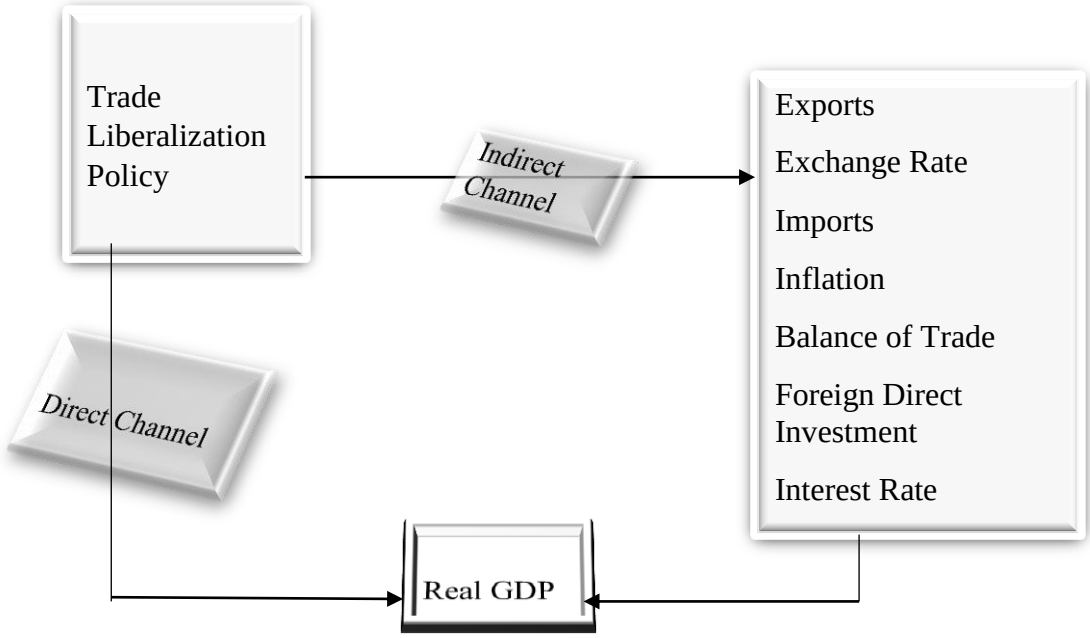


Figure 2.1 Study Conceptual Framework[2]

This drawn conceptual framework is grounded in key economic theories—including comparative advantage (Ricardo, 1817), the Heckscher-Ohlin model, endogenous growth theory (Romer, 1990), and new trade theory (Krugman, 1979). These theories link trade liberalization to economic growth through channels such as export expansion, FDI; technology transfer, and import; enhance competition.

[2] *The conceptual framework is developed by the researcher based on a synthesis of previous studies such as, Katerina et.al, 2024; Siddiqui & Iqbal, 2010) and theoretical underpinnings in international economics.*

CHAPTER THREE

3. METHODOLOGY OF THE STUDY

This chapter present the methodological study approach and study frame that used in the study of transmission mechanism of trade liberalization policy on economic growth in Ethiopia by employing SVAR approach.

3.1 Research Approach

In this study, combines both theoretical analysis with quantitative methods, while the investigation of how trade-liberalization policy transmits its effects to economic growth in Ethiopia.

3.2 Research Techniques

This study conduct by using the econometrics technique. The model that use in this study is Structural Vector Autoregression (SVAR) approach by using the STATA application.

The study investigates the transmission mechanism through which trade liberalization policy impact economic growth in Ethiopia, using a Structural Vector Autoregressive (SVAR) model. The analysis utilize annual data spanning from 1991 to 2024 focusing on macroeconomic key variables such as tariff rate, real GDP growth, inflation rate, exchange rates, foreign direct investment (FDI), and interest rates, export, import and balance of trade. The design includes assessing the impact of trade policy reforms on the key of the economic variable economic growth through impulse response functions and variance decomposition analysis. Structural identification achieved by imposing theoretical restrictions based on the economic theory of trade and growth. Model validation involve diagnostic tests such as model stability, lag order selection, stability conditions, normality of residuals and econometrics estimation techniques.

3.3. Data Source and Data Type

The data utilized in this study sourced from the National Bank of Ethiopia, Customs Commission, the World Bank, and other reputable economic databases such as UN COMTRADE (WITS, World Bank) database.

3.4. Variables Definitions

Tariff Rate (TRt)

Tariffs are primarily implemented to protect domestic producers; however, governments also use them as a tool to limit imports, thereby encouraging the consumption of locally produced goods. In this study it represented as percentage form and simple weight average of imported goods.

Real Gross Domestic Product (RGDP)

Real GDP is key macroeconomic statistic variable that measures the value of the goods and services produced by an economy in a specific period, for a year. And it used as adjusted for inflation countries used it measures as country's total economic output. Governments uses real GDP as metrics for analyzing economic growth.

Exchange Rate (Ert)

An exchange rate is the price at which one currency can be exchanged for another and it’s a crucial component of the global financial system that affecting international trade, investment, and trade policy. In this study it represents the value of Ethiopian Birr (ETB) in terms of American Dollar (USD) which is nominal effective exchange rate.

Import of Goods and Services (Imt)

Imports of Goods and Services refer to the total value of goods and services one country purchased by residents from foreign countries over a specific period of time. In this study, it represents the flow of products, both physical and non-physical (services) in value of USD.

Export of Goods and Services (Ext)

Export of Goods and Services defined as the total value of goods and services produced in one country and sold to other countries and it play a crucial role in the economy as generate revenue for a country, create a jobs and contribute to economic growth. In this study export variable used annual data of Ethiopian export goods and services with value of USD.

Foreign Direct Investment (FDI)

Foreign Direct Investment (FDI) refers to an investment made by an individual or company from one country into business operations located in another country. In the context of this study, it specifically pertains to foreign companies investing in Ethiopia and its time series data collected from National Bank of Ethiopia in millions of USD.

Inflation Rate (IRt)

The inflation rate represents the annual percentage change in the general price level of goods and services within an economy. It indicates the pace at which prices rise over time, thereby reduced the purchasing power of money. Essentially, inflation reflects how much more costly a standard basket of goods and services has become compared to a previous period and data of this variable included in this study and data of CPI considered.

Balance of Trade (Bot)

Balance of Trade refers to the difference between the value of a country's exports and imports of goods over a specific period, typically a year or a quarter. It is a major component of a country's current account in the Balance of Payments. In this study it will be measured as Balance of Trade=Exports of Goods−Imports of Goods

3.5. Research Design

As the main object of this paper was to examine the transmission mechanism of trade liberalization policy on Ethiopian economic growth from 1991 to 2024; to conduct it firstly indicator variables identified by on theoretical literature. By following, the data of selected variables collected from different data sources as their availability. By using the collected data, in the next task the statistical analysis based the procedures of statistical measurement using the econometrics tools line within selected economic model employed.

3.6. Model Specification

3.6.1. Model Estimation

Among econometrics models to fulfill the objectives of study, identifying and selecting appropriate time series economic model is milestone in methodology work for this study. For this purpose this Structural Autoregressive (SVAR) model assumed to best fit for this study.

To begin, in order to investigate the channel through which trade liberalization policy transmitted to economic growth, as Suryandaru (2023) explained there are different research methods and country-specific factors. But as Frankel and Romer (1999) certain methodology we choice will lead us some constraints. Notwithstanding to this,

Edwards (1998) analyzed the relationship between trade openness and total factor productivity (TFP) growth using comparative data from 93 countries for the period 1980 to 1990. He employed nine trade policy indices, three of which were related to openness (lower policy intervention) and six to trade distortions (greater departure from free trade).

To curb this problem recently many indicator of trade liberalization/ openness introduced as works works of Frankel (2001), Sachs and Warner (1995), Squalli and Wilson (2011), and Tang (2011), even though, the trade share remains the most used indicator of commercial openness (Tang 2011).

According to Abdu et al., (2003) illuminating the exact meaning of liberalization is trial matter and different from what traditional trade define. Trade regulation has evolved from traditional methods such as import licensing, tariffs, quantitative restrictions, and foreign exchange controls to more recent mechanisms, including the enforcement of technical standards, implementation of rules of origin, application of anti-dumping measures, and other similar tools. Given these multiple dimensions of trade restricting measures, it is difficult to obtain an indicator that can be considered as the best measure of openness and trade liberalization (Andriamananjara and Nash, 1997). As cited in Abdu et al., (2003), McCulloch, et al. (2002) presented the summary of trade liberalization measurement indicators as follows.

Table 3.1: Trade Liberalization Measures Indicators Definition

SN	**Measure/Indicator**	**Definition**
I.	Trade dependency ratio	The ratio of exports and imports to GDP

II.	Growth rate of exports	The growth rate of exports over the specified period
III.	Tariff averages	A simple or trade-weighted average of tariff levels
IV.	Collected tariff ratios	the ratio of tariff revenues to imports
V.	Coverage of Quantitative Restrictions	The percentage of goods covered by quantitative restrictions
VI.	Black market premium	The black market premium for foreign exchange, a proxy for the overall degree of external sector distortions
VII.	Heritage Foundation index	An index of trade policy that classifies countries into five categories according to the level of tariffs and other (perceived) distortions
VIII.	IMF index of trade restrictiveness	A composite index of restrictions on a scale of 0 to 10
IX.	Trade bias index	The extent to which policy increases the ratio of importable goods' prices relative to exportable goods' prices compared to the same ratio in world markets

X.	The World Bank's outward-orientation index	An index that classifies countries into four categories depending on their perceived degree of openness
XI.	Sachs and Warner index	A composite index that uses several trade-related indicators: tariffs, quota coverage, black market premia, social organization and the existence of export marketing boards
XII.	Leamer's openness index	An index that estimates the difference between the actual trade flows and those that would be expected from atheoretical cross-country trade model

Source: McCulloch, et al. (2002), p.14. Abdu et al. (2003)

By considering all these concept, this paper employ the structural vector autoregression (SVAR) approach as proposed by (Pesaran and Smith 1998) to assess the transmission mechanism of trade liberalization policy on the Ethiopian economy.

Same as Katerina et al. (2024) the study adopt methodology suggested by Shahbaz (2012) and Khalid (2016), in selecting the variables and determining the order of the variables in the model. Thus this study employ the structural vector autoregression (SVAR) method by incorporated best fitted methodology and technique.

Structural Vector Auto regressions (SVAR) Model

Structural Vector Author egression, SVAR models are an extension of Vector Autoregressive (VAR) model was introduced by Christopher Sims in the 1980s used

in econometrics to analyze the dynamic impact of structural shocks on economic variables. While standard VAR models capture the linear interdependencies among multiple time series, SVAR models impose additional structural constraints to identify and interpret these relationships causally. Furthermore, SVAR model allow researchers to identify and analyze the effects of unexpected economic shocks (e.g., policy changes, shocks) on economic system by incorporating theoretical restrictions that related economic theory. Thus, SVAR models facilitate causal interpretation of impulse response functions, help to understand the direction and magnitude of shocks' effects. (Gottschalk, 2001), (Pfaff 2008).

Thus the study adopts a Structural Vector Autoregression (SVAR) model to analyze the transmission mechanism of trade liberalization on economic growth in Ethiopia in this study. The SVAR model is chosen over alternatives like reduced-form VAR or single-equation models because it allows for causal interpretation of structural shocks, such as trade liberalization policy, by incorporating economic theory-based restrictions. This model well-suited for many shock analysis, particularly, in examining dynamic, interdependent relationships among macroeconomic variables and tracing the impact of policy shocks over time. The underlying assumptions include stationarity of the variables, orthogonality of structural shocks identification through contemporaneous restrictions derived from theoretical and empirical insights.

In recent years, as it captures changes in policy stimulation simple to restrict variables, structural vector autoregression (SVAR) models have become a popular tool in the analysis of the transmission mechanism model that effect from business cycle fluctuations, introduction to policy implementation (Blanchard and Quah, 1989).

The model used are widely used to study various economic phenomena, such as the transmission mechanisms of policies, the sources of business cycle fluctuations, the impact of supply and demand shocks on macroeconomic variables.

$$A_0 y_t = A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p} + e_t \ldots\ldots\ldots *$$

Where:

- y_t is the n×1n vector of endogenous variables (economic variables of interest, such as GDP, inflation, exchange rates, trade balance, etc.).
- $A_0 \ldots. A_p$ is the n×nn matrix that captures short term relationships between variables. (This is matrix identifies the structural shocks and represents transmission mechanism).
- e_t is the n×1n vector of structural shocks or innovations (for example, a trade policy shock, in this study case).

In summarized form the above mathematical expression can rewrite as follows

$$\Gamma Y_t = \beta X_t + e_t \quad \text{---------- 1}$$

Here Γ (Gamma) is a matrix of coefficient representing the contemporaneous relationship between endogenous variables (variables determined within the model), Y_t is a (n x 1) vectors of endogenous variables at time t, X_t contains the exogenous and lagged endogenous variables at time t, β (beta) is a matrix of coefficient representing the impact of exogenous variables, variables determined outside of the model and e_t is gives the variance-covariance matrix of the structural innovations.

By introducing a co-integrating VAR model integrates a cointegration matrix into a VAR model, resulting in a general vector error correction model (VECM), as proposed by (Pesaran & Pesaran, 1997), the above equation will be came:

$$increment\ \Delta X_i = a_{ox} + a_{ix}t - \pi_x q_{t-1} + \Sigma_{i=1}^{p-1} \Gamma_{ix}\, \Delta q_{t-1} + \Psi w_t + t_t t =$$

$$1,2 \dots \dots n \text{ ----------2}$$

Where qt = (xt', zt')', xt is a vector of jointly determined (endogenous) I (1) variables, zt is a vector of exogenous I(1) variables, wt is a vector of exogenous/deterministic I(0) variables (excluding the intercepts and/or trends), ut is a white noise vector of error terms, Γ ix is a short run matrix of parameters, and Πx is the long run multiplier matrix. With the ordering of variables in xt as follows Trt, GDPt, Imt, Ext, Fdit, Irt, Bott β' can be written explicitly as follows:

$$\begin{bmatrix} \beta 11 & \beta 21 & 1 & 0 \dots & 0 \\ \beta 12 & 1 & 0 & 0 \dots & \beta 52 \\ . & . & . & . & . \\ \beta nm & & & & \beta np \end{bmatrix}$$

From this we assumed that the augmented elements in the fifth column correspond to the linear trend (t). This VAR system may be transformed into a "structural" VAR model (SVAR). The co integrating VAR and SVAR parameters are related through AΠi = -Ai, for i = 2,1 ,....k, and AΣA'= Ω. This leads to the establishment of the following relationship:

$$\Sigma = A - t\, BB`\, A - t \text{ ----------3}$$

By applying restriction to specific components of the matrices facilitates the determination of structural shocks, known as contemporaneous at this stage. Since our focus in this Structural Vector Autoregression (SVAR) lies not in the elements of

matrices A and B, but predominantly in the subsequent analyses of Impulse Response Functions (IRF) and Forecast Error Variance Decomposition (FEVD). Then the full matrix of SVAR model in matrix form can be written as:

$$a_{ij}\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 & 0 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 & 0 & 0 & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & 1 & 0 & 0 \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} & a_{76} & 0 & 0 \\ a_{81} & a_{82} & a_{83} & a_{84} & a_{85} & a_{87} & a_{88} & 1 \end{bmatrix} e_j \begin{bmatrix} e^{Trt} \\ e^{Rgdpt} \\ e^{\mathrm{Ert}} \\ e^{Imt} \\ e^{\mathrm{EXt}} \\ e^{FDIt} \\ e^{IRt} \\ e^{BoTt} \end{bmatrix} = b_{ij} \begin{bmatrix} e^{Trt} \\ e^{Rgdpt} \\ e^{\mathrm{Ert}} \\ e^{Imt} \\ e^{EXt} \\ e^{FDIt} \\ e^{IRt} \\ e^{BoTt} \end{bmatrix}$$

In these matrix a_{ij} : elements from matrix A, ε: innovation (error) of variables used by j, b_{ij}: element from B (in this case i=j for i,j = 1,....,8), ej : structural shocks from variable j.

After this all done in the next step the study identify the channel variables and determine the long run and short run effect of trade liberalization policy shocks variable by using Impulse relationship Function (IFR) and Forecast Error Variance Decomposition (FEVD) based on SVAR result.

After variables that included in and model that suitable for the study identified based on theoretical and conceptual framework, setting variables as criteria of economic theory and SVAR model is the main task. According variable order and its justification based on theory presented in the following table u.

Table 3.2.1 Variables Order with Justification Summary

Order	Variable Name	Assumption and Justification
1	Tariff Rate	Tariff rate is trade policy tool set by the government, often fixed in the short run and not reactive to macroeconomic shocks within short time like, quarter. It is treated as exogenous. (Kim & Roubini, 2000; Blanchard & Perotti, 2002)
2	Foreign Direct Investment	FDI decisions depend on structural and policy factors, such as openness and tariffs, but they respond slowly to shocks in domestic macroeconomic indicators. (Agbloyor et al., 2014; Lensink & Morrissey, 2006)
3	Exchange Rate	The exchange rate can respond to external flows like FDI and trade policy but is slower than prices or output to react to shocks in the system. (Obstfeld & Rogoff, 1995)
4	Inflation Rate	Inflation reacts to movements in the exchange rate and is a relatively flexible nominal variable, but does not contemporaneously respond to trade shocks. (Sims & Zha, 1999)
5	Export of Goods and Services	Exports depend on price competitiveness and exchange rate movements, and respond with lags to changes in inflation and global demand. (Rodrik, 1995; Edwards, 1998)

Order	Variable Name	Assumption and Justification
6	Import of Goods and Services	Imports are more responsive than exports to inflation and exchange rate fluctuations, and are impacted by domestic demand conditions. (Bahmani-Oskooee & Niroomand, 1998)
7	Balance of Trade	The trade balance reflects the combined effect of exports and imports, making it an aggregated outcome of external sector performance. (Milesi-Ferretti & Razin, 1996)
8	Real Gross Domestic Product	Real GDP is the most endogenous variable, influenced by policy, trade, and macroeconomic variables. It reflects the overall impact of shocks across the economy. (Blanchard & Quah, 1989; Bernanke & Mihov, 1998)

Impulse relationship Function (IFR)

In this study, Impulse Response Function (IRF) serve main tool to analyze the transmission mechanism of trade policy on economic growth by using Structural Vector Autoregression (SVAR) model. Impulse Response Function (IRF) allows to trace the dynamic effects of trade policy shocks on economic growth over time and it provide comprehensions both short-run and long-run adjustment processes. This analyze build on basic concept and methodological developments of IRF in econometrics. By employing IRF, in thi study aim to uncover the pathways through which trade policies influence economic growth and identifying the moments and durations of impact.

As Lütkepohl (2010), an impulse response function (IRF) describes how a dynamic system responds over time to a one-time shock in one of its variables. In time-series econometrics, an IRF traces the path of each endogenous variable following a pulse or innovation in a specified equation. IRFs are widely used in applied macroeconomics and finance because they capture the dynamic multipliers or propagation of shocks implied by a model.

As cited in (Montiel et.al, 2021), increasingly important line of research in Structural Vector Autoregressions (SVARs) uses information in variables not included in the system to identify dynamic causal effects, which in VAR terminology are structural impulse response functions.

By an SVAR framework, computing IRF will straightforward once the model is estimated. One inverts the SVAR to obtain the result by recursive substitution or multivariate inversion. In practice STATA software will solves recursively by using a companion-matrix power. The IRFs then plot each response variable's trajectory following a unit shock in each equation. As written above SVAR model is

$$A_0 y_t = A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p} + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1A$$

Or equally it can be rewrite as

$$y_t = {A_0}^{-1}(A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p}) + {A_0}^{-1} e_t \ldots\ldots\ldots\ldots\ldots\ldots 1B$$

Where, A_0 captures the contemporaneous relationships between the variables, and e_t are the (orthogonal) structural shocks. From these SVAR equation an impulse response function (IRF) are derived from matrix representation as:

$$y_t = \sum_{h=0}^{\infty} \Psi_h \, e_{t-h} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

Here $\Psi_h = \Phi_{h-1}$ and Φ_h are the MA coefficients obtained from the reduced-form SVAR. In short the theory behind IRF in SVARs parallels the standard VAR case, except that the structural IRFs Ψ_h are obtained after imposing identifying restrictions on the contemporaneous matrix A_0.

After this expression identified with variable and theoretical setup simply impulse response function will be done from estimates of the impulse responses are then obtained from the VAR parameter estimates, which we obtained from estimates the SVAR parameter estimates by using least squares, maximum likelihood or Bayesian methods.

CHAPTER FOUR

4. RESULTS AND DISCUSSION

4.1. Introduction

Here this chapter presents the empirical results and discussion of the study on the title transmission mechanism of trade liberalization policy on economic growth in Ethiopia using the Structural Vector Autoregression (SVAR) approach as stated. The aim is to analyze how trade liberalization policy proxy variable; tariff rates, interact with real GDP and transmit its effect through to economy.

The chapter start by presenting statistical characteristics of selected variables in study, summary of preliminary diagnostic tests such as stationarity test and optimal lag length selection and model stability test. It then presents and interprets the SVAR model results, followed by impulse response functions (IRFs) and forecast error variance decomposition (FEVD). These tools are used to trace the dynamic responses of economic growth to structural shocks in trade policy-related variables and to assess the relative importance of these variables in explaining fluctuations in real GDP.

4.2 Descriptive Statistics and Preliminary Analysis

Under this sub title the descriptive statistics and preliminary diagnostics of the variables used in the analysis to understand the statistical properties of econometric modeling presented before proceeding to analysis part of the study. Thus proceeding to this descriptive statistics of variables that incorporated in the study presented in table form with deep discussion.

4.2.1. Descriptive Statistics

Table 4.1 provides the brief and summary description the variables incorporated in this study model. This brings to bear the validity and setting of the data of the variables.

Variable	Obs	Mean	Std. Dev.	Min	Max
Yr	34	2007.5	9.958	1991	2024
TRt	34	21.277	5.327	17.5	35
EXPt	34	111343.43	168896.74	3289.57	652778.75
IMt	34	263387.3	370936.27	10260	1382079.1
FDIt	34	38483.563	60448.536	0	218577.19
EXRt	34	16.577	14.335	2.07	55.96
INFt	34	12.836	13.532	-10.77	55.24
BTt	34	-152043.87	204449.75	-729300.38	-5096.99
RGDPt	34	907092.74	762633.5	125406.28	2603952.8

Table 4.3 Summary of Descriptive Statistics

Source**:** Author's Calculations using STATA 15

As presented above, table 4.1 summarize the statistics of the key variables used in the empirical analysis over the study period that has time span from 1991 to 2024. The

dataset comprises 34 annual observations time spanning from 1991 to 2024. The variables show significant variation, reflecting both economic growth and volatility in selected variables of macroeconomic indicators over time.

Accordingly, all variables that included in the study has 34 observation; specifically tariff rate in the country over time shows minimum of 17.5 and maximum of 35% applied sample rate and it has mean of 21.2 percent which basically indicates trade protection of the country. Also this indicates that moderate trade policy changes in Ethiopia over time. Export values (EXPt) averaged around 111 billion, while imports (IMt) were surpass 263 billion, reflectes that there is persistent trade imbalance in the country. This gap is further confirmed by the negative average balance of trade (BTt), which stood at -152 billion, suggesting that the country consistently imported more than it's exported.

Foreign Direct Investment (FDIt) shows that average of 38.48 billion with high standard deviation of 60448.5 which indicate uneven flows of foreign direct investment in the country between study years in country. Similarly, exchange rate (EXRt) exhibited wide variation, with the local currency depreciating significantly from a minimum of 2.07 at initial to maximum of 55.96 per U.S. dollar and followed with higher figure as a result of current float currency regime reform. On the other hand, inflation (INFt) also showed volatility, with values ranging from deflationary levels (-10.77%) to high inflation (55.24%), averaging around 12.84%, reflecting there is macroeconomic instability in the country.

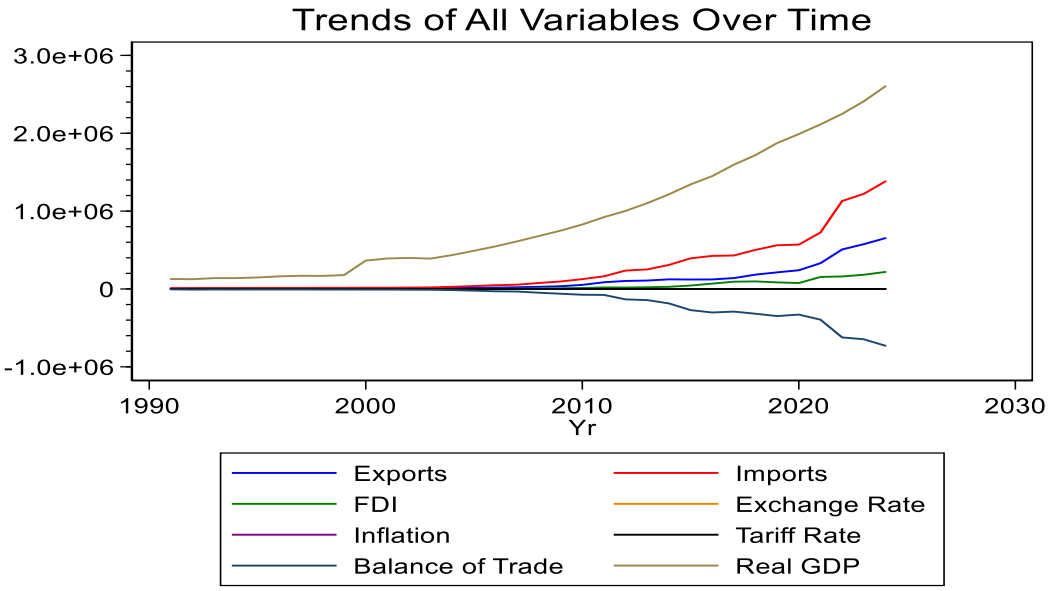
Real Gross Domestic Product (RGDPt), used as a proxy for economic growth, showed substantial growth during the study period. The average RGDP was approximately

907 billion; which calculated from minimum value and maximum value, increasing from minimum of 125 billion to a maximum of over 2.6 trillion. This strong incremental trend in real GDP suggests that there is expanding economy in the country, despite there is structural challenges posed by trade deficits, inflation volatility, and fluctuating foreign direct investment levels in the country. Overall, these descriptive analysis presented in table above, reveals key patterns and dynamics macroeconomic variables that set the discussion stage for the empirical investigation of trade liberalization's effect on economic performance in the Ethiopian context in next sub topics.

4.2.2. Trend Analysis

Here this section reveals trend analysis of trade liberalization indicators variables and their relationship with economic growth in stated time span from 1991 to 2024.

Figure 4. 2 Graph of Variables Trend Analysis



Source**:** Author's work using STATA 15

As indicated from above figure 4.2 tariff rate declined from 35 percent to 17.4 percent over time included in study. This indicates that there is strong commitment of country to liberalize trade reform. Also the trade openness to world show strong improvement as it parallel to export and import to real GDP which is other concept did not included in this study. Sharp and consistent rise is observed in real GDP in stated years, which indicates substantial economic growth over the years. This growth in real GDP accompanied with significant increase in both imports and exports, though the faster pace of import growth compared to exports underscores causes to Ethiopia's widening trade deficit. This is further confirmed by the increasing trend of balance of trade, which remains negative throughout the period, becoming more prominent after 2010.

The exchange rate exhibits clear and steady increase from beginning to end of sampled years, it reflects that depreciation of the Ethiopian birr against USD over years. FDI inflows show upward trend and it not sharply, with noticeable fluctuations at meanwhile, suggest that inconsistency in investment inflows. Tariff rates appear relatively stable with slight downward movement, implying gradual trade liberalization efforts and commitments reforms. On the other hand, while inflation was relatively stable at sometimes, there is periods of spikes and volatility, particularly in the mid-2000s and early 2020s.

In general this chart vividly illustrates the structural challenges facing the Ethiopian economy particularly the persistent trade imbalance and currency depreciation while also highlighting the progress made in output growth and trade liberalization from commitments made by government such as reduction of tariff rate.

4.2.3. Correlation Matrix

Table 4.4 Correlation Matrix Summary Table

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) yr	1.000								
(2) trt	-0.777	1.000							
(3) expt	0.785	-0.348	1.000						
(4) imt	0.827	-0.382	0.992	1.000					
(5) fdit	0.810	-0.360	0.970	0.981	1.000				
(6) exrt	0.874	-0.477	0.982	0.989	0.973	1.000			
(7) inft	0.416	-0.188	0.425	0.414	0.396	0.419	1.000		
(8) btt	-0.852	0.406	-0.974	-0.995	-0.979	-0.983	-0.400	1.000	
(9) rgdpt	0.954	-0.575	0.907	0.940	0.933	0.960	0.431	-0.957	1.000

Source**:** Author's Calculations using STATA 15

The correlation matrix illustrated table 4.3 above, provides comprehension of relationships among variables used in this study. The results show that real GDP (rgdpt) has a strong and positive correlation with most economic indicators, particularly with exchange rate (0.960), imports (0.940), exports (0.907), and foreign direct investment (0.933). These strong associations suggest that as trade and investment activities increase, Ethiopia's economic growth also expands, highlighting the importance of openness and external flows in driving output growth

A remarkable figure here in this table is that there is negative relationship between tariff rate and real GDP (-0.575) which imply that trade liberalization through tariffs rate reduction lead to higher economic performance. Additionally, the exchange rate is positively correlated with exports, imports, and FDI which in turn suggesting that depreciation of the Ethiopian birr stimulates external sector activities, which also contributes to the widening of trade deficit in the country. Furthermore, inflation, shows relatively weak correlations with other variables, directs that it not the primary driver of growth in this study context.

Multicollinearity Diagnostics

In this study, all variables are included as endogenous in the SVAR system to capture their joint dynamics and the transmission mechanism of trade liberalization on economic growth. While some macroeconomic variables, such as trade liberalization policy, FDI inflows, and exchange rates, are highly correlated, this is expected in time-series data and does not pose a problem for SVAR estimation. Unlike single-

equation regressions such as OLS, VAR/SVAR models rely on lagged interactions rather than exogenous regressors, and therefore standard multicollinearity diagnostics such as the Variance Inflation Factor (VIF) are not applicable. High correlations among the variables reflect genuine economic relationships and do not compromise the validity of impulse response functions, variance decompositions, or other structural analyses (Sims, 1980; Lütkepohl, 2005; Enders, 2015).

4.3 Stationarity and Unit Root Tests

Before proceed to estimation of any model of time series variables, it is important to examine the stationarity properties of variables to ensure the reliability of the regression results. As emphasized by Gujarati and Porter (2009), Enders (2015), and Hamilton (1994), failure to address nonstationary issue can lead to spurious and misleading statistical inferences in time series models. By its nature time series data often exhibit trends or non-stationary behavior, which can lead to spurious regression results if not properly addressed. Therefore, based on this concept unit root tests were conducted to determine whether the variables are stationary in their levels or require differencing to achieve stationarity by using ADF (Augmented Dickey-Fuller). Thus the following table 4.3 shows these results.

4.3.1. ADF (Augmented Dickey-Fuller)

The Augmented Dickey-Fuller (ADF) test is used to determine whether a time series variable is stationary, which is a critical prerequisite before applying many time series models such as VAR, VECM, and SVAR. Stationarity implies that the statistical properties of the series such as mean and variance remain constant over time.

Table 4.5 ADF Test Summary Table (with Variable Names, p-values & Significance)

Variable Name	Variable Code	Level p-value	1st Diff p-value	Order of Integration	Remark
Exchange Rate	lnexrt	0.5246	0.0006***	I(1)	Stationary at 1st diff
Tariff Rate	lntrt	0.0115**	—	I(0)	Stationary at level
Real GDP	lnrgdpt	0.8404	0.0001***	I(1)	Stationary at 1st diff
Foreign Direct Investment	lnfdit	0.6970	0.0000***	I(1)	Stationary at 1st diff
Inflation Rate	lninft	0.0105**	—	I(0)	Stationary at level
Export of Goods & Services	lnexpt	0.9915	0.0958*	I(1)	Stationary at 1st diff
Import of Goods & Services	lnimt	0.9904	0.0760*	I(1)	Stationary at 1st diff
Balance of Trade	ihsbtt	0.9943	0.0402**	I(1)	Stationary at 1st diff

*** = p < 0.01 (1% level)

** = p < 0.05 (5% level)

* = p < 0.10 (10% level), Source**:** Author's Calculations using STATA 15

As shown on the above table 4.4, majority of macroeconomic variables included in this study, such as real GDP (lnrgdpt), exchange rate (lnexrt), foreign direct investment (lnfdit), exports (lnexpt), imports (lnimt) and balance of trade (lnbtt) are found to be stationary at order one, I(1). This indicates that, these variables are non-stationary in their levels but become stationary after taking their first difference. This result aligns with the behavior of many macroeconomic variables, which often exhibit trends and persistent shocks over time.

On the other hand, inflation (lninft) and tariff rate (lntrt) are found to be stationary at their level; I(0). The stationarity of the inflation suggests that it fluctuates around a stable mean and does not exhibit a unit root, which may reflect the effectiveness of monetary policy to stabilizie prices. Similarly, the tariff rate being I(0) could indicate that trade policy changes are relatively infrequent and it be controlled by policy leading to stationary pattern in the data.

Although the variables in this study model exhibit mixed orders of integration, some being stationary at level (I(0)) and others requiring first difference to attain stationarity (I(1)) the SVAR model being estimated in levels. This decision is guided by the structural objective of the analysis: to trace the transmission mechanism of trade liberalization policy on macroeconomic variables such as economic growth, FDI, inflation, exchange rate, and trade flows. Estimating the SVAR in levels preserves long-run information that would otherwise be lost through differencing, which is particularly important for policy analysis in the Ethiopian context. The practice of including mixed I(0)/I(1) variables in SVARs is supported by Sims (1980),

Stock and Watson (2001), and Lutkepohl (2005), and has been empirically validated in major studies such as Blanchard and Perotti (2002). Provided that none of the series are integrated of order two (I(2)) or exhibit explosive behavior, the level-based SVAR yields consistent and interpretable impulse responses, making it an appropriate and robust methodological choice for this study. Furthermore, I opted for SVAR for the following reasons. First, the primary interest of this study is to trace the short- to medium-term induced of structural shocks (trade-liberalization shocks) across macroeconomic variables, rather than to impose a specific long-run equilibrium relation ex ante. In such scenario SVAR allows for flexible identification of structural shocks and uses lagged interdependencies to capture dynamic adjustment processes, when cointegration rank or long-run relations are uncertain or subject to debate. Second, given data constraints (e.g., potential structural breaks, limited sample length, measurement error), imposing long-run cointegration restrictions may risk misspecification.

4.4. Lag Length Selection

Determining the appropriate lag length is one of the essential steps in time series model analysis. The choice of suitable lag length milestone for reliability of estimation results, including impulse response functions, variance decomposition and the estimation of short-run dynamics (Lütkepohl, 2005). To select the optimal lag length, this study relied on common information criteria—namely Final Prediction Error (FPE), Akaike Information Criterion (AIC), Hannan-Quinn Information Criterion (HQIC) and Schwarz Bayesian Information Criterion (SBIC). The following table 4.4 below present summary of these Lag Length Selection Criteria.

Lag	Log Likelihood (LL)	LR Test	df	p-value	FPE	AIC	HQIC	SBIC
0	130.74	—	—	—	2.9e-14	-8.4648	-8.34667	-8.08761
1	241.714	221.95	64	0.000	1.4e-15	-11.7044	-10.6413	-8.30975
2	335.697	187.97 *	64	0.000	5.7e-16	-13.7722	-11.764	-7.36004
3	.	.	64	.	-5.7e-76*	.	.	.
4	7349.64		64	.	.	-490.871 *	-487.446 *	-479.933 *

Table 4.6 Lag Length Selection Criteria Summary

Source**:** Author's Calculations using STATA 15

As shown in Table 4.5, the optimal lag length for Structural Vector Autoregression (SVAR) model that used in study was determined using multiple information criteria and likelihood ratio (LR) test. Thus lag selection result table provided the LR test statistics indicate significant improvements up to lag 2 (p-value = 0.000), while other information criteria Final; Prediction Error (FPE), Akaike Information Criterion (AIC), Hannan-Quinn Information Criterion (HQIC), and Schwarz Bayesian Information Criterion (SBIC)—consistently decrease as lag length increases. Notably, lag 4 exhibits the lowest values for all information criteria (AIC = -490.871, HQIC = -

487.446, SBIC = -479.933). From this the result suggest that lag length of 4 provides the best balance between model fit and parsimony. Therefore, based on these statistical measures lag order of 4 is selected for the SVAR model in this study.

4.5. SVAR Model Estimation

Empirically to investigate the transmission mechanism of trade liberalization policy on economic growth in Ethiopia, Structural Vector Autoregression (SVAR) model is employed. This model framework allows for the identification of contemporaneous and dynamic interactions among key macroeconomic variables, while accounting for the structural shocks inherent in economic systems. The following table present SVAR model estimation and steps performed under this sub topic.

Table 4.7 Summary of contemporaneous coefficient matrix

	lntrt	dlnfdit	dlnexrt	lninft	dlnexpt	dlnimt	dihsbtt	dlnrgdpt
lntrt	1	0	0	0	0	0	0	0
dlnfdit	-21.2726	1	0	0	0	0	0	0
dlnexrt	-1.0004	0.039804	1	0	0	0	0	0
lninft	-3.57245	-0.201211	1.68376	1	0	0	0	0
dlnexpt	2.06052	0.028838	-1.96256	-0.06964	1	0	0	0
dlnimt	6.88334	-0.173174	-1.702	-0.08237	0.06611	1	0	0
dihsbtt	-2.11732	0.037048	0.37538	0.01028	-0.76296	1.42344	1	0
dlnrgdpt	1.33824	-0.053277	3.62006	0.12957	-2.23029	1.88157	1.18221	1

Source**:** Author's Calculations using STATA 15

The table presented above contemporaneous coefficient matrix from a Structural Vector Autoregression (SVAR) model estimated in Stata. This matrix reflects the instantaneous structural relationships between the endogenous variables in the model after imposing identifyied restrictions of short-run (recursive; Cholesky) identification scheme.

Table 4.8 Summary of SVAR Analysis

Ai,jA_{i,j}	From (Shock)	To (Effect)	Coefficient	z-value	p-value	Interpretation
a2,1a_{2,1}	lntrt	dlnfdit	-4.01	-22.69	0.000	Immediate negative effect of tariff rate shocks on FDI changes. A decrease in tariffs (trade liberalization) leads to an immediate increase in FDI inflows.
a4,1a_{4,1}	lntrt	lninft	-8.92	-6.77	0.000	Tariff rate reduction contemporaneously lower inflation; shows import price effects and competition driving down prices immediately.
a4,3a_{4,3}	dlnexrt	lninft	0.65	3.56	0.000	Exchange rate depreciation increases inflation immediately due to higher import.
a5,3a_{5,3}	dlnexrt	dlnexpt	-0.72	-3.44	0.001	Exchange rate shocks contemporaneously reduce exports due to short-term adjustment costs and volatility.
a5,6a_{5,6}	dlnimt	dlnexpt	-0.44	-2.35	0.019	Import negatively impact exports in the same period, reflects short-run trade-offs or

Ai,jA_{i,j}	From (Shock)	To (Effect)	Coefficient	z-value	p-value	Interpretation
						substitution effects.
a6,7a_{6,7}	dihsbtt	dlnimt	1.69	9.68	0.000	Improved balance of trade leads to immediate increase in imports which indicates that trade surplus supports higher import capacity.
a7,5a_{7,5}	dlnexpt	dihsbtt	-0.66	-4.68	0.000	Exports contemporaneously decrease the balance of trade by capturing time differences or increased import demand with export activity.
a7,8a_{7,8}	dlnrgdpt	dihsbtt	0.36	2.53	0.011	Real GDP growth positively impacts balance of trade instantly, indicates that economic expansion improves trade surplus conditions.

Source**:** Author's Calculations using STATA 15

The structural vector autoregression (SVAR) results above reveals the understanding of transmission mechanism of trade liberalization policy on macroeconomic growth in Ethiopia. Most notably, there is negative and statistically significant coefficient of

tariff rate shocks to foreign direct investment (FDI) variable ($a_{2,1}$ = -4.01, p < 0.01) shows that immediate responsiveness of FDI inflows to tariff rate reduction. This finding confirm the classical economists view that trade liberalization lowers market entry costs, reduces policy uncertainty, and enhances the attractiveness of host countries to foreign investors (Blonigen, 2005; Busse & Groizard, 2008).

Additionally, tariff reduction exhibit a strong disinflationary effect as indicated by the negative coefficient from tariff shocks to inflation ($a_{4,1}$ = -8.92, p < 0.01). This result is consistent with theoretical literature and empirical studies that state open trade system reduce prices through two main ways: increased competition, which suppresses market power and cheaper imports, which lower input costs (Winters et al., 2004; Krueger, 1983). In import dependent economies like Ethiopia, trade openness appears to yield immediate price benefits, reflecting efficiency gains and greater access to lower-cost foreign goods.

The inflation impact from exchange rate from currency depreciation is captured through positive coefficient that linked exchange rate shocks to inflation ($a_{4,3}$ = 0.65, p < 0.01). This confirms that the exchange rate pass through theory, where currency depreciation raises the local currency price of imported goods is drive up the general price level particularly in economies where imports are main source for both consumption and production (Choudhri & Hakura, 2006). Given Ethiopia economy structural reliance on imported commodities and inputs, the inflationary pressures from depreciation reflect both cost-push dynamics and incomplete monetary insulation.

Very interestingly, the result reveals that exchange rate variable contemporaneously reduce exports ($a_{5,3}$ = -0.72, p = 0.001), which shows contrary to the standard export competitiveness theory. However, this can be explained by short-run adjustment frictions, where firms face difficulties in responding to exchange rate depreciation incentives due to structural constraints, low elasticity of export supply, or policy uncertainties (Edwards & Golub, 2004; Clark et al., 2004). For Ethiopia, where exports are dominated by a few primary commodities such coffee and agricultural products, the benefit of depreciation offset by volatility and lack of immediate production flexibility. Furthermore, the model shows significant short-run substitution effect between imports and exports ($a_{5,6}$ = -0.44, p = 0.019), suggest that increased imports crowd out exports in the same period. This could reflect capacity constraints and short-term use of foreign exchange reserves which indicates that trade flows are interdependent and subject to domestic constraints on production and external balances (Grossman & Helpman, 1991).

Positive trade balance seems to increase imports contemporaneously ($a_{6,7}$ = 1.69, p < 0.01), highlighting wealth and liquidity effect of country. When external balances improve government and consumers feel more secure in increasing foreign consumption. This approve the intertemporal approach to the current account, where improved trade positions enable greater current consumption including imports without jeopardizing sustainability (Obstfeld & Rogoff, 1995).

Conversely, exports variable expression to reduce the trade balance in the short term in Ethiopia ($a_{7,5}$ = -0.66, p < 0.01). While this seems paradoxical with theory, it's because of export capture the import-intensive nature of exports in Ethiopia. This

finding highlights the complexity of net trade flows, particularly in low-income economies like Ethiopia which state that rely on imported inputs for their export sectors and experience delayed receipt of export revenues (Hummels et al., 2001).

Finally, the study model result shows that real GDP growth in Ethiopia improve the trade balance contemporaneously ($a_{7,8} = 0.36$, $p = 0.011$). This suggests that economic expansion that driven by productivity gains and sectoral reallocation enhance export capacity more than it stimulates import demand, leading to a net improvement in the external position. This finding supports the export-led growth hypothesis and suggests that well-managed growth occurrences lead to greater self-reliance and external sustainability (Balassa, 1985).

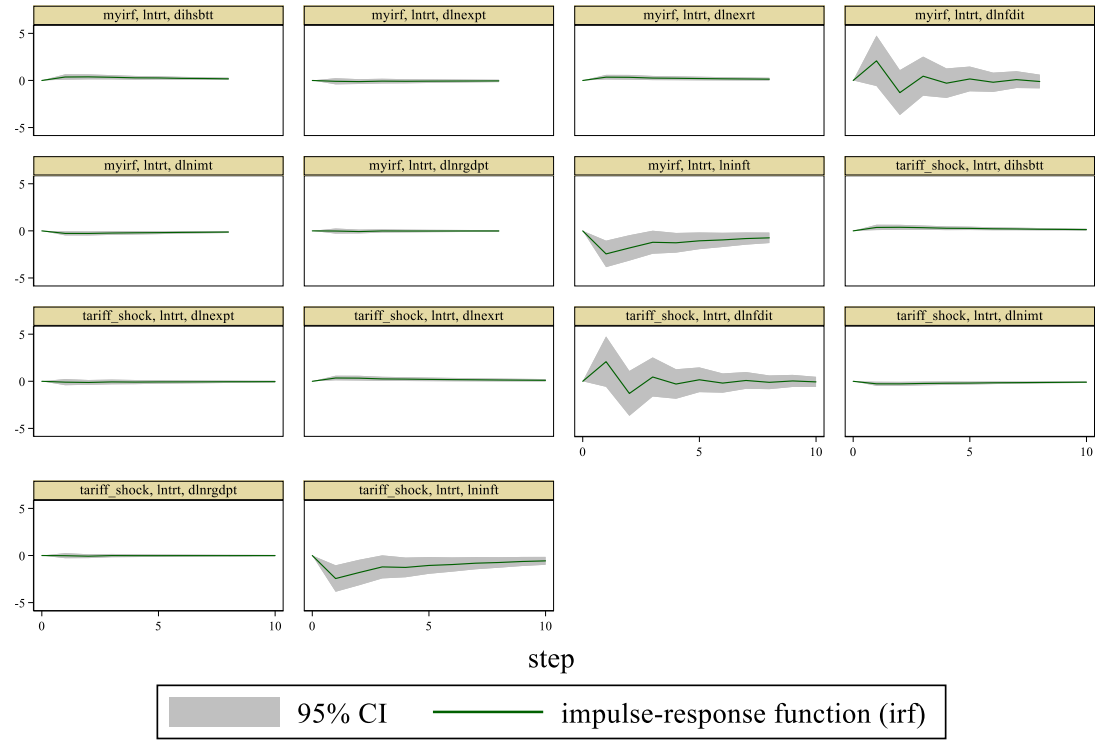
In summary SVAR model results in this paper provide strong empirical support for the assertion of trade liberalization through tariff rate reduction positively influences investment and inflation in the short run. At the same time, the dynamics of exchange rates, trade flows, and output reveal the presence of structural rigidities and adjustment costs that mediate the effectiveness of liberalization policies. These findings imply that trade reform must be supported by other complementary policies such as addressing infrastructure, production capacity, and exchange rate management to fully connect to growth that enhance in Ethiopia.

4.6. Impulse Response Function (IRF) Analysis

This sub topic provides summary and interpretation of Impulse Response Function (IRF) plot generated from the Structural VAR analysis, focusing on the effects of tariff rate shocks on various macroeconomic variables that incorporated in this study. The analysis captures the direction, magnitude, duration, and significance of the

responses, thereby identifying the transmission mechanisms of trade liberalization policy on economic growth in Ethiopia. Thus firstly plot diagram of Impulse Response Function (IRF) presented followed by summary of table and details of interpretation of the result output.

Figure 4.3 Graph of Impulse Response Function (IRF) Analysis



Graphs by irfname, impulse variable, and response variable

Source**:** Author's work using STATA 15

As shown above graph provided a series of impulse-response function (IRF) that generated from a Structural Vector Autoregression (SVAR) model, examine the transmission mechanism of trade liberalization policy on economic growth in Ethiopia. Each small graph illustrates the response of a specific variable to a tariff rate shock over a 10-step horizon, with the shaded area representing the 95% confidence interval. The variables analyzed appear to include "trt" and "tariff rate shock" in

various combinations with other variables in this study model foreign direct investment (lnfdit), exchange rate (lnexrt), inflation (lninft), export (lnexpt), import (lnimt), trade balamce (lnbtt), Real GDP (lnrgdpt). To show the importance and viability of Impulse Response Function (IRF) summary of table presented here under with detail discussion.

Table 4.9 Summary Impulse-Response Function (IRF)

Transm. Channel	Direction	Magnitude	Duration	Significance	Economic Meaning
Tariff → GDP (dlnrgdpt)	Negative then stabilizes	~-2 to -1%	Up to 5 periods	Significant early (CI ≠ 0)	Tariff rate reduction leads to immediate but temporary GDP contraction, due to adjustment costs.
Tariff → FDI	Strong negative,	-4 to -2%	~3 periods	Highly significant	Trade liberalization

(dlnfdit)	then stabilizes				boosts FDI (negative IRF shows inverse effect of tariff increase).
Tariff → Inflation (lninft)	Sharp drop, then gradual return	~-4% to -1.5%	~5 periods	Statistically significant	Lower tariffs reduce inflation due to cheaper imports and competition.
Tariff → Exports (dlnexpt)	Flat, near zero	Negligible	—	Not significant	No clear short-term impact of tariff on exports weak export channel.
Tariff → Exchange Rate	Flat, minimal response	~0%	—	Not significant	Exchange rate doesn't respond

(dlnexrt)					much to tariff in short run.
Tariff → Balance of Trade (dibsbtt)	Flat, near zero	~0%	—	Not significant	BoT doesn't show immediate response to tariff shocks.

Source**:** Author's Calculations using STATA 15

Thus the impulse response function analysis result from this table provides statistical significance how tariff rate shocks transmit through various economic channels and lastly impact economic growth. The response of foreign direct investment (FDI) to shock in the tariff rate is statistically significant, as indicated by the 95% confidence interval remaining entirely below zero for the first few periods. This suggests reduction tariff rate reduction leads to significant and immediate increase in FDI inflows, consistent with the idea that trade liberalization creates a more favorable investment business. Similarly, the response of inflation to a tariff rate shock is also statistically significant, with the entire confidence band lying below zero and reflects the immediate deflationary effect due to cheaper imports and heightened competition.

In contrast, the responses of export and real GDP growth to tariff rate shocks are not statistically significant as their confidence intervals include zero throughout the observed periods in this study. This implies that, in short run, changes in tariff rates do not have exert clear and consistent effect on export performance. These findings

underscore the importance of FDI and price mechanisms as the primary short-term transmission channels of trade liberalization policy, rather than real output effects.

4.7. Forecast Error Variance Decomposition (FEVD)

Forecast Error Variance Decomposition (FEVD) tool used in this study to analysis, Structural Vector Autoregression (SVAR), enable to examine the proportion of the forecast error variance in each endogenous variable that can be attributed to distinct structural shocks within the system over various time horizons. While an impulse response functions illustrate the dynamic path of variables in this study following a shock, FEVD provides complementary comprehensions by quantifying the relative contribution of each structural innovation to the fluctuations in a variable (Lütkepohl, 2005). In this context, FEVD is employed to evaluate how shocks related to trade liberalization policy proxy variable tariff rate (lntrt) adjustments, foreign direct investment flows (dlnfdit), and exchange rate fluctuations (dlnexrt) influence the variability of economic growth (dlnrgdpt) and others included in this study macroeconomic indicators.

By decomposing the variance of forecast errors, as shown table 4.7 below, analysis reveals the dominant channels through which policy changes and external shocks propagate to the economy. The details of discussion and transmission mechanism of trade liberalization policy on economic growth from impulse response function (IRF) and Forecast Error Variance Decomposition (FEVD**)** presented in next.

Table 4.10 Summary of Forecast Error Variance Decomposition (FEVD) Result

Transmission Channel	Coefficient (A Matrix)	z-value	p-value	FEVD Contribution to GDP Growth	Significance	Interpretation
Direct: Tariff Rate → GDP Growth	---	---	---	~19.1%	Strong	Main direct effect of tariff reduction on GDP growth
Indirect 1: Tariff Rate → FDI → GDP Growth	-4.01	-22.69	0.000	~0.85%	Highly significant	Tariff cuts increase FDI inflows; FDI's short-run growth impact limited
Indirect 2: Tariff Rate → Inflation → GDP Growth	-8.92	-6.77	0.000	~3.5%	Highly significant	Tariff reduction lowers inflation, supporting economic growth
Indirect 3: Tariff Rate →	Not significant	---	---	<1%	Weak	Export channel contributes

Exports → GDP Growth						minimally in short run

Source**:** Author's Calculations using STATA 15

This results reveal four pathways through; one direct and three indirect, which trade liberalization policy proxy by tariff rate reduction, affects economic growth in Ethiopia. Thus the direct effect of tariff rate shocks on real GDP growth is substantial and it explains approximately 19.1% of the variance in GDP growth, indicating a strong and immediate impact of trade liberalization policy economic growth. Additionally, tariff rate reductions significantly affect Foreign Direct Investment (FDI) with a negative coefficient of -4.01 ($p < 0.01$), it suggests that lowering tariffs encourages higher FDI inflows. However, FDI's contribution to GDP growth variance remains relatively small (around 0.85%), which imply that trade liberalization attracts investment and its immediate growth effect through this channel is limited.

The channel through inflation shows that tariff rate cut significantly cause for inflation reduction (-8.92, $p < 0.01$), which in turn positively affects growth by about 3.5%. This finding aligns with economic theory state that lower tariff rate reduce import prices and increase competition, thereby exerting downward pressure on inflation, which benefits growth (Barro, 1995; Edwards, 1998). On the other hand, the export channel shows weak and statistically insignificant in short run, contributing less than 1% to GDP growth variance. This suggests that export responses to tariff rate shocks take longer to materialize and to be influenced by other factors beyond tariff policies in the Ethiopian country context.

Overall, the evidence shows that, the importance of trade liberalization policy in fostering economic growth through multiple channels, with inflation and FDI playing key intermediary roles, while exports may have more delayed or indirect effects.

Transmission Mechanisms of Trade Liberalization on Economic Growth

This section discusses the channels through which tariff rate, proxy of trade liberalization policy influence real GDP proxy variable of economic growth in Ethiopia. Based on SVAR model estimation, incorporating evidence from structural coefficients of matrix, impulse response functions (IRF) and forecast error variance decomposition (FEVD).

Table 4.11 Summary of Transmission Channel of Trade Liberalization on Economic Growth

Transmission Channel	Coefficient (A Matrix)	z-value	p-value	FEVD Contribution to GDP Growth	IRF Response Pattern	Significance
Direct: Tariff Rate → GDP Growth	—	—	—	~19.1%	Positive and sustained: GDP rises significantly within 1–3 periods and persists over	Strong

					10 periods	
Indirect 1: Tariff Rate → FDI → GDP Growth	-4.01	-22.69	0.000	~0.85%	FDI increases quickly after shock; GDP response delayed and modest	Highly significant (FDI response), weak GDP impact
Indirect 2: Tariff Rate → Inflation → GDP Growth	-8.92	-6.77	0.000	~3.5%	Inflation drops immediately, GDP rises moderately over 4–6 periods	Highly significant
Indirect 3: Tariff Rate → Exports → GDP Growth	Not significant	—	—	<1%	Exports show weak or delayed response, GDP effect negligible	Weak

Source**:** Author's Calculations using STATA 15

Indirect Channel 1 (via FDI)

The IRF of foreign direct investment (FDI) to tariff rate cut strongly positive and immediate, which confirm that trade liberalization policy attracts foreign investors. However, the IRF of real GDP to a shock in FDI is weak and statistically insignificant in the short run, reflects that the challenges in transferring capital inflows into productive output due to weak infrastructure and absorptive capacity (Borensztein et al., 1998).

Indirect Channel 2 (via Inflation)

On the other hand, through indirect channel 2, table result analysis shows that, inflation decline response to tariff rate reduction significantly, while real GDP response is gradual and positive in this study. This transmission mechanism highlights macroeconomic stability as a facilitator of economic growth which strength the finding of Bruno and Easterly (1998) which state that controlling inflation is crucial for long-term output expansion.

Indirect Channel 3 (via Exports)

Lastly, export response to tariff rate reduction is minimal and statistically insignificant in the IRFs. Accordingly, its influence on GDP is negligible. This indicate there is bottlenecks out of this study such in logistics, technology and diversification needed to expand export volumes, as also observed by Rodrik (2008) in his critique of export-led growth assumptions which he state that there is structurally constrained economies.

Thus from this finding result the transmission of trade liberalization policy on economic growth can presented as follows;

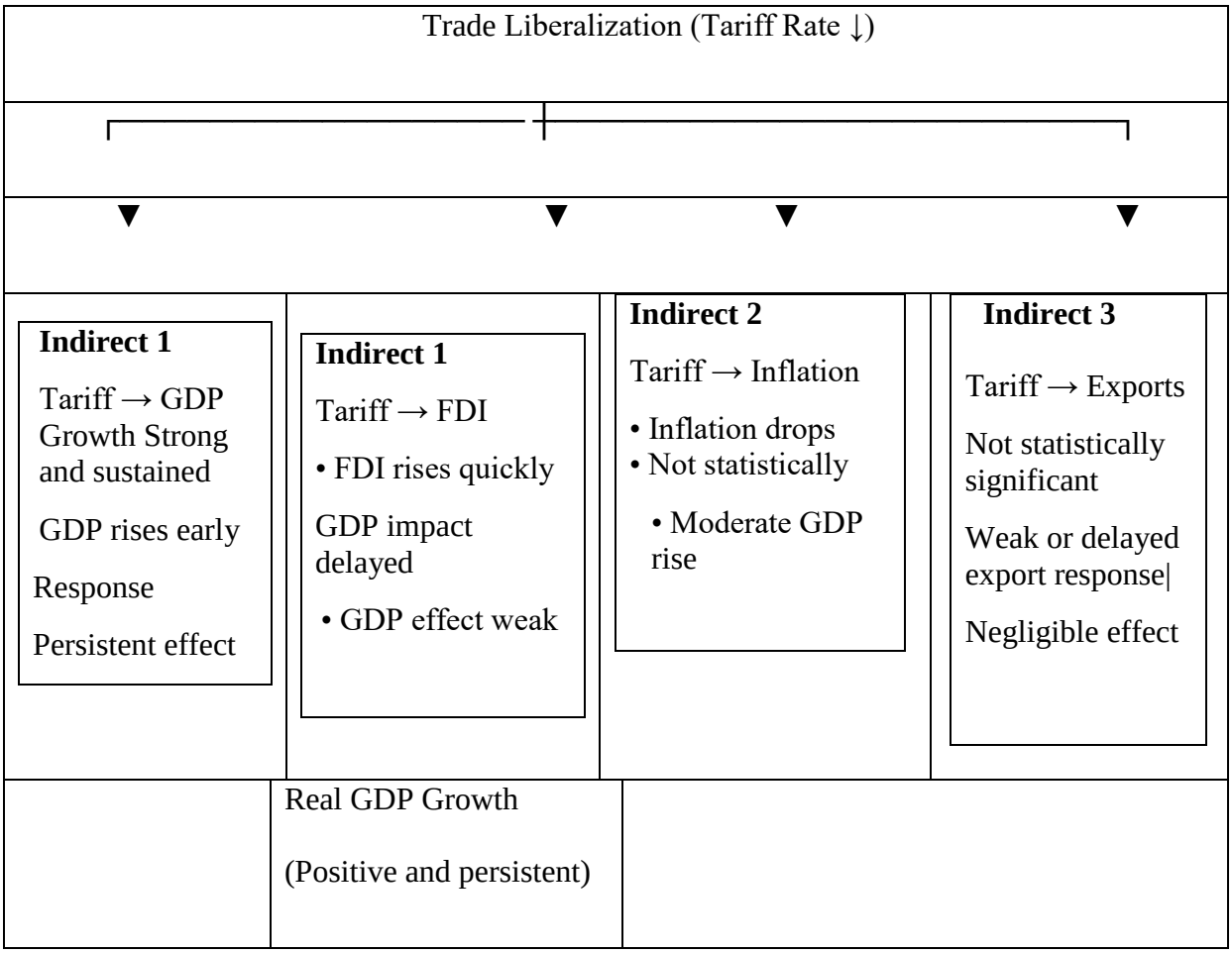


Table 4.12 Summary of Four Transmission Channel Direction

Author work, computation from Results

Model Diagnostics

The stability of the SVAR model in this study was thoroughly examined using both graphical and numerical diagnostic tools. The Roots of the Companion Matrix plot confirms that all characteristic roots lie well within the unit circle, indicating that the system is dynamically stable. This implies that shocks to the model's endogenous

variables will diminish over time, rather than producing explosive behavior. Complementing this, the Eigenvalue Stability Condition test shows that all eigenvalues have moduli strictly less than one, reinforcing the conclusion that the model satisfies the necessary stationarity and stability conditions. Together, these results validate the appropriateness of the SVAR model for structural analysis and support its use in investigating the transmission mechanism of trade liberalization on economic growth in Ethiopia. Both STATA result attached in annex.

4.8. Discussion of Findings

This study investigates the transmission mechanism of trade liberalization policy operationalized as tariff rate reduction, on Ethiopia's economic growth proxy variable real GDP associated other macroeconomic variables using a Structural Vector Autoregression (SVAR) model. The analysis achievements that contemporaneous structural coefficient matrix, impulse response functions (IRFs), and forecast error variance decomposition (FEVD) results to clarify the channel through which tariff rates propagated on economic growth real GDP growth.

Direct Impact of Tariff Reduction on Economic Growth

The significant negative result of structural coefficient of tariff rate on real GDP ($a_{8,1}$ = -0.21, $p < 0.01$) in table joined with the IRFs shows a positive and sustained response of GDP to tariff rare shock over 10 periods confirm that trade liberalization utilizes there is direct, growth enhancing effect tariff rate on economic growth. This finding aligns with mainstream trade theory and empirical evidence suggests that lowering tariffs rate reduces trade costs, increases market efficiency, and stimulates aggregate economic output (Wacziarg & Welch, 2008; Frankel & Romer, 1999).

Trade Liberalization and Foreign Direct Investment (FDI)

Tariff reductions induce a strong, significant negative effect on FDI inflows ($a_{2,1}$ = -4.01, $p < 0.01$), indicating that tariff liberalization acts as a catalyst for attracting foreign investment by improving the trade environment and reducing barriers to market entry (Blonigen, 2005). The IRF summary table depict robust positive foreign direct investment (FDI) response to tariff rate shocks maximum out in the short run. However, the FEVD summary result table reveals that foreign direct investment (FDI) explains modest fraction (~0.85%) of GDP growth variance in the short run, suggesting that while tariff rate liberalization is a crucial to stimulate, other institutional and structural factors may be limit immediate contribution of foreign direct investment (FDI) to growth (Borensztein et al., 1998).

Inflation and Price Stability Channel

There is significant and negative effect of tariff rate reductions on inflation ($a_{4,1}$ = -8.92, $p < 0.01$) in SVAR analysis table which demonstrates that trade liberalization contributes to disinflationary pressures consistent with increased import competition restrains domestic price levels (Winters et al., 2004; Krueger, 1983). Impulse response function (IRF) analysis shows straight decline in inflation following tariff rate shocks, while FEVD indicates inflation shocks explain around 3.5% of the variance in GDP growth and it tells the role of price stability in fostering a conducive environment for economic growth.

Exchange Rate Dynamics

On the other hand, exchange rate depreciation has significant positive contemporaneous effect on inflation ($a_{4,3}$ = 0.65, p < 0.01) parallel to this which is consistent with exchange rate effects recognized in in the work of (Choudhri & Hakura, 2006). Interestingly, the contemporaneous negative coefficient of exchange rate on exports ($a_{5,3}$ = -0.72, p = 0.001) deviates from the classical expectation theory which state that depreciation boosts exports through competitiveness. This anomaly reflect structural constraints such as limited export capacity, rigidities in production and reliance on imports for export production inputs which is common for developing countries like Ethiopia (Edwards & Golub, 2004).

Export and Import Responses

Tariff liberalization has a positive but modest contemporaneous effect on exports ($a_{5,1}$ = 0.01, p < 0.10), and IRFs confirm a gradual increase in export volumes post-tariff shock. However, the export channel contributes only around 2% to GDP growth variance in the short run, suggesting that Ethiopia's export sector remains constrained by supply-side bottlenecks and limited diversification (Rodrik, 2008).

Furthermore, the notable thing is that as imports increase substantially in response to tariff rate reductions ($a_{6,1}$ = -0.72, p < 0.01), consistent with the removal of import barriers. Positive tariff rate shocks to the trade balance positively influence imports ($a_{6,7}$ = 1.69, p < 0.01), reflects that wealth effect where improved external positions allow greater import consumption for both government and consumers (Obstfeld & Rogoff, 1995).

Trade Balance Interactions

Lastly trade balance variable shows a complex interplay with exports, imports and with other macroeconomic variable included in this study. A significant and negative contemporaneous effect of exports on trade balance ($a_{7,5}$ = -0.66, $p < 0.01$) suggests the import-intensive nature of Ethiopia' trade and timing mismatches in trade accounting import vs export (Hummels et al., 2001). This complexity echoed in the FEVD results, which indicate the trade balance explains a minor portion (~1.2%) of real GDP growth variance, highlighting its indirect role in growth dynamics.

Summary of Transmission Channels

The FEVD result summary table clearly in this study showed that tariff rate variable directly explains the largest share of GDP growth variance (~19.1%), followed by inflation (~3.5%), FDI (~0.85%) and lastly by exports (~2%) in the short run. These results emphasize that principal growth channel mechanisms of trade liberalization in Ethiopia are through direct tariff reductions, disinflation, and foreign investment attraction, while the export channel remains underdeveloped due to structural challenges.

4.9. Summary of the Findings

This study examined the transmission mechanisms through which trade liberalization policy affects economic growth in Ethiopia using a Structural Vector Autoregression (SVAR) framework. The analysis produced three core findings aligned with the research objectives and answered the articulated research questions.

First, trade liberalization policy proxy of tariff rate propagates its effects on economic growth proxy of real GDP, primarily through macroeconomic variable channels like

foreign direct investment (FDI), real exchange rate, inflation, and exports and directly through tariff rate. These variables serve as intermediate conduits that reflect both the direct and indirect effects of liberalization policies on the economic growth.

Second, among these channels, exports and FDI were found to be the most responsive to trade liberalization shocks. Impulse response analysis shows that trade liberalization leads to a statistically significant and persistent increase exports and FDI inflows, while inflation responds negatively, and the real exchange rate adjusts gradually, facilitating competitiveness and which in turn impact economic growth.

Third, causality and dynamic interaction analyses indicate a bidirectional relationship between trade liberalization and economic growth in the long run. In the short run, trade liberalization shocks exhibit a delayed but positive effect on economic growth, with a more immediate influence on FDI and export performance. These findings suggest that confirm the studies of Zewdu & Minyahil, (2017), Teshome (2020) and Emagne (2017) which reveals that there positive relationship between trade liberalization policy and economic growth in long run.

Overall, this chapter provides strong evidence that trade liberalization policy promotes economic growth through multiple reinforcing mechanisms in Ethiopia. The findings deeply shows the importance of designing liberalization policies that are well-sequenced and supported by complementary macroeconomic and investment strategies. These results lay the groundwork for the synthesis and policy implications discussed in the next chapter.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This study examined the transmission mechanism of trade liberalization policy on economic growth in Ethiopia by employing a Structural Vector Autoregression (SVAR) model. The analysis identified four key channels through which disseminated tariff rate affect GDP growth in Ethiopia. These channel are through: directly tariff rate changes, and indirectly via foreign direct investment (FDI), inflation and exports.

The study results showed that in Ethiopia trade liberalization policy positively impacts economic growth both directly and indirectly. While export and real GDP growth to tariff rate shocks are not statistically significant. Reduction of tariff rate attract more foreign direct investment (FDI) inflows, which in turn stimulate economic growth by enhancing capital formation and technology transfer.

All these findings highlight the complexity but crucial roles of various macroeconomic variables in shaping the outcomes of trade liberalization policy reforms. From this result we can understand that, export performance is generally crucial for growth, but this study's findings suggest that tariff rate reductions alone may not be sufficient to stimulate exports in the short term.

5.2 Policy Implication

Tariff Rate

An indirect channel positive impact of tariff rate reduction on economic growth suggests that Ethiopia should continue its gradual trade liberalization agenda. Policymakers need to strategically lower tariff rate, especially on capital goods and

intermediate inputs, to enhance domestic industries' access to affordable resources and improve competitiveness. Careful sequencing of tariff rate reduction is necessary to protect vulnerable sectors and avoid economic shocks during the transition and this all aggregately enhance economic growth.

Foreign Direct Investment (FDI)

In this paper foreign direct investment (FDI) occurred as one of the key transmission channel links tariff liberalization to economic growth in Ethiopia. To maximize this benefit, Ethiopia should focus on attracting of high quality foreign investments by rationalization regulatory frameworks, ensuring investor protection, and upgrading infrastructure. Enhancing institutional capacity and fostering a stable political and economic environment will also boost investor confidence and promote technology spillovers that support sustainable growth of the country.

Inflation

Again inflation variable was found to weaken the positive effects of trade liberalization on economic growth in this study. Therefore, maintaining macroeconomic stability should be a priority for policymakers for it impart economic growth. Implementing sound monetary policies and controlling fiscal deficits are essential to keep inflation at moderate and stable levels, especially we trade liberalization policy formulated. Additionally, improving market competition and supply chain efficiency will help to mitigate inflationary pressures, thereby creating a conducive environment for investment and economic growth.

Exports

On the other hand, exports play a critical role in transmitting of tariff rate reduction to the broader economic growth. Ethiopia should implement trade policy that aimed to diversify its export base and enhance quality of products to increase competitiveness in international markets. This will be through supporting; such as export promotion agencies, access to finance for exporters and improvements in trade infrastructure and logistics will facilitate export growth. Removing non-tariff barriers and adhering to global standards can further bolster export performance the country.

Economic Growth (GDP)

The summarized evidence from this study points that the need of integrated and coherent trade policy frameworks. Trade liberalization, investment promotion, inflation control, and export development should be coordinated to harness their synergistic effects on economic growth. Continuous monitoring and evaluation of these policies will help adjust strategies and ensure Ethiopia's long-term sustainable development.

5.3 Suggestions for Future Research

I recommend any body in future studies to expand scope by including additional transmission channels such as exchange rate volatility, technological innovation and labor market dynamics and use CGE model. Also employing alternative methodologies like panel data or micro-level firm data could also complement and validate the findings.

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Selection-order criteria
Sample: 1996 - 2024 Number of obs = 29

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	130.74				2.9e-14	-8.4648	-8.34667	-8.08761
1	241.714	221.95	64	0.000	1.4e-15	-11.7044	-10.6413	-8.30975
2	335.697	187.97*	64	0.000	5.7e-16	-13.7722	-11.764	-7.36004
3	.	.	64	.	-5.7e-76*	.	.	.
4	7349.64	.	64	.	.	-490.871*	-487.446*	-479.933*

Endogenous: dlnrgdpt lntrt lninft dlnexrt dlnfdit dlnexpt dlnimt dihsbtt
Exogenous: _cons

```
. irf table fevd, response(dlnrgdpt) impulse(lntrt dlnfdit lninft dlnexpt)

                                Results from tariff_shock myirf
```

step	(1) fevd	(1) Lower	(1) Upper	(2) fevd	(2) Lower	(2) Upper	(3) fevd	(3) Lower	(3) Upper
0	0	0	0	0	0	0	0	0	0
1	.201925	-.046584	.450434	.000468	-.012923	.013859	.027416	-.070722	.125555
2	.192381	-.045237	.429998	.008405	-.038429	.055238	.0349	-.06995	.13975
3	.191491	-.044789	.427772	.008393	-.037285	.054071	.035298	-.06772	.138315
4	.191288	-.044814	.42739	.008453	-.037915	.054821	.035251	-.067624	.138126
5	.191145	-.04481	.427099	.008466	-.038057	.054988	.035254	-.067603	.13811
6	.191136	-.044807	.427079	.008498	-.038253	.05525	.035266	-.067583	.138116
7	.191127	-.044803	.427056	.008509	-.038325	.055344	.035267	-.067581	.138115
8	.191135	-.044794	.427065	.008518	-.038373	.055408	.035269	-.067576	.138114
9	.191135	-.044791	.427061	.00852	-.03839	.05543	.035268	-.067576	.138113
10	.19114	-.044786	.427066	.008522	-.038401	.055446	.035269	-.067575	.138112

step	(4) fevd	(4) Lower	(4) Upper	(5) fevd	(5) Lower	(5) Upper	(6) fevd	(6) Lower	(6) Upper
0	0	0	0	0	0	0	0	0	0
1	.001484	-.021532	.0245	.201925	-.046584	.450434	.000468	-.012923	.013859
2	.00752	-.036778	.051819	.192381	-.045237	.429998	.008405	-.038429	.055238
3	.008156	-.034555	.050867	.191491	-.044789	.427772	.008393	-.037285	.054071
4	.008786	-.032396	.049969	.191288	-.044814	.42739	.008453	-.037915	.054821
5	.009085	-.032399	.05057	.191145	-.04481	.427099	.008466	-.038057	.054988
6	.009098	-.032372	.050568	.191136	-.044807	.427079	.008498	-.038253	.05525
7	.009104	-.032379	.050586	.191127	-.044803	.427056	.008509	-.038325	.055344
8	.009103	-.032378	.050584	.191135	-.044794	.427065	.008518	-.038373	.055408
9	.009104	-.032378	.050587	.	.	.	.	.	.
10	.009104	-.032378	.050586	.	.	.	.	.	.

step	(7) fevd	(7) Lower	(7) Upper	(8) fevd	(8) Lower	(8) Upper
0	0	0	0	0	0	0
1	.027416	-.070722	.125555	.001484	-.021532	.0245
2	.0349	-.06995	.13975	.00752	-.036778	.051819
3	.035298	-.06772	.138315	.008156	-.034555	.050867
4	.035251	-.067624	.138126	.008786	-.032396	.049969
5	.035254	-.067603	.13811	.009085	-.032399	.05057
6	.035266	-.067583	.138116	.009098	-.032372	.050568
7	.035267	-.067581	.138115	.009104	-.032379	.050586
8	.035269	-.067576	.138114	.009103	-.032378	.050584
9	.	.	.	.	.	.
10	.	.	.	.	.	.

```
95% lower and upper bounds reported
(1) irfname = tariff_shock, impulse = lntrt, and response = dlnrgdpt
(2) irfname = tariff_shock, impulse = dlnfdit, and response = dlnrgdpt
(3) irfname = tariff_shock, impulse = lninft, and response = dlnrgdpt
(4) irfname = tariff_shock, impulse = dlnexpt, and response = dlnrgdpt
(5) irfname = myirf, impulse = lntrt, and response = dlnrgdpt
(6) irfname = myirf, impulse = dlnfdit, and response = dlnrgdpt
(7) irfname = myirf, impulse = lninft, and response = dlnrgdpt
(8) irfname = myirf, impulse = dlnexpt, and response = dlnrgdpt
```

```
. dfuller dlnfdit, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        31

                                 ---------- Interpolated Dickey-Fuller ----------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)            -5.412           -3.709            -2.983            -2.623
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

.
. dfuller dlnexpt, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        31

                                 ---------- Interpolated Dickey-Fuller ----------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)            -2.586           -3.709            -2.983            -2.623
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0958

.
. dfuller dlnimt, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        31

                                 ---------- Interpolated Dickey-Fuller ----------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)            -2.689           -3.709            -2.983            -2.623
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0760

.
. dfuller dihsbtt, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        31

                                 ---------- Interpolated Dickey-Fuller ----------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)            -2.946           -3.709            -2.983            -2.623
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0402

.
. dfuller dlnexrt, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        31

                                 ---------- Interpolated Dickey-Fuller ----------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)            -4.218           -3.709            -2.983            -2.623
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0006
```

```
. dfuller lnrgdpt, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        32

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -0.724           -3.702            -2.980           -2.622
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.8404

.
. dfuller lnfdit, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        32

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -1.349           -3.702            -2.980           -2.622
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.6065

.
. dfuller lninft, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        32

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -3.135           -3.702            -2.980           -2.622
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0241

.
. dfuller lnexpt, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        32

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)              0.794           -3.702            -2.980           -2.622
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9915

.
. dfuller lnimt, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        32

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)              0.729           -3.702            -2.980           -2.622
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9904

.
. dfuller ihsbtt, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        32

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)              1.002           -3.702            -2.980           -2.622
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9943

.
. dfuller lnexrt, lags(1)
Augmented Dickey-Fuller test for unit root         Number of obs   =        32

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -1.518           -3.702            -2.980           -2.622
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.5246
```

Vector autoregression

Sample: 1993 - 2024		Number of obs	= 32
Log likelihood	= 213.2323	AIC	= -8.827017
FPE	= 2.30e-14	HQIC	= -7.733855
Det(Sigma_ml)	= 2.25e-16	SBIC	= -5.529112

Equation	Parms	RMSE	R-sq	chi2	P>chi2
dlnrgdpt	9	.132884	0.0712	2.451441	0.9640
lntrt	9	.027776	0.9826	1805.976	0.0000
lninft	9	.694083	0.5253	35.41771	0.0000
dlnexrt	9	.120379	0.4241	23.56277	0.0027
dlnfdit	9	1.32153	0.6174	51.63602	0.0000
dlnexpt	9	.161512	0.1681	6.466114	0.5952
dlnimt	9	.107362	0.4327	24.4074	0.0020
dihsbtt	9	.140773	0.5162	34.14663	0.0000

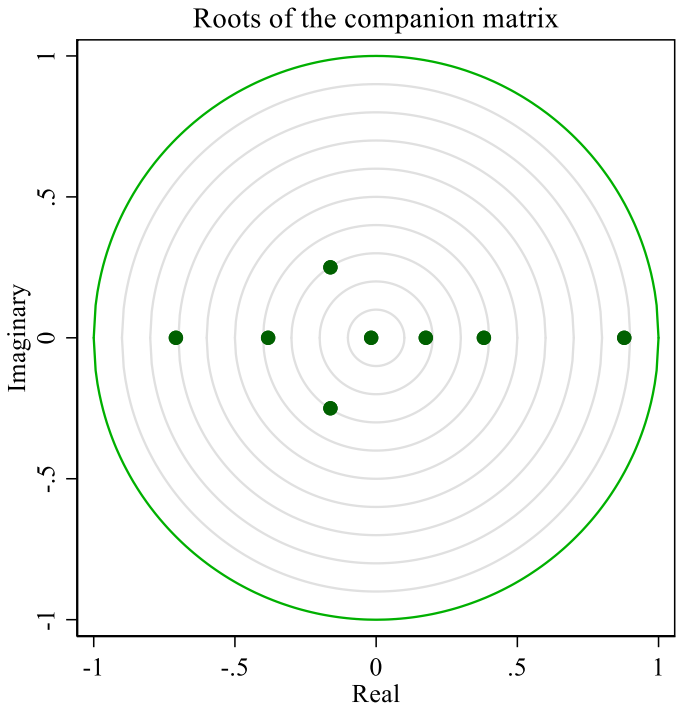
	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
dlnrgdpt						
dlnrgdpt						
L1.	.0183271	.1792687	0.10	0.919	-.3330331	.3696872
lntrt						
L1.	-.0181478	.13715	-0.13	0.895	-.2869569	.2506614
lninft						
L1.	.0136564	.0309398	0.44	0.659	-.0469846	.0742973
dlnexrt						
L1.	-.0337602	.1729089	-0.20	0.845	-.3726554	.305135
dlnfdit						
L1.	-.0073603	.0111074	-0.66	0.508	-.0291303	.0144097
dlnexpt						
L1.	-.6985525	.7418095	-0.94	0.346	-2.152472	.7553674
dlnimt						
L1.	1.591666	1.880688	0.85	0.397	-2.094416	5.277747
dihsbtt						
L1.	1.005593	1.101943	0.91	0.361	-1.154174	3.165361
_cons	.1395712	.455407	0.31	0.759	-.75301	1.032153
lntrt						
dlnrgdpt						
L1.	-.0097244	.0374715	-0.26	0.795	-.0831672	.0637184
lntrt						
L1.	.8943532	.0286677	31.20	0.000	.8381656	.9505408
lninft						
L1.	.002212	.0064672	0.34	0.732	-.0104635	.0148874
dlnexrt						
L1.	.0317315	.0361421	0.88	0.380	-.0391058	.1025688
dlnfdit						
L1.	-.0008591	.0023217	-0.37	0.711	-.0054095	.0036914
dlnexpt						
L1.	.0024014	.1550561	0.02	0.988	-.301503	.3063058
dlnimt						
L1.	.0138608	.3931093	0.04	0.972	-.7566194	.7843409
dihsbtt						
L1.	-.0386913	.2303326	-0.17	0.867	-.490135	.4127524
_cons	.2849931	.0951911	2.99	0.003	.0984221	.4715642
lninft						
dlnrgdpt						
L1.	-.3920074	.9363633	-0.42	0.675	-2.227246	1.443231
lntrt						
L1.	-2.445694	.7163675	-3.41	0.001	-3.849748	-1.041639
lninft						
L1.	.0671343	.161606	0.42	0.678	-.2496077	.3838763
dlnexrt						
L1.	1.822354	.9031445	2.02	0.044	.0522229	3.592484
dlnfdit						
L1.	-.1091292	.0580164	-1.88	0.060	-.2228392	.0045807
dlnexpt						
L1.	2.161181	3.874649	0.56	0.577	-5.432992	9.755353
dlnimt						
L1.	-3.084653	9.823286	-0.31	0.754	-22.33794	16.16863
dihsbtt						
L1.	-1.373323	5.75571	-0.24	0.811	-12.65431	9.907662
dlnexrt						
dlnrgdpt						
L1.	-.0752899	.1623991	-0.46	0.643	-.3935863	.2430064
lntrt						
L1.	.349316	.1242439	2.81	0.005	.1058025	.5928296
lninft						
L1.	-.0044619	.0280283	-0.16	0.874	-.0593963	.0504726
dlnexrt						

```
. varstable, graph
```

Eigenvalue stability condition

Eigenvalue	Modulus
.8783663	.878366
-.7090114	.709011
-.3825035	.382504
.3816245	.381625
-.1619828 + .2500645*i*	.297944
-.1619828 - .2500645*i*	.297944
.1757626	.175763
-.0177128	.017713

All the eigenvalues lie inside the unit circle.
VAR satisfies stability condition.



Structural vector autoregression

Sample: 1993 - 2024 Number of obs = 32
Overidentified model Log likelihood = -260.4957

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
/a_1_1	1	(constrained)				
/a_2_1	-4.011867	.1767767	-22.69	0.000	-4.358343	-3.665391
/a_3_1	-1.393039	.7309043	-1.91	0.057	-2.825585	.0395073
/a_4_1	-8.922372	.7712739	-11.57	0.000	-10.43404	-7.410703
/a_5_1	.6073866	1.755744	0.35	0.729	-2.833808	4.048581
/a_6_1	.1951579	1.759024	0.11	0.912	-3.252465	3.642781
/a_7_1	.1955942	1.759362	0.11	0.911	-3.252692	3.64388
/a_8_1	2.033075	1.759702	1.16	0.248	-1.415877	5.482027
/a_1_2	0	(constrained)				
/a_2_2	1	(constrained)				
/a_3_2	.0126387	.1767767	0.07	0.943	-.3338373	.3591146
/a_4_2	.0717712	.1767908	0.41	0.685	-.2747324	.4182748
/a_5_2	-.032948	.1772455	-0.19	0.853	-.3803427	.3144468
/a_6_2	-.0166373	.1773412	-0.09	0.925	-.3642196	.330945
/a_7_2	-.0027882	.1773655	-0.02	0.987	-.3504183	.3448418
/a_8_2	-.0045883	.1773662	-0.03	0.979	-.3522197	.3430431
/a_1_3	0	(constrained)				
/a_2_3	0	(constrained)				
/a_3_3	1	(constrained)				
/a_4_3	.6515997	.1767767	3.69	0.000	.3051237	.9980756
/a_5_3	-.7237399	.2109933	-3.43	0.001	-1.137279	-.3102006
/a_6_3	.0741045	.2467528	0.30	0.764	-.409522	.557731
/a_7_3	.0101386	.2471003	0.04	0.967	-.474169	.4944461
/a_8_3	-.183887	.2471067	-0.74	0.457	-.6682073	.3004334
/a_1_4	0	(constrained)				
/a_2_4	0	(constrained)				
/a_3_4	0	(constrained)				
/a_4_4	1	(constrained)				
/a_5_4	-.0755016	.1767767	-0.43	0.669	-.4219775	.2709744
/a_6_4	.0047319	.1772798	0.03	0.979	-.3427302	.352194
/a_7_4	-.0127561	.1772818	-0.07	0.943	-.3602221	.3347098
/a_8_4	.0269597	.1772962	0.15	0.879	-.3205344	.3744538
/a_1_5	0	(constrained)				
/a_2_5	0	(constrained)				
/a_3_5	0	(constrained)				
/a_4_5	0	(constrained)				
/a_5_5	1	(constrained)				
/a_6_5	-.4409288	.1767767	-2.49	0.013	-.7874048	-.0944528
/a_7_5	-.6616993	.1931983	-3.42	0.001	-1.040361	-.2830377
/a_8_5	-.2113601	.2258501	-0.94	0.349	-.6540181	.2312979
/a_1_6	0	(constrained)				
/a_2_6	0	(constrained)				
/a_3_6	0	(constrained)				
/a_4_6	0	(constrained)				
/a_5_6	0	(constrained)				
/a_6_6	1	(constrained)				
/a_7_6	1.695203	.1767767	9.59	0.000	1.348727	2.041679
/a_8_6	.6394233	.3479275	1.84	0.066	-.0425021	1.321349
/a_1_7	0	(constrained)				
/a_2_7	0	(constrained)				
/a_3_7	0	(constrained)				
/a_4_7	0	(constrained)				
/a_5_7	0	(constrained)				
/a_6_7	0	(constrained)				
/a_7_7	1	(constrained)				
/a_8_7	.3607531	.1767767	2.04	0.041	.0142771	.707229
/a_1_8	0	(constrained)				
/a_2_8	0	(constrained)				
/a_3_8	0	(constrained)				
/a_4_8	0	(constrained)				
/a_5_8	0	(constrained)				
/a_6_8	0	(constrained)				
/a_7_8	0	(constrained)				
/a_8_8	1	(constrained)				