DETERMINANTS OF EXPORT EARNINGS IN ETHIOPIA: A TIME SERIES ANALYSIS

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Declaration Statement

I, Shalemu Asnake Metekia, hereby declare that this thesis, entitled “Determinants of Export Earnings in Ethiopia: A Time Series Analysis,” is my original work and has not been submitted for any degree or academic award at any university or institution. This thesis is submitted in partial fulfillment of the requirements for the degree of Master of Science in Economics (Economic Policy Analysis) at the Department of Economics, Addis Ababa University. I affirm that all sources of materials used for this work have been properly acknowledged.

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This is to certify that the thesis prepared by Shalemu Asnake Metekia, entitled: Determinants of Export earnings in Ethiopia**:** a time series analysis and submitted in partial fulfillment of the requirements for the degree of Master of Science in Economics (Economic Policy Analysis) complies with the regulations of the university and meets the accepted standards with respects to originality and quality.

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Abstract

This study examines the determinants of Ethiopia's export earnings using annual time series data from the National Bank of Ethiopia (NBE) spanning 1991–2024, motivated by the country's persistent underperformance in export earnings despite its economic potential. The research addresses the critical question: What factors explain Ethiopia's export earnings dynamics, and how can policymakers enhance export performance to address foreign exchange shortages and drive structural transformation. The primary objective is to identify long-run and short-run determinants of export earnings to inform evidence-based policy interventions, employing Johansen cointegration and Vector Error Correction Models (VECM) to analyze relationships between export earnings and five key variables: real gross domestic product, terms of trade (ToT), trade openness, real effective exchange rate (REER), and infrastructure (proxied by real capital expenditure). Results indicate that in the long run, real gross domestic product, terms of trade, trade openness, and infrastructure significantly boost export earnings, while real effective exchange rate exerts a negative effect, reflecting competitiveness challenges from currency overvaluation. Short-run estimates align with expectations, showing positive impacts from all variables, including real effective exchange rate (consistent with the J-curve effect). Thus high and sustainable economic growth, improvements in infrastructural facilities, and maintaining a stable exchange rate policy as well as working to reduce trade constraint mechanism should be given due emphasis so as to improve Ethiopia's export earnings.

Keywords: Ethiopia, Export earnings, infrastructural development, Johansson co-integration, Openness, Real effective exchange rate, real GDP, terms of trade and Vector Error Correction.

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Table of Content

List of Figures

List of Tables

List of Acronyms and Abbreviations

ADF	**Augmented Dickey Fuller**
DF	**Dickey Fuller**
ECS	**Ethiopia Customs Authority**
ESS	**Ethiopia Statistical Services**
ECM	**Error Correction Model**
FCY	**Foreign Currency**
FDI	**Foreign Direct Investment**
GDP	**Gross Domestic Product**
IMF	**International Monetary Fund**
MoF	**Ministry of Finance**
NBE	**National Bank of Ethiopia**
OLS	**Ordinary Least Squares**
REER	**Real Effective Exchange Rate**
TO	**Trade Openness**
TOT	**Terms of Trade**
USD	**US Dollar**

Chapter One: Introduction

1.1. Background of the study

Export earnings serve as a critical pillar of foreign currency generation for Ethiopia. A consistent and robust inflow of foreign exchange empowers the country to finance essential imports, stabilize the national currency, and manage its balance of payments more effectively. This financial strength is fundamental to accelerating industrialization, advancing infrastructure, and facilitating technological progress. Moreover, increased export earnings reflect strong international demand, which in turn stimulates domestic production, enhances competitiveness, and fuels a self-reinforcing cycle of economic growth and development (IMF, 2024). Therefore, understanding the key drivers of export earnings is vital for shaping effective trade and macroeconomic policies, particularly in the case of Ethiopia.

Ethiopia with about 103 million people population (ESS ,2022) is the second most populous nation in Africa after Nigeria, with an estimated 6.4% economic growth. However, it also remains one of the poorest countries, with a per capita gross national income of $1,020 (World Bank 2022). The total export earnings stood at USD 4.1 billion and imported a total of approximately USD 18.1 billion in merchandise during the 2022, leading Ethiopia to a USD 13.98 billion trade deficit (NBE, 2022). Kenya is a relevant comparator due to its geographic proximity and similar regional context. Unlike Ethiopia, which is landlocked, Kenya benefits from direct access to international markets through the Port of Mombasa, significantly facilitating its trade activities. In the same year, Kenya recorded total exports of about USD 11 billion (World Bank, 2022). Such trade disparities underscore deeper structural challenges in Ethiopia's export sector, as reflected in international performance indicators.

Ethiopia ranked 143rd in the first dimension of the competitive industrial performance index (CIP) that indicates the capacity to produce and export manufactured goods (UNIDO, 2023). Therefore, it is vital to examine the key factors that contributed to these poor export earnings. Specifically, it is worth to analyze the export behavior of firms at a micro level to provide evidence to managers, investors, and the public sector. However, these export earnings remain susceptible to external factors and relies heavily on a narrow base of

commodities. Analyzing the determinants of export earnings is crucial for understanding Ethiopia's economic future and formulating effective policy interventions. This study aims to identify the key factors influencing Ethiopian export earnings by drawing insights. To achieve this, a macroeconomic perspective is also essential, particularly through a time series analysis of key economic variables.

Conducting a study on the determinants of export earnings in Ethiopia through a time series analysis is crucial for understanding the factors influencing the country's export earnings. By examining variables such as exchange rates, trade openness, terms of trade, GDP, and capital expenditure, this research aims to provide valuable insights into the dynamics of Ethiopia's export sector. The findings of this study can inform policymakers, businesses, and other stakeholders on strategies to enhance export earnings, promote sustainable economic growth, and strengthen Ethiopia's position in the global market. Ultimately, the study serves as a tool to support more targeted and evidence-based economic planning. Beyond identifying short-term influences, it is equally important to situate the findings within the broader goal of transforming Ethiopia's export landscape.

Understanding the determinants of export earnings in Ethiopia is crucial for unlocking the country’s economic potential. Although Ethiopia’s export sector remains heavily reliant on primary commodities, it holds significant promise for diversification and value-added growth. By carefully analyzing the complex interplay of factors such as global demand, domestic production capacities, trade policies, and infrastructure constraints, policymakers and researchers can identify effective strategies to enhance export competitiveness. Addressing these challenges is essential to building a more resilient and sustainable export-driven economy. This will not only contribute to economic growth but also support broader development goals, including industrialization and poverty reduction. Ultimately, this study aims to provide insights that inform evidence-based interventions, paving the way for a stronger, more diversified Ethiopian export sector and a more robust economic future.

1.2. Statement of the problem

Ethiopia, despite its economic potential, has experienced slow growth in export earnings. In 2022, total merchandise exports reached USD 4.1 billion, showing a 14.1% annual growth driven by coffee (57.3%), flowers (15.1%), fruits and vegetables (26.8%), textiles (19.4%), meat (45.5%), and electricity (3.3%) (NBE, 2021/22, p.50). Export earnings are crucial for economic stability as they generate foreign exchange and support growth. In Ethiopia, exports play a key role in driving the economy. Understanding the determinants is essential for designing effective policies to enhance and sustain export performance and long-term development. Therefore, understanding the determinants of export earnings is essential for designing effective policies to enhance and sustain export performance and long-term development.

Several studies have attempted to identify the key determinants of Ethiopia's export earnings. (Kassa, 2012) found that variables such as real gross domestic product, real effective exchange rate, financial development, trade liberalization, and infrastructure positively influence exports in the long run, although only trade liberalization was significant in the short run. Similarly, Nega (2013) reported that real gross domestic product, real effective exchange rate, trade openness, and infrastructure had a significant long-run impact on exports, while terms of trade and capital expenditure were insignificant in both the short and long run. These findings indicate that, despite policy efforts, the short-run responsiveness of exports to economic variables remains limited, and some expected factors such as terms of trade may even have adverse effects. This suggests a need for further investigation into the structural and policy-related constraints that continue to hinder Ethiopia's export performance.

Building on these observations, this research seeks to explore more deeply the complex factors that continue to hinder export earnings growth and to provide evidence-based insights for policy intervention. Unlike earlier studies that rely on outdated data, this study utilizes more recent data to analyze the relationship between export earnings and its key determinants. The findings aim to help policymakers identify critical areas for action to improve export competitiveness. Strengthening export performance is essential for addressing Ethiopia's persistent balance of payment deficit and promoting sustainable economic growth.

Despite increasing import trade in Ethiopia, export performance has not kept pace, leading to a widening balance of payments deficit and posing a serious economic challenge. The persistent gap between growing imports and stagnant exports further underscores the need for a comprehensive and updated analysis of the factors constraining export growth. This study, therefore, seeks to uncover these underlying barriers using recent data, with the goal of providing actionable insights to inform policymakers, support trade experts, and guide the development of strategies to improve Ethiopia's export competitiveness and reduce the trade imbalance.

1.3. Research Question

- What are the key macroeconomic and structural factors determining Ethiopia's export earnings?
- To what extent has Ethiopia's exchange rate policy (REER) affected the competitiveness of its exports in international markets?
- Which factor real gross domestic product, real effective exchange rate, capital expenditure, terms of trade, or trade openness has exerted the strongest influence on Ethiopia's export earnings?
- How do real GDP, trade openness, and infrastructure affect Ethiopia's export earnings in the short and long run?

1.4. Objectives of the study

1.4.1. General Objective

The General objective of this thesis is to assess Ethiopia's export earnings and identify major Determinants influencing its growth.

1.4.2. Specific Objectives

- Analyze the overall earnings of Ethiopia's export sector over a period of time
- Examine the relationship between export earnings and its explanatory variables
- Scrutinize those quantitative factors and constraints hindering the growth of the export sector, and
- Suggest possible recommendation for decision makers regarding how to increase export earnings.

1.5. Significance of the study

Export earnings are a crucial driver of economic growth in Ethiopia, contributing to foreign exchange generation, gross domestic product expansion, and job creation. Understanding the factors influencing these earnings enables policymakers to implement effective strategies tailored to it. Since Ethiopia heavily relies on primary commodities for exports, analyzing this dependence and exploring opportunities for diversification can foster a more stable and resilient economy. This study aims to identify key drivers that boost export earnings, offering valuable insights for designing targeted interventions in areas such as infrastructure development, trade facilitation, financial incentives, and skills training for producers and exporters. Additionally, it contributes to ongoing discussions on trade liberalization and regional cooperation. By employing recent time series data for empirical analysis, the study addresses gaps in existing research and provides up-to-date evidence on the major factors affecting Ethiopia's export earnings.

1.6. Scope and Limitation of The study

This study critically investigates the underlying determinants of Ethiopia's export earnings over a 34-year period, from 1991 to 2024. Utilizing robust and reliable time series data sourced from the National Bank of Ethiopia, the research provides a comprehensive, evidence-based analysis of the structural and macroeconomic factors influencing Ethiopia's export earnings. By examining long term trends and fluctuations, the study aims to identify the key drivers of export growth as well as factors contributing to stagnation, offering valuable insights to support policy formulation and strategic economic planning.

The study has several limitations that should be acknowledged. While it focuses on selected macro level quantitative factors, important variables such as foreign direct investment (FDI), political stability, institutional quality, and sector-specific dynamics were not included in the model, which may limit the comprehensiveness of the analysis. Additionally, external factors such as global economic shocks, geopolitical events, and sudden changes in international trade policies are beyond the scope of this research but can significantly affect export earnings. These limitations suggest that although the study offers valuable insights, its findings should be considered within the context of these constraints.

1.7. Organization of the Study

This study is structured into five chapters. The first chapter lays the introduction by presenting the background context, defining the research problem, outlining objectives, highlighting the study's importance, specifying its scope, and explaining key operational definitions. Chapter two is about a thorough and critical examination of existing literature and theoretical perspectives relevant to determinants of export earnings. Chapter three details the research design, including data collection methods and analytical approaches. Chapter four delivers an in-depth analysis of the empirical data and discusses the principal findings using STATA17. The final chapter is about the conclusions and proposes actionable recommendations.

Chapter Two: Review of Literature

2.1. Theoretical Literature

2.1.1. Absolute Advantage Versus Comparative Advantage

Adam Smith's Theory of Absolute Advantage (1776/2024), suggests that a country should focus on producing goods it can manufacture more efficiently than others. Specialization should occur only when a nation can produce a good using fewer inputs or at a lower cost compared to its trading partners. While this theory is useful for understanding the benefits of specialization, it overlaps with Ricardo's comparative advantage theory in a way that is less applicable to modern trade. Ethiopia, despite not having an absolute advantage in manufacturing or high-tech sectors, can still thrive by specializing in primary goods (like coffee and textiles), where it has a comparative advantage. Ricardo's theory provides a more relevant framework for Ethiopia's export strategy, focusing on sectors with the lowest opportunity costs, such as labor-intensive agriculture.

David Ricardo's Theory of Comparative Advantage (1821) posits that nations advance from specializing in the production of goods for which they incur the lowest opportunity cost. This specialization enables countries to engage in mutually beneficial trade, even in the absence of an absolute advantage in producing any particular good. Applying this theory to Ethiopia implies that the country should concentrate on sectors such as agriculture particularly coffee and floriculture and labor-intensive industries like textiles and leather, where it holds a relative efficiency advantage compared to other countries.

2.1.2. Intra-Industry Trade Theory and Export Diversification in Ethiopia

The Intra-Industry Trade (IIT) Theory, as developed by Paul Krugman (1979, 1981) and later extended by Elhanan Helpman and Krugman (1985), explains the exchange of similar but differentiated products between countries, often those with comparable factor endowments and levels of development. Unlike classical trade theories such as Ricardo's comparative advantage, which emphasize inter-industry trade, The Intra-Industry Trade

(IIT) Theory accounts for the simultaneous import and export of goods within the same sector. While originally applied to developed countries, this theory is increasingly relevant to developing economies.

In the Ethiopian context, this theory provides a useful framework for understanding how export earnings could improve through diversification within existing sectors. For example, instead of exporting only raw coffee, Ethiopia could expand into differentiated, value-added forms such as roasted beans, packaged specialty coffees, or organic certifications. Similarly, within textiles, the country could diversify into various garments, fashion products, and traditional fabrics. As Krugman (1981) suggests, economies of scale and product differentiation can create opportunities for increased trade even in the absence of major differences in resource endowments. Time series analysis of the determinants of export earnings in Ethiopia can assess how intra-industry trade contributes to export diversification and growth. This approach helps measure the long-term effects of product differentiation within sectors on Ethiopia's export performance

2.1.3. New New Trade Theory and Firm-Level Determinants of Export Performance

This theory is introduced by Marc Melitz (2003), adds a firm-level dimension to the understanding of international trade. Melitz argues that only the most productive firms within an industry are able to absorb the fixed costs associated with entering foreign markets, while less efficient firms either serve only domestic markets or exit altogether. This theory emphasizes that firm heterogeneity differences in productivity, technology use, and market access plays a crucial role in determining export performance.

For Ethiopia, Melitz's model is particularly relevant in sectors like agriculture, textiles, and leather, where firm productivity varies widely. Time series analysis can capture how shifts in firm competitiveness over time measured indirectly through proxies such as financial development, infrastructure investment, or export incentives affect aggregate export earnings. The theory implies that policy efforts should focus on supporting the most efficient firms through credit access, export training, and market linkage programs to maximize export gains. Furthermore, as only a subset of firms drives export growth,

policies aiming to scale up firm capacity and reduce export entry barriers could enhance national export earnings in both the short and long run.

2.1.4. Gravity Model of Trade

Analogous to Newton's law of gravity, the Gravity Model of Trade posits that trade volume between two countries is directly proportional to the product of their GDPs and inversely proportional to the distance separating them (Tinbergen, 1962; Anderson, 1979). Key components of the model include economic size, geographic distance, and other structural factors. Larger economies tend to trade more due to their greater production and consumption capacities (Anderson, 1979), which suggests that Ethiopia is more likely to generate higher export earnings through stronger trade relationships with major economies such as China, the European Union, and the United States.

Geographic distance, on the other hand, raises transportation and transaction costs, thereby reducing trade volumes and potentially limiting export earnings (Helpman, Melitz, & Rubinstein, 2008). This makes regional trade agreements such as the African Continental Free Trade Area (AfCFTA) especially relevant for Ethiopia, as they reduce barriers and enhance trade with geographically proximate African nations. In addition to size and distance, other factors like shared language, colonial history, trade agreements, and common borders also play a significant role in influencing bilateral trade flows and, by extension, export performance (Rose, 2004).

The Gravity Model provides a useful framework for understanding how structural factors affect the country's export earnings. It underscores the importance of market access, regional integration, and partnerships with large economies as key determinants of export growth. Therefore, analyzing export performance through the lens of the Gravity Model can help policymakers identify external and internal trade-related constraints, thereby informing targeted strategies to improve Ethiopia's export competitiveness and earnings.

2.1.5. Heckscher-Ohlin Theory and Factor Endowments

The **Heckscher-Ohlin (H-O) Theory** (1919, 1933) expands on comparative advantage by emphasizing factor endowments like **natural resources** (land), **human resources** (labor), and **financial assets** (capital). It recommends that countries shall export goods that intensively use their ample factors of production. Ethiopia, rich in labor and land but lacking in capital, has a comparative advantage in labor-intensive industries like agriculture (coffee, flowers) and textiles, aligning with the Heckscher-Ohlin model.

The **Stolper-Samuelson Theorem** (1941), which builds on the H-O model, argues that trade liberalization tends to value the production factors that are relatively abundant within a country, while potentially disadvantaging those that are scarce. For Ethiopia, this means that labor-intensive industries like agriculture could benefit from increased export opportunities, while capital-intensive sectors (like manufacturing) might struggle. Time series analysis could help assess how export earnings has impacted income distribution, particularly in Ethiopia's agriculture and textiles sectors.

2.1.6. Global Trade Policies and Export Performance

Global trade policies significantly shape Ethiopia's export performance. Engagement in frameworks such as the World Trade Organization (WTO) and the African Growth and Opportunity Act (AGOA) provides Ethiopia with preferential access to markets and the opportunity to specialize in its comparative advantage sectors where it holds a comparative advantage. Even if Ethiopia loses its duty-free textile market access to the United States under AGOA, it still serves as a clear example of how global trade frameworks can boost export performance by lowering tariffs and trade barriers. Paul Krugman's New Trade Theory highlights how global trade policies enhance export earnings by expanding market access and enabling countries like Ethiopia to exploit economies of scale. Engagement in agreements such as the World Trade Organization (WTO), the African Growth and Opportunity Act (AGOA), and African Continental Free Trade Area (AfCFTA) magnifies Ethiopia's export potential by reducing trade barriers, which supports sustained growth in export earnings as reflected in time series analyses.

2.1.7. The Prebisch-Singer Hypothesis and Terms of Trade

The Prebisch-Singer Hypothesis (1950) contends that countries reliant on exporting primary commodities are likely to experience a long-term deterioration in their TOT, since the prices of manufactured goods generally increase at a faster rate than those of primary commodities. For Ethiopia, this means that its reliance on raw agricultural exports like coffee could lead to a worsening trade balance and reduced revenue in the long term. Diversifying exports into higher value added products is critical to overcoming this issue, as emphasized by Paul Krugman (1987), who argues that industrialized economies benefit from value added production.

2.1.8. Real Effective Exchange Rate and its Influence On Ethiopia's Export Sector

Ethiopia's shift to a floating exchange rate presents both challenges and opportunities for exports. According to the Mundell-Fleming Model (Mundell, 1963), currency depreciation can boost export competitiveness by lowering export prices, but excessive depreciation risks inflation and higher import costs. The J-Curve Effect (Magee, 1973) suggests export gains may be delayed as volumes adjust to new rates. Cassel's Purchasing Power Parity (Cassel, 1918) indicates exchange rates should reflect price levels, yet inflation in Ethiopia could cause an overvalued real effective exchange rate (REER), reducing competitiveness. The Balassa-Samuelson Effect (Balassa, 1964; Samuelson, 1964) highlights that productivity gains in tradable sectors are crucial to maintain competitiveness. Without improvements in agriculture and manufacturing productivity, the benefits of a floating rate are limited. While a floating exchange rate can stabilize the economy and attract investment, low productivity may lead to trade imbalances and inflation, undermining export performance. To fully benefit, Ethiopia must boost productivity, control inflation, and invest in infrastructure to avoid REER overvaluation and enhance export competitiveness.

2.1.9. Export-Led Growth and Trade Openness

The Balassa Hypothesis (Balassa, 1978) posits that increased trade openness stimulates higher economic growth and enhances export performance by integrating countries into global markets. For Ethiopia, liberalizing trade policies and reducing trade barriers can

facilitate access to broader international markets and attract foreign direct investment, thereby strengthening key export sectors. This export-led growth strategy can diversify the economy, increase foreign exchange earnings, and promote sustainable development. However, Rodrik (1998) cautions that trade openness alone is insufficient to realize these benefits fully. Effective institutions help manage economic transitions and enhance competitiveness (North, 1990), while quality infrastructure reduces costs and facilitates trade logistics. Moreover, investment in human capital ensures a skilled workforce capable of supporting export diversification and innovation. Thus, for Ethiopia to harness the full potential of trade openness, a holistic approach that includes both policy liberalization and structural reforms is essential.

2.1.10. Institutional Theory and Infrastructure

Institutional Theory (North, 1990) emphasizes that well-functioning institutions such as clear trade policies, effective governance, and regulatory stability are foundational for enabling trade and economic growth. Complementing this, (Krugman, 1980) underscores the importance of infrastructure in supporting economies of scale and efficient market access. Poor transport networks, high inland freight costs, and inefficiencies at ports and border checkpoints significantly reduce Ethiopia's export competitiveness. Addressing these gaps through targeted investments in roads, logistics, and customs modernization can reduce transaction costs and improve supply chain reliability. Together, strong institutions and robust infrastructure are essential for boosting Ethiopia's export earnings and sustaining long-term trade growth.

2.2. Empirical Literature review

This section reviews previous studies focused on the determinants of Ethiopia's export earnings and related topics. The existing literature identifies multiple key factors that significantly determine export earnings; however, the impact of each factor varies depending on the country group, individual nations, and specific timeframes. This review provides an overview of the current state of research in this field and highlights how the present study contributes to the existing body of knowledge. The researcher has selected a range of relevant studies from various scholars to inform this analysis.

A recent study by Lakew (2005) analyzes the impact of various factors such as real GDP, trade openness, infrastructure, financial development, and the exchange rate on Ethiopia's export performance using a single-equation log-linear model. The findings highlight that Ethiopia's exports remain heavily reliant on coffee (56.4% of total exports) and a few traditional commodities, with limited geographic diversification (67.3% of exports to just six countries). In the long run, real exchange rate depreciation and increased private sector credit were found to significantly boost exports. Meanwhile, in the short run, domestic demand pressures particularly private consumption was shown to crowd out exportable goods, revealing important production bottlenecks. Regarding policy priorities, the research emphasizes the need for diversification into high-value agricultural exports such as horticulture and flowers, along with exploration of new markets.

Muhabaw's (2013) time-series analysis of Ethiopia's export performance (1974–2011) reveals critical insights into the country's trade dynamics. The study identifies real GDP growth and trade openness as significant positive determinants of exports in both short and long-run periods, emphasizing the importance of production capacity and trade liberalization. Surprisingly, domestic credit exhibits a negative relationship with exports, suggesting that increased credit primarily fuels imports and domestic consumption rather than export-oriented production. While real exchange rate depreciation aligns with theoretical expectations, its weak statistical significance questions the efficacy of devaluation policies. The error correction model underscores structural production capacity as the most robust export driver, whereas capital expenditure and terms of trade prove statistically insignificant.

Addis (2019) investigated the key determinants behind volume fluctuations in Ethiopia's agricultural exports. The study identified infrastructure, government policy, product quality, and access to finance as major positive influencers of export volume. Domestic price, however, was found to negatively affect performance. Primary data from 99 exporters and 10 government professionals supported the analysis. An ordered logit regression model was used for econometric analysis. Findings emphasized poor infrastructure, weak quality control, limited market coordination, and ineffective policy implementation. Export subsidies were poorly distributed and often misused. The study recommends strengthening infrastructure, reforming policy, and improving credit access to stabilize export volumes.

Kassa (2012) conducts a study on determinants of export performance in Ethiopia: a VAR model analysis. He employs a VAR model to analyze the long-run and short-run dynamics of export performance in Ethiopia. Finds that real effective exchange rate, openness, domestic GDP, infrastructure, and private credit all positively influence export earnings and suggests prioritizing policies for infrastructure development, financial access, and trade openness for long-term export growth. The study finds that in the long run, export performance in Ethiopia is positively influenced by the real effective exchange rate, trade openness, domestic GDP, infrastructure, and financial development. In the short run, only the previous year's trade openness significantly enhances current export performance.

Kefelegn (2020) conducts a research on determinants of Ethiopia's manufacturing exports and applies GMM model. The result from the system GMM model showed that importer's GDP, importer's GDP per capita and having common border between Ethiopia and its trading partners had a positive and statistically significant effect on Ethiopia's manufacturing exports and distance between Ethiopia and its trading partners, Real exchange rate a negative and statistically significant effect on Ethiopia's exports. On the other hand, Lagged Ethiopia's manufacturing export and Ethiopia's FDI had positive relationship and found to be statistically insignificant, but Ethiopia's GDP had negative relationship and found statistically insignificant

Dalango, (2020) studies on Determinants of Export Performance in Ethiopia (Time Series Analysis) and applies Autoregressive Distributed Lag (ARDL) model to determine the co-integration relation between variables in small samples. The long-run coefficient result for the model evident that foreign direct investment and per capita GDP are positively associated with exports in Ethiopia while rate of inflation has negative and significant effect. In the short run dynamics, ECM model results reveals that FDI, per capita GDP and capital formation are significant and positively affect the export performance of Ethiopia in the short run.

Gerezgiher (2017) examined the export performance of selected garment factories in the Lebu Industry Zone, Addis Ababa. The study identified key factors affecting export success, including export sales growth, availability of export strategies, and challenges in marketing, raw materials, and technology adoption. Despite infrastructure improvements and government incentives, performance remained below expectations due to high production costs, lack of skilled labor, and weak global value chain integration. The study also found heavy reliance on domestic sales. Recommendations include improving workforce skills, adopting modern technologies, streamlining production, and enhancing market research to boost international competitiveness.

Agasha (2006) used the VEC model to analyze the determinants of Uganda's export price. The researcher used quarterly data from 1987 to 2006 and estimated export growth as a function of gross domestic product, trade policy, real exchange rate, exchange rate, and foreign direct investment. Results of long-term integration show that total stock, real exchange rate and terms of trade have a positive and positive effect on the growth of exports, while the external price structure affects the growth of exports. exported negatively and significantly. Foreign direct investment is seen as pointless.

Elshehawy, Shen, & Ahmed (2014) Investigates the factors that affects the bilateral export flows of Egypt to its 42 main trading partners. The study covers 32 years (from 1990/91 to 2021/22) and gravity model has been used to estimate Egypt’s exports. Egypt’s exports were assumed to depend on its GDP, importer’s GDP, importer’s population, regional trade agreement (RTA), transportation costs (Distance variable) and dummy variable the border between Egypt and its trading partner. Growth in domestic national income (GDP of

Egypt), importer's GDP, importer's population, regional trade agreement (RTA) and border between Egypt and its trading partner were found to positively and significantly determine Egypt's exports. Whereas transportation costs (Distance variable) are found to have negative but insignificant effect on exports of Egypt.

Tsoukis (2016) investigates the relationship between government size and export performance across 18 OECD countries from 1980 to 2005. His research finds that the optimal level of tax revenue for maximizing exports lies between 40–45% of GDP. In contrast, the highest effective level of government spending for supporting exports is around 16% of GDP. The study highlights that beyond these thresholds, larger government involvement can hinder export performance. Excessive government intervention negatively affects productivity and market dynamics, which in turn reduces export competitiveness. Tsoukis emphasizes the importance of maintaining a balanced government role in the economy. His findings suggest that while moderate taxation can support export activity, overreach in spending or regulation may have the opposite effect. This research underscores the need for efficient fiscal policies to sustain export growth.

Hussain and Mazhar (2018) estimated the impact of demand and supply side factors on the export performance of Pakistan from 1971 to 2015 using unrestricted autoregressive distributive lag model (ARDL) and conclude based on the findings of the study that although both demand and supply side factors are equally important in explaining export behavior at the aggregate level, supply side factors have relatively high impact on export performance at a disaggregated level.

Ozgur (2018) study on determinants of export performance in East Africa by selecting seven East Africa countries states (Ethiopia, Madagascar, Kenya, Sudan, Mozambique, Tanzania, and Zambia) and covers the time period from 1990 up to 2015 and employ annual data. Empirical results from the study shows that Gross domestic product growth was found to be statistically insignificant. Therefore, GDPG is the only variable that does not affect the exportation of East Africa countries but this is different from the previous researchers.

Ngeno (1996) analyzes the impact of Structural Adjustment Programs (SAPs) and economic reforms in Eastern Africa, focusing on trade liberalization and its effects on export performance. The study finds that in countries like Kenya and Uganda, liberalization boosted exports of traditional crops such as coffee, tea, and flowers by improving global market access and competitiveness. Non-traditional exports like horticulture and floriculture also expanded. However, the benefits were uneven, as many countries struggled to convert liberalized trade into sustained export growth. The study highlights persistent structural weaknesses and recommends a more comprehensive export strategy that combines market access with institutional and production reforms.

Kindinew (2023) conducted a study on Ethiopia's export potential and efficiency using a Stochastic Frontier Gravity Model (SFGM) to assess how well the country is realizing its export potential and to identify key constraints. The model incorporated traditional gravity variables such as gross domestic product, population of Ethiopia and its trading partners, geographical distance, FDI inflow, arable land, and a landlocked dummy, along with beyond-the-border factors like partner country tariffs and trade agreements. Results show that GDP, population of trading partners, arable land, exchange rate, and geographical distance significantly influence export flows, while foreign direct investment inflow is statistically insignificant in enhancing export performance. The study recommends that Ethiopia prioritize export development policies focused on improving efficiency, reducing trade barriers, and exploring new markets, especially in Asia and the Middle East.

Tanasritunyakul (2020) examined export performance in developing Asian economies, focusing on diversification, product variety, and productivity. The study analyzed trade margins on intensive, extensive and failure perspective, found that while intensive margin drives export growth, extensive margin is vital for newer exporters, and failure margin impacts long-term sustainability. It supports the self-selection hypothesis, where only productive firms export, but also finds evidence of learning by exporting. FDI and global production network (GPN) integration enhance competitiveness, though dependence on foreign firms poses risks. Export diversification increases trade resilience, but economies often specialize as they develop. Countries like China and South Korea shifted to high-value manufacturing, while Vietnam and Bangladesh rely on labor-intensive goods.

The Embassy of India in Ethiopia (2022) researched export opportunities for Ethiopian oilseeds, pulses, cotton, gemstones, and coffee to India. Despite $2.8 billion in bilateral trade, Ethiopia's exports to India remain low at $80 million. Key challenges include Ethiopia's ban on raw coffee exports, regulatory barriers, inefficient trade facilitation, high logistics costs, and complex export procedures. The study used primary and secondary data, engaging stakeholders like government agencies and exporters, though data access was limited. Findings suggest Ethiopia should lift coffee export restrictions, streamline trade processes, and improve infrastructure. It also calls for reducing logistical costs, enhancing value addition, and reforming trade finance access. Strengthening bilateral cooperation and capacity building for exporters are also recommended. Overall, Ethiopia has strong potential to boost exports by leveraging bilateral ties with India.

2.3. Conceptual framework

2.3.1. Key Concept: Export Earnings

At the center of the conceptual framework is export earnings, which refer to the total revenue Ethiopia generates from the sale of goods and services to foreign markets. Export earnings play a vital role in the country's economic development by providing foreign exchange, stimulating production, and contributing to GDP growth.

2.3.2. Dependent and Independent Variables

1. Export Earnings**:** The dependent variable in this study is export earnings, which represents the primary outcome of interest. It captures the value of goods and services Ethiopia sells to international markets and is influenced by a variety of economic and policy-related factors.
2. The study considers five key explanatory variables that are hypothesized to influence export earnings:

a. Gross Domestic Product (GDP): Represents the overall economic activity and productive capacity of the country. A growing GDP is expected to enhance the volume and quality of goods available for export.

b. Capital Expenditure: Refers to government investment in infrastructure, including transportation, energy, and trade-related facilities. These investments are believed to improve trade efficiency and logistics, thereby supporting export performance.

c. Terms of Trade (ToT): Defined as the ratio of export prices to import prices. An improvement in terms of trade indicates more favorable export conditions and greater profitability, which can boost export earnings.

d. Trade Openness: Measured by the ratio of total trade (exports + imports) to GDP. This variable reflects Ethiopia's degree of integration into the global economy. Greater openness is associated with enhanced market access and export potential.

e. Real Effective Exchange Rate (REER): A measure of the value of the domestic currency against a basket of foreign currencies, adjusted for inflation. A more competitive Real Effective Exchange Rate makes Ethiopian exports more affordable to foreign buyers and is expected to stimulate export growth.

2.3.3. Assumptions and Nature of Relationships

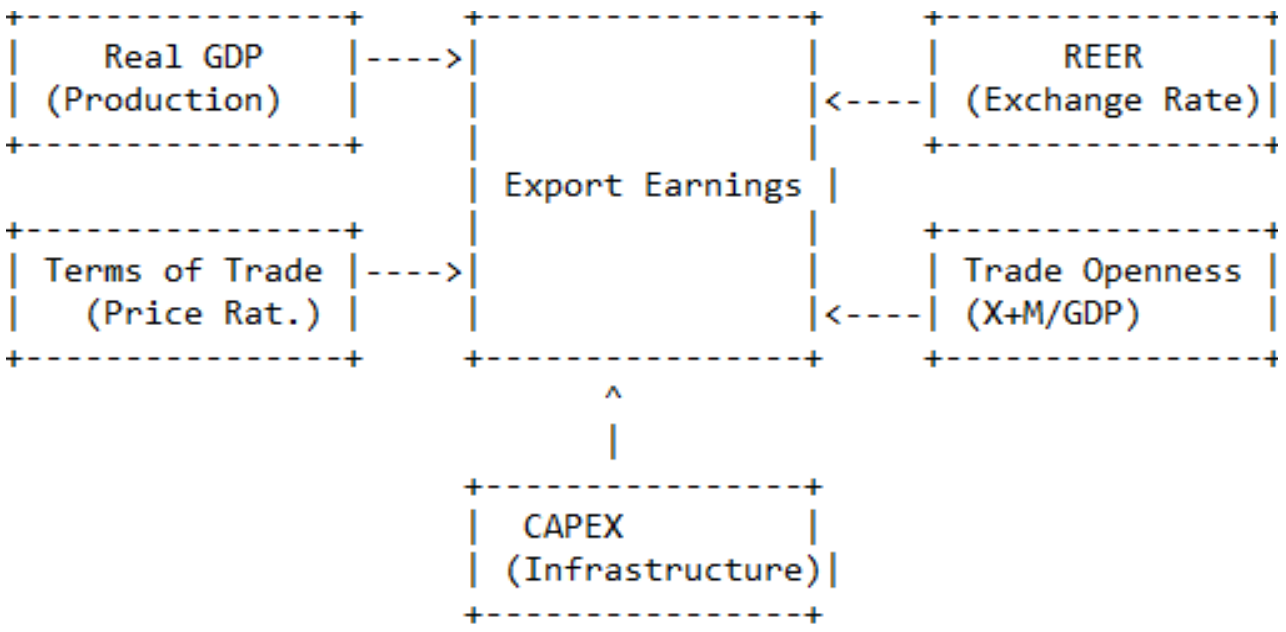
This study assumes that selected macroeconomic and structural indicators positively influence Ethiopia's export earnings. An increase in GDP reflects greater productive capacity and supports higher export volumes, while capital expenditure, particularly in infrastructure, improves trade logistics and efficiency, facilitating better export performance. Improvements in terms of trade and trade openness are expected to enhance market access and export earnings. Additionally, a more competitive real effective exchange rate through currency depreciation is likely to increase export revenues by boosting international price competitiveness (Helpman, Melitz, & Yeaple, 2004; Edwards, 1989).

2.3.4. Descriptive Conceptual Model

The conceptual model underlying this study summarizes the hypothesized linkages between the independent and dependent variables:

- **Gross Domestic Product (GDP):** Higher GDP is expected to enhance export earnings through increased production capacity.
- **Capital Expenditure:** Greater investment in infrastructure is anticipated to improve trade efficiency and raise export performance.
- **Terms of Trade:** Improved terms of trade are likely to increase the profitability and volume of exports.
- **Trade Openness:** A more open trade regime is expected to broaden international market access and boost exports.
- **Real Effective Exchange Rate (REER):** A more competitive REER is presumed to increase demand for Ethiopian exports by improving their price competitiveness.

Figure 1 Conceptual Framework



Source: Researcher's Own Design (2025)

Chapter Three: Data and Methodology

3.1. Data sources and type

Secondary data obtained from the National Bank of Ethiopia and other compiled sources were used for the analysis. Time series data covering the period from 1991 to 2024 were employed to examine the determinants of the country's export earnings.

3.2. Research Method

According to Creswell (2009), there are three primary research paradigms: the quantitative approach, the qualitative approach, and the mixed methods approach. Quantitative research is characterized by its objective stance, relying on the collection and statistical analysis of numerical data to draw conclusions. In contrast, qualitative research assumes a more subjective standpoint, focusing on the interpretation and understanding of phenomena through non-numerical data, often aiming to generate in-depth insights that can be generalized to broader contexts (Collis & Hussey, 2003). The mixed methods approach combines elements of both paradigms, grounded in pragmatism, and involves collecting and analyzing data simultaneously or in sequence to provide a comprehensive understanding of the research problem (Creswell, 2009). For the purpose of identifying and analyzing the key factors influencing export performance, this study employed a quantitative research methodology.

3.3. Methods of Data Presentation and Analysis

The researcher applied descriptive analytical techniques to examine secondary data and to systematically summarize the findings. To illustrate the patterns and dynamics of Ethiopia's export earnings in relation to key influencing factors, the data was processed and analyzed using Microsoft Excel. Graphical tools were utilized to visually represent the trends, thereby facilitating clearer understanding. Furthermore, time series regression analysis was employed to investigate the data more rigorously, with interpretations supported by core financial indicators and statistical metrics using STATA17.

3.4. Methods of Estimation and Procedure: test used

Stationary test

The standard classical estimation methods used in applied econometrics depend on several assumptions, one of which is that the variables must be stationary. A variable is said to be covariance (weakly) stationary if its mean and variance remain constant over time, and the covariance between two time points depends only on the lag between them, not the actual time of measurement. In contrast, a non-stationary series shows a mean that changes over time and a variance that grows with the size of the sample (Debel G., 2002).

Unit root test

Unit root tests are essential for determining the stationarity of time-series data. To examine whether the series contains unit roots, the study applies tests developed by Fuller (1976) and Dickey and Fuller (1979, 1981). The Augmented Dickey-Fuller (ADF) test, a modified version of the Dickey-Fuller test, is used particularly when the error term is not white noise. During stationarity testing, if a variable is stationary at its level form, it is considered integrated of order zero, denoted I(0). If it becomes stationary only after the first differencing, it is integrated of order one, I(1). More generally, a variable that requires differencing n times to achieve stationarity is integrated of order n, I(n) (Verbeek, 2004).

3.5. Model Specification

The data consumed in this study are suitable for time series analysis. The quantitative data collected were examined using multiple regression techniques. The model includes one dependent variable, five independent variables, a constant term, and an error term. This regression framework enables explicit control over multiple factors that simultaneously influence the dependent variable. Such an approach is essential for both testing economic theories and assessing policy impacts, particularly when working with observational (non-experimental) data. Consequently, the general model incorporating all relevant variables to test the study's hypotheses is as follows. The model used in this study is a multiple linear regression model applied to time series data, specified in a log-linear form. This approach is widely used in applied econometrics to examine the relationship between a dependent variable (in this case, export earnings) and multiple explanatory variables over time. This

specific model (Equation 3.1) is formulated by the researcher, drawing on these econometric foundations and tailored to the context of Ethiopia's export earnings and relevant macroeconomic variables. A log-linear form single equation export determination model of equation 3.1 is employed to capture the determinants of export in Ethiopia is thus given by:

$$\text{Ln } X_t = \beta_0 + \beta_1 \ln RGDP_t + \beta_2 \ln TOT_t + \beta_3 \ln TO_t + \beta_4 \ln REER_t + \beta_5 \ln CE + \varepsilon_t \quad \text{------3.1}$$

Where; Xt= export performance in million birr.

GDP= Value of gross domestic product in million birr.

TOT = Terms of trade

TO=Trade openness

REER = Real effective exchange rate

CE= Capital expenditure on infrastructure

β's are unknown parameters to be estimated

t = time in years (1991-2024) and ε = random terms

3.5.1. The underlying assumptions for selecting this model

The selection of the model is based on several important econometric assumptions. First, the model is specified in a log-linear form, which assumes that the relationships between export earnings and the explanatory variables are multiplicative in nature. Second, it is assumed that the time series data used in the analysis are stationary, meaning that their statistical properties such as mean and variance remain constant over time. If the variables are not stationary, appropriate transformations or co-integration techniques are applied. Third, the model assumes that there is no perfect multicollinearity among the independent variables, ensuring that each variable's effect can be distinctly identified. Fourth, the assumption of homoscedasticity implies that the variance of the error terms remains constant throughout the sample period. Fifth, the model requires no autocorrelation in the residuals, meaning that the error terms should not be serially correlated over time. Sixth,

normality of residuals is assumed to ensure the validity of hypothesis testing and confidence intervals. Lastly, the model is grounded in theoretical relevance, as all selected variables such as GDP, real effective exchange rate, terms of trade, trade openness, and capital expenditure have well-established economic justifications for their potential influence on export earnings.

3.6. Definition of Variables

3.6.1. Real Effective Exchange Rate

It is mostly recognized that depreciation of the exchange rate generally stimulates export growth, whereas an increase in the real exchange rate tends to suppress exports. Therefore, managing the real exchange rate is considered a crucial policy tool to preserve a country's export competitiveness in the global market (Prasad, 1992). This study utilizes market-weighted real exchange rate data to evaluate its impact on exports, with the expectation of a positive association collected from NBE.

3.6.2. Terms of Trade

Terms of trade are a key determinant of export performance in both developing and developed economies. Favorable terms of trade typically link with higher export growth rates, while unfavorable terms are linked to slower export growth. According to Muhabaw (2013), long-run model estimations indicate that terms of trade positively influence a country's export performance.

3.6.3. Trade Openness

Economic integration through trade liberalization is essential for export growth and overall economic development. Historically, no country has realized significant improvements in living standards without opening its economy to international trade. Empirical studies, such as those by Kassa (2012), demonstrate that trade openness positively affects export earnings. Trade openness is typically measured by the ratio of total exports and imports to GDP, with higher ratios indicating deeper integration and potentially higher export earnings. In conclusion, increased trade openness is expected to have a positive effect on export performance.

3.6.4. Capital Expenditure

Capital expenditure on infrastructure plays a critical role in influencing or limiting export capacity, especially in least developed countries. Robust infrastructural facilities are fundamental for enhancing production and export supply. Poor infrastructure reduces trade returns and economic activity, thereby hindering growth prospects (Tekeste, 2012). In this study, infrastructure's impact is magnified by capital expenditure, reflecting investments in roads, railways, telecommunications, electricity, and other key facilities. Such investments facilitate market access internationally, whereas inadequate infrastructure hampers export performance. Thus, the variable is expected to have a positive relationship with exports.

3.6.5. Gross Domestic Product

A higher GDP in the exporting country signals greater production capacity, which is anticipated to positively influence export volumes. Muhabaw (2013) confirms through his study on export growth determinants in developing countries that GDP has a significant and favorable effect on export volume. He emphasizes that an increased production level is a primary driver of export expansion. Consequently, a positive relationship between GDP and export earnings is expected.

3.7. Model Variables

The analysis focuses on both dependent and independent variables. Export earnings serve as the dependent variable influenced by five independent variables, which represent the factors determining export performance. These explanatory variables include gross domestic product, terms of trade, trade openness, real effective exchange rate, and infrastructure as a ratio of GDP. Although other factors may affect export earnings, this study concentrates on these five variables, with remaining influences captured in the error term.

3.8. Validity and Reliability of Data

Data reliability refers to the consistency and dependability of the data. Given the potential limitations of secondary data, this study prioritizes information sourced from reputable institution; NBE. To ensure the validity and reliability of the regression model's results, it is essential to conduct diagnostic tests such as autocorrelation, normality, and stability tests. The autocorrelation test checks whether residuals from the model are independent over time, since the presence of autocorrelation can lead to biased standard errors and unreliable inference, thus undermining the validity of the results. The normality test evaluates if the error terms follow a normal distribution, a key assumption for valid hypothesis testing and confidence interval estimation, directly impacting the reliability of the model's estimates. Finally, the stability test evaluates whether the model parameters remain reliable throughout the study period. Stable parameters confirm that the relationships identified are dependable and not affected by structural breaks or shifts, thereby supporting both the validity and reliability of the findings. Together, these tests strengthen confidence in the data and the robustness of the conclusions drawn from the econometric analysis.

3.9. Operational Terms

Export Earnings/Performance: The total amount of FCY or U.S. dollars earned by a country through the export of goods or products and services within a defined time frame.

Determinants: Factors that influence or affect a particular outcome or result. In this case, the determinants refer to the variables that impact export earnings in Ethiopia.

Time series analysis: A quantitative statistical method or technique used to analyze and evaluate data points collected at consistent time intervals, with the goal of identifying underlying trends, patterns, and structural changes over time.

Real Gross Domestic Product: An inflation-adjusted indicator of Ethiopia's total economic output, reflecting the true market size and the prospective level of domestic demand that can influence export capacity.

Real Effective Exchange Rate: A weighted index that measures the relative price competitiveness of Ethiopian goods and services compared to those of its major trading partners, significantly influencing the country's export performance.

Global Economic Growth: Growth rate of the world economy, influencing demand for Ethiopian exports. (Image of World GDP growth map)

Terms of Trade (TOT): The ratio of export prices to import prices, serving as a key indicator of Ethiopia's trade competitiveness by influencing the country's real income and purchasing power derived from international trade.

Foreign Direct Investment (FDI): The inflows of foreign capital into Ethiopia, which can enhance the country's production capacity and boost its export prospective.

Trade Openness: The ratio of total trade volume (imports plus exports) to GDP, demonstrating the degree of Ethiopia's integration and participation in the global economy.

Government Expenditure on Infrastructure: Strategic public investment in transportation, communication, and essential infrastructure that underpins export logistics, drives trade efficiency, and accelerates sustainable economic growth.

Human Capital: Educational attainment and skills of the Ethiopian workforce, affecting productivity and export competitiveness. (Image of literacy rate and education statistics of Ethiopia)

Technological Adoption: Level of technological advancement in Ethiopian export sectors, enhancing efficiency and product quality. (Image of technology adoption in Ethiopian industries)

Political Stability: Level of political stability and conflict in Ethiopia, affecting investor confidence and export trade flows. (Image of political stability index of Ethiopia)

Regional Trade Agreements: Participation in free trade agreements with other countries, reducing trade barriers and boosting export opportunities. (Image of Ethiopia's trade agreements map)

Global Commodity Prices: Prices of Ethiopia's key export commodities, impacting export earnings. (Image of price trends of Ethiopia's major export commodities)

Exchange Rate Volatility: Fluctuations in the exchange rate, creating uncertainty for exporters and hindering investment. (Image of exchange rate volatility graph of Ethiopia)

Informal Trade: Unrecorded cross-border trade activity potentially affecting official export earnings data. (Image of informal border crossing in Ethiopia)

Export Diversification: Expansion of export product range beyond traditional commodities, mitigating risks and creating new market opportunities.

Chapter Four: Data Analysis and Interpretation

4.1. Ethiopia's Export Performance

According to the National Bank of Ethiopia's 2021/22 report, total merchandise export earnings reached approximately USD 4.1 billion, highlighting an annual growth rate of 14.1 percent. This growth was mainly driven by key export sectors including coffee, flowers, fruits and vegetables, textiles, meat products, and electricity. Coffee exports alone surged by 57.3 percent, propelled by a 29.0 percent increase in international prices and a 22.0 percent rise in export volumes, raising its contribution to total merchandise exports from 25.3 percent to 34.9 percent. Similarly, flower exports grew by 15.1 percent due to increases in both volume (12.5 percent) and price (2.3 percent), slightly raising its share of total exports to 13.2 percent. Fruits and vegetables saw a 26.8 percent growth, mainly from a 26.3 percent price increase, with volume remaining relatively stable, which increased their export share to 2.1 percent. Meat and meat products experienced a significant 45.5 percent rise in earnings, supported by a 29.9 percent increase in volume and a 12.0 percent price hike, increasing their share to 2.7 percent. Despite an 18.5 percent decline in international prices, textile exports rose by 19.4 percent, driven by a substantial 46.5 percent growth in export volumes, marginally increasing their share to 4.3 percent (National Bank of Ethiopia, 2022, pp. 50-51).

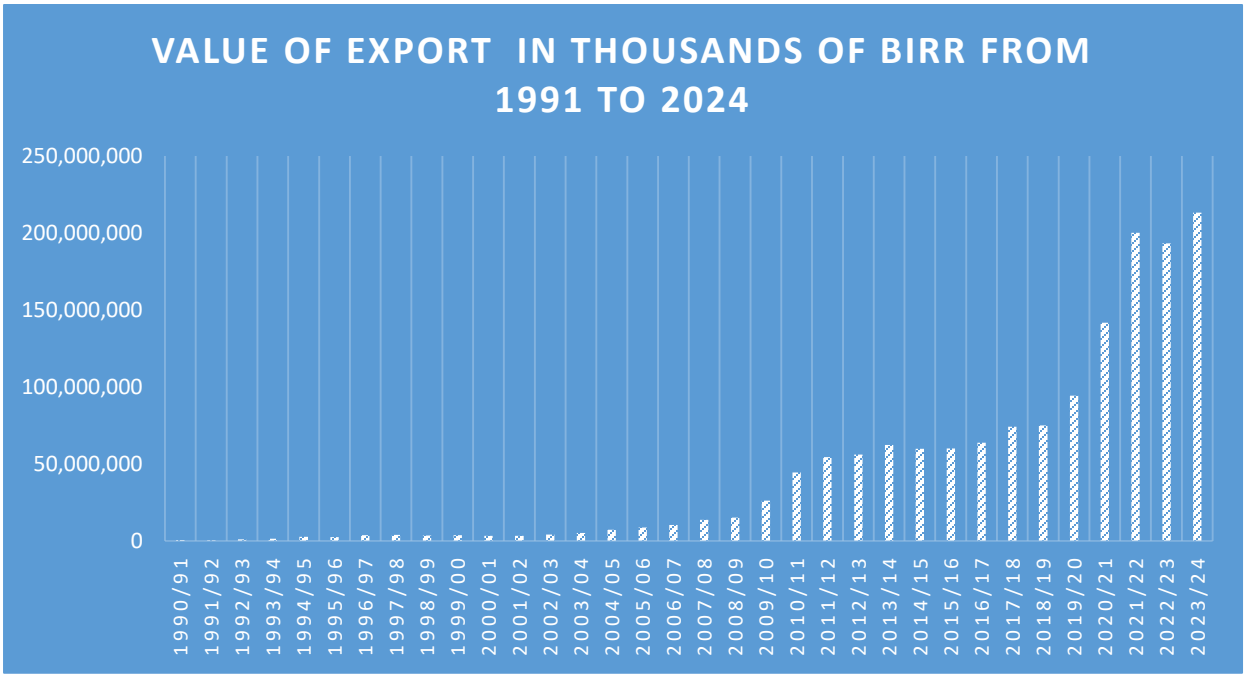
4.2. Descriptive data analysis

Descriptive analysis was made to inspect the patterns and trends in the time series data for both the dependent and independent variables prior to their use in the economic analysis model.

4.2.1. Dependent variable

Export performance is the dependent variable in this study. The Graph below reveals time series data of Ethiopia's export performance from 1991 to 2024.

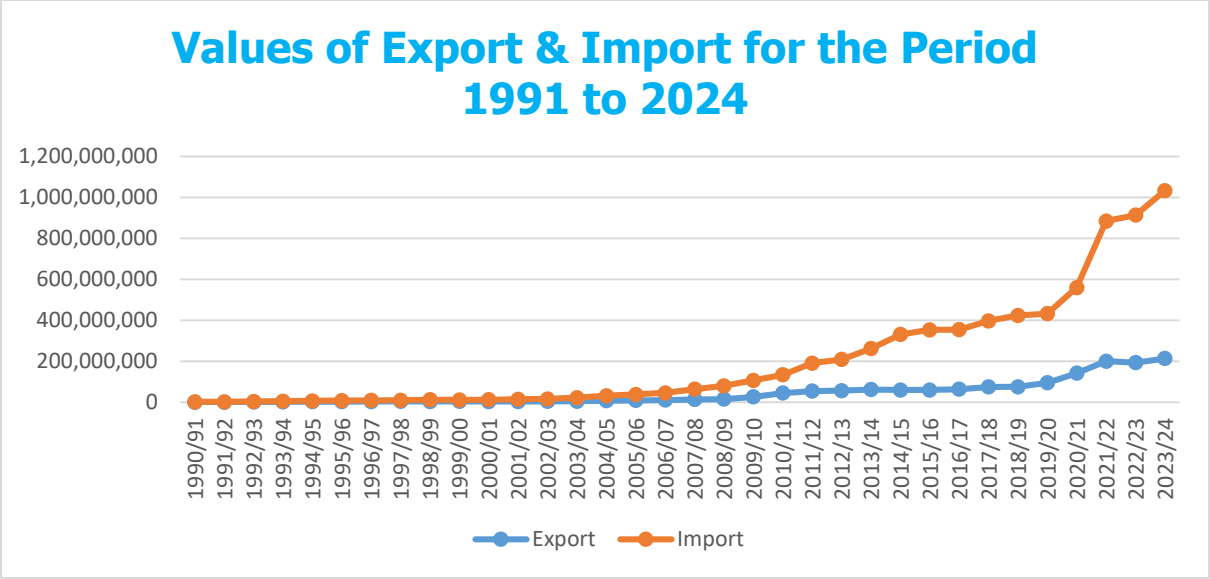
Figure 2: Ethiopia Export Performance covering from years 1991 GC to 2024 GC



Source: National Bank of Ethiopia, Unpublished data, received via official communication (Email), May 2025

The data reveals a steady increase in export performance from 1991 to 2024. Notably, starting from 2011, exports doubled compared to the previous year and continued to grow, exceeding 200 billion birr by 2024. However, despite this upward trend in exports over the period, the export levels remain significantly lower than import volumes, which has become a major concern for the country's balance of payments.

Figure 3: Export versus Import performance in thousands of birr from 1991 to 2024



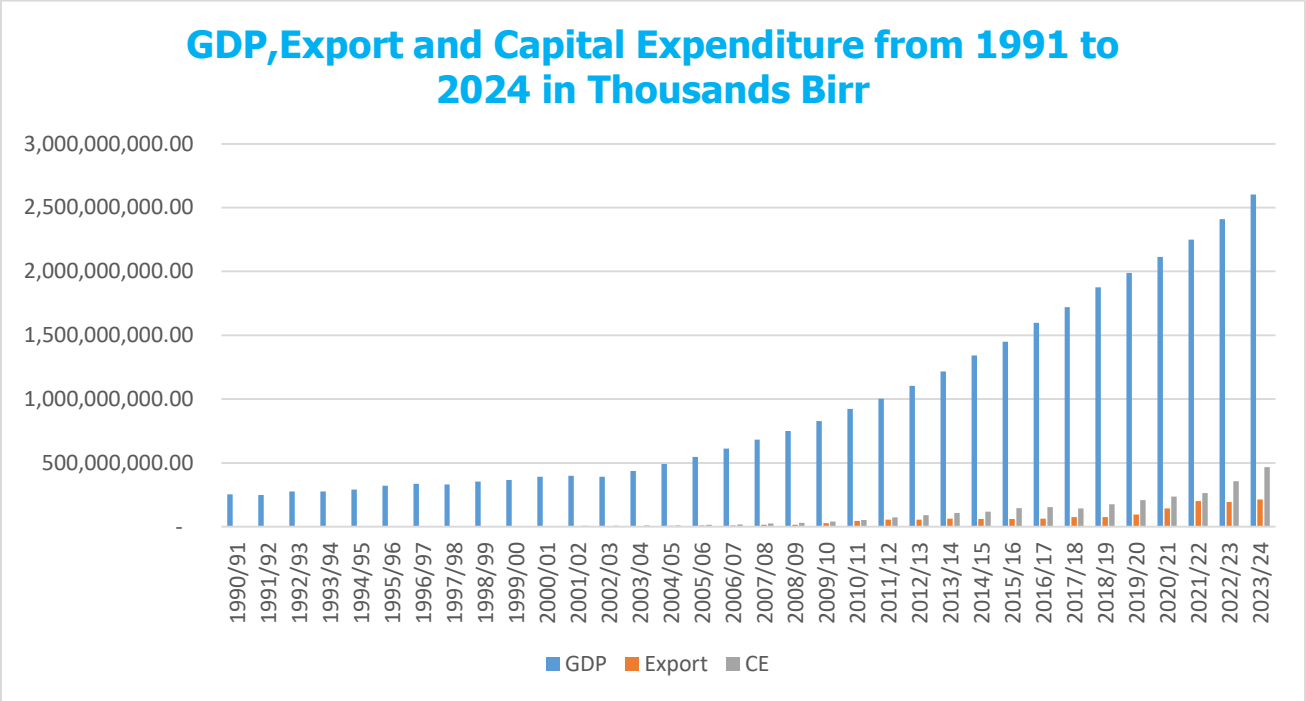
Source: National Bank of Ethiopia, Unpublished data, received via official communication (Email), May 2025

Graph 2 indicates a comparison between import and export performance, clearly illustrating the weakness of our export earnings relative to the payments made for imported goods an issue that requires critical attention to address.

4.2.2. Independent variables

The Independent Variables in this study are real GDP, terms of trade, trade openness, capital expenditure and real effective exchange rate. Let us compare export with real GDP, and capital expenditure in the figure below. Since some of the explanatory variables are ratio of one another let us take and compare GDP and capital expenditure with export.

Figure 4: GDP-Export-Capital Expenditure



Source: National Bank of Ethiopia, Unpublished data, received via official communication (Email), May 2025

As illustrated in Graph 3, the growth patterns of real GDP and exports do not align, indicating that despite export growth during the analyzed period, its contribution is not proportional to the growth of real GDP. Additionally, there has been a notable increase in capital expenditure, which supports export growth by improving production capacity, improving efficiency, and strengthening competitiveness.

4.3. Empirical Analysis

4.3.1. Result of Unit Roots Tests

In data analysis, a crucial preliminary step before conducting regression is to test for the presence of unit roots in the variables and to determine their order of integration. This is crucial because, to ensure meaningful regression results, the variables must be properly adjusted or transformed (D. Gemechu, 2002). Accordingly, all variables included in the

estimation process were examined using the Dickey-Fuller optimality test, and the results are presented in the table below.

Table 1: Results of unit root tests

ADF test at Level			
	Test Statistics	*p-value*	*Result*
lnX	-0.267	.9301	Non-stationary
lnRGDP	1.652	.9980	Non-stationary
lnToT	-2.383	.1465	Non-stationary
lnTO	1.670	.9981	Non-stationary
lnREER	-2.179	.2138	Non-stationary
lnIG	-1.295	.6317	Non-stationary
ADF test at First Difference			
	Test Statistics	*p-value*	*Result*
lnX	-6.626	*.000*	*Stationary*
lnRGDP	-4.840	*.000*	*Stationary*
lnToT	-7.106	*.000*	*Stationary*
lnTO	-2.918	*.043*	*Stationary*
lnREER	-6.407	*.000*	*Stationary*
lnIG	-5.743	*.000*	*Stationary*

Note: DF Critical Value at 1% = -3.702; 5% = -2.98; & 10% = -2.622

Source: Research Data from Stata17

The Augmented Dickey-Fuller (ADF) test was applied to assess the stationarity of the variables included in the model. The critical values for the ADF test are -3.702 at the 1% level, -2.980 at the 5% level, and -2.622 at the 10% level. As shown in Table 1, all variables namely export earnings, real GDP, terms of trade, trade openness, real effective exchange rate, and capital expenditure (used as a proxy for infrastructure) were found to be non-

stationary at their level form. However, after first differencing, each variable became stationary, indicating that all variables are integrated of order one, I(1).

4.3.2. Optimal Lag-selection

Johansen's co-integration analysis is sensitive to the number of lags specified in the model. Including too few lags may lead to the premature rejection of the null hypothesis, whereas incorporating too many lags can reduce the test's statistical power (Verbeek, 2004). Therefore, selecting an optimal lag length is crucial to ensure reliable results and to prevent the unnecessary loss of valuable initial observations.

Table 2. Optimal lag

Sample: 1993 thru 2024 Number of obs = 32

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	67.3303				8.7e-10	-3.83314	-3.74205	-3.55832
1	280.782	426.9	36	0.000	1.4e-14*	-14.9239	-14.2862*	-13.0001*
2	317.037	72.509*	36	0.000	1.8e-14	-14.9398*	-13.7555	-11.3671

*Note: * optimal lag; Endogenous: lnX lnGDP lntot lnto lnreer lnig: and Exogenous: _cons*

Source: Research Data from Stata17

Based on Table 2 above the data it is computed that FPE, SBIC and HQIC suggest an optimal lag of 1 that indicates variation in current value of variables in the system comes from last 1 period of their own values**.**

4.3.3. Johansen tests for cointegration

Macroeconomic variables often display non-stationary behavior and tend to follow long-term trends. When such variables are cointegrated, it suggests a stable long-run relationship

among them (Johansen, 1991). The Johansen test provides a unified approach to both estimate and test for the existence of multiple cointegrating relationships. Unlike other methods, it does not require prior classification of variables as endogenous or exogenous. Instead, all variables are considered potentially endogenous within the model framework (Johansen, 1988).

Table 3. Johansen tests for cointegration

Johansen tests for cointegration

Trend: Constant — Number of obs = 32

Sample: 1993 thru 2024 — Number of lags = 2

Maximum rank	Params	LL	Eigenvalue	Trace statistic	Critical value 5%
0	42	243.74238	.	146.5888	94.15
1	53	285.54324	0.92665	62.9871*	68.52
2	62	298.23629	0.54766	37.6010	47.21
3	69	309.28393	0.49866	15.5057	29.68
4	74	314.26126	0.26735	5.5510	15.41
5	77	317.03596	0.15921	0.0016	3.76
6	78	317.03677	0.00005		

* selected rank

Source: Research Data Result from Stata17

Note: * selected rank

The Johansen test reveals the existence of one cointegrating vector at the 5% significance level, as shown in Table 3. This indicates that the variables share both long-run equilibrium and short-run interactions. Therefore, examining both the long-run relationship and short-run dynamics among the variables is essential.

4.3.4. Estimation of the long run and error correction models

Table 4. Normalized Long run Model

beta	Coefficient	Std. err.	z	P>z
lnGDP	.8490701	.1081769	7.85	0.000
lntot	.9366538	.0954964	9.81	0.000
lnto	1.397971	.1898429	7.36	0.000
lnreer	-.120835	.0634562	-1.90	0.057
lnig	.0339579	.1361324	0.25	0.803

Source: Research Data Result from Stata17

The results from the long-run model estimation show that real GDP, terms of trade, trade openness, and infrastructure positively influence the country's export performance. In contrast, the real effective exchange rate has a negative association with exports. As shown in Table 4, all variables are statistically significant at the 5% level, except for infrastructure (capital expenditure) and the real effective exchange rate, which are not statistically significant.

Short Run Dynamics

Following the estimation of the long-run model and its coefficients, the next step involves analyzing the short-run dynamics, which carry significant policy relevance. To capture these short-term relationships and the speed at which the system adjusts back to long-run equilibrium, an error correction model (ECM) is employed. The estimated ECM, which reflects these dynamics, is summarized in the table below

Table 5. Result of the Error Correction Term

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
ECT	-0.973	0.2075	-4.69	0.000	-1.3806	-0.5671
LD.lnX	-1.2231	0.5130	-2.38	0.017	-2.2286	-0.217
LD.lnGDP	2.207	1.355	1.63	0.103	-0.4493	4.864
LD.lntot	1.8055	0.872	2.07	0.038	-0.9603	3.514
LD.lnto	2.190	0.7376	2.97	0.003	0.744	3.6363
LD.lnreer	-0.396	0.2294	-0.17	0.863	-0.4893	0.410
LD.lnig	0.561	0.399	1.41	0.160	-0.221	1.343
Constant	0.177	0.096	0.18	0.854	-0.172	0.2077

RMSE = .196627 R-sq = 0.7521 chi2 = 72.799 P>chi2 = 0.0000

Source: Research Data Result from Stata17

The coefficient of the error correction term is statistically significant and carries the expected negative sign, indicating the existence of a short-run reaction mechanism. This suggests that any short-run disequilibrium is corrected over time. The relatively large magnitude of the coefficient (-0.973) implies that approximately 97.3% of deviations from the long-run equilibrium are corrected each period, reflecting a rapid adjustment process. The R^2 value of 0.7521 (75.21%) indicates that the explanatory variables included in the model account for about 75% of the variation in Ethiopia's export performance, while the remaining 25% is attributed to factors not included by the model. Additionally, the F-statistic is highly significant (p-value = 0.00000), confirming that the overall model is a good fit. In the short run, real GDP, terms of trade, trade openness, and capital expenditure (infrastructure) are found to be significant drivers of the country's exports. As expected, all these variables have a positive relationship with export performance during the short-run period.

4.3.5. Assumption Tests

4.3.5.1. Autocorrelation

Autocorrelation refers to the correlation between values in a series of observations that are arranged in time. In the context of regression analysis, the classical linear regression model assumes that there is no autocorrelation among the error terms (disturbances), denoted as ui. When the error terms are correlated with each other, this assumption is violated, demonstrating the presence of an autocorrelation problem in the model.

Table 6. Autocorrelation test

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	46.4488	36	0.11390
2	36.6963	36	0.43641

H0: no autocorrelation at lag order

Source: Research Data Result from Stata17

Therefore, as shown in Table 6, the p-value exceeds the 5% significance level, signifying that there is no statistical evidence of autocorrelation in the model. This suggests that the assumption of no autocorrelation among the error terms holds true.

4.3.5.2. Normality Test

In a normality test, the null hypothesis assumes that the data are drawn from a population with a normal distribution. A significant p-value (less than 0.05) provides evidence to reject this assumption, indicating the data may not be normally distributed. On the other hand, an insignificant p-value (greater than 0.05) suggests there is not enough evidence to reject the null hypothesis, implying the data are consistent with a normal distribution.

Accordingly, as shown below, the p-value exceeds the 5% significance level, indicating that the normality assumption holds for the dataset.

Table 7. Jarque - Bera test

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_lnX	0.208	2	0.90122
D_lnGDP	1.300	2	0.52209
D_lntot	0.815	2	0.66518
D_lnto	2.218	2	0.32982
D_lnreer	2.951	2	0.22865
D_lnig	2.814	2	0.24488
ALL	10.307	12	0.58907

Source: Research Data Result from STATA17

4.3.5.3. Stability Test

Eigenvalue stability condition is a criterion used in data analysis to determine their stability. This condition is based on the eigenvalues of the system's state transition matrix or characteristic equation.As we see in figure below the eigen value is below one which indicates the model stability, please look Table 8 and Figure 4.

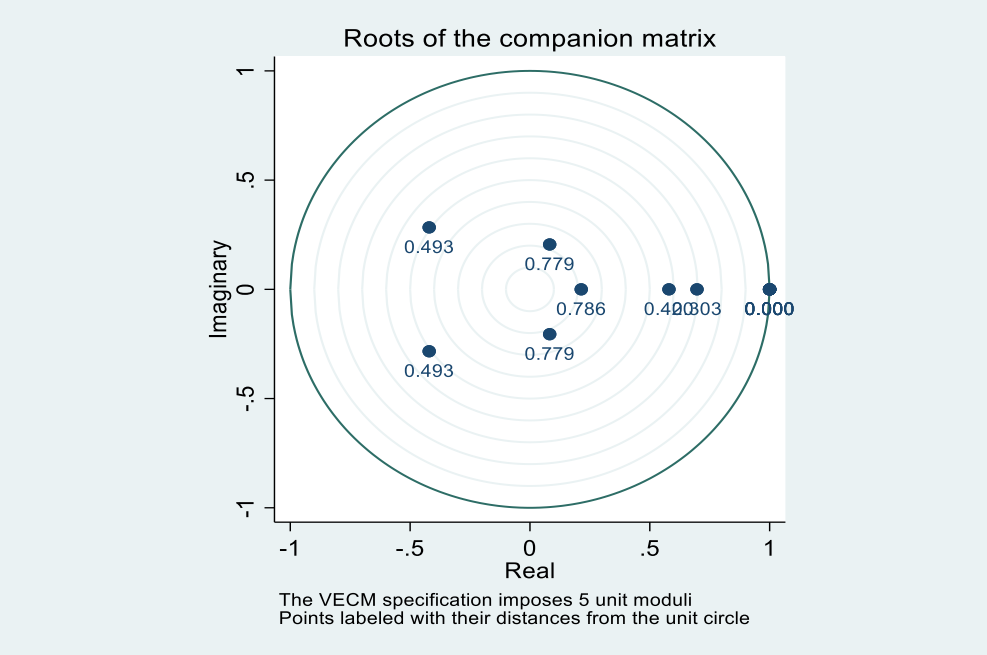
Table 8. Eigen Stability Condition

Eigenvalue stability condition

Eigenvalue	Modulus
1	1
1	1
1	1
1	1
1	1
.6969732	.696973
.5799425	.579942
-.4204051 + .2834836*i*	.507054
-.4204051 - .2834836*i*	.507054
.0822565 + .2053442*i*	.221207
.0822565 - .2053442*i*	.221207
.2139095	.21391

Source: Research Data from STATA17

Figure 5: Roots of the companion matrix



Source: Research Data from STATA17

Once the companion matrix is constructed above, the stability of the model can be assessed by examining the eigenvalues of this matrix. If all eigenvalues lie within the unit circle in the complex plane (i.e., their magnitudes are less than 1), then we can say that it is stable. Conversely, if any eigenvalue lies outside the unit circle, the system is unstable. As we see above all the Eigen values are within the circle and their magnitude is less than one and we can say that the model is stable.

4.4. Discussion

The findings of this study provide empirical evidence on the determinants of Ethiopia's export earnings over the period 1991 to 2024. The results are largely consistent with both classical trade theories and previous empirical studies, particularly those focusing on developing economies like Ethiopia.

The positive long-run and short-run influence of real GDP on export performance aligns with the Comparative Advantage Theory (Ricardo) and Heckscher-Ohlin Theory, both of which emphasize the role of domestic production capacity in enhancing export potential. Empirical studies by Lakew (2005), Kassa (2012), and Rodrik (1999) similarly identified real GDP as a critical driver of export growth, noting that economic growth enables countries to expand production and meet international demand. Although Dereje (2020) found an insignificant link between GDP and manufacturing exports, this could be due to the capital-intensive nature and underdevelopment of Ethiopia's manufacturing sector compared to agriculture.

The significance of trade openness in promoting export earnings supports the Export-Led Growth Hypothesis (Balassa, 1978) and findings from Muhabaw (2013) and Kassa (2012). These studies highlighted that liberalizing trade, simplifying export processes, and removing tariffs and non-tariff barriers have a positive impact on export performance. The theoretical framework provided by Krugman's New Trade Theory and practical insights from Ngeno (1996) further strengthen this conclusion, suggesting that trade liberalization expands market access and enhances competitiveness.

The positive impact of terms of trade in the short run also confirms the observations of Agasha (2006) and Muhabaw (2013), who noted that improved export prices relative to imports boost earnings. However, the long-term risk of terms-of-trade deterioration, as outlined by the Prebisch-Singer Hypothesis, remains a concern for countries like Ethiopia that rely heavily on primary commodity exports. This reinforces the argument made by Krugman (1987) for diversification into value-added products to mitigate long-run vulnerabilities.

The importance of infrastructure, proxied by capital expenditure, confirms findings from Addis (2015) and Gerezgiher (2017), who identified poor logistics and infrastructure gaps as major barriers to export performance. These results also support North's Institutional Theory and Krugman's emphasis on infrastructure in New Trade Theory, which highlight that efficient institutions and transport networks are essential for global competitiveness.

The findings on the real effective exchange rate (REER) show a dual effect: positive in the short term and negative in the long run. This is consistent with the Mundell-Fleming model and the J-Curve Effect (Magee, 1973), which suggest that currency depreciation initially boosts exports but may lead to inflation and competitiveness loss over time. Studies by Muhabaw (2013) and Kefelegn (2020) found similar mixed effects. The Cassel (1918) PPP theory and Balassa-Samuelson effect further emphasize that an overvalued exchange rate often due to domestic inflation or productivity gaps can erode export competitiveness in the long run.

In summary, the results of this time series analysis strongly align with both theoretical expectations and empirical findings from earlier studies. The study extends the literature by using updated data covering more than three decades, providing current policy-relevant insights. The consistent role of macroeconomic stability, trade openness, and infrastructure development highlights the urgent need for a coordinated national export strategy. Such a strategy should focus not only on improving production and market access but also on addressing structural bottlenecks and ensuring competitive exchange rate management for sustainable export-led growth in Ethiopia.

Chapter Five: Conclusion and Recommendation

This section summarizes the major findings of the study and offers policy-relevant recommendations based on the econometric analysis conducted on Ethiopia's export earnings from 1991 to 2024. The conclusion highlights the key determinants affecting export performance, both in the short and long run, using robust time series methodologies. It reflects how well the study objectives have been addressed and provides insights into the relationships between export earnings and macroeconomic variables. The recommendations are derived from the empirical results and are intended to guide policymakers, researchers, and stakeholders in designing strategies that enhance Ethiopia's export capacity. These recommendations focus on gross domestic product, infrastructure development, trade openness, terms of trade and effective exchange rate management, with the goal of creating a more competitive and sustainable export sector and enhancing export earnings.

5.1. Conclusion

This study aims to identify the key determining factors that influence Ethiopia's export earnings. To achieve this, time series data from 1991 to 2024 were utilized, sourced NBE. The analysis considers total exports (in million Birr) as the dependent variable, while terms of trade, trade openness, real GDP, real effective exchange rate, and capital expenditure (used as a proxy for infrastructure) serve as explanatory variables.

The initial step involved estimating the relationship between exports and the explanatory variables using the Ordinary Least Squares (OLS) method. Prior to estimation, the Augmented Dickey-Fuller (ADF) test was conducted to assess the stationarity of the data. The results showed that all variables were non-stationary at their levels but became stationary after first differencing, indicating that they are integrated of order one (I(1)).

Following this, the Johansen cointegration test was applied to determine whether a long-run relationship exists among the variables. The findings confirmed cointegration, supported by a significant and negatively signed error correction term, which signals a stable long-term relationship. The long-run results reveal that real GDP, terms of trade,

trade openness, and infrastructure positively affect exports, while the real effective exchange rate has a negative impact on export performance.

In the short run, real GDP, terms of trade, trade openness, and capital expenditure (infrastructure) remain significant factors positively influencing exports, consistent with theoretical expectations.Additional diagnostic tests showed no evidence of autocorrelation, and the residuals passed the normality test, confirming the assumption of normal distribution. The model's stability was also verified, with all eigenvalues lying within the unit circle, indicating a stable system.

5.2. Recommendations

- The positive and significant coefficients of the production capacity, denoted by real GDP in the long run ,suggests maintain macroeconomic stability through sound monetary and fiscal policies, including inflation control, exchange rate stability, and prudent fiscal management, to create an enabling environment for sustainable economic growth and investment which in turn highly contributes to export performance of the country.
- The advancement of infrastructure is essential not only for fostering economic growth but also for maintaining consistent export performance. Therefore, investing in infrastructure development is critical, particularly in upgrading major roads that link production regions to central markets. Such investments improve connectivity, lower transportation and production costs, and ultimately strengthen the competitiveness of Ethiopian exporters in the global market.
- Ethiopia should continue efforts to liberalize trade through reducing tariffs and non-tariff barriers, especially by pleasing bilateral and multilateral trade agreements. Additionally, simplifying customs procedures and implementing efficient digital platforms will ease export processes and encourage participation in international markets.
- Trade openness allows Ethiopian producers and exporters to access international markets, thereby expanding the potential customer base for Ethiopian goods and services. This can lead to increased export sales, higher revenues, and economic growth. The conclusion emphasizes that the government should enhance

collaboration with major trading partners to promote trade liberalization and achieve its objective of WTO membership. This can be accomplished through bilateral and multilateral agreements aimed at lowering tariffs and eliminating trade barriers, which will help sustain and boost export growth.

- The real effective exchange rate (REER) is posetively related with export performance in the short run which implies that maintaining competititve exchange rate enhance export performance because as changes in the REER can affect a country's export competitiveness and trade balance. In the longrun data analysis results reveals that there is negative relation ship with export performance so focusing on other determinant factors is very important to dramatically change export performance of Ethiopa.

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Appendices

Appendix A: Data set from 1991 to 2024

Value of Export and Import in thousands of Birr

Periods	Export	Import	REER	TOT	TO
1990/91	536,662	2,130,305	282	0.251918	0.01
1991/92	300,267	1,810,897	344	0.165811	0.01
1992/93	932,413	3,618,718	149	0.257664	0.02
1993/94	1,404,173	4,739,967	150	0.296241	0.02
1994/95	2,737,233	6,546,274	138	0.418136	0.03
1995/96	2,499,515	7,708,246	121	0.324265	0.03
1996/97	3,635,399	8,505,200	114	0.427432	0.04
1997/98	4,019,286	9,338,459	112	0.430401	0.04
1998/99	3,437,260	11,702,004	112	0.293733	0.04
1999/00	3,754,872	11,438,661	109	0.328262	0.04
2000/01	3,378,926	12,313,956	98	0.274398	0.04
2001/02	3,373,308	14,485,289	94	0.232878	0.04
2002/03	4,137,208	16,067,348	101	0.257492	0.05
2003/04	5,178,465	22,295,690	97	0.232263	0.06
2004/05	7,331,258	31,434,174	101	0.233226	0.08
2005/06	8,685,376	38,053,554	113	0.228241	0.09
2006/07	10,457,615	45,126,388	119	0.231741	0.09
2007/08	13,643,976	63,146,822	152	0.216068	0.11
2008/09	15,217,753	80,032,470	142	0.190145	0.13
2009/10	26,115,306	106,675,484	123	0.244811	0.16
2010/11	44,525,571	133,639,235	124	0.333177	0.19
2011/12	54,487,427	191,006,032	142	0.285265	0.24
2012/13	56,123,592	208,490,479	142	0.26919	0.24
2013/14	62,243,013	261,847,552	144	0.237707	0.27
2014/15	59,860,359	330,938,955	162	0.18088	0.29
2015/16	59,938,567	353,016,619	165	0.16979	0.28
2016/17	63,685,744	354,271,135	179	0.179766	0.26
2017/18	74,211,483	397,115,468	169	0.186876	0.27
2018/19	74,932,423	423,394,151	193	0.17698	0.27
2019/20	94,365,138	432,189,352	202	0.218342	0.26
2020/21	141,701,410	559,341,145	193	0.253336	0.33
2021/22	199,995,039	884,019,490	235	0.226234	0.48
2022/23	193,172,672	912,983,688	306	0.211584	0.46
2023/24	213,115,203	1,032,756,715	376	0.206356	0.48

Real GDP and Capital Expenditure in Million

Br. From 1991G.C to 2024 G.C

Year	GDP	Capital Expenditure
1991	253,728.57	1,214.10
1992	247,914.63	951.80
1993	275,601.44	1,784.90
1994	275,737.20	2,694.30
1995	291,501.64	3,156.50
1996	320,994.11	3,562.60
1997	334,582.75	4,264.47
1998	331,954.64	3,608.32
1999	352,900.22	4,144.20
2000	364,984.33	3,855.10
2001	392,058.84	5,296.00
2002	398,464.76	6,129.00
2003	390,102.91	6,968.00
2004	435,859.45	8,543.00
2005	490,970.44	11,581.00
2006	547,625.36	14,091.00
2007	612,217.20	18,397.90
2008	680,706.93	24,121.00
2009	749,058.85	30,599.00
2010	828,212.74	39,322.00
2011	922,512.81	53,296.70
2012	1,002,766.90	72,971.30
2013	1,102,467.80	91,182.88
2014	1,216,015.30	107,384.88
2015	1,342,555.90	117,145.68
2016	1,449,397.40	141,027.31
2017	1,596,481.60	152,583.83
2018	1,719,491.30	143,735.10
2019	1,874,689.30	174,949.13
2020	1,989,587.80	204,176.15
2021	2,114,238.30	235,409.74
2022	2,248,662.80	262,055.70
2023	2,409,921.40	355,916.99
2024	2,603,952.90	467,457.62

Source: National Bank of Ethiopia, Unpublished data, received via official communication (Email), May 2025

Appendix B : STATA Results

```
. dfuller lnX

Dickey-Fuller test for unit root                 Number of obs  = 33
Variable: lnX                                    Number of lags =  0

H0: Random walk without drift, d = 0
```

	Test statistic	Dickey-Fuller critical value 1%	5%	10%
Z(t)	-0.267	-3.696	-2.978	-2.620

MacKinnon approximate *p*-value for Z(t) = 0.9301.

```
. dfuller d.lnX

Dickey-Fuller test for unit root                 Number of obs  = 32
Variable: D.lnX                                  Number of lags =  0

H0: Random walk without drift, d = 0
```

	Test statistic	Dickey-Fuller critical value 1%	5%	10%
Z(t)	-6.626	-3.702	-2.980	-2.622

MacKinnon approximate *p*-value for Z(t) = 0.0000.

```
. dfuller lnGDP

Dickey-Fuller test for unit root                   Number of obs  = 33
Variable: lnGDP                                    Number of lags =  0

H0: Random walk without drift, d = 0

                                       Dickey-Fuller
                   Test     ---------- critical value ----------
              statistic           1%           5%           10%
----------------------------------------------------------------
 Z(t)             1.652       -3.696       -2.978        -2.620
----------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9980.

. dfuller d.lnGDP

Dickey-Fuller test for unit root                   Number of obs  = 32
Variable: D.lnGDP                                  Number of lags =  0

H0: Random walk without drift, d = 0

                                       Dickey-Fuller
                   Test     ---------- critical value ----------
              statistic           1%           5%           10%
----------------------------------------------------------------
 Z(t)            -4.840       -3.702       -2.980        -2.622
----------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000.
```

```
. dfuller lnto

Dickey-Fuller test for unit root                   Number of obs   =        33
Variable: lnto                                     Number of lags  =         0

H0: Random walk without drift, d = 0

                     Test       Dickey-Fuller critical value
                statistic           1%               5%               10%
------------------------------------------------------------------------------
 Z(t)              1.670          -3.696           -2.978           -2.620
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9981.

. dfuller d.lnto

Dickey-Fuller test for unit root                   Number of obs   =        32
Variable: D.lnto                                   Number of lags  =         0

H0: Random walk without drift, d = 0

                     Test       Dickey-Fuller critical value
                statistic           1%               5%               10%
------------------------------------------------------------------------------
 Z(t)             -2.918          -3.702           -2.980           -2.622
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0433.
```

```
. dfuller lntot

Dickey-Fuller test for unit root              Number of obs  = 33
Variable: lntot                               Number of lags =  0

H0: Random walk without drift, d = 0

                                       Dickey-Fuller
                   Test      ———————— critical value ————————
              statistic           1%           5%          10%
———————————————————————————————————————————————————————————————
 Z(t)            -2.383       -3.696       -2.978       -2.620
———————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.1465.

. dfuller d.lntot

Dickey-Fuller test for unit root              Number of obs  = 32
Variable: D.lntot                             Number of lags =  0

H0: Random walk without drift, d = 0

                                       Dickey-Fuller
                   Test      ———————— critical value ————————
              statistic           1%           5%          10%
———————————————————————————————————————————————————————————————
 Z(t)            -7.106       -3.702       -2.980       -2.622
———————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0000.
```

```
. dfuller lnreer

Dickey–Fuller test for unit root          Number of obs  = 33
Variable: lnreer                          Number of lags =  0

H0: Random walk without drift, d = 0

                                  Dickey–Fuller
                   Test      ——— critical value ————
              statistic         1%           5%          10%
————————————————————————————————————————————————————————————
 Z(t)            -2.179     -3.696       -2.978       -2.620
————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.2138.

. dfuller d.lnreer

Dickey–Fuller test for unit root          Number of obs  = 32
Variable: D.lnreer                        Number of lags =  0

H0: Random walk without drift, d = 0

                                  Dickey–Fuller
                   Test      ——— critical value ————
              statistic         1%           5%          10%
————————————————————————————————————————————————————————————
 Z(t)            -6.407     -3.702       -2.980       -2.622
————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0000.
```

```
. dfuller lnig

Dickey-Fuller test for unit root                  Number of obs  = 33
Variable: lnig                                    Number of lags =  0

H0: Random walk without drift, d = 0

                                       Dickey-Fuller
                   Test          -------- critical value ---------
              statistic           1%           5%          10%
------------------------------------------------------------------
 Z(t)            -1.295       -3.696       -2.978       -2.620
------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.6317.

. dfuller d.lnig

Dickey-Fuller test for unit root                  Number of obs  = 32
Variable: D.lnig                                  Number of lags =  0

H0: Random walk without drift, d = 0

                                       Dickey-Fuller
                   Test          -------- critical value ---------
              statistic           1%           5%          10%
------------------------------------------------------------------
 Z(t)            -5.743       -3.702       -2.980       -2.622
------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000.
```