Empirical Analysis of the Relationship between Trade Liberalization, Industrial Performance and Economic Growth of the Indian Economy

(A Dissertation Submitted to Mahapurusha Srimanta Sankaradeva Viswavidyalaya in partial fulfillment of the requirements for the award of the degree of

Master of Arts in Economics)

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CERTIFICATE

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DECLARATION

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I confirm that all information, data, theories or textual content taken from other sources have been properly cited within the text and duly acknowledged in the references section. Every borrowed material has been clearly credited to its original author(s).

This declaration is made in good faith and with complete integrity, affirming the originality and authenticity of the research work submitted.

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ABSTRACT

This study titled 'Empirical Analysis of the Relationship between Trade Liberalization, Industrial Performance and Economic Growth of the Indian Economy' undertakes an empirical analysis of the co-integration between India's Trade Liberalization, Industrial Performance and Economic Growth over the period 1980–81 to 2023–24. The primary objectives are to analyze the trends in these variables, examine their long-run and short-run dynamics, and suggest appropriate policy measures. Using annual time-series data sourced from reputable institutions such as the World Bank, UNCTAD and various Indian government departments, the study ensures accuracy and consistency by transforming all variables into natural logarithms and using 2015 as the base year. The study applies the Autoregressive Distributed Lag (ARDL) bounds testing approach along with the Augmented Dickey-Fuller (ADF) test and Error Correction Model (ECM) to test for stationarity, co-integration, and short-run adjustments. The results confirm a strong and stable long-run relationship among the three core variables. The models exhibit high explanatory power and pass diagnostic tests for serial correlation, heteroscedasticity and structural stability, supported by CUSUM and CUSUMSQ tests.

Trend analysis reveals that Trade Liberalization, marked by key reforms and global events, has significantly influenced both industrial growth and GDP performance. Industrial Value Added has responded variably to policy shifts, global crises and domestic reforms, while GDP has shown resilience. The findings suggest that changes in one domain be it trade, industry or output can substantially influence the others. Therefore, a balanced policy framework is essential. The study recommends fostering liberal trade policies aligned with industrial development, enhancing infrastructure, supporting SMEs, encouraging innovation and ensuring institutional efficiency. It emphasizes that effective trade liberalization, when accompanied by robust industrial and macroeconomic policies can drive sustained economic growth. Despite its comprehensive approach, the study acknowledges limitations including its exclusion of political, institutional, and environmental factors, and its reliance solely on secondary, national-level data. Future research should incorporate regional and sectoral analyses, as well as non-economic variables, for a more nuanced understanding of these complex interdependencies.

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
ARDL	Autoregressive Distributed lag
BoP	Balance of Payment
CAD	Current Account Deficit
CUSUM	Cumulative Sum
ECM	Error Correction Model
ECT	Error Correction Term
EX	Export
GDP	Gross Domestic Product
IM	Import
INVA	Industrial Value-Added
LN	Natural Logarithm
LPG	Liberalization, Privatization and Globalization
RBI	Reserve Bank of India
T.L.	Trade Liberalization
UNCTAD	United Nations Conference on Trade and Development
VAR	Vector Auto-regression

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CHAPTER I

INTRODUCTION

1.1 Introductory Statement:

The liberalization of trade in economies through lowering or fully removing trade barriers has emerged as the leading economic policy among both developed and developing nations today. Import and export duties, quotas, export subsidies, and technical obstacles are common trade barriers that have been utilized over the past few decades. Nevertheless, with the current trend of globalization, nearly all countries around the world are actively working to lower trade barriers with their trading partners. The primary aim of transitioning to free trade is to reach the ultimate macroeconomic objectives of their economies, i.e. to attain significant economic growth. Thus, developing nations have been adopting free trade policies over the past few decades resulting in the expansion of trade openness in these economies.

India's economic strategies have progressively adopted liberalization, focusing on eliminating trade and domestic economic barriers to enhance growth. At first, similar to numerous developing countries, India's initial strategies highlighted industrialization and an inward-oriented import substitution approach based on the Harrod-Domar model designed for a closed economy, concentrating on self-reliance. However, the trade liberalization in 1991 represented a significant departure from India's previous strategy. During that period, the approach of trade liberalization was highly endorsed by economists, and it was frequently claimed that free trade leads to comprehensive economic expansion, which was precisely what India needed at that moment. Lessons from the 1950s and 1960s showed that nations employing export-driven industrialization approaches experienced greater growth rates. East Asian economies that implemented open trade policies during the 1960s exhibited remarkable increases in industrial production and income. Even with their elevated trade ratios, it is still uncertain if this was exclusively attributed to free trade policies since additional factors played a role in their swift growth. However, trade policy plays a vital role in strategies for economic development. Following India's independence, its trade policies have changed considerably, shifting from a protectionist strategy characterized by elevated tariffs in the 1950s to a gradual

liberalization starting in the 1980s, culminating in the structural reforms of the 1990s that lowered trade barriers and transformed domestic industrial policies.

Trade liberalization was viewed as crucial for enhancing the efficiency and competitiveness of India's industrial sector, since restrictive trade policies obstructed industrial development. To tackle this issue, the Indian government established several committees to evaluate trade policies and recommend strategies for boosting exports. The Alexander Committee (1978) condemned restrictive trade measures and suggested substituting the licensing framework with a tariff-oriented system. Likewise, the Sondhi Committee (1974) concerning capital goods and the Tandon Committee (1980) regarding exports recommended minimizing excessive quantitative restrictions and embracing a more open trade policy. Additional suggestions for a liberal trade policy were provided by the AbidHussain Committee (1984), M. Narasimham Committee (1985), and Rangarajan Committee (1991), all stressing the importance of an outward-looking trade approach for accelerated economic development. Consequently, India transitioned to adopting a more adaptable and internationally interconnected trade and industrial policy. Institutions such as the I.M.F. and World Bank also exerted pressure on India to adopt a liberal trade policy. India was a significant borrower from the I.M.F. and World Bank. Therefore, the country's trade policy is significantly shaped by the terms and conditions set by these organizations. The biggest loan granted by the I.M.F. in November 1987 was SDR 5 billion to India through the Extended Financing Facility, altering the trade policy landscape. The nation was required by the stipulations of the loan to adopt a highly liberal and globally-oriented trade policy.

In recent years, the correlation between trade liberalization and economic growth in developing nations has sparked significant discussion among development economists. Some research has identified a direct association between economic growth and trade openness, including studies by Little, Scitovosky, and Scott (1970), Balassa (1971, 1982), Bhagwati (1978), Krueger (1978), Heitger (1987), World Bank (1987), Romer (1989), Quah and Rauch (1990), Michaely, Papageorgiou, and Choksi (1991), Thomas, Nash and Associates (1991), Dollar (1992), Edwards (1992), Harrison (1995), Savvides (1995), Bakht (1998), and Onafowora and Owoye (1998). However, alternative studies have not provided empirical evidence backing this connection, as documented in works by Sachs (1987), UNCTAD (1989), Agosin (1991), Taylor (1991), Shafaeddin (1994), Clarke and Kirkpatrick (1992), Greenaway and Sapsford

(1994), Karunaratne (1994), Jenkins (1996), and Greenaway, Morgan, and Wright (1997).

In this recent era of progressive trade policies, there are various methods to determine the long-term connection between trade orientation and economic growth. Initially, import liberalization is anticipated to facilitate technology transfer via the import of sophisticated capital goods. The influx of technologically advanced capital goods was further supported by rising export revenues and increased foreign capital inflows, reflecting the nation's capacity to repay from export earnings. In addition, a development strategy focused on exports typically results in increased growth. This is due to several economic factors, including economies of scale, indivisibilities, and competitive effects, which likely yield better economic outcomes with an export-oriented approach compared to import substitution (Krueger, 1978). Thirdly, foreign direct investment (FDI) transfers export technology from developed nations to emerging economies, similar to what occurred in the East Asian economies. Fourthly, external orientation enables the utilization of outside capital for development while avoiding significant issues in managing the associated debt (Dollar, 1992). Fifthly, the liberalization of an economy is expected to accelerate economic growth by enabling greater economies of scale in production, driven by the beneficial spillover effects from technological advancements in industrialized nations. It is often suggested that a more open economy and a less distorted trade system lead to a quicker uptake of technological advancements that originate from developed nations.

1.2 Strategy of Industrial Development:

The industrialization approach adopted by India post-Second World War primarily concentrated on essential products such as steel and machinery. Private capital was perceived as an ineffective means for development, and it was thought to promote monopolization. As a result, it was deemed crucial to have state control. Development policies encompassed the regulation of industrial operations, the designation of critical zones for government activities, restrictions on foreign direct investment, and actions in the labor market. The initial plans focused on industrialization and a strategy of import substitution based on the Harrod-Domar model designed for a closed economy.

The development strategies in India have been classified by policymakers into four main categories:

1.2.1 The Mahalanobis Strategy (Mid-1950s):

Industrial policy of 1956 aimed to enhance economic growth rates and speed up industrialization to achieve a socialist pattern of society. In this time, capital was limited and the foundation of entrepreneurship was not robust enough. Therefore, the primary emphasis was on developing the foundational industries to create a robust industrial foundation. The public sector expanded to promote the socio-economic development of the nation. The government concentrated on developing a substantial and expanding cooperative sector.

1.2.2 Import Substitution (IS) Strategy (1960s):

The industrial policy of 1960 focused on the growth of small-scale industries. These sectors were categorized into cottage and household industries designed to offer widespread self-employment opportunities. There was a creation of small-scale industries that involved investing in machinery and equipment. The industrial policy centered on import substitution, industrial growth, and promoted the substitution of imports with local goods. This initiative diminished reliance on foreign sources and boosted industrial output. The industrial policy primarily focused on decentralization and the significance of small-scale, tiny, and cottage industries for import substitution and growth of cottage industries. The import substitution policy prioritized reducing imports of consumer durable goods while concentrating on importing technology and machinery to create a robust industrial foundation in India.

1.2.3 Export Promotion (EP) Strategy (1980s):

The industrial policy of 1980 emphasized the importance of enhancing competition in the local market, upgrading technology, and modernization. The policy underscored the importance of building a more competitive export-driven economy and promoting foreign investment in advanced technology sectors. These policies established an environment conducive to swift industrial expansion, so by the start of the seventh five-year plan, a comprehensive infrastructure had been developed. Fundamental industries were created. A significant level of self-sufficiency in a vast array of products like raw materials, intermediates, and finished goods has been attained. New

hubs of industrial activity and a new wave of entrepreneurs arose. A significant quantity of engineers, technicians, and skilled laborers had also received training.

1.2.4 Trade Liberalization Strategy (1990s):

The trade liberalization of 1991 represented a significant shift in India's previous approach. The approach of trade liberalization received significant backing from economists, and it is frequently claimed that free trade leads to overall economic expansion. The new trade policy changed the course taken for years. Import licensing was eliminated for most machinery, equipment, and manufactured intermediate products. Internal reforms involved decreased regulation on location limitations and industrial permits. In certain industries, regulations on administrative prices were loosened. The main focus of the policy was on liberalizing capital goods and industrial inputs to promote domestic and export-driven growth. Nonetheless, the importation of consumer products continued to be controlled.

The industrial policy implemented after trade liberalization enables India to establish a large and varied industrial framework. India achieved self-sufficiency in various consumer products. The revised industrial policy focused on enhancing and leveraging local capabilities in technology and manufacturing, along with raising global market standards. The revised industrial policy aims at breaking down the regulatory framework, enhancing the capital market, and boosting advantages for the general public. The dissemination of industrialization in underdeveloped regions of the country has been vigorously encouraged via suitable financial incentives, institutions, and infrastructure investments. Acknowledging the importance of the public sector, the new industrial policy aims to operate the public sector in a business-oriented manner, contemplating privatization, disinvestment, and restructuring of public entities. The industrial policy has been revised to include various initiatives addressing the following areas:

1. Industrial Licensing
2. Foreign Investment
3. Foreign Technology Agreements
4. MRTP Act (Monopoly and Restrictive Trade Practices Act)

In previous industrial policies, industries faced strict control via the licensing system. As per the MRTP Act of 1969, all major corporations and large business entities (with assets of Rs. Companies with an investment of 100 crores or more (as per the 1985 amendment to the Act) needed to secure approval from the MRTP Commission before establishing any new industrial unit, since they were permitted to invest solely in specific industries. In addition to acquiring a license, they were also mandated to secure MRTP clearance. This posed a significant barrier to industrial advancement since the large companies that possessed the resources for growth were unable to expand and diversify their operations. The Industrial Policy of 1991 has placed these industries on par with others by eliminating specific provisions of the MRTP Act, which will focus solely on regulating monopolies and unfair restrictive trade practices that harm consumer interests and limit competition. Large business houses no longer need prior approval or clearance from the MRTP Commission to establish industrial units. While certain liberalization policies were implemented in the 1980s that had a positive impact on the industry's growth. Nevertheless, industrial growth continued to be limited to a significant degree. The updated industrial policy eliminated the industrial licensing system for the majority of industries covered by the policy. No licenses were needed to establish new industrial units or significantly expand the capacity of current ones, apart from a select list of industries connected to national security and strategic issues, hazardous sectors, and those that harm the environment. Starting with, there were 18 sectors included in this compilation of industries that needed licenses. Subsequent revisions to the policy led to a reduction of this list. It currently encompasses just five sectors associated with health security and strategic issues that necessitate mandatory licensing. As a result, the industry has nearly entirely been liberated from the licensing requirements and the restrictions associated with them.

The revised industrial policy aims to reduce the public sector's role while promoting private sector involvement across a broader industrial landscape. As part of these changes, the number of industries exclusively reserved for the public sector has been significantly reduced. Initially, 17 industries were restricted to the public sector under the 1956 policy, but this number was later reduced to eight. Further revisions have confined public sector exclusivity to just four key industries: (i) defense production, (ii) atomic energy, (iii) railways and (iv) minerals essential for atomic energy

generation. Public enterprises that consistently incur losses and remain financially unviable will be referred to the Board of Industrial and Financial Reconstruction (BIFR) or similar institutions established for this purpose. These institutions will develop strategies for their rehabilitation and revival. The New Industrial Policy aims to enhance the autonomy of public enterprises in their daily operations, emphasizing performance and accountability. Unlike the previous policy, which strictly controlled foreign investment and technology imports, requiring government approval and limiting foreign equity to maintain Indian ownership, the new policy seeks a balanced approach by offering greater flexibility while ensuring national interests are safeguarded.

The 1991 policy initially capped foreign equity participation at 40% in industrial units open to foreign investments, later increasing the limit to 51%. Additionally, 34 more industries were included under this provision, and some sectors saw a further rise in foreign equity limits to 74%. Foreign Direct Investment (FDI) was further liberalized, allowing 100% foreign ownership in sectors such as mining, pollution control equipment, power generation, transmission, ports, and harbors. Subsequent reforms expanded 100% FDI permissions to oil refining, manufacturing in Special Economic Zones (SEZs), and select telecom activities. To support industrial growth, the 1991 Industrial Policy introduced measures such as the establishment of the Foreign Investment Promotion Board (FIPB) to attract global investors. Additionally, the National Renewal Fund was created to provide financial assistance and rehabilitation for workers displaced due to technological advancements.

The New Industrial Policy allows automatic approval for foreign technology agreements in high-priority industries, eliminating the need for prior government clearance. Previously, Indian companies had to obtain approval before importing foreign technology, causing delays and slowing industrial modernization. Under the new policy, companies can enter into agreements with foreign firms without prior approval if the payments do not exceed Rs. 1 crore in lump sum and royalties are capped at 5% for domestic sales and 8% for exports.

Trade liberalization and industrial policy are crucial for boosting industrial performance and economic growth. Economists and policymakers globally recognize their significance, particularly in developing nations where economic progress relies

on liberal trade policies, technological advancement, and infrastructure development. Enhanced trade policies and industrial growth positively impact a country's overall economic performance.

This study examines the relationship between trade liberalization, industrial performance, and economic growth from 1980 to 2017. These reforms played a key role in overcoming economic stagnation, which had persisted since the 1950s, often referred to as the "Hindu growth rate".

1.3 Conceptual Framework:

1.3.1 Industrial Value-Added: In this study, industrial value-added serves as an indicator of the industrial sector's performance. It represents the industry's contribution to the overall gross domestic product (GDP), often referred to as GDP-by-industry. This value is derived from components such as employee compensation, production taxes, and gross operating surplus. Industrial value-added is calculated by subtracting the cost of intermediate inputs—such as energy, raw materials, semi-finished goods, and purchased services—from an industry's total output, which includes sales, other operating income, commodity taxes, and inventory changes.

1.3.2 Trade Liberalization: It refers to the openness of an economy to international trade, typically measured using the ratio of a country's total exports and imports to its Gross Domestic Product (GDP). A higher trade liberalization index indicates a stronger integration into global trade, reflecting economic health and greater influence of trade on domestic activities. Various methods exist to assess trade liberalization.

$(X + M)i/_{GDPi}$	Trade liberalization (T.L.) is quantified as the sum of exports and imports relative to the GDP of country i.
$Mi/_{GDPi}$	Import trade share, defined as imports (M) divided by the nominal income (GDP) of country i.
$Xi/_{GDPi}$	Export trade share, calculated as exports (X) divided by the GDP of country i.

However, the present study has employed the subsequent approach which is considered to be more effective and efficient:

$$\frac{\text{EXPORT + IMPORT}}{\text{GDP}} = \textbf{Trade Liberalization Index}$$

1.3.3 Gross Domestic Product: The study considers real GDP as an indicator of economic growth. Gross Domestic Product (GDP) represents the total value of goods and services produced within a country's borders in a year. Economic growth is the sustained rise in the market value of these goods and services over time, leading to higher real output. This growth boosts income levels and improves living standards. GDP can be measured in nominal terms, which include inflation, or in real terms, which are adjusted for inflation. The growth rate is typically expressed as the percentage change in real GDP.

1.4 Theoretical Framework:

The relationship between trade liberalization, industrial performance, and economic growth is rooted in classical international trade theories introduced by economists such as Adam Smith, David Ricardo, and John Stuart Mill. Adam Smith was a strong advocate of free trade, a principle that also underlies the comparative cost theory and the Heckscher-Ohlin model of international trade.

Adam Smith's Theory of Absolute Differences in Costs (1776): Adam Smith critiques the mercantilists and lauds the benefits of openness and competition nearly two hundred years ago in his renowned work, Wealth of Nations (1776). "Between whatever place foreign trade is carried on, they all of them derive into two distinct benefits from it. It carries the surplus part of the produce of their land and labor for which there is no demand among them and brings back in return something else for which there is demand. It gives value to their surplus facilities, by enhancing them for something else which may satisfy part of their wants and increase their enjoyments. Using it, the narrowness of the home market does not hinder the division of labor in any particular branch of art or manufacture from being carried to the highest perfection. By opening a more extensive market for whatever part of the produce of their labor exceeds the home consumption, it encourages them to improve its

productive powers and to augment its annual produce to the utmost and thereby to increase the real revenue of wealth and society". Adam Smith claimed that each trading nation can focus on the goods and services it produces most cheaply and export them to others, allowing a country to gain the greatest advantages from international trade.

Krueger (1978) and Bhagwati (1978) are considered key pioneers in categorizing trade regimes based on the level of anti-export bias. To do that, they developed an index of biasness, defined as the ratio of import's effective exchange (EERM) to the export's effective exchange (EERE). The effective exchange for imports is defined as the nominal exchange rate applied to imports (NERM) corrected by the average (effective) import tariff (TARM), other import surcharges (IMPS) and the premium associated with the existence of quantitative restrictions, such as import license (PR). Thus, the effective exchange rate equation for imports can be written as:

$$EERM = NERM\ (1 + TARM + IMPS + PR) \quad (1)$$

The effective exchange rate for exports is calculated as the nominal exchange rate applied to exports (NERX) corrected by export subsidies (ES) and other incentives to exports (EIN); such as export encouragement schemes. It is written as:

$$EERX = NERX\ (1 + ES + EIN) \quad (2)$$

When the nominal exchange rates are unified for commercial transactions, then

$$NERX = NERM = NER \quad (3)$$

It follows therefore that the degree of bias of trade is given by the following index:

$$Anti - export\ bias\ = \frac{EERm}{EERx} = \frac{NERm\ (1+TAR\quad)\ NER\ (1+TAR\quad IMPs+\quad)}{NERx\ (1+Es+Ein)} \quad (4)$$

There are three situations present here. Initially, if the ratio in equation 4 exceeds one, the trade system is unfavorable toward exports. Secondly, when this ratio falls below one, the country is considered to be implementing import substitution strategies. Third, a value of one signifies a neutral trade system. According to equation 4, Krueger and Bhagwati later defined trade liberalization as any strategy that diminishes the level of anti-export bias. This can be accomplished by eliminating all trade distortions, such as import tariffs and export subsidies.

Thirlwall's Model: Thirlwall's model (1979) relies on Harrod's dynamic foreign multiplier (1939), which assesses long-term economic growth. This model can be represented by the next three equations:

$$X = fq + rz \quad (1)$$

$$M = ap + py \quad (2)$$

$$X + q = m \quad (3)$$

Equation (1) represents the export function, equation (2) illustrates the demand for imports, and (3) indicates the equilibrium of the current account. The variables represent the actual growth rates of: x (exports), m (imports), q (relative prices), y (national income), and z (global income).

Substituting equations (1) and (2) into equation (3) we obtain:

$$Y* = \frac{1+\emptyset-\alpha}{\pi} q + \frac{p}{\pi} z \quad (4)$$

By replacing equation (1) in (4), and considering the Marshall-Lerner condition, or presuming that relative prices remain constant (which means its growth rate is zero, q=0), we derive:

$$Y* = (1/p)x \quad (5)$$

This formula is referred to in economic texts as Thirlwall's Law, which states that a rise in income elasticity for import demand (p) decreases the equilibrium product growth rate concerning the balance of payments. Observe that the causation in this model flows from exports to the product, which is why, unlike the conventional growth model, it is believed that a rise in external demand is a significant factor in an economy's growth. Thirlwall (1979) demonstrated that in multiple countries, the growth rate does not surpass the proportion of export growth rate to the income elasticity of demand for imports. This indicates that growth is constrained by the equilibrium of the balance of payments. This outcome is referred to as Thirlwall's law. The industrial exports, which are the drivers of economies of scale, are more closely linked to economic growth than total exports, indicating that export-led growth operates through economies of scale. The second component of the export-led model is that a positive feedback loop functions through export demand impacting

investment, which in turn fosters technological advancement and productivity; this process aligns with an improved performance of the total export variable.

Nicholas Kaldor (1966) and Anthony Thirlwall (1979) created a model of growth driven by exports, which is founded on Verdoorn's Law. In a specific country, a growth in the export sector can lead to a focus on producing export goods, which boosts productivity and raises skill levels in the export industry. This could result in a shift of resources from the less efficient non-trade sector to the more productive export sector, reduced prices for traded goods, and increased competitiveness. This alteration in productivity could consequently result in increased exports and growth in output. Kaldor suggests that exports will boost industries characterized by substantial economies of scale. The industrial sector is essential for achieving economies of scale, and exports play a crucial role in sustaining demand for industrial production. Kaldor suggests that demand driven by exports is superior to demand fueled by consumption. Additionally, Kaldor suggested that economic development is characterized by three growth laws, which are as follows:

1. Firstly, the faster the industrial sector grows, the faster the Gross Domestic Product (GDP) will increase, not just in a definitional manner due to industrial output being a significant part of total output, but also for essential economic reasons linked to stimulated productivity growth both within and beyond the industrial sector. This concept can be captured in the saying that the industrial sector of the economy serves as the "engine of economic growth."
2. Secondly, there is a significant positive correlation between labor productivity growth in the industrial sector and the growth industrial output, known as Verdoorn's Law. Kaldor emphasized the concept of endogenous productivity growth, where productivity improvements are driven by output growth.
3. Thirdly, as industrial output grows rapidly, labor shifts more quickly from non-industrial to industrial sectors. This transition boosts overall productivity since industrial growth positively influences both output and employment, while employment growth outside industries has a negative impact on productivity.

Rivera-Batiz and Romer (1991) introduced the "Lab Equipment Model," which analyzes economic growth in a setting with two identical countries. The model assumes intra-industry trade in intermediate goods, with labor and human capital as

the key production factors, and a single final good. It operates under constant returns to scale across all production activities, which share the same production function.The model's findings suggest that international trade expands the market for intermediate goods, leading to increased intra-industry trade and higher profitability in research and development (R&D). As trade provides a greater variety of intermediate products, R&D productivity improves, resulting in economic growth. The model highlights how technology influences the cost of innovation relative to other economic activities. Ultimately, a larger market and higher profits drive R&D expansion, creating a scale effect on growth.

Grossman and Helpman (1991) introduced the "Quality Ladders" model, which describes how entrepreneurs engage in R&D to enhance the quality of existing producer or consumer goods. Each innovation represents an advancement up the quality ladder, with new developments building on previous ones. Innovators earn profits from product improvements until they are displaced by a competitor with a superior innovation. The profitability of an innovation depends on current expenditures, which grow with the labor force. The model suggests that as markets expand, R&D becomes more lucrative due to increased demand for new products. However, increased R&D activity shortens the monopoly period for industry leaders, leading to higher but shorter-lived profits. Ultimately, this acceleration in R&D drives economic growth through a scale effect.

Taylor (1994) explored the impact of trade policy on economic growth, emphasizing the role of market integration. His study highlights that trade liberalization fosters a "market expansion effect," which enhances research and development (R&D) activities and accelerates growth. By increasing market size through trade, firms find R&D more profitable, leading to higher investment in innovation and dynamic gains from trade. A key policy takeaway is that trade restrictions, such as limiting foreign market access or reducing incentives for international trade, can hinder economic growth.

Fisher (1995), in his "overlapping generations model," examines the impact of physical capital accumulation in an open economy. The model includes two factors—capital and labor—under a Cobb-Douglas production function, where investment goods are produced solely with capital at a constant marginal product. He assumes

perfectly competitive markets and two countries with differing individual savings rates (s), defined as a fraction of wages. The model suggests that if the countries have significantly different factor ratios, leading to complete specialization under free trade, the less thrifty country will focus entirely on producing consumption goods, while the thrifty country remains diversified. As a result, the thrifty country's growth rate declines, whereas the less thrifty country experiences accelerated growth. This indicates that trade can potentially alter a nation's natural growth trajectory compared to an autarkic scenario.

Lucas (1988) explores the impact of human capital accumulation on international trade through a dynamic model of learning by doing. The model suggests that countries producing high-technology goods experience faster economic growth. A key policy implication is that if a country has the potential for a long-term advantage in high-technology goods but is initially in autarky, it may show a short-term advantage in low-technology goods. If it immediately adopts free trade, it risks becoming permanently specialized in low-technology goods, preventing growth in high-technology sectors. To foster economic growth, the country should initially restrict trade, allowing the economy to develop its high-technology advantage before liberalizing trade.

The Neoclassical Supply-Side Model, also known as the conventional orthodox model, suggests that the export sector is more productive than the non-export sector. Additionally, it benefits from externalities due to its exposure to foreign markets. As a result, both the share of exports in GDP and the growth of exports play a crucial role in industrial performance. Feder (1983) was the first to introduce a formal model explaining the relationship between exports and economic growth. In this model, output in the export sector depends on capital and labor, whereas output in the non-export sector is influenced by export sector output along with capital and labor. Moreover, the conventional production function includes three key elements: export growth, export share in GDP, and a coefficient that accounts for differential productivity and externality effects. The augmented neo classical growth equation derived is:

$$G = a(I/Y) + b(dL/L) + [\delta/(1+\delta) + FX](X/Y)(dX/X)$$

Where I/Y is the investment ratio as a proxy for capital accumulation, dL/L is the growth of labour force, dX/X is the growth of exports, X/Y share of exports in GDP, δ/(1+δ) is the differential productivity effect and Fx is the externality effect.

The balance-of-payments constrained growth model suggests that a country's long-term GDP growth is primarily influenced by the ratio of real export growth to the income elasticity of demand for imports, assuming minimal impact from real exchange rate fluctuations. The rate of growth of output can be approximated by the formula:

$$G = {}^{x}/_{\pi}$$

The growth of export volume (x) depends on global income growth and the income elasticity of demand for exports, while (π) represents the income elasticity of demand for imports. Exports play a crucial role in economic growth by supplying foreign exchange needed for imports. In an open economy, export growth is a key driver of autonomous demand, enabling faster expansion of other demand components, including investment, government spending, and consumption.

The Virtuous Circle Model of Growth: The Virtuous Circle Model of Growth explains the interconnected relationship between exports and economic growth, emphasizing a self-reinforcing cycle. Based on Kaldor's export-led growth model, it suggests that output growth drives export expansion, which in turn is influenced by price competitiveness and foreign income levels. Price competitiveness depends on wage and productivity growth, while productivity growth itself is stimulated by increased output. This aligns with Verdoorn's Law, which highlights the role of productivity improvements through economies of scale and learning by doing. As a result, higher output leads to enhanced productivity, reducing labor costs and further boosting exports and growth, making the cycle continuous.

Trade theories have long emphasized the benefits of trade liberalization, industrial performance, and economic growth. Historically, mercantilists promoted trade surpluses and export-driven wealth accumulation, while classical economists advocated for free trade. In modern times, trade liberalization remains crucial for global economic development. It strengthens industrial sectors, enhances market access for domestic goods, and allows nations to import goods they cannot produce

efficiently. This dual advantage of exports and imports significantly contributes to a country's economic prosperity.

1.5 Significance of the Study:

Investigating the relationship between trade liberalization, industrial performance, and economic growth in India is crucial as these factors are deeply interconnected and have significant implications for the country's trajectory. Trade liberalization often leads to increased competition, access to new technologies, and better integration into global value chains. Investigating its impact on industrial performance helps identify whether liberalization has boosted productivity, innovation, and competitiveness in key sectors like manufacturing, textiles, and pharmaceuticals. It also helps determine if certain industries have struggled due to increased foreign competition, leading to deindustrialization or job losses.

Industrial performance is a critical driver of economic growth, especially in a developing economy like India. By examining how trade liberalization affects industrial output, policymakers can design strategies to maximize growth. If trade liberalization enhances industrial performance, it can lead to higher GDP growth, increased exports, and improved standards of Industrial growth is closely linked to job creation. Understanding how trade liberalization impacts industrial performance can shed light on its effects on employment levels, particularly in labor-intensive sectors. This is especially important for India, where job creation is a pressing concern due to its large and growing Trade liberalization exposes domestic industries to global competition. Investigating its impact helps identify which industries have become more competitive and which ones require protection or support to survive.

This balance is critical for ensuring that liberalization does not lead to the collapse of vulnerable sectors, which could have adverse effects on economic growth. Trade liberalization often promotes export-oriented growth by reducing barriers to international trade. Examining its impact on industrial performance can reveal whether Indian industries have successfully expanded their export markets, contributing to economic growth. For example, sectors like IT services, pharmaceuticals, and textiles have benefited from liberalization, but other sectors may need similar Trade liberalization can facilitate the inflow of foreign technology and investment, which can

enhance industrial performance. Investigating this relationship helps determine whether liberalization has led to technological upgradation and innovation in Indian industries. This is particularly important for moving up the value chain and transitioning from low-cost manufacturing to high-value production.

Industrial performance varies across regions in India. Trade liberalization may benefit some regions more than others, exacerbating regional disparities. Investigating this relationship helps identify how liberalization impacts industrial growth in different states and regions, enabling targeted policy interventions. Different industries respond differently to trade liberalization. For instance, while the IT and services sectors have thrived, traditional manufacturing sectors may have struggled. A detailed investigation can provide sector-specific insights, helping policymakers tailor strategies for each industry.

Thus Trade liberalization can drive structural transformation by shifting resources from less productive to more productive sectors. Understanding its impact on industrial performance and economic growth helps assess whether India is moving toward a more diversified and resilient economy. Trade liberalization enables countries to integrate into global value chains (GVCs). Investigating its impact on industrial performance can reveal whether Indian industries have successfully integrated into GVCs, which can boost exports, create jobs, and enhance economic growth. The findings from such an investigation can inform trade and industrial policies. For example:

- Should India further liberalize trade in certain sectors?
- Are there industries that need protection or subsidies to remain competitive?
- How can trade agreements be designed to maximize benefits for industrial performance and economic growth?

While trade liberalization can bring benefits, it also poses challenges such as increased competition, vulnerability to global shocks, and potential job losses in uncompetitive sectors. Investigating its impact helps identify these challenges and develop strategies to mitigate them.

India’s economic liberalization in 1991 marked a turning point in its trade and industrial policies. Examining the relationship between trade liberalization, industrial

performance, and economic growth since then provides valuable lessons for future policy decisions.

It also helps assess whether the benefits of liberalization have been evenly distributed across sectors and regions. Additionally, Trade liberalization and industrial performance must contribute to sustainable and inclusive growth. Investigating this relationship helps ensure that economic growth is not achieved at the expense of environmental degradation or social inequality. As India aims to become a global economic powerhouse, understanding how trade liberalization impacts industrial performance and economic growth is essential for enhancing its global competitiveness. This includes improving ease of doing business, attracting foreign investment, and fostering innovation.

Keeping this in mind, investigating the relationship between trade liberalization, industrial performance, and economic growth in India is critical for designing policies that promote sustainable, inclusive, and high-quality growth. It helps identify the winners and losers of liberalization, ensures that industries remain competitive in a globalized world, and provides insights into how India can leverage trade to achieve its development goals. This understanding is particularly important in the context of India's aspirations to become a $5 trillion economy and a global manufacturing hub.

1.6 Objectives of the Study:

1. To analyze the trends in Trade Liberalization, Industrial Performance and Economic Growth in India from 1980-81 to 2023-24.
2. To examine the long-run as well as the short-run relationship and direction of causality between Trade Liberalization, Industrial Performance and Economic Growth of the Indian economy.
3. To suggest policy implications.

1.7 Hypothesis:

Null Hypothesis [H_0]	**Alternative Hypothesis [H_1]**
There is no co-integration or causality present among Trade Liberalization,	Co-integration and causality are present between Trade Liberalization, Industrial

Industrial Performance and Economic Growth of the Indian Economy.	Performance and Economic Growth of the Indian Economy.

1.8 Data Source and Methodology:

1.8.1 Data Source:

The current study is based on the annual time series data for the period 1980-81 to 2023-24. The data has been sourced from reliable and authoritative sources like World Bank Database and UNCTAD. The data are presented in constant US$, using 2015 as the base year for all the three variables: Trade Liberalization, Industrial Value Added and Gross Domestic Production (GDP) that measures the level of economic growth of a country during a given period. To ensure the relevance and accuracy, the data has also been cross-verified and compared with other sources such as Foreign Trade Statistics of India, Department of Commerce, Directorate General of Foreign Trade, Department of Economic Affairs, Directorate General of Commercial Intelligence and Statistics and Annual Survey of industries (ASI). All variables are also transformed into natural logs to minimize issues related to heteroscedasticity in the residuals.

1.8.2 Methodology:

Research methodology always includes the scientific design of the research process and covers the steps adopted by the researcher to pursue the research work to achieve the desired objective of the study. To investigate the relation between Trade Liberalization (TL), Industrial Performance (IP) and GDP, the ARDL method is going to be used. For measuring the co-integration and causality between trade liberalization, industrial performance and GDP the whole collected data has been arranged in tabulation form so that meaningful inference could be drawn. The study has used the ARDL co-integration technique to examine the long-run relationship between the variables. The estimation procedure involves the following steps. The first and the foremost step is to test the presence of unit root in the variables because in the presence of non–stationary data there is a possibility of spurious regression. By using the Augmented Dickey-Fuller test, the whole data is checked for its stationarity. The second step is to draw the long-run relationship between the variables by using the

ARDL bound testing approach. The third step is to formulate an Error–Correction Model (ECM) to estimate short-term disequilibrium in the way of long-term equilibrium in the variables. Lastly, to validate the results and assess the reliability of the model, a residual diagnostic test is conducted, followed by the CUSUM test to evaluate the stability of the long-term relationship and the model's consistency over time. For analyzing the results the **E Views 12 Student Version Lite** software has been used.

The Autoregressive Distributed Lag (ARDL) model is an efficient tool for estimating various variables while saving time. It is particularly advantageous over traditional co-integration methods because it can be applied regardless of whether the underlying regression is purely I(0), purely I(1), or a combination of both. Additionally, the ARDL approach is more robust and performs well with small sample sizes. However, despite its advantages, it is not entirely free from issues such as heteroscedasticity and serial correlation. In this study, diagnostic tests confirmed that the ARDL model used was not affected by these problems. The ARDL model selection process uses a consistent sample for each estimation. Since lag selection affects the number of observations, some data points will be excluded based on the maximum lag length during the selection phase. However, the final model estimation will incorporate all available observations, leading to potential differences in results if the selected model has fewer lags than the maximum tested.

1.9 Limitations of the Study:

- While numerous factors influence a country's economic performance, this study focuses solely on trade liberalization (TL), Industrial Value-added (INVA), imports and exports.
- This study does not take into account recent global economic events, such as wars or policy changes like the U.S. tariff hikes.
- This study is based on the period from 1980 to 2023, with 2015 selected as the base year. Choosing a different base year might yield slightly different results and a broader time frame could be considered for future research.
- While essential macroeconomic indicators are included, other significant factors such as political stability, institutional quality, informal sector dynamics or environmental consequences have been excluded.

- This research relies exclusively on secondary data. Findings based on national-level data may not adequately reflect regional differences or sector-specific dynamics in the Indian economy.
- The research may indicate ideal policy responses, but it fails to account for the political, administrative and institutional barriers that may hinder effective implementation.

1.10 Organization of the Dissertation:

Chapter I: INTRODUCTION

This chapter includes background of the study area, Conceptual framework, Theoretical framework, Objectives followed by Hypothesis, Data Source and Methodology, Limitation of the study and Chapter scheme for study.

Chapter II: REVIEW OF RELATED LITERATURE

This Chapter includes review of existing theoretical and empirical literature followed by Research gap.

Chapter III: TRENDS IN TRADE LIBERALIZATION, INDUSTRIAL PERFORMANCE AND ECONOMIC GROWTH OF INDIAN ECONOMY

This chapter highlights the trends and pattern for each of the three variables, i.e., Trade Liberalization, Industrial Performance and Economic Growth of India for the period 1980-2023.

Chapter IV: CO-INTEGRATION BETWEEN TRADE LIBERALIZATION, INDUSTRIAL PERFORMANCE AND ECONOMIC GROWTH OF INDIAN ECONOMY

This chapter examines the causal relationship between Trade Liberalization Industrial Performance and Economic Growth of the Indian Economy.

Chapter V: SUMMARY, POLICY IMPLICATIONS AND CONCLUSION

This chapter contains the summary, major conclusions of the study and also indicates broad policy implications.

CHAPTER II

REVIEW OF RELATED LITERATURE

2.1 Introductory Statement:

The literature review covers a wide range of topics during the research process. The entire research revolves around the topic that one chooses to investigate. The literature evaluation broadens our thinking and clarifies the focus of our investigation. The primary goal of our literature review of relevant studies is to get more understanding and clarity of ideas that have been formed on a topic, as well as to identify new areas that have not yet been investigated or to determine whether there is any disparity among the researchers on the topic under consideration in the study. As a result, reviewing the work of many researchers over the last couple of decades would be extremely beneficial.

2.2 Reviews on Empirical Literature:

Sharma H (2021) in her study investigates the long-term relationship and causal direction among trade liberalization, industrial performance, and economic growth in India during the post-reform period. Using the ARDL model for co-integration analysis and the Granger causality test within a multivariate VAR framework, the research identifies key determinants of industrial performance. The findings indicate a positive correlation between industrial value-added and factors such as GDP, exports, gross fixed capital formation, import tariffs, labor force, secondary education, and trade liberalization. Moreover, a positive linkage is observed between trade liberalization, industrial growth, and economic development. Based on these insights, the study emphasizes the need for integrating liberal trade policies with broader economic and industrial strategies to foster national development.

Adeel-Farooq et al. (2017) analyses the impact of financial liberalization and trade openness on the economic growth of Pakistan and India from 1985 to 2014. Utilizing the autoregressive distributed lag (ARDL) model, which accommodates mixed integration orders, the research constructs a financial liberalization index through principal component analysis. The findings indicate that while trade openness positively affects Pakistan's growth in both the short and long run, financial

liberalization has a significant impact only in the long run. In contrast, India experiences a positive and significant influence from both trade openness and financial liberalization in both timeframes. The comparative analysis suggests that India benefits more from these factors than Pakistan. Given these insights, the study emphasizes the need for Pakistan to adopt effective financial and trade policies to enhance stable economic growth. The research is notable for its comparative approach, addressing a gap in existing literature where findings on these economies have been inconclusive.

Hossein S and Leelavathi D (2013) explore the relationship between trade liberalization and industrial growth in India, focusing on the period from 1970 to 2010. It aims to assess how economic openness influences industrial expansion by dividing the timeline into pre-liberalization (1970–1990) and post-liberalization (1991–2010) phases. Using quantitative analysis, including graphical representations and regression techniques, the study examines key variables and their interrelationships. Additionally, the Chow test is applied to identify structural changes. The findings indicate that trade liberalization has not significantly altered industrial growth trends in India over the past four decades.

Mitra A et al. (2014) explores the impact of policy reforms on economic growth and industrial productivity of India since India's economic liberalization in the 1990s extensively. Studies indicate that trade liberalization, including export and import activities, has played a crucial role in shaping firms' efficiency. Research highlights that infrastructure, encompassing transport, energy, and ICT, significantly influences manufacturing performance, especially in a country where infrastructure deficiencies persist. Additionally, knowledge transfer in India appears to be more effective through exports rather than imports. Moreover, empirical findings suggest that Indian firms depend more on foreign technology acquisition rather than in-house R&D, as domestic research and innovation activities remain limited. These insights provide valuable policy implications for enhancing industrial competitiveness and productivity in India.

Dutta D and Ahmed N (2006) examine the impact of trade policies on Pakistan's industrial growth from 1973 to 1995. Applying an endogenous growth model and using co-integration and error correction modeling techniques, it establishes a long-term relationship between industrial value-added growth and key factors such as

capital stock, labor force, real exports, import tariff rates, and secondary school enrollment. The short-term analysis, conducted through an error correction model, confirms the significance of the error correction term, indicating a stable adjustment mechanism toward long-run equilibrium.

Hosseini S and Leelavathi D (2013) examine the effects of liberalization on industrial growth using data from 1970 to 2010, employing co-integration and error correction models. The findings highlight key determinants of long-term industrial growth, including real capital stock, labor force, real exports, tariff collection rates, and secondary school enrollment. Additionally, the study explores the short-term industrial growth dynamics by analyzing the industrial value-added function. The results indicate that the error correction term is statistically significant and appropriately signed, confirming a stable adjustment process. This suggests that India's industrial sector responds predictably to economic shocks and policy changes. The research underscores the vital role of trade policies and human capital development in shaping industrial expansion, providing insights into the broader impacts of liberalization on economic growth.

Jain H (2017) examines the complex relationship between trade liberalization, economic growth, and environmental impacts, with a particular focus on Indian manufacturing industries. It synthesizes existing studies on trade liberalization-led economic growth, highlighting both theoretical and empirical perspectives that link trade openness to structural transformations in developing economies. Additionally, it reviews research on the environmental implications of liberalized policies, distinguishing between global and Indian contexts. The review also explores the growth-environment nexus, emphasizing the scale, composition, and technique effects of industrial expansion on pollution levels. Furthermore, it discusses market economy dynamics, property rights, and their role in environmental externalities, underscoring policy gaps and regulatory challenges in balancing industrial growth with environmental sustainability.

Sankaran U et al. explores the impact of trade liberalization on employment in India's organized manufacturing sector. It draws on Heckscher-Ohlin trade theory, which suggests that trade liberalization should benefit labor-intensive economies like India by expanding employment. However, empirical studies show mixed results, with some

indicating that increased import competition reduces employment, while export expansion does not necessarily lead to job growth due to capital-intensive production. Studies on India have found limited attention to trade's role in jobless growth, focusing instead on labor market rigidities, wage growth, and productivity changes. The methodology employs a panel data analysis using fixed effects regression, analyzing industry-level data from the Annual Survey of Industries (ASI), COMTRADE, and WTO databases from 1990-91 to 2004-05. Employment is measured through total employees, while trade impact is assessed using import penetration ratio, export intensity, and tariff changes. Control variables include capital-labor ratio, net value added, and real wages. The study finds that trade liberalization has a negative impact on employment, contradicting theoretical expectations. The negative effect is primarily due to rising capital intensity and shifting production patterns, favoring high-tech and capital-intensive industries. The conclusion suggests that while trade liberalization has benefits, India must promote labor-intensive sectors and adopt policies that ensure employment growth alongside economic expansion.

Parikh A and Stirbu C (2004) analyze the impact of trade liberalization on economic growth, investment, and trade balances across 42 developing countries in Asia, Africa, and Latin America. Utilizing both panel data and country-specific regressions, it examines how liberalization influences domestic economic growth, measured in purchasing power parity (PPP) terms, based on Heston, Summers, and Aten's (2001) dataset. The findings indicate that while liberalization generally promotes growth, it often negatively affects the trade balance. The study incorporates control variables such as terms of trade, debt-related factors, and growth rates of advanced economies. Using the balance of payments constrained growth model, it confirms that growth post-liberalization surpasses pre-liberalization levels. Various econometric techniques, including fixed and random effect models and ordinary least squares (OLS) regression, support the conclusion that liberalization enhances economic expansion, though at the cost of trade balance deterioration. Additionally, a cross-sectional analysis integrating political and security variables supports the "catching-up" hypothesis, suggesting that extreme political repression hinders growth. The study finds that a one-unit increase in the liberalization index results in an average 1.62 percentage point rise in growth rates, holding other factors constant.

Manni U and Afzal M (2012) examine Bangladesh's economy from 1980 to 2010, assessing the impact of liberalization on growth, inflation, exports, and imports. Using the Ordinary Least Squares (OLS) method, the study finds that GDP growth increased following liberalization, while inflation remained largely unaffected. The results indicate that greater openness had a positive effect on economic development, with both real exports and imports rising significantly. Particularly after the 1990s, trade liberalization policies contributed to export growth, which in turn boosted overall economic expansion. These findings highlight the benefits of liberalization for trade and growth, serving as a useful reference for policymakers in other developing countries. The study emphasizes that well-implemented liberalization policies can enhance economic performance, making it a valuable case for future research on trade policies in emerging economies.

Topalova P and Khandelwal A (2010) investigate the relationship between trade liberalization and firm productivity in India, leveraging the country's rapid and externally-driven tariff reductions. The findings indicate that lower tariffs on final goods fostered competition, while reduced input tariffs enhanced firms' access to better-quality inputs, with the latter playing a more significant role in boosting productivity. The positive effects were particularly evident in industries facing import competition and those with fewer domestic regulatory constraints. Although the study does not find substantial variation in the impact based on state-level characteristics, it highlights the complementary role of broader industrial policy reforms in maximizing the benefits of trade liberalization. These results underscore the importance of integrating trade policy with domestic economic reforms to achieve sustained productivity growth.

Hye Q and Lau W (2012) try to construct a novel trade openness index and analyze its relationship with economic growth in India. By employing an endogenous growth model as a theoretical foundation, the research utilizes the autoregressive distributed lag (ARDL) model and rolling window regression to explore both long-term and short-term dynamics. Additionally, the Granger causality test is applied to determine the causal direction of the relationship. Findings indicate that while human and physical capital contributes positively to long-term economic growth, trade openness exerts a negative impact over the same period. However, rolling window regression results suggest that this impact is not consistent throughout the sample. In the short run, trade

openness is positively associated with economic growth. Furthermore, the Granger causality test supports the trade openness-led and human capital-led growth hypotheses in both the short and long run.

Kannan E and Birthal P (2010) analyze the dairy sector of India. India leads global milk production, with dairy ranking as the second most significant agricultural sector after rice in terms of its contribution to the agricultural GDP. While the country has attained self-sufficiency in milk production, its dairy products have limited competitiveness in international markets, largely due to inefficiencies in processing and trade barriers imposed by developed nations. To evaluate the impact of trade liberalization on the dairy industry, a study utilized data from the Annual Survey of Industries and employed Data Envelopment Analysis (DEA) to assess technical and scale efficiency. Findings revealed that apart from employment, key performance indicators such as gross output, net value added, and productivity exhibited a negative correlation with protection levels. This suggests that reducing trade protection could enhance industry performance, making Indian dairy products more competitive in the global market.

Shafaeddin S explores the mixed economic outcomes of trade liberalization and structural reforms in developing countries since the 1980s, particularly regarding export expansion and industrial diversification. While some nations, primarily in East Asia, successfully expanded manufacturing exports alongside industrial upgrading, the majority—especially in Africa and Latin America—faced de-industrialization and economic vulnerability. Many industries that thrived under import substitution policies struggled under liberalization, except for those near maturity, such as Brazil's aerospace sector. Moreover, reform programs designed by international financial institutions failed to stimulate private investment in manufacturing. A key distinction between successful and struggling economies was the approach to liberalization; East Asian nations implemented gradual and selective policies as part of long-term industrial strategies, whereas others adopted rapid, broad-based reforms. The findings suggest that trade liberalization, when executed without careful sequencing, risks dismantling emerging industries rather than fostering sustainable industrial growth, especially in low-income countries, which remain confined to low-value economic activities.

Geng N (2008) utilizes the Time Varying Panel Smooth Transition Regression (TV-PSTR) model to assess the impact of India's 1991 trade liberalization on market efficiency and productivity growth in the manufacturing sector. Contrary to the notion of an immediate transformation, the findings suggest a gradual adjustment period of approximately 4–8 years, varying across industries. Increased competition led to reduced markups, enhancing welfare by minimizing deadweight losses. However, while some industries faced stagnation or decline in total factor productivity (TFP) growth due to market contraction, the leather industry significantly benefited from economies of scale. These results align with endogenous growth theory, which links post-liberalization TFP growth to the influence of trade on research, development, and innovation.

Hasan R et al. (2010) have investigated the trade liberalization and unemployment relationship. An analysis of state and industry level data indicates that liberalization is associated with a decline in unemployment. Specifically, urban unemployment tends to decrease in states with flexible labor markets and a greater share of employment in net-exporting industries. Additionally, industry-level data reveal that workers in sectors with substantial reductions in trade protection faced a lower likelihood of unemployment, particularly in net-exporting industries. There is some tentative evidence suggesting that a tariff reduction may initially cause a brief surge in unemployment before stabilizing at a lower rate. These findings align with a theoretical framework that integrates trade dynamics, search-related unemployment, and key institutional aspects of the Indian economy.

Goldar B and Kumari A (2002) examine the relationship between import liberalization and factor productivity growth of India in the 1990s. The decline in total factor productivity (TFP) growth in Indian manufacturing during the post-reform period is not a consequence of import liberalization. Instead, a reduction in effective protection for industries has positively influenced productivity growth. The slowdown in TFP growth may be attributed to factors such as investment gestation lags, as industrial investments increased after the reforms, and a deceleration in agricultural growth during the 1990s. These findings indicate that structural changes and sectoral interdependencies played a significant role in shaping productivity trends in Indian manufacturing.

Kumari R et al. (2021) explores the relationship between foreign direct investment (FDI) inflows, trade openness, and economic growth in India using annual time series data from 1985 to 2018. Employing the Johansen co-integration and vector autoregression (VAR) model, the research finds no long-term relationship among the three variables. However, VAR Granger causality results indicate a bi-directional causality between FDI and economic growth, while no such relationship exists between trade openness and economic growth. The findings have significant implications for policymakers, suggesting that decisions regarding FDI should consider trade openness trends. Additionally, impulse analysis provides insights into how these variables may fluctuate over the next decade, aiding future policy formulation. The study contributes to the existing literature by offering new perspectives on the dynamic interactions of FDI, trade openness, and economic growth in India.

Abubakar A (2016) in his paper examines the impact of trade liberalization on economic growth of India, which implemented trade liberalization in 1991, using the Vector Error Correction Model (VECM) methodology. The findings indicate that trade openness and Foreign Direct Investment (FDI) positively influence GDP, whereas the exchange rate negatively impacts economic growth. The Johansen co-integration test confirms a long-run relationship among variables, and a dummy variable analysis supports the beneficial effect of liberalization. Additionally, the Impulse Response Function (IRF) demonstrates a positive response of GDP to trade openness and FDI, while the exchange rate continues to exert a negative influence. Based on these findings, the study recommends policies that promote free trade and export growth through incentives and tariff reductions to enhance India's economic performance.

Majeed S et al. (2010) utilizes the endogenous growth model framework to examine the impact of trade liberalization (TL) on total factor productivity (TFP) growth in Pakistan’s large-scale manufacturing (LSM) sector from 1971 to 2007. By employing the growth accounting technique, the research first quantifies TFP growth and then applies the Auto-Regressive Distributed Lag (ARDL) model to assess the relationship between TL and productivity growth. Findings indicate a negative and statistically significant association between trade openness and TFP growth, suggesting that trade liberalization policies has not yielded substantial economic benefits for the LSM sector. The study emphasizes that while reducing government intervention is a key

aspect of liberalization, it alone is insufficient to drive significant economic progress. Instead, the government must actively invest in infrastructure to foster a competitive manufacturing environment.

Salimi F et al. (2014) have examined the advantages and disadvantages of trade liberalization. Analyzing data from 30 developed and developing countries from 2000 to 2011 and using the generalized method of moments (GMM) for dynamic panel models, identified key factors affecting trade liberalization, economic growth, and income inequality. The results confirmed a positive correlation between trade liberalization and economic growth, suggesting that reducing trade barriers accelerates economic expansion, which in turn promotes globalization. Moreover, trade liberalization and economic growth contribute to a more equitable income distribution, especially when supported by investments in education and healthcare. However, persistent income inequality can hinder economic growth and slow down globalization.

Kakarlapudi K (2010) explores the impact of trade liberalization on organized manufacturing sector employment which underwent considerable structural shifts since the post-reform period. Categorizing the industries into export-oriented and import-competing sectors, the study indicates that employment growth declined in the post-liberalization era compared to the pre-liberalization period, with a more pronounced decline in import-competing industries. Additionally, trade liberalization did not contribute to employment growth through scale effects, reinforcing concerns about stagnant job creation despite economic progress.

SenGupta S (2020) investigates the relationship between trade openness and economic growth in India, utilizing the ARDL Bounds Test approach for a dynamic analysis. A composite trade openness index is developed using Principal Component Analysis (PCA), alongside a time dummy variable to account for the structural changes brought by the 1991 economic reforms. Per capita GDP growth is employed as the key indicator of economic growth, with annual time-series data spanning from 1960 to 2018. The findings indicate that trade openness negatively affects economic growth in both the short and long run, aligning with previous research on the topic. Additionally, the study explores the reasons behind this negative impact, despite the general

perception of trade openness as beneficial, and considers the influence of the 1991 economic reforms in shaping these outcomes.

Biwott P et al. (2013) emphasizes the importance of regulatory policies in maximizing the benefits of trade openness. Trade liberalization, characterized by the removal of trade barriers, is often associated with economic growth; however, its effectiveness depends on the regulatory framework governing credit, labor, and product markets. Employing panel data methodologies, such as Instrumental Variables (IV) and the Generalized Method of Moments (GMM) the authors suggest that better regulatory policies significantly enhance economic growth. Additionally, the synergy between trade liberalization and improved regulatory policies is crucial, as less regulated economies tend to gain more from liberalization than heavily regulated ones. The findings highlight that reforming regulatory policies in Sub-Saharan Africa can amplify the positive impact of trade liberalization, with physical capital accumulation also playing a vital role in driving growth. Thus, policymakers in the region should prioritize regulatory improvements alongside efforts to deepen trade openness.

Pandey M (2004) examines India's trade policy changes during the 1980s and 1990s, focusing on non-tariff barriers, protection rates, and their impact on industrial performance. Findings indicate a decline in industry protection, with the registered manufacturing sector experiencing notable growth in output and gross value added, particularly in consumer goods and export-oriented industries. Employment, stagnant until the mid-1990s, showed improvement thereafter, while labor productivity and wages initially increased but later saw slower growth. Trade performance revealed sluggish export and import growth initially, followed by acceleration, with export intensity rising due to reduced anti-export bias. Import penetration trends varied across industries, and evidence on price-cost margins was inconclusive.

Topalova P (2004) investigates how economic reforms impact various regions and social demographics. This research contributes to the field by evaluating the wider implications of trade liberalization, particularly regarding agricultural workers and those in non-traded sectors. The approach utilized takes advantage of the differences in industrial composition across Indian districts and the timeline of liberalization in various industries. A district-level measure of trade exposure is developed by applying industry-specific tariffs, weighted by the shares of employment. The empirical

approach employs a regression model that includes district fixed effects and year indicators to account for unobserved variability and macroeconomic shocks. By concentrating on regional differences, the research explores whether trade reforms have disproportionately favored or harmed certain regions, providing insights for policymakers on potential redistributive actions.

Ali S et al. (2016) investigates the empirical relationship between trade openness, industrial value-added, and economic growth in Bangladesh using annual time series data from 1981 to 2015. To evaluate the stationarity of important economic indicators, such as GDP, exports, imports, and industrial value-added, the study uses unit root tests. Using the Granger causality test and the Ordinary Least Squares (OLS) estimation method, the study concludes that imports have a negative effect on economic growth while exports and industrial value-added have a positive effect. The report concludes that in order to boost its economy and raise the standard of life for its citizens, Bangladesh should concentrate on encouraging exports and putting import substitution plans into place.

Balakrishnan P et al. (2002) examines the impact of India's 1991 trade policy reforms on market power and scale efficiency within the manufacturing sector using data from listed firms across various industry groups. By estimating a production function that accounts for firm-specific effects, the research derives an appropriate measure of market power and largely refutes the assumption of constant returns to scale. However, the findings indicate that the expected shift toward a more competitive market structure and enhanced scale efficiency following the policy change was not uniform across Indian manufacturing industries.

Rakshit B (2021) examines trade openness, foreign direct investment (FDI), and economic growth dynamics in India from 1979 to 2017, considering both pre and post economic reform periods. Utilizing the autoregressive distributed lag model, the study identifies long-term associations among the variables, while the Zivot-Andrew test detects structural breaks. Findings suggest that trade openness negatively impacts economic growth in the long run, whereas FDI contributes positively to long-term growth but has no short-term effect. Furthermore, causality analysis indicates a unidirectional relationship, where FDI inflow and labor force influence per capita GDP growth. These results highlight the need for export-oriented policies and

strategies to maximize the benefits of FDI. Unlike previous studies that have explored either FDI or trade openness in isolation, this research comprehensively integrates capital formation and labor force factors, offering fresh insights into India's economic trajectory.

Zameer H et al. (2020) examine how trade openness, energy consumption, technical innovation, FDI, and economic growth interact with regard to carbon emissions in India between 1985 and 2017. The study validates a long-term co-integration between these variables using VECM and ARDL bound testing techniques. The results show that while economic growth, energy consumption, and trade openness all eventually lead to increasing CO2 emissions, FDI and technical innovation help slow down environmental deterioration. While GDP has a unidirectional effect on carbon emissions, foreign direct investment, innovation, trade, and energy use, the VECM study shows a bidirectional long-term relationship between these factors. In the medium term, trade openness has a bidirectional link with carbon emissions, but FDI, innovation, and energy consumption have unidirectional effects.

Edwards S (1989) through a critically analysis of existing theoretical and empirical literature, investigates the ways in which trade policies impact economic growth in developing countries. The difficulty of developing trade orientation metrics that are continuous, objective, and comparable across nations has been noted as a major problem in previous studies. In order to solve this, the study presents a growth model that, especially for small economies, connects trade openness to technological adoption from the global economy. The research uses cross-country data to test the model using a recently created trade orientation index that gets over earlier drawbacks. The results clearly show that countries with less trade distortion grow faster than those with highly limited trade sectors. The study assesses recent theories of economic growth and how well they explain the connection between growth and trade policies.

Wani S (2022) uses an autoregressive distributed lag (ARDL) bound testing approach to investigate the relationship between trade openness, capital formation, and economic growth in the context of India. The trade openness index is created utilizing a variety of trade openness proxies in order to accomplish this goal. The empirical findings show a negative relationship, both in the short and long term, between trade openness and economic growth in the case of India. The current study's findings have

significant policy ramifications for India. The report recommends, among other things, the adoption of policies that can increase the production of physical and human capital in order for the economy to reach the threshold level needed to profit from trade openness.

Kareem P (2024) explores the transformative impact of economic reforms since 1991 on India's trade sector, positioning it as a key driver of economic growth. Trade openness, measured by the export-import ratio to GDP, has significantly influenced macroeconomic variables, fostering industrial development, service sector expansion, technological advancements, and employment generation. The study employs econometric techniques to examine the relationship between trade openness, employment, and income levels. Using the Dickey-Fuller test for stationarity, Johansen's co-integration tests, and the Engle-Granger method, the research establishes a statistically significant long-term relationship among these variables. The Vector Error Correction Model (VECM) further supports the existence of both short- and long-term integration, indicating that increased trade openness positively impacts employment and income levels in India.

Alessandrini M et al. (2009) examines India's economic reforms since the early 1990s, which have significantly influenced its trade structure by enhancing international trade openness. Analyzing trade data from 1990 to 2006, the study indicates that trade liberalization has reshaped India's specialization patterns, with industries experiencing the greatest tariff reductions showing the highest specialization gains. Empirical findings from dynamic panel regression suggest that these reforms have strengthened India's comparative advantage in medium- to high-technology sectors and industries with strong global demand growth. This underscores the role of liberalization in driving structural shifts toward more competitive and technologically advanced industries.

Kaushal L and Pathak N (2015) examine the causal relationship between trade openness, financial development, and economic growth in India during the post-liberalization period from 1991 to 2013. Using Vector Auto-Regression and the Granger Causality test, the findings suggest that economic growth in a developing nation like India drives trade openness, encompassing exports and imports. Additionally, growth influences private credit, which subsequently impacts trade

openness. Financial development, measured through private credit and money supply, plays a crucial role in fostering trade openness by efficiently allocating resources to enhance productivity and technological progress. The results align with the growth-led trade hypothesis, emphasizing the role of technological change, as outlined in the neoclassical growth model. This technological advancement is facilitated by well-designed economic policies, such as foreign direct investment (FDI) in various sectors, an area in which India has been actively engaged.

Thirlwall A (2000) examines the effect of liberalization on economic growth. Empirical data indicates that nations participating in regional trade agreements typically perform worse than those that unilaterally reduce tariffs. Although the neoclassical supply-side approach helps explain some of the relationship between exports and growth, theoretical discussions point out that it ignores the critical role that export performance plays in reducing balance of payments constraints, which in turn affects demand and overall economic growth.

Siregar A and Widjanarko N (2022) examine how trade openness influences economic growth in agricultural nations. Using data from 72 agrarian countries between 2011 and 2020, sourced from the World Bank, the research employs panel data analysis, selecting the fixed-effects model as the most suitable. Findings indicate that only 16 of these countries experienced positive economic growth during the period, while gross fixed capital formation (GFCF) grew by 19 percent. The population showed a continuous increase, though in two nations, trade volumes (exports plus imports) exceeded GDP. The analysis reveals a positive relationship between trade openness and economic growth, with a coefficient of 3.81, while an increase in GFCF contributes to a 3.32 percent rise in economic growth. Conversely, a one percent rise in population correlates with a 25.46 percent decline in economic growth. Ultimately, the study suggests that greater trade engagement can enhance economic performance in agricultural economies.

Arif A et al. (2020) examines the connection between South Asian nations' financial success, trade openness, and sustainable environmental-economic growth using panel data from the World success Indicators from 1980 to 2018. The results, which were obtained using the autoregressive distributive lag approach, show that financial development both short- and long-term improves environmental-economic growth.

Additionally, pooled mean group, mean group, and common correlation effect mean group analyses show that trade openness has a beneficial impact on economic growth. Notably, this study is the first to examine how trade openness and financial development brought about by globalization affect sustainable environmental-economic growth in the South Asian context.

Vasiliki P investigates the relationship between trade openness and economic progress in 71 developing countries from 1990 to 2005. Employing an augmented Solow growth model in a panel data setting, the study, which includes fixed and two-way fixed effects, validates that trade liberalization notably boosts economic growth. Nonetheless, the situation in Sub-Saharan Africa differs from this trend because of existing trade obstacles, dependence on primary commodity exports, and insufficient infrastructure linking to far-off major markets, which impede the advantages of enhanced trade openness in the area.

Marelli E and Signorelli M (2011) explores the economic development of China and India concerning their incorporation into the global economy. The research examines essential institutional changes, trade connections, and their influence on development, analyzing economic growth trends, trade specialization, and foreign direct investment (FDI) patterns in both nations. By utilizing econometric analysis, the study applies a panel data model featuring fixed effects along with a two-stage least squares (2SLS) method to address possible reverse causality. The results suggest that trade openness and FDI positively and significantly influence GDP per capita in both the countries; supporting the notion that economic liberalization promotes growth. Furthermore, the research emphasizes how the economic strength of China and India aided in reducing the impacts of the global financial crisis while promoting global recovery. The conclusions also offer policy insights about the advantages of global integration for developing economies.

Goswami A et al. (2023) investigate how India's carbon emissions from 1980 to 2021 are affected by trade openness, urbanization, economic growth and energy use. The study finds both short- and long-term correlations between the variables using the random forest approach and the ARDL model. In the short term, energy consumption and urbanization have a positive impact on emissions, while CO2 emissions at the prior lag, economic growth, and trade openness have a negative impact. In the long

run, emissions are positively correlated with energy consumption, urbanization, and trade openness, but negatively correlated with economic growth and previous CO2 emissions. The random forest model's low RMSE and MAE and high R2 value attest to its predictive accuracy. The report talks about its conclusions and suggested policies to reduce carbon emissions.

Sahoo M and Sethi N (2020) examine the impact of financial globalization and trade openness on economic growth in selected South Asian countries from 1990 to 2017. Using panel unit root tests such as Im–Pesaran–Shin (IPS) and Levin–Lin–Chu (LLC), the authors establish the stationarity of variables, while co-integration tests like Kao, Fisher, and Pedroni confirm a long-term relationship among them. The Granger causality test reveals unidirectional causality between economic growth and financial globalization, as well as between trade openness and financial globalization. Further analysis using FMOLS and DOLS methods indicates that both financial globalization and trade openness significantly and positively influence economic growth. The study emphasizes the need for South Asian countries to implement policies that maximize benefits from trade and capital flows, strengthen domestic financial systems, and engage in global coordination to mitigate financial crises and economic shocks.

Burange L et al. (2013) investigates the causal relationship between trade openness and economic growth among the BRICS countries using time series econometric analysis. The study examines the relationship between trade openness and GDP per capita growth, taking into account that these nations enacted liberalization policies in the late 1980s. Merchandise exports, merchandise imports, service exports, and service imports are the four dimensions it uses to assess trade openness. The results show that trade openness has boosted GDP per capita growth in Brazil, which has drawn investment. While South Africa shows a growth-led export pattern, the analysis backs up the export-led growth hypothesis for China. Both theories are true for Russia and India, demonstrating the reciprocal relationship between trade and economic growth.

Paudel R (2014) explores the relationship between trade liberalization and economic growth, building on previous studies, particularly the Sachs and Warner (1995) index. This study extends the index to cover 193 countries up to 2010 and employs a dynamic growth model to analyze panel data from 1985 to 2010. Findings suggest that

the effects of trade liberalization vary based on a country's economic development stage. Notably, lower-middle-income nations experience approximately 3% greater benefits than other developing economies. These results highlight the need for policy approaches that consider economic development levels rather than adhering strictly to the conventional "Washington Consensus" framework.

Table: 2.2 - Summary of Literature Review:

AUTHORS	STUDY AREA	METHODOLOGY	FINDINGS
Sharma H (2021)	Long term relationship among trade liberalization, industrial performance and economic growth during post reform period	ARDL model and Granger causality test, VAR framework	Positive correlation among the variables and emphasizes need for liberal trade policies
Adeel-Farooq et al. (2017)	Economic growth of India and Pakistan from 1985-2014	ARDL model approach	Financial liberalization impacts only in the long run in Pakistan whereas India benefits both in short as well as long run
Hossein S and Leelavathi D (2013)	Comparison of Trade liberalization and industrial growth relationship in India: pre-liberalization (1970-1990) and post-liberalization (1991-2010) period	Quantitative analysis, graphical and regression techniques, Chow test	Trade liberalization has NOT significantly altered industrial growth
Mitra et al. (2014)	Impacts of policy reforms on economic growth	Empirical findings	Interrelated growth across industrial sector and

			dependency of foreign capital
Dutta D and Ahmed N (2006)	Pakistan's trade policies impact from 1973-1995	Endogenous growth model, co-integration, error correction models	Stable adjustment mechanism towards long run equilibrium
Hosseini S and Leelavathi D (2013)	Effects of liberalization on industrial growth (1970-2010)	Co-integration and error correction models	Determinants of long term industrial growth confirms stable adjustment process
Jain H (2017)	Relationship among trade liberalization, economic growth and environmental impacts in manufacturing industries	Synthesizes existing studies, both theoretical and empirical	Growth-environment nexus, market economy dynamics and property rights for environmental sustainability
Sankaran U et al.	Impacts of trade liberalization in India's manufacturing sector	Heckscher-Ohlin theory and panel data analysis	Negative impact of trade liberalization in employment
Parikh A and Stirbu C (2004)	Impacts of trade liberalization on economic growth, investment and trade balances across 42 developing countries in Asia, Africa and Latin America	Control variables using balance of payments constrained growth model, OLS and cross-section analysis	Post-liberalization growth surpasses pre-liberalization growth, 1 unit increase in liberalization index results an avg. 1.62% point rise in growth rates
Manni U and Afzal M (2012)	Liberalization in Bangladesh's economy from 1980-	OLS Estimation	Growth in GDP and unaffected inflation

	2010		
Topalova P and Khandelwal A (2010)	Trade liberalization and firm productivity in India	Empirical analysis	Positive impact, boost in productivity
Hye Q and Lau W (2012)	Trade openness and economic growth in India	ARDL model, Granger Causality test	Physical and human capital impacts positively while trade openness impacts negatively in long-run
Kannan E and Birthal P (2010)	Dairy sector of India	Analysis of collected data	Reduce in trade protection enhance industry performance
Shafaeddin S	Trade liberalization and structural reforms of developing countries since 1980s	Researcher's own analytical work	Trade liberalization without careful sequencing risks dismantling emerging industries especially in low income countries
Geng N (2008)	Trade liberalization and market efficiency and productivity of India in manufacturing sector	TV-PSTR model	Gradual adjustment period approx. 4-8 yrs. Some industries faced stagnation whereas leather industry benefitted from economies of scale
Hasan R et al. (2010)	Trade liberalization and unemployment relationship	Analysis of state and industry level data	Liberalization is associated with decline in unemployment
Goldar B and	Import liberalization	Researcher's own	Reduction in effective

Kumari A (2002)	and factor productivity growth of India in 1990's	work	protection positively influenced productivity growth
Kumari R et al. (2021)	FDI, trade openness and growth in India from 1985-2018	Johansen co-integration and VAR model, Granger causality test	No long term relationship among the variables but bi-directional causality between FDI and economic growth
Abubakar A (2016)	Impact of trade liberalization on economic growth in India	VEC model	Trade openness and FDI positively influence GDP
Majeed S et al. (2010)	Impact of trade liberalization on TFP in Pakistan's large scale manufacturing sector	Growth accounting techniques, ARDL model	Negative and statistically significant association between trade liberalization and FTP growth
Salimi F et al. (2014)	Analyze the advantages and disadvantages of trade liberalization from 30 developed and developing countries from 2000-2011	GMM for dynamic panel model	Positive relationship between trade liberalization and economic growth
Kakarlapudi K (2010)	Impacts of trade liberalization on organized manufacturing sector employment since post reform period	Researcher's own analytical work	Decline in employment growth and stagnant job creation

SenGupta S (2020)	Relationship between trade liberalization and economic growth in India	ARDL bound test using PCA	Trade openness negatively affects economic growth in both short as well as long run
Biwott P et al. (2013)	Importance of regulatory policies in trade openness	Panel data, GMM methods	Reforming regulatory policies positively impacts trade liberalization that can drive growth
Pandey M (2004)	India's trade policy changes during 1980's and 1990's	Researcher's own analytical work	Decline in industry protection and growth in output
Topalova P (2004)	Economic reform impacts in social demographics	Researcher's own empirical evaluation using regression models	Differences in industrial composition; reforms disproportionately favored some regions
Ali S et al. (2016)	Empirical relationship between trade openness, industrial value-added and growth in Bangladesh from 1981-2015	Unit root tests, Granger causality test and OLS estimation	Imports have negative effects while export have positive effect on economic growth
Balakrishnan P et al. (2002)	Impact of India's trade policy reforms on market power and scale efficiency within manufacturing sector	Researcher's own empirical analysis	Shift towards more competitive market was not uniform across Indian manufacturing industries
Rakshit B (2021)	Trade openness, FDI and economic growth	ARDL model, Zivot-Andrew test	Trade openness negatively affects the

	dynamics of India from 1979-2017		economy in the long run while FDI contributes positively
Zameer H et al. (2020)	Effects of trade openness, energy consumption, technical innovation, FDI and economic growth on carbon emission between 1985-2017	VECM and ARDL model bound testing techniques	Economic growth, energy consumption and trade openness led to increase on environmental degradation while FDI and technological innovation slowed down environmental degradation
Edwards S (1989)	Impact of trade policies in developing countries	Researcher's own investigation using cross-country data	Countries with less trade distortion grow faster than those with highly limited trade sectors
Wani S (2022)	Relationship between trade openness, capital formation, and economic growth in the context of India	ARDL bound testing approach	Negative relationship both in short as well as long run
Kareem P (2024)	Transformative impact of economic reforms since 1991 on India's trade sector	Econometric techniques including Dickey-Fuller test, Johansen's co-integration test, Engle-Granger method and VEC Model	Existence of both short and long-term integration, indicating that increased trade openness positively impacts employment and income levels in India.

Alessandrini M et al. (2009)	Examination of India's economic reforms since the 1990's	Researcher's own analysis on empirical findings and dynamic panel regression models	Trade liberalization reshaped India's specialization gain patterns resulting from reduced tariffs
Kaushal L and Pathak N (2015)	Relationship between trade openness, financial development, and economic growth in India during the post-liberalization period from 1991-2013	Vector Auto-Regression and the Granger Causality test	Economic growth drives trade openness and financial development
Thirlwall A (2000)	Effect of liberalization on economic growth	Researcher's own empirical work	Nations participating in regional trade agreements typically perform worse than those that unilaterally reduce tariffs
Siregar A and Widjanarko N (2022)	Influence of trade openness in economic growth of agricultural countries	Panel data analysis of 72 agrarian countries between 2011 and 2020 (sourced from world bank) and incorporating fixed-effects model	positive relationship between trade openness and economic growth, with a coefficient of 3.81; gross fixed capital formation (GFCF) contributes to a 3.32 percent rise in growth; one percent rise in population correlates with a 25.46 percent decline in economic growth

Arif A et al. (2020)	Relationship between South Asian nations' financial success, trade openness, and sustainable environmental-economic growth	Panel data analysis from World success Indicators (1980-2018; ARDL model	Financial development improves environmental-economic growth both in short and long run; trade openness benefits economic growth
Vasiliki P	Relationship between trade openness and economic progress in 71 developing countries from 1990-2005	Augmented Solow growth model in panel data analysis	Trade liberalization boosts economic growth
Marelli E and Signorelli M (2011)	Economic development of China and India concerning trade connections, FDI patterns	Panel data analysis and 2SLS method for causality test	Trade openness and FDI positively and significantly influence GDP per capita in both countries
Goswami A et al. (2023)	Effect of trade openness, urbanization, economic growth and energy use on India's carbon emissions from 1980-2021	ARDL model and random forest approach model	Emissions are positively correlated with energy consumption, urbanization, and trade openness, but negatively correlated with economic growth and previous CO2 emissions
Sahoo M and Sethi N (2020)	Impact of financial globalization and	Panel unit root test-Im–Pesaran–Shin	Long term relationship among

	trade openness on economic growth in selected South Asian countries from 1990-2017	(IPS) and Levin–Lin–Chu (LLC); co-integration tests-Kao, Fisher, and Pedroni; Granger causality test; FMOLS and DOLS methods	the variables; unidirectional causality between economic growth and financial globalization, as well as between trade openness and financial globalization; financial globalization and trade openness significantly and positively influence economic growth
Burange L et al. (2013)	Relationship between trade openness and economic growth among the BRICS countries	Time series econometric analysis	Boost in GDP/capita growth in Brazil and growth-led export pattern for South Africa and China but existence of reciprocal relationship between trade and economic growth in Russia and India
Paudel R (2014)	Relationship between trade liberalization and economic growth of 193 countries from 1985-2010	Sachs and Warner (1995) index; Panel data analysis	Lower-middle-income nations experience approximately 3% greater benefits than other developing

			economies; Need for policy approaches that consider economic development levels rather than adhering strictly to the conventional "Washington Consensus" framework

Source: Researcher's own analysis

2.3 Research Gap:

Thus it is seen that there are ongoing debate regarding the correlation between trade liberalization and industrial performance in transforming the ideal resources into capital formation to spur long–term economic growth. This debate is revolved around two major issues i.e., whether trade liberalization affects industrial performance or it is industrial performance that affects trade liberalization. There is wide literature available on this issue at both theoretical levels as well as at empirical level but no consensus is seen amongst the thinkers. Conventional thinkers Adam Smith and Heckscher-Ohlin nodded at the comparative gain from free trade as an important constituent in promoting higher economic growth. Trade liberalization helps to stimulate industrial production, promote economic efficiency and reduce the cost of production and thus increase international confidence in the market mechanism of an economy. Some studies showed that the relationship between trade policies and industrial growth has a positive impact on economic growth. The results suggested that there exists a long-run relationship among the aggregate growth function of industrial value-added and its major determinants of the gross fixed capital formation, the labor force, exports, and the import tariff collection rate. But in contrast, some countries didn't have a positive impact on economic growth with the trade liberalization policies. The experiences of countries are different. The variables taken for the studies are different in countries and the period of studies is also different. A lot of disagreement was also seen regarding the existence of short-run and long-run

relationship them. It is also seen that most of the existing literature has found the whole nexus within a bi-variate framework. Not much attention has been paid to the causal relationship amongst trade liberalization, industrial performance and economic growth in India within a multivariate framework. Thus the present work fills the existing gap considering both long run and short run relationship between trade liberalization, economic growth and industrial performance in India using ARDL framework.

CHAPTER III

TRENDS IN TRADE LIBERALIZATION, INDUSTRIAL PERFORMANCE AND ECONOMIC GROWTH OF INDIAN ECONOMY

3.1 Introductory Statement:

This chapter examines the country's Trade Liberalization, Industrial Performance and Economic growth from 1980–81 to 2023–24. It is vital to evaluate these trends in order to ensure the continuation of the growth pattern following the implementation of significant new economic reforms in 1991. All data are in constant prices in US$ and 2015 as the base year.

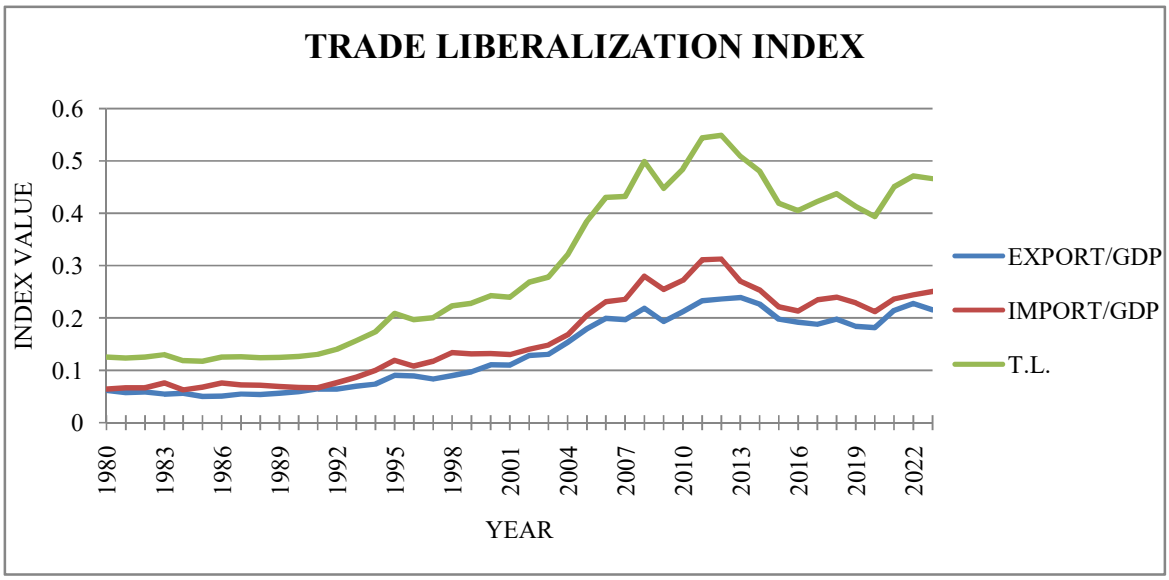
The chapter is divided into the following sections:
3.2 Trends in terms of Trade Liberalization (1980-2023)
3.3 Trends in terms of Industrial value-added (1980-2023)
3.4 Trends in terms of Gross Domestic Product (1980- 2023)

3.2 Trends in terms of Trade Liberalization:

The following part presents a detailed analysis of the trends in India's Trade Liberalization index from 1980-81 to 2023-24. The Trade Liberalization Index evaluates how open a country’s trade policies are by measuring the degree to which trade restrictions like tariffs and quotas have been reduced or eliminated thus, determining the level of openness in a nation's trade system and its free trade practices. The trend in Trade Liberalization is analyzed using Figure 3.2.

During the year 1980-81, India’s export and import were $16.58 billion and $17.89 billion respectively, which improved to $30.26 billion and $31.25 billion respectively in 1991-92. This was mainly due to the various export promotion measures adopted in the late 1980s. India's trade liberalization started in the 1990s, prompted by a balance-of-payments crisis and depleted foreign exchange reserves. At the time, India's economy was largely protectionist, with high tariffs, extensive import licensing and tight prohibitions on foreign investment.

Figure: 3.2 - T.L. Index (constant 2015 US$):



Source: Researcher's Analysis

Faced with economic instability, the Indian government, led by Prime Minister P.V. Narasimha Rao and Finance Minister Dr. Manmohan Singh, implemented a series of structural reforms to stabilize the economy and open it up to global markets. One of the first important efforts was to reduce tariffs on imports, which were formerly among the highest in the world. Import licensing, which required enterprises to obtain permission to import most commodities, was eliminated for many products. The administration also relaxed foreign direct investment (FDI) laws, allowing foreign firms to invest in a broader range of industries with fewer limitations. Over time, India has signed various bilateral and regional trade agreements, including those with ASEAN and South Asian countries, to improve market access. Thus, the Trade Liberalization index improved from 0.125 in 1980-81 to 0.131 in 1991-92.

The Asian financial crisis, often known as the "Asian Contagion," was a catastrophic financial crisis that occurred in 1997 and spread quickly to other nations in East and South-East Asia. It caused a dramatic drop in currency prices, stock markets and other asset values across multiple countries. Exports declined as Southeast Asian markets shrunk and the fear of contagion led to capital withdrawal and currency depreciation. However India was relatively insulated due to limited capital account convertibility and its export stood at $55.69 billion and import at $78.32 billion during 1997-98 with

the T.L index being 0.201. In 2001 the worldwide recession and global economic slowdown affected India's IT and Software exports, especially to the US, and this global uncertainty affected other sectors resulting in India's export to stand at $92.23 billion and import at $109.23 billion. With the Quick recovery fuelled by global outsourcing boom in 2004, India's export and import were $155.64 billion and $169.93 billion respectively taking the T.L. index to a rise from 0.240 in 2001 to 0.321 in 2004.

The next major setback for India's exports was the Global Financial Crisis of 2007-08. Rising inflation as a result of rising oil costs and the global collapse of huge investment banks triggered a recession which were fuelled by high global crude prices and reduced import taxes. Often known as the Great Recession it caused a reduction in exports, especially textiles, gems and jewelry, and IT services. Capital outflows led to stock market crash and depreciation of rupee which triggered a sharp drop in remittances and FDI/FII inflows. India's export and import were $250.12 billion $300.28 billion respectively during 2007-08 and with the slow recovery, export and import rose to $326.42 billion and $417.63 billion respectively during 2010-11. This economic crisis is clearly shown by the drop in T.L. index from 0.499 in 2008 to 0.448 in 2009.

In 2013 the Indian economy was once again influenced by the Euro-zone debt crisis and Taper Tantrum. The Rupee depreciated and imports became costlier which widened the Current Account Deficit (CAD). During this time period, India's export and import were $ 434.02 billion and $489.73 billion respectively in 2013-14. In 2016, the Govt. of India, in an effort to clean out black money and counterfeit money demonetized all ₹500 and ₹1,000 banknotes which caused a short-term economic disruption and a liquidity constraint. Also, the Chinese stock market turbulence and oil price crash led to India's export and import to stand at $437.56 billion and $485.48 billion respectively in 2016-17. This is marked by the sharp fall in the T.L. index from 0.549 in 2012 to 0.509 in 2013 which further dropped to 0.405 in 2016.

2020 was marked by the COVID-19 Pandemic. Global trade came to a stop, and supply systems broke down. Exports and imports fell sharply and sectors like textiles, leather, tourism, and automobile industries suffered significant losses. In 2020-21 India's export was $460.37 billion while import was $537.49 billion, which reduced

from $615.14 billion in 2019-2020. The T.L. index clearly highlights this crisis with a significant drop to 0.394 in 2020.

As the Indian economy becomes increasingly integrated with the global economy, it is continuously impacted by global shocks and events. The economy was significantly influenced by global incidents that occurred in 2022-23 like the Ukraine War and Global Inflation that worsened CAD and depreciated the Rupee. Export and import during 2022-23 were $676.58 billion and $725.74 billion respectively. To recover from this shock, India adopted the promotion of rupee trade settlement with some select countries and export bans were implemented on commodities such as wheat and rice to protect domestic food security. India also adopted trade diversification efforts like more crude imports from Russia at a discount. Amidst these global events, the T.L. index currently stands at 0.466 in 2023-24 with export and import being $694.38 billion and $805.16 billion respectively.

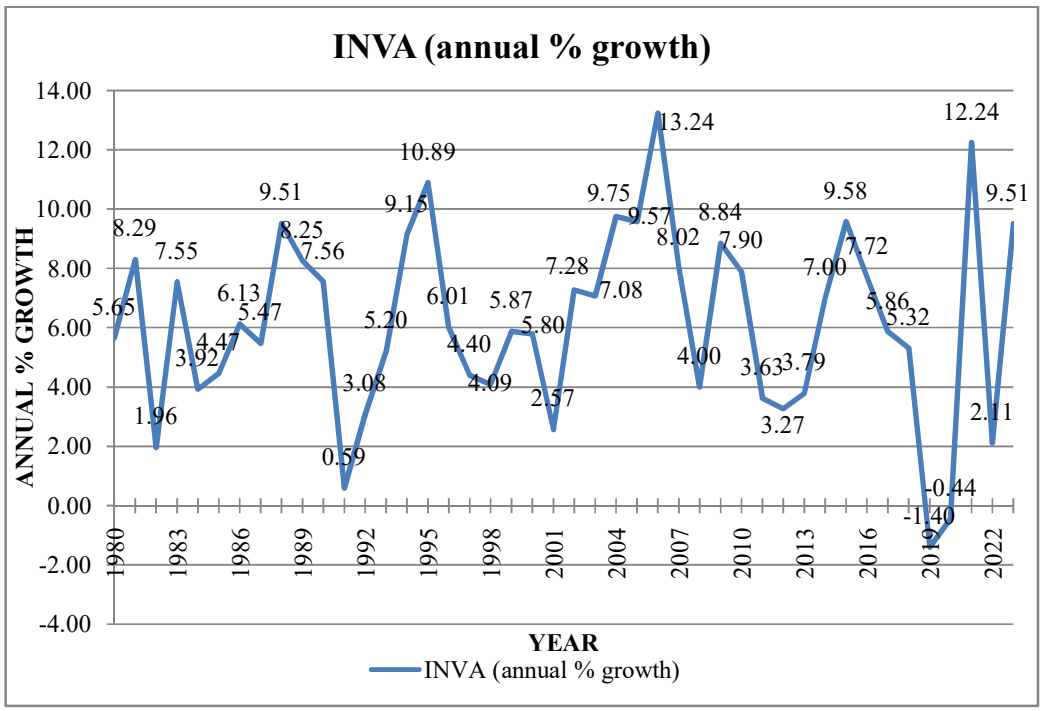
3.3 Trends in terms of Industrial Value-Added:

This section discusses the trends in the country's Industrial Performance, analyzing the growth of Industrial Value Added (INVA) as the key indicator from 1980-81 to 2023-24. Following independence, India faced significant challenges in revitalizing its industrial sector, which had been severely damaged under British rule due to the exploitation and decline of native industries and artisans. To rebuild, India implemented the Mahalanobis Model, prioritizing the development of basic industries. Initially, focus was placed on consumer goods like textiles, sugar, bicycles, and automobiles, along with capital and intermediate goods industries. However, this phase of industrialization was primarily focused on increasing output rather than efficiency. Many industries operated below capacity, leading to poor resource utilization. The public sector, which led industrial growth, struggled to generate enough funds and contributed to rising regional inequalities. Industrial growth tended to cluster around already developed areas, leaving underdeveloped regions largely untouched. Figure 3.3 shows a detailed analysis of trends in India's growth pattern in terms of industrial performance.

From 1980–81 to 1981-82, India's industrial sector recorded a significant growth rate of 8.29% largely due to better use of existing resources and efforts to reduce costs by boosting productivity. Special emphasis was placed on capital goods, electronics, and energy efficiency. To support these goals, industrial policies were revised, and the country began liberalizing its industrial and trade frameworks. As a result, there was

substantial growth in industrial production, with the chemical and consumer durables sectors showing especially strong performance.

Figure: 3.3 - Annual % growth of INVA:



Source: Researcher's Analysis

During the years 1988-89 and 1991-92, industrial production fell consistently due to a lack of infrastructure, such as power and transportation and inadequate port handling facilities, and so on. All of these factors increased the real costs of manufacturing, reducing the domestic industry's competitiveness. It is difficult to secure cash for capital market expansion and development. In the lack of a developed capital sector, capitalists encounter difficulty in raising funds for expansion. The annual growth rates of textile products, basic metals and alloys, metal products and parts, electrical machinery and appliances, and other manufacturing products increased during the period, while those of beverages, tobacco and tobacco products, and wood and wood products decreased.

With the introduction of liberalization, privatization, and globalization policies, India opened its economy to the global market. Several underperforming public sector enterprises were either closed or privatized to promote economic growth. In response to a severe balance of payments crisis between 1985 and 1990, a major shift in

industrial policy was introduced on July 24, 1991. This reform redefined the roles of the public and private sectors, giving the private sector a greater role in driving industrial development, especially in non-strategic areas. The 1991 economic reforms positively influenced industrial value-added output. However, industries that had been shielded from both domestic and global competition for decades suddenly faced exposure to international markets due to import liberalization and reduced tariffs. This abrupt change led to an expected slowdown, worsened by the global economic recession of the 1990s. Investment levels dropped sharply, and since industrial growth heavily depends on capital investment from both public and private sectors, this decline weakened overall industrial performance. Investments not only provide direct demand but also stimulate indirect demand by generating income, both of which are crucial for industrial momentum

After a significant drop to 0.59% in 1991-92, the industrial growth rate experienced an increasing trend from 1992-93, marked with an overall growth of 3.08% in 1992-93, 5.20% in 1993-94, 9.15% in 1994-95 and 10.89% in 1995-1996. After peaking in 1995-96, industrial growth dropped significantly to 4.09% in 1998-99, before somewhat improving to 5.87% in 1999-2000. This new industrial policy in the economy focused mostly on the liberalization initiatives with the public sector focused solely on the basic and core industries. India's industrial revival was driven by the adoption of a new industrial policy, a more liberal fiscal framework, agricultural growth, expansion of the service sector, and improvements in infrastructure. Some economists believe that rising incomes among wealthy farmers in certain regions led to increased demand for consumer goods. Additionally, the expansion of the service sector contributed to higher government spending on various services. This shift led to a change in consumption patterns, with service-sector employees favoring consumer durables over food, boosting demand for such products and fueling industrial growth.

The strong performance of the consumer durables sector became a major factor in driving overall industrial growth. However, this momentum slowed in the following years due to weak electricity production, mining challenges, and declining agricultural output, which negatively impacted rural incomes and reduced demand for industrial goods. Depressed capital markets further limited investment in industry, while slow export growth and rising competition from imports also hindered production. By 2001–02, industrial performance suffered due to several issues: exposure to global

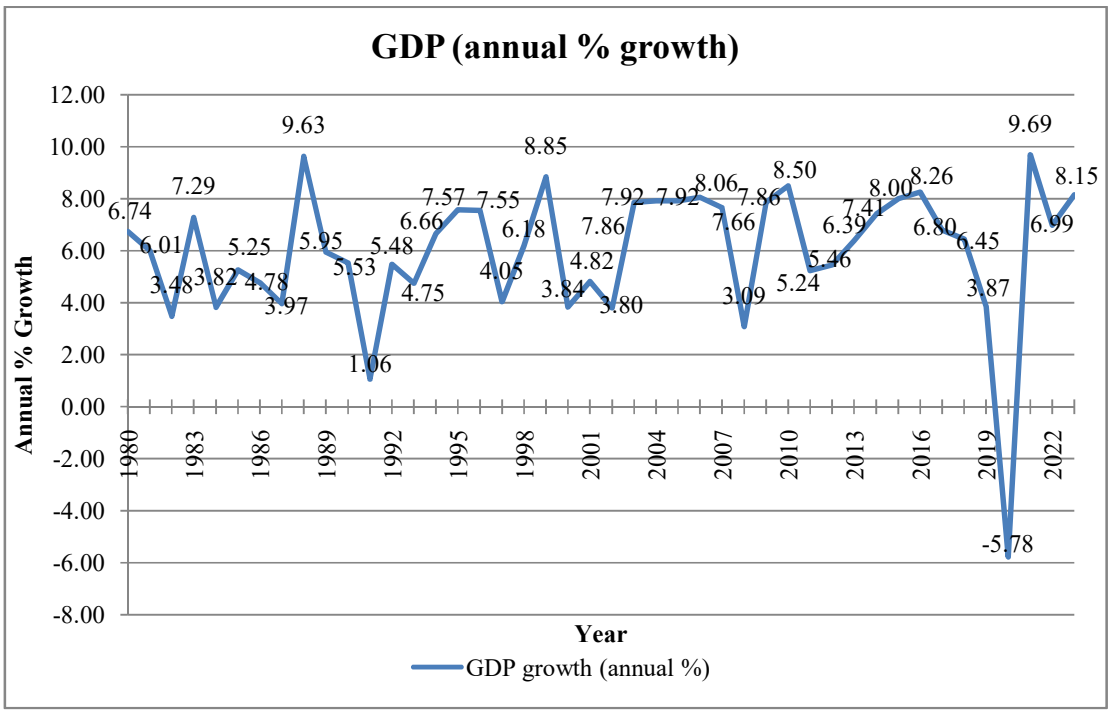
competition, reduced investment, infrastructure bottlenecks and limited access to expansion funds, weak exports, tariff inconsistencies and shrinking demand for consumer goods and the growth declined to 2.57%.

India’s industrial sector grew from 2002–03 to 2006–07, recording growth rates of 7.28%, 7.08%, 9.75%, 9.57% and 13.24% respectively. However, the sector experienced fluctuations and the growth rate eventually dropped to 4.00% in 2008–09 due to the Global Financial Crisis. Despite this, the impact on India was relatively mild due to a tightly regulated financial system, limited exposure to global capital flows, and lower levels of international trade. As a result, industrial growth rebounded sharply to 8.84% the following year. However, this was followed by a consistent decline, with growth falling to 3.27% by 2012–13. As of 2015-16, the industrial growth rate increased to 9.58% which was followed by a consistent decline and a sharp drop to -1.40% in 2019-20 and -0.44% in 2020-21. This was mainly due to the impact of the COVID-19 pandemic which had a significant detrimental influence on India's industrial sector, causing widespread factory closures, labour shortages, and supply chain disruptions, resulting in a severe decrease in manufacturing and industrial activity. The rebound was gradual and uneven, with industries like pharmaceuticals and digital services recovering faster than conventional manufacturing sectors. Following the swift recovery, the industrial growth rate rose to 12.24% in 2021-22 but again fell sharply to 2.11% in 2022-23 as a result of a combination of weak domestic demand, reduced private investment and slowing global demand, particularly in the export and manufacturing sectors. Furthermore, the Reserve Bank of India's interest rate hikes to combat inflation raised borrowing costs, reducing consumer spending and industrial output. By 2023-24, the industrial growth rate reached 9.51%.

3.4 Trends in terms of Gross Domestic Product:

The trend in Economic Growth is examined through the analysis of the growth rate patterns of GDP from 1980-81 to 2023-24.The Indian economy was exploited for about 200 years under British colonial control, with vast resources drained, resulting in severe economic backwardness and lengthy stagnation. Following independence, the Government of India prioritized attaining a balanced growth in all areas of the economy.

Figure: 3.4 – Annual % growth of GDP:



Source: Researcher's Analysis

To address the stagnation and encourage development, the government implemented a number of short and long-term strategies which targeted at enhancing economic growth and per capita income. A detailed analysis of India's GDP growth pattern is illustrated in Figure 3.4. Following independence, the Indian government implemented various economic policies to drive development and boost GDP growth. During the 1980s, the economy performed well, consistently meeting the targets set in the Five-Year Plans. All major sectors showed progress, with improvements in the balance of payments, a revival in exports, reduced imports, and the repayment of short-term IMF debt. Key measures such as the nationalization of banks and policies aimed at maintaining price stability also contributed to a notable rise in India's GDP.

India's GDP growth rate during the 1980s showed notable fluctuations. It ranged from a high of 6.74% in 1980–81 to a lower 3.48% in 1982–83. Improved infrastructure helped push GDP up again to 7.29% in 1983–84. However, after fluctuations, it stayed at a low of 3.97% in 1987–88.In 1988-89, India's GDP growth rate rose to 9.63% due to a combination of factors, including a strong recovery in agricultural production, sustained industrial growth and the early effects of liberalization policies. The agricultural sector witnessed a significant rebound, which contributed notably to the

overall economic expansion. Industrial output also remained robust, while the liberalization of industry and trade along with increased foreign borrowing played a key role in stimulating economic activity.

This was followed by a gradual decline and eventually the growth rate dropped to 1.06% in 1991-92. This was largely attributed to a worsening balance of payments due to rising imports, which severely depleted foreign exchange reserves. The situation was worsened by the Gulf War, prompting the Indian government to seek emergency financial assistance from the International Monetary Fund (IMF). India secured a $2.2 billion loan by pledging 67 tonnes of gold as collateral, a move that sparked public outcry due to national pride concerns. To protect the public interest, Prime Minister P.V. Narasimha Rao appointed Dr. Manmohan Singh as Finance Minister and introduced the 1991 New Economic Policy, Liberalization, Privatization and Globalization (LPG) policy, which aimed to ease industrial licensing, promote private investment and attract foreign direct investment. As a result, the GDP growth rate increased to 7.57% in 1995-96. This was followed by the Asian Financial Crisis impacted India's economy, along with several other countries like Indonesia, South Korea, Philippines and Thailand, leading to a decline in the growth rate to 4.05% in 1997-98.

India's economy experienced a short-lived revival with GDP growth reaching 8.85% in 1999-2000. However, this momentum was not sustained and by 2000–01, growth had dropped to a low of 3.84% remaining nearly stagnant through 2002–03. A key factor behind this decline was a severe drought, which caused agricultural output to shrink by 3.1%. Additionally, other sectors such as energy, manufacturing, trade, hospitality, and communications also experienced a slowdown. In response, the Indian government implemented corrective measures, which helped boost GDP growth to 8.06% by 2006–07.

In 2008-09, India's GDP growth experienced a decline falling to 3.09%. This drop was largely attributed to the U.S. sub-prime mortgage crisis, which had global repercussions and slowed growth in many developing economies, including India. However, in 2010–11, GDP growth surged to a high of 8.50%, driven by strong performance across all major sectors. Following this peak, the economy saw a decline in growth rate to 5.24% in 2011-12 but slowly recovered and reached 8.26% in 2016–

17, which was followed by a decline to 6.45% in 2018-19, primarily due to a slowdown in the manufacturing and mining sectors.COVID-19 caused a historic contraction in India's economic performance and the growth declined to a record low of -5.78% in the fiscal year 2020–21 due to nationwide lockdowns and reduced economic activity. Major sectors like services, manufacturing and construction were severely affected but soon India's economy recovered in the following quarters and it recorded a growth of 9.69% in 2021-22. As of the fiscal year 2023-24, India's GDP growth rate stands at 8.15%.

3.5 Conclusion:

The chapter analyzes trends in Trade Liberalization, Industrial Value-Added and GDP in India from 1980 to 2023. Post 1991, exports and imports became more volatile but continued to rise, indicating stronger global trade integration. Industrial performance showed steady growth before liberalization, with increased fluctuations afterward due to global events and policy changes. GDP growth was influenced by inflation in the 1980s, while the post-reform period saw moderate but steady growth driven mainly by services and industry. Overall, the data reflects India's growing integration into the global economy and the evolving role of industrial and trade policies in shaping economic outcomes.

CHAPTER IV

CO-INTEGRATION BETWEEN TRADE LIBERALIZATION, INDUSTRIAL PERFORMANCE AND ECONOMIC GROWTH OF INDIAN ECONOMY

4.1 Introductory Statement:

This chapter empirically examines the relationship between Trade Liberalization, Industrial performance and Economic Growth in India from 1980 to 2023 with a focus on understanding how policy shifts in trade openness influence industrial development and overall economic growth. Trade liberalization is often viewed as a catalyst for economic efficiency and competitiveness, while industrial performance serves as a key driver of sustained growth through value addition, employment and innovation. By employing econometric methods, this study seeks to quantify the interdependencies among these variables. The objective is to assess whether liberalized trade policies have translated into tangible industrial gains and GDP growth, both in the short and long term, thereby offering insights for future policy design and macroeconomic planning.

4.2 Data Source and Methodology:

The study uses annual time series data from 1980–2023, sourced from World Bank, with all variables, i.e., Trade Liberalization, Industrial Value Added, GDP, Import and Export represented in constant prices in US$ and converted to a common base year 2015. Data are log-transformed to minimize issues related to heteroscedasticity in the residuals. The analysis employs the ARDL model to examine long-run relationships among the variables. Stationarity is ensured using ADF test, followed by co-integration testing, ECM formulation, and diagnostic checks. ARDL is chosen for its flexibility with mixed integration orders and small samples, with results verified using E Views 12 SV Lite software. The variables in the model are converted into their natural logarithmic form to minimize issues related to heteroscedasticity in the residuals.

4.3 Results:

The initial step in applying the co-integration model involves checking for the presence of unit roots in the variables, which is done using the Augmented Dickey-Fuller (ADF) test in this section of the study.

4.3.1 Testing Unit Roots: Augmented Dickey-Fuller Test:

To determine whether the variables are co-integrated, it is essential to test the stationarity of the data using the Augmented Dickey-Fuller (ADF) test. This test helps evaluate the null hypothesis that a time series is non-stationary against the alternative that it is stationary. Rejection of the null hypothesis is based on three criteria:

1. P– value should be statistically significant
2. The absolute value of the test statistic should exceed the critical value.
3. The value of coefficients should be negative.

Hypothesis:

H_0: The time series has a unit root (i.e., it is non-stationary).

H_1: The time series is stationary.

Table 4.3.1.a presents the ADF test results:

Table: 4.3.1.a - ADF unit root test:

VARIABLES	**At level (Trend and intercept)**		**First Difference (Intercept)**		
	ADF - Statistics	P-value	ADF-Statistics	P-value	Order of Integration
LN_EXPORT	-1.539207	0.8000	-5.574396	**0.0000*** **	I (1)
LN_GDP	-2.523001	0.3161	-6.386817	**0.0000*** **	I (1)
LN_IMPORT	-1.296043	0.8756	-5.808030	**0.0000*** **	I (1)
LN_INVA	-2.730921	0.2301	-5.431015	**0.0000*** **	I (1)
LN_TL	-0.974782	0.9370	-5.210609	**0.0001*** **	I (1)

Note:

i) The results have been derived using the Augmented Dickey-Fuller (ADF) test.

ii) The variables considered in the analysis include GDP and investment (INVA).

Source: Derived from system

From Table 4.3.1.a, it is evident that the variables exhibit stationarity at first difference I(1). Specifically, the time series data for GDP, INVA and Trade Liberalization are all stationary. This is supported by their respective p-values: 0.0000 for GDP, 0.001 for Trade Liberalization and 0.000 for INVA, each of which is statistically significant at the 1% level.

4.3.2 Model-01: Ln_GDP as Dependent Variable:

This model explores the relationship between GDP, Industrial Value Added and Trade Liberalization. In this model, GDP serves as the dependent variable, while INVA and TL act as the independent variables. The optimal lag length for the model is selected using the following criteria: LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion and HQ: Hannan-Quinn information criterion. The results derived from the Vector Auto Regression (VAR) model are presented in Table 4.3.2.a.

Table: 4.3.2.a - VAR Lag order selection criteria: LN_GDP as dependent variable:

Lag	LogL	LR	FPE	AIC	SC	HQ
0	325.2734	NA	1.13e-13	-15.62309	-15.41412	-15.54700
1	523.2030	**337.9287***	**2.48e-17***	**-24.05868***	**-22.80485***	**-23.60211***
2	543.1714	29.22205	3.35e-17	-23.81324	-21.51455	-22.97618
3	565.1893	26.85100	4.51e-17	-23.66777	-20.32421	-22.45023

(* Indicates lag order selected by the criterion)

Source: Derived from system

It is accepted by all the criteria that the optimal lag length is 1. Therefore, the ARDL model is employed to investigate the long-run relationship among the variables using lags of 1 for each. The ARDL framework for the given variables is represented by the following equation:

$$\Delta ln(GDP)t = \alpha 0 + \Sigma pj = 1bj\Delta ln(GDP)t - 1 + \Sigma qj = 1cj\Delta ln(Inva)t - 1 + \Sigma rj$$

$$= 1dj\Delta\, ln\,(T.L.)t-1+\delta 1 lnGDP.t-1\ +\delta 2\ ln\ Invat-1\ +\delta 3\ ln\ T.L.t-1 + e1t$$

In the ARDL model, the parameters δ_1, δ_2, and δ_3 represent the long-run multipliers, while the coefficients $\mathbf{b_j}$, $\mathbf{c_j}$ and $\mathbf{d_j}$ capture the short-run dynamics of the model. The null hypothesis tests for the absence of co-integration among the variables, meaning that $\delta_1 = \delta_2 = \delta_3 = 0$. In contrast, the alternative hypothesis suggests the presence of a long-run relationship, indicated by at least one of the δ parameters being non-zero (i.e., $\delta_1 \neq 0$, $\delta_2 \neq 0$ and $\delta_3 \neq 0$).

Table: 4.3.2.b – ARDL (LN_GDP as dependent variable):

Variable	Coefficient	Std. error	t-Statistic	Prob.*
LNGDP(-1)	0.004549	0.007043	0.645881	0.5230
LNEX	0.444197	0.004780	92.92233	0.0000***
LNIM	0.552223	0.005533	99.81317	0.0000***
LNIM(-1)	-0.002645	0.002486	-1.063847	0.2954
LNIM(-2)	-0.004180	0.002382	-1.754859	0.0889*
LNIM(-3)	0.005717	0.001760	3.247890	0.0027***
LNTL	-0.994563	0.009328	-106.6256	0.0000***
LNINVA	-0.000746	0.007101	-0.105059	0.9170
C	0.710422	0.024140	29.42912	0.0000***
R-Squared		**0.999998**		
Prob.		**0.000000*** **		

Source: Derived from system

In the first stage of the ARDL model, using a lag structure of 1, the coefficient is found to be statistically significant. The R-squared value is 0.999998, suggesting that the model explains nearly all the variability in the dependent variable. Additionally, the p-value of the F-statistic is zero, indicating that the model is statistically well-fitted. The Durbin-Watson statistic is 2.856942, which falls within the acceptable range of 2 to 4, signifying no issues with autocorrelation.

In the next step, the Bounds Test is conducted to examine whether a long-run relationship exists among the variables. The null hypothesis for the Bounds Test states that there is no long-run relationship, while the alternative hypothesis suggests that

such a relationship does exist. According to the decision rule, if the F-statistic is below the lower bound (I(0)), we fail to reject the null hypothesis. However, if it is above the upper bound (I(1)), we reject the null, indicating co-integration. The values of the F-statistic and the critical bounds at various significance levels are presented in Table 4.3.2.c.

Hypothesis:

H_0: There is no co-integration relationship among the variables.

H_1: There exists a co-integration relationship among the variables.

Table: 4.3.2.c - ARDL Bounds Test: LN_GDP as Dependent Variable:

Test Statistic	**Value**	**K**
F–statistics	4.85	4
Significance	I(0)Bound	I(1)Bound
10%	2.2	3.09
5%	2.56	3.49
2.5%	2.88	3.87
1%	3.29	4.37

Source: Derived from system

The ARDL Bounds test results indicate that the null hypothesis is rejected because the F-statistic value (4.85) exceeds the upper bound critical value (I(1) = 3.49) at the 5% significance level. This provides strong evidence supporting the existence of a long-run co-integration relationship among the variables.

Since the Bounds Test results confirm a long-run relationship among the variables, the subsequent step involves the implementation of the Error Correction Model (ECM) to evaluate the temporal stability of these variables. The ECM approach enables an assessment of how rapidly the system adjusts back to its equilibrium state following a short-term shock. In line with ECM principles, the Error Correction Term (ECT) is expected to be negative and statistically significant, signifying a return to long-run equilibrium. In this context, a short-run ARDL model has been applied to analyze the

immediate effects of the independent variables on the dependent variable.

Table: 4.3.2.d – Error Correction Model (LN_GDP as Dependent Variable):

VARIABLE	Coefficient	Std. Error	t-Statistic	Prob.
C	1.172411	0.035660	32.87772	0.0000***
@TREND	0.001208	6.86E-05	17.60619	0.0000***
D(LNEX)	0.386191	0.012863	30.02398	0.0000***
CointEq(-1)*	-0.988859	0.031251	-31.64203	0.0000***

Source: Derived from system

The findings presented in Table 4.3.2.d indicate that the Error Correction Term (ECT) is negative and statistically significant, with a P-value of 0.000, which is well below the 5% significance level. This result confirms the existence of a stable long-run relationship among the variables.

To validate the results and assess the reliability of the model, residual diagnostic tests were conducted. The analysis included checks for serial correlation and heteroscedasticity. The outcomes of these diagnostic tests for the estimated model are presented in Table 4.3.2.e, confirming the model's robustness and statistical soundness.

Table: 4.3.2.e - Diagnostic Tests: LN_GDP as Dependent Variable:

Serial Correlation				**Heteroscedasticity**			
Test Statistics		**LM version**		**Test Statistic**		**LM version**	
F-Statistics	**P-Value**	**Chi – square**	**P-Value**	**F-Statistics**	**P-Value**	**Chi - square**	**P-Value**
1.616235	0.2131	3.635553	0.1624	1.515438	0.2087	7.309103	0.1986

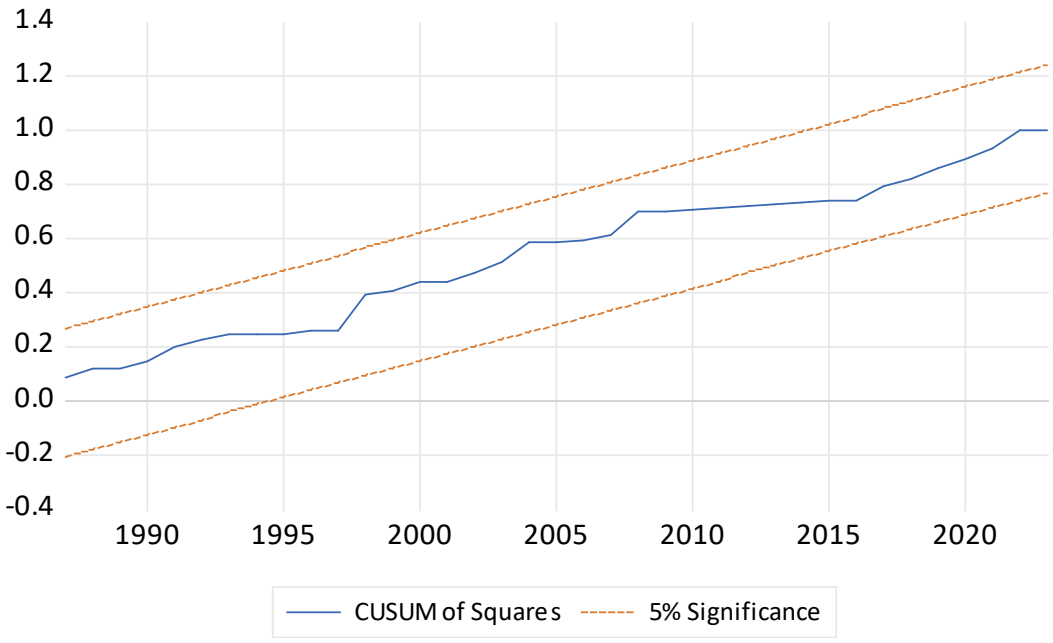
Source: Derived from system

The findings reveal that serial correlation is not present, as indicated by the statistically insignificant P-values (0.2131 and 0.1624). Likewise, the

heteroscedasticity tests also show no significant issues, with P-values of 0.2087 and 0.1986. Therefore, the model does not support the null hypotheses that assume the presence of serial correlation and heteroscedasticity. Furthermore, the CUSUM test has been employed to assess the stability of the long-term relationship, confirming the model's reliability over time.

The present study employs the Cumulative Sum of Squares (CUSUMSQ) test to assess the stability of both long-run and short-run parameters. As shown in Figure 4.3.2.a, the CUSUMSQ plot remains within the critical bounds at the 5% significance level. This indicates that the estimated parameters are stable over time and the model is well-specified. In other words, the model demonstrates structural stability, and any long-run disequilibrium among GDP, INVA, Trade Liberalization, LNIM and LNEX will be corrected relatively quickly, within approximately 2 years, suggesting a stable adjustment process in the Indian economy.

Figure: 4.3.2.a - CUSUMSQ Stability Test: LN_GDP as dependent variable:



Source: Derived from system

4.3.3 Model-02: Ln_T.L. as Dependent Variable:

This model explores the relationship between Trade Liberalization, Economic Growth and Industrial Value Added. In this framework, TL is treated as the dependent variable, while INVA and GDP serve as the independent variables. Trade liberalization plays a key role in shaping a nation's industrial sector and economic performance. By implementing liberal trade policies, a country can expand the market for its industrial goods and simultaneously influence technological advancement, attract foreign direct investment (FDI), and boost exports. The optimal lag length for the model is selected using the following criteria: LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion and HQ: Hannan-Quinn information criterion and the corresponding results from the VAR model are presented in Table 4.3.3.a.

Table: 4.3.3.a - VAR Lag order selection criteria: LN_TL as dependent variable:

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-31.60417	NA	0.298896	1.630208	1.672430	1.645474
1	45.58573	**146.6608***	**0.006624***	**-2.179287***	**-2.094843***	**-2.148754***
2	46.34726	1.408818	0.006705	-2.167363	-2.040697	-2.121564
3	46.42566	0.141122	0.007024	-2.121283	-1.952395	-2.060218
4	46.89436	0.820222	0.007217	-2.094718	-1.883608	-2.018387

(* Indicates lag order selected by the criterion)

Source: Derived from system

It is accepted by all the criteria that the optimal lag length is 1. Therefore, the ARDL model is employed to investigate the long-run relationship among the variables using lags of 1 for each. The ARDL framework for the given variables is represented by the following equation:

$$\Delta ln\,(T.L.) = \alpha 0 + \Sigma pj = 1 bj \Delta ln\,(T.L.)t - 1 + \Sigma qj = 1 cj \Delta ln\,(Inva)t - 1 + \Sigma rj$$

$$= 1dj\Delta ln\ (GDP)t - 1\ + \delta 1ln\ T.L.t - 1\ + \delta 2ln\ Invat - 1\ + \delta 3ln\ GDPt - 1 + e1t$$

In the ARDL model, the parameters δ_1, δ_2, and δ_3 represent the long-run multipliers, while b_j, c_j, and d_j capture the short-run dynamic coefficients. The null hypothesis of the model suggests no co-integration among the variables, meaning $\delta_1 = \delta_2 = \delta_3 = 0$. Conversely, the alternative hypothesis posits that a long-run relationship does exist, implying at least one of the δ parameters is non-zero (i.e., $\delta_1 \neq \delta_2 \neq \delta_3 \neq 0$).

Table: 4.3.3.b - ARDL (LN_TL as dependent variable):

Variable	**Coefficient**	**Std. error**	**t-Statistic**	**Prob.***
LNTL(-1)	-0.002443	0.002455	-0.995130	0.3261
LNGDP	-0.998258	0.006442	-154.9703	0.0000***
LNIM	0.554883	0.002367	234.4660	0.0000***
LNEX	0.446825	0.002495	179.1136	0.0000***
LNINVA	-0.003049	0.007381	-0.413009	0.6820
C	0.673354	0.021704	31.02499	0.0000***
R-Squared		**0.999996**		
Prob.		**0.000000*** **		

Source: Derived from system

In the first stage of the ARDL model, with a lag structure of 1, the coefficient is found to be statistically significant. The model yields an R-squared value of 0.999996, indicating that the endogenous variables explain nearly all the variation in the dependent variable. Additionally, the F-statistic has a p-value of zero, confirming that the model is statistically robust. The Durbin-Watson statistic is 2.920967, which falls within the acceptable range and suggests that there is no issue of autocorrelation.

Next, the Bounds test is applied to assess the presence of a long-run relationship among the variables. Under this approach, the null hypothesis assumes that no long-run co-integration exists, while the alternative hypothesis suggests the existence of such a relationship. According to the decision rule, if the F-statistic is below the lower bound (I(0)), we fail to reject the null hypothesis. However, if it exceeds the upper bound (I(1)), we reject the null hypothesis in favor of co-integration. The F-statistic value and critical bounds at various significance levels are shown in Table 4.3.3.c.

Hypothesis:

H_0: There is no co-integration relationship among the variables.

H_1: There exists a co-integration relationship among the variables.

Table: 4.3.3.c - ARDL Bounds Test: LN_TL as Dependent Variable:

Test Statistic	**Value**	**K**
F–statistics	6.04	4
Significance	I(0)Bound	I(1)Bound
10%	2.45	3.53
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Source: Derived from system

The null hypothesis is rejected based on the ARDL Bounds test, as the calculated F-statistic value (6.04) exceeds the upper critical bound (I(1) = 4.01) at the 5% significance level. This provides strong evidence supporting the existence of a long-run co-integration relationship among the variables.

As the Bounds Test results confirm the presence of a long-run relationship among the variables, the next step involves applying the Error Correction Model (ECM) to assess the stability of these variables over time. The ECM framework helps determine how quickly the system returns to equilibrium after a short-term disturbance. According to ECM theory, the Error Correction Term (ECT) should be negative and statistically significant, indicating convergence to long-run equilibrium. In this study, the short-run ARDL model was used to evaluate the short-term impact of the independent variables on the dependent variable.

Findings presented in Table 4.3.3.d suggests that since ECT is negative and statistically significant, as indicated by a P-value of 0.000 (which is below the 5% significance threshold), there is a stable relationship among the variables.

Table: 4.3.3.d – Error Correction Model (LN_TL as Dependent Variable):

VARIABLE	Coefficient	Std. Error	t-Statistic	Prob.
C	1.712086	0.234255	7.308654	0.0000***
@TREND	0.001576	0.000224	7.041905	0.0000***
D(LNTL(-1))	0.457474	0.140133	3.264563	0.0030***
D(LNGDP)	-0.910504	0.041339	-22.02546	0.0000***
D(LNGDP(-1))	0.461234	0.142668	3.232915	0.0032***
D(LNINVA)	-0.078422	0.036188	-2.167073	0.0392**
D(LNIM)	0.557650	0.009035	61.71890	0.0000***
D(LNIM(-1))	-0.249941	0.77657	-3.218515	0.0033***
D(LNEX)	0.413360	0.11027	37.48646	0.0000***
D(LNEX(-1))	-0.222414	0.064360	-3.455790	0.0018***
CointEq(-1)*	-1.504651	0.206097	-7.300697	0.0000***

Source: Derived from system

Table: 4.3.3.e - Diagnostic Tests: LN_TL as Dependent Variable:

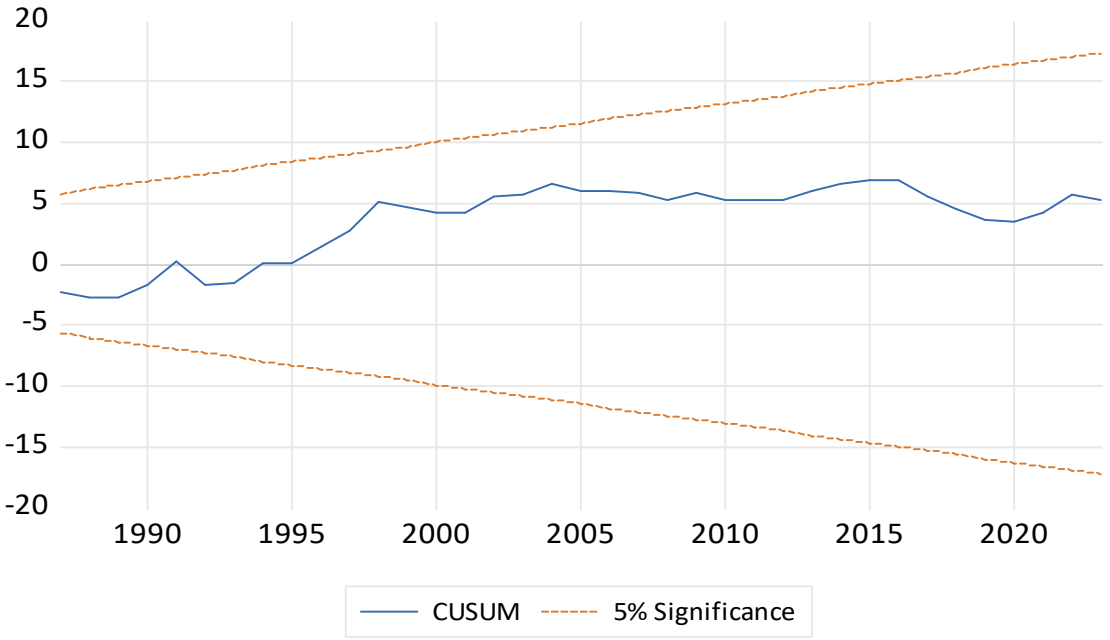
Serial Correlation				**Heteroscedasticity**			
Test Statistics		**LM version**		**Test Statistic**		**LM version**	
F-Statistics	**P-Value**	**Chi – square**	**P-Value**	**F-Statistics**	**P-Value**	**Chi - square**	**P-Value**
1.229051	0.3049	2.821777	0.2439	1.577245	0.1906	7.554825	0.1825

Source: Derived from system

To validate the results and assess the reliability of the model, a series of residual diagnostic tests have been conducted. Given that the model includes only one independent variable, the issue of multicollinearity is not applicable and thus does not

require testing. However, tests for serial correlation and heteroscedasticity have been carried out to evaluate potential issues within the model. The outcomes of these diagnostic checks are summarized in Table 4.3.3.e. The results presented indicate that there is no evidence of serial correlation, as the associated P-values (0.3049 and 0.2439) are statistically insignificant. Similarly, tests for heteroscedasticity yield P-values of 0.1906 and 0.1825, which are also not statistically significant. Hence, the null hypotheses suggesting the presence of serial correlation and heteroscedasticity are rejected in this model. Additionally, the stability of the long-run relationship has been further examined using the CUSUM test.

Figure: 4.3.3.a - CUSUM Stability Test: LN_TL as dependent variable:



Source: Derived from system

The CUSUM test has been employed in this study to evaluate the stability of both long-run and short-run parameters. As shown in Figure 4.3.3.a, the CUSUM plot remains within the critical boundaries at the 5% significance level, indicating that the model is structurally stable and well-specified. This confirms that the estimated parameters are reliable, and the model behaves consistently over time. If a long-run disequilibrium arises between INVA, GDP and TL, the Indian economy is estimated to return to equilibrium within approximately 1.2 years.

4.3.4 Model-03: Ln_INVA as Dependent Variable:

This model investigates the relationship among Industrial Value Added (INVA), GDP, and trade liberalization. In this model, INVA serves as the dependent variable, while GDP and TL are treated as independent variables. The optimal lag length for the model is selected using the following criteria: LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion and HQ: Hannan-Quinn information criterion. The results derived from the VAR model based on these criteria are presented in Table 4.3.4.a.

Table: 4.3.4.a - VAR Lag order selection criteria: LN_INVA as dependent variable:

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-43.41668	NA	0.539543	2.220834	2.263056	2.236100
1	82.94211	**240.0817***	**0.001023***	**-4.047105***	**-3.962661***	**-4.016573***
2	83.63405	1.280096	0.001039	-4.031703	-3.905073	-3.985904
3	83.69625	0.111965	0.001090	-3.984813	-3.815925	-3.923748
4	84.43505	0.292892	0.001105	-3.971752	-3.760643	-3.895422

(* Indicates lag order selected by the criterion)

Source: Derived from system

It is accepted by all the criteria that the optimal lag length is 1. Therefore, the ARDL model is employed to investigate the long-run relationship among the variables using lags of 1 for each. The ARDL framework for the given variables is represented by the following equation:

$$\Delta ln\,(INVA)t \;=\; \alpha 0 \;+\; \Sigma pj = 1bj\Delta ln\,(Inva)t-1 \;+\; \Sigma qj = 1cj\Delta ln\,(GDP)t-1 + \;\Sigma rj = 1dj\Delta ln\,(T.L.)t-j \;+ ¥1ln\,Invat-1 \;+ ¥2ln\,GDPt-1 + ¥3ln\,T.L.t-1 + \;e1t$$

In the ARDL model, the parameters δ_1, δ_2, and δ_3 represent the long-run coefficients,

while b_j, c_j, and d_j correspond to the short-run dynamic coefficients. The null hypothesis assumes that there is no long-run relationship among the variables, meaning $\delta_1 = \delta_2 = \delta_3 = 0$. The alternative hypothesis proposes the presence of co-integration, indicating that at least one of the long-run coefficients is non-zero (i.e., $\delta_1 \neq \delta_2 \neq \delta_3 \neq 0$).

Table: 4.3.4.b - ARDL (LN_INVA as dependent variable):

Variable	Coefficient	Std. error	t-Statistic	Prob.*
LNINVA(-1)	0.649593	0.133209	4.876482	0.0000***
LNGDP	-1.071243	2.903507	-0.368948	0.7144
LNGDP(-1)	-0.539067	0.163878	-3.289433	0.0023***
LNIM	1.047801	1.605183	0.652761	0.5182
LNEX	0.891658	1.293104	0.689549	0.0078***
LNTL	-1.829507	2.893445	-0.632294	0.5313
LNTL(-1)	-0.066083	0.044034	-1.500731	0.0424**
C	1.525057	1.987127	0.767468	0.0079***
R-Squared		**0.999430**		
Prob.		**0.000000*** **		

Source: Derived from system

In the initial stage of the ARDL model estimation, using a lag length of 1, the coefficient is found to be negative and statistically significant, indicating meaningful relationships among the variables. The R-squared value of 0.999430 suggests that the endogenous variables account for nearly all the variation in the dependent variable, highlighting a strong explanatory power. The F-statistic, with a p-value of 0.000, confirms the overall statistical significance and robustness of the model. The Durbin-Watson statistic is 2.38752 which falls within the acceptable range of 2 to 4, indicating that there is no significant autocorrelation in the residuals.

Subsequently, the Bounds test is applied to evaluate the existence of a long-run relationship among the variables. The null hypothesis of the Bounds testing framework states that there is no long-term co-integration among the variables, whereas the alternative hypothesis suggests the presence of such a relationship. According to standard econometric decision rules, if the F-statistic is below the I(0) lower bound, the null hypothesis cannot be rejected. Conversely, if the F-statistic exceeds the I(1)

upper bound, the null hypothesis is rejected, confirming co-integration. The calculated F-statistic and the corresponding critical value bounds at various significance levels are reported in Table 4.3.4.c.

Hypothesis:

H_0: There is no co-integration relationship among the variables.

H_1: There exists a co-integration relationship among the variables.

Table: 4.3.4.c - ARDL Bounds Test: LN_INVA as Dependent Variable:

TestStatistic	**Value**	**K**
F–statistics	5.877	4
Significance	I(0)Bound	I(1)Bound
10%	2.2	3.09
5%	2.56	3.49
2.5%	2.88	3.87
1%	3.29	4.37

Source: Derived from system

The ARDL Bounds test leads to the rejection of the null hypothesis, as the calculated F-statistic value (5.877) exceeds the upper critical bound (I(1) = 3.49) at the 5% significance level. This provides strong evidence supporting the existence of a long-run co-integration relationship among the variables.

Since the Bounds Test results confirm the existence of a long-run relationship among the variables, the next step involves implementing the Error Correction Model (ECM) to evaluate the temporal stability of these variables. The ECM framework facilitates an understanding of how quickly the system reverts to its long-run equilibrium following a short-term disturbance. According to ECM theory, the Error Correction Term (ECT) should be negative and statistically significant, indicating the presence of a stable long-run equilibrium. In this context, a short-run ARDL model has been employed to examine the immediate (short-run) effects of the independent variables on the dependent variable.

Table: 4.3.4.d – Error Correction Model (LN_INVA as Dependent Variable):

VARIABLE	Coefficient	Std. Error	t-Statistic	Prob.
C	6.858004	1.621644	4.229044	0.0002***
@TREND	0.013542	0.003268	4.143666	0.0003***
D(LNINVA(-1))	0.117400	0.118471	0.990960	0.3299
D(LNINVA(-2))	0.235664	0.101674	2.317841	0.0277**
D(LNGDP)	-0.032512	0.228827	-0.142080	0.8880
D(LNEX)	0.414577	0.082368	5.033248	0.0000***
D(LNEX(-1))	-0.124029	0.040769	-3.042234	0.0049***
CointEq(-1)*	-0.409845	0.097078	-4.221834	0.0002***

Source: Derived from system

The findings presented in Table 4.3.4.d reveal that the Error Correction Term (ECT) is both negative and statistically significant, with a P-value of 0.002, which is well below the 5% significance threshold. This result provides strong evidence of a stable long-run equilibrium relationship among the variables.

Table: 4.3.4.e - Diagnostic Tests: LN_INVA as Dependent Variable:

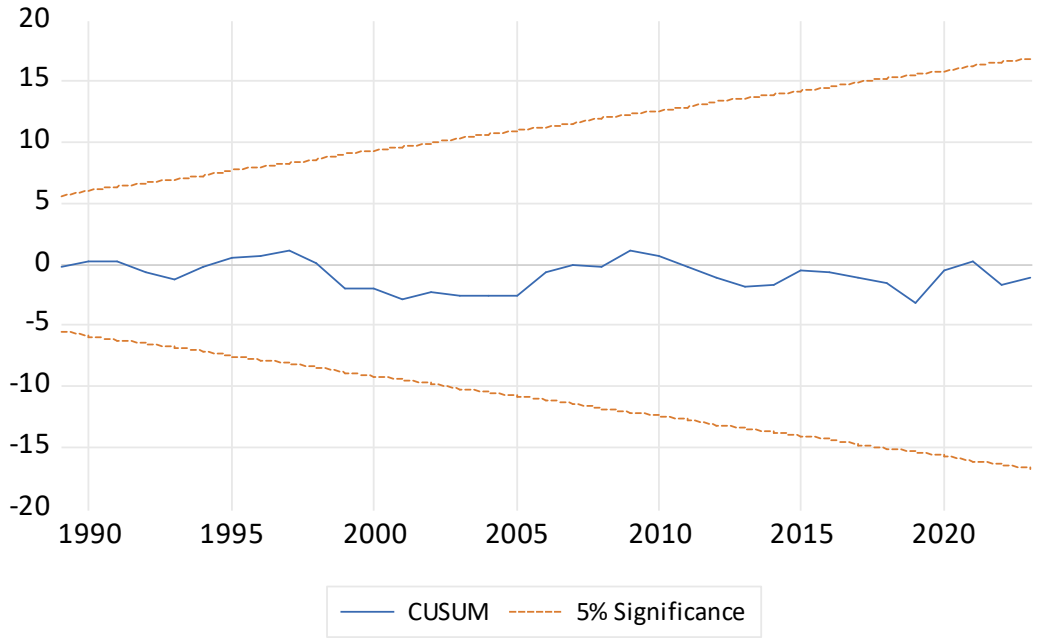
Serial Correlation				**Heteroscedasticity**			
Test Statistics		**LM version**		**Test Statistic**		**LM version**	
F-Statistics	**P-Value**	**Chi – square**	**P-Value**	**F-Statistics**	**P-Value**	**Chi - square**	**P-Value**
0.281915	0.5989	0.353608	0.5521	1.356191	0.2544	9.174711	0.2404

Source: Derived from system

To further validate these findings and assess the reliability of the model, a series of residual diagnostic tests were performed. These tests included assessments for serial correlation and heteroscedasticity. The results, summarized in Table 4.3.4.e, indicate that the estimated model does not suffer from these issues, thereby confirming its statistical robustness and soundness. The findings indicate that serial correlation is not present, as evidenced by the statistically insignificant P-values of 0.5989 and 0.353608. Similarly, the heteroscedasticity tests reveal no significant issues, with P-values of 0.2544 and 0.2404. As a result, the model fails to support the null hypotheses that assume the presence of serial correlation and heteroscedasticity. In addition, the CUSUM test has been applied to evaluate the stability of the long-run relationship, and the results confirm that the model remains stable and reliable over time.

The CUSUM test has been employed in this study to evaluate the stability of both long-run and short-run parameters. As illustrated in Figure 4.3.4.a, the plots of the cumulative sum (CUSUM) remains within the 5% critical bounds, indicating that the model's parameters are stable over time. This confirms that the model is well-specified and structurally robust. Practically, this implies that in the event of any long-run disequilibrium among GDP, TL and INVA the Indian economy is expected to return to equilibrium within approximately 1.13 years.

Figure: 4.3.4.a - CUSUM Stability Test: LN_INVA as dependent variable:



Source: Derived from system

4.4 Conclusion:

The study investigates long-run co-integration and causality among trade liberalization, industrial value added (Inva) and GDP in India from 1980–2023 using the ARDL model. ADF tests confirmed mixed orders of integration, making ARDL suitable. The results show significant long-run relationships among all three variables. GDP and INVA positively affect trade liberalization. Similarly, trade liberalization and GDP positively influence INVA and INVA and trade liberalization impact GDP, all with statistically significant p-values. Adjustment speeds to equilibrium range from 37% to 89% per year depending on the dependent variable. Diagnostic tests confirmed model validity. The findings align with previous studies, indicating that trade liberalization enhances industrial growth and economic performance through increased investment and productivity.

CHAPTER V

SUMMARY, POLICY IMPLICATIONS AND CONCLUSION

5.1 Introductory Statement:

Trade plays a vital role in achieving economic growth by boosting consumption, expanding production and providing access to scarce resources and global markets. International trade stems from countries' differences in resources, preferences, and capacities. Economists widely agree that when nations specialize in goods they produce efficiently (comparative advantage), global prices fall and markets grow. India's post-liberalization industrial policies have promoted growth through technology transfer, skill development and improved product quality. Yet, developing nations often face fiscal challenges and stagnation. Trade liberalization and foreign investment can help by increasing income, employment and output.

Although many support trade as a growth driver, debate continues over whether it improves industrial performance or the reverse. Growth theories (Solow, Romer, Lucas) emphasize the role of technology and human capital. Later "new growth" models connect trade openness with innovation and productivity through better access to global technology and markets. Open trade policies support industrial efficiency, encourage innovation, enable scale economies and introduce competitive pressure. Productivity grows when resources shift to competitive sectors, managerial inefficiency is reduced and advanced technology is imported. However, some argue that protected domestic markets can also promote growth by ensuring demand and encouraging technological investment. Still, current research links trade openness to faster innovation, global knowledge sharing and long-term economic development through human capital accumulation.

5.2 Major Findings:

This study investigates the long-term relationship and causal links between Trade Liberalization, Industrial Performance and Economic Growth in India over the period 1980–2023 and explores the evolving dynamics of Trade Liberalization, Industrial Performance and Economic Growth, highlighting their interconnections and impacts on national development. It begins by tracing the global and domestic trends in trade

policy reforms, particularly focusing on the shift from protectionism to liberalized trade regimes and then examines how these policy shifts have influenced industrial productivity, competitiveness and structural transformation and assesses the broader implications of these changes for economic growth.

5.2.1 Trends in terms of Trade Liberalization:

- Export and Import both rose to $30.26 billion and $31.25 billion respectively in 1991-92 from $16.58 billion and $17.89 billion respectively in 1980-81 mainly due to the major reforms introduced such as reduced import tariffs, eliminated import licensing, liberalized FDI laws.
- The Asian Financial Crisis of 1997-98 caused currency crashes and capital outflows across East and Southeast Asia. However India was relatively insulated due to limited capital account convertibility and Exports and Imports were $55.69 billion and $78.32 billion respectively with T.L. index: 0.201.
- In 2001 Global recession impacted India's IT and software exports, especially to the U.S. and T.L. index was 0.240 but outsourcing boom led to quick recovery by 2004 and T.L. index improved to 0.321.
- In 2007-08 the Global Financial Crisis was triggered by collapse of major global banks and rising oil prices which greatly affected India's exports such as textiles, gems and IT and T.L. index was 0.448.
- In 2013-14, the Euro-zone debt crisis and U.S. Taper Tantrum led to the depreciation of the Rupee and widening of CAD and T.L. index was 0.509
- Demonetization, China market crash and oil price slump further reduced T.L. index to 0.405 in 2016-17.
- Covid-19 Pandemic in 2020-21 caused severe disruption in global supply chains. The major export sectors like textiles, tourism, automobile, leather, etc. were severely affected. T.L. index significantly dropped to 0.394 in 2020-21.

- The Ukraine war and global inflation caused CAD pressure and Rupee depreciation in 2022-23. With various recovery measures undertaken like Rupee trade settlement, export bans (wheat, rice), crude import diversification, etc. T.L. settled at 0.466.

5.2.2 Trends in terms of Industrial Value-Added:

- In 1980–81 to 1981–82 Industrial growth rate was 8.29% which was driven by better resource use, cost reduction and productivity boosts. It was the start of industrial and trade liberalization where special emphasis was placed on capital goods, electronics, and energy efficiency.

- From 1988-89 to 1991-92 there was consistent decline in industrial production mainly due to poor infrastructure, high manufacturing costs and inadequate port facilities. The industrial sector witnessed a growth in textiles, metals and electrical machinery but decline in beverages, tobacco and wood products.

- In 1991, the Industrial policy was reformed due to the BoP crisis which led to the introduction of LPG. This facilitated greater private sector role in non-strategic areas with the public sector focused on core industries. Even though there was a short-term disruption due to the quick exposure to global competition and falling investment, the annual Industrial growth quickly rebounded and reached 10.89% in 1995-96.

- In the early 2000s, due to sluggish investment, weak exports and infrastructure issues, industrial growth rate reduced to 2.57% in 2001-02.

- The introduction of liberal fiscal policies, expansion of services sector and improvement in infrastructure facilitated industrial growth rate and it reached 13.24% in 2006-07.

- The Global Financial Crisis of 2008-09 led to a sharp fall in the industrial growth rate to 4% but it quickly rebounded to 8.84% in 2009-10.

- The Covid-19 Pandemic caused factory closures, labour shortages and supply chain issues which led to a sharp drop in the annual industrial

growth rate to -1.40% in 2019-20. This was followed by a strong rebound and the annual growth rate reached 12.24% in 2021-22.

- In 2022-23 due to factors like weak domestic and global demand and high borrowing costs due to RBI rate hikes, industrial growth declined to 2.11% but it recovered and reached 9.51% in 2023-24.

5.2.3 Trends in terms of Gross Domestic Product:

- Post independence to 1980s the Government adopted planned economic development via Five-Year Plans which achieved export revival, reduced imports and improvement in balance of payments. Annual growth rate of GDP peaked at 9.63% in 1988-89 mainly due to the early liberalization effects, strong industrial growth and better performance in the agricultural sector.

- In 1991-92 due to various factors like BoP crisis, Gulf war and depletion of forex reserves, GDP growth rate dropped to 1.06% that compelled India to pledge 67 tons of gold for a $2.2 billion IMF loan.

- With the Economic Reforms and introduction of LPG policies, the annual GDP growth rate increased to 7.57% in 1995-96.

- In 1997-98 the growth rate fell to 4.05% due to the Asian Financial Crisis and the slowdown of energy, trade and manufacturing sectors and the severe drought slowed GDP growth rate in the early 2000s.

- The Global Financial Crisis in 2008-09 led to a decrease in GDP growth rate to 3.09% but it quickly recovered and reached 8.50% by 2010-11.

- Until the outbreak of Covid-19 Pandemic, the annual GDP growth rate continued to fluctuate but it fell sharply to -5.78% in 2020-21 due to the economic disruption caused by the pandemic. However, this fall was reversed by 2021-22, marked by a sharp rise to 9.69%.

- Despite global headwinds, the India's GDP remains stable post-pandemic and the annual growth rate was 8.15% in 2023-24.

5.2.4 Co-Integration between Trade Liberalization, Industrial Performance and Economic Growth:

This study explores the long-term and short-term relationships between Trade Liberalization, Industrial Performance, and Economic Growth in India from 1980 to 2023 using econometric models like ADF, ARDL and ECM. It confirms the existence of co-integration among these variables, indicating that changes in one significantly impact the others over time. The chapter also validates the stability and robustness of the models through diagnostic and stability tests.

- **Augmented Dickey-Fuller (ADF) Test:** All variables (LN_GDP, LN_INVA, LN_TL, LN_EXPORT, LN_IMPORT) are stationary at first difference I(1), none at I(2)

- **ARDL Bounds Testing:** Confirms co-integration i.e., long-run relationship among the variables for all models.

- **Model 1: GDP as Dependent Variable:** To assess impact of Trade Liberalization and Industrial Value Added on GDP

- Strong long-run and short-run relationship among GDP, TL, and INVA.

- $R^2 = 0.999998$ i.e. very high explanatory power.

- Significant variables: LNEX, LNIM, LNTL.

- Error Correction Term (ECT): Negative & significant (−0.988), implying stable long-term adjustment.

- Adjustment to equilibrium within 2 years.

- Model passes diagnostic tests (no serial correlation or heteroscedasticity).

- CUSUMSQ test confirms parameter stability.

- **Model 2: Trade Liberalization (T.L.) as Dependent Variable:** To assess how GDP and INVA influence Trade Liberalization.

- $R^2 = 0.999996 \rightarrow$ high explanatory power.

- GDP has significant negative short-term impact on TL.
- Error Correction Term (−1.504) is significant → fast adjustment.
- System returns to equilibrium in approx. 1.2 years.
- Diagnostic tests: No serial correlation or heteroscedasticity.
- CUSUM test confirms structural stability.
- **Model 3: Industrial Value Added (INVA) as Dependent Variable:** To assess how GDP and T.L. influence industrial performance.
- $R^2 = 0.99943$ → strong explanatory power.
- Some variables not statistically significant in short run.
- Error Correction Term (−0.409) is negative and significant.
- Adjustment to equilibrium in ~1.13 years.
- No issues of serial correlation or heteroscedasticity.
- CUSUM test confirms model's stability over time.

The empirical analysis validates that changes in one variable significantly influence the others, demonstrating the interconnected nature of Trade Liberalization, Industrial Performance and Economic Growth. All econometric models used are found to be structurally stable and robust; indicating that economic policy changes in one domain such as liberalization can have substantial ripple effects on both industrial output and overall GDP growth.

5.3 Policy Implications:

The findings suggest that policymakers should pursue balanced trade liberalization strategies that support industrial growth to sustain long-term economic development. Strengthening industrial infrastructure and investment policies can amplify the positive effects of liberalization on GDP growth.

Industrial performance is shaped by a country's industrial policy, which outlines the framework for growth, regulations and strategic direction. This policy, supported by broader macroeconomic measures such as fiscal, monetary, trade, labor, education and export-import policies, plays a vital role in enhancing industrial value added. In India, industrial value added has both long- and short-term linkages with key variables like gross fixed capital formation, trade liberalization, GDP, import tariffs, etc. Therefore, improvements in industrial performance are closely tied to the development of these macroeconomic factors.

- The government should promote liberal trade policies to boost industrial growth and expand the domestic market. A collaborative environment between public and private sectors is key to strengthening industrial performance nationally and globally.

- Policymakers should identify how different industries' exports link to the domestic economy to ensure a stable export strategy that supports industrial growth. The government must also offer financial support to these export-oriented sectors.

- The government should align export diversification, promotion, and import substitution strategies with trade, fiscal, and exchange rate policies to enhance economic growth and improve the balance of trade.

- This research suggests that the government should continue trade liberalization by focusing on trade and capital flow strategies, industrial deregulation, disinvestment, and financial sector reforms to maximize the benefits of global trade integration.

- The government should foster a suitable environment for investment and savings to boost domestic capital formation. Increasing gross fixed capital formation can reduce reliance on external sources, with liberal trade playing a key role. This capital should be directed toward accelerating industrial growth in India.

- The government should prioritize comprehensive trade liberalization policies to accelerate and sustain economic growth.

- The government should ensure quality and widespread education to boost growth, productivity, and poverty reduction. To harness the demographic dividend, India must adopt strong HRD policies and capacity-building programs.

- It is evident that India cannot fully benefit from comprehensive trade liberalization without strong infrastructure and good governance. With structural reforms still incomplete in some areas, the government must prioritize trade policies to enhance industrial performance and drive economic growth.

- The government should align liberal trade policies with broader economic growth and development strategies, as strong linkages between trade and industrialization are crucial for the country's economic progress.

- The government should strengthen institutional capacity and streamline regulatory frameworks to ensure smoother implementation of trade and industrial policies. Efficient institutions and transparent governance can enhance investor confidence, reduce transaction costs, and ensure that the benefits of liberalization are equitably distributed across sectors and regions.

- The government should promote innovation and technology adoption in industries to improve competitiveness in global markets. Trade liberalization exposes domestic industries to international competition, making it essential to invest in R&D, skill development, and digital infrastructure to boost productivity and sustain industrial growth.

- The government should help small and medium enterprises (SMEs) by expanding access to finance, technology, and export prospects, allowing them to efficiently integrate into global value chains and profit from free trade policies.

- Improving ports, transportation networks, customs efficiency, and digital trade facilitation may dramatically cut trade costs, boost competitiveness, and spur industrial growth.

- India should actively participate in and negotiate favorable regional and bilateral trade agreements in order to diversify export markets, lower tariff barriers and create new opportunities for industrial growth.

- To guarantee equitable and responsible growth, the government must establish regulations that protect labor rights, promote sustainable practices, and reduce environmental degradation while liberalizing trade.

- The government should provide sector-specific incentives and support to lagging or strategic industries to assist them in adapting to competitive challenges and maximizing the benefits of liberalization.

5.4 Conclusion:

The study highlights that Trade Liberalization, Industrial Performance and Economic Growth are deeply interconnected. Econometric models confirm that changes in one area significantly impact the others. It emphasizes the need for balanced liberalization policies that support industrial growth to sustain long-term economic development. Strengthening industrial policy and macroeconomic measures like fiscal, trade and education policies is crucial. In India, Industrial value-added is closely linked to factors such as capital formation, GDP and import tariffs, both in the short and long term.

However, this research is subject to several limitations. Firstly, it narrows its scope to GDP, Trade Liberalization, Industrial value-added, Imports and Exports, omitting the multitude of other factors that influence a country's economic performance. Additionally, it does not consider recent global economic events such as wars or policy shifts like U.S. tariff hikes, which may significantly impact economic outcomes. The study is confined to the period from 1980 to 2023 with 2015 as the base year; selecting a different base year or extending the timeframe could potentially alter the findings. Furthermore, important variables such as political stability, institutional quality, informal sector dynamics and environmental impacts have been excluded, despite their relevance. The exclusive reliance on secondary data poses limitations regarding data accuracy and contextual depth. Moreover, the use of national-level data may obscure regional disparities and sector-specific dynamics

within the Indian economy. Lastly, while the study suggests optimal policy responses, it does not account for real-world constraints such as political, administrative and institutional challenges that could impede policy implementation.

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APPENDIX I

For model 1: Ln_GDP as Dependent Variable:

Dependent Variable: LNGDP
Method: ARDL
Date: 05/23/25 Time: 22:00
Sample (adjusted): 1983 2023
Included observations: 41 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): LNEX LNIM LNTL LNINVA
Fixed regressors: C
Number of models evaluated: 2500
Selected Model: ARDL(1, 0, 3, 0, 0)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNGDP(-1)	0.004549	0.007043	0.645881	0.5230
LNEX	0.444197	0.004780	92.92233	0.0000
LNIM	0.552223	0.005533	99.81317	0.0000
LNIM(-1)	-0.002645	0.002486	-1.063847	0.2954
LNIM(-2)	-0.004180	0.002382	-1.754859	0.0889
LNIM(-3)	0.005717	0.001760	3.247890	0.0027
LNTL	-0.994563	0.009328	-106.6256	0.0000
LNINVA	-0.000746	0.007101	-0.105059	0.9170
C	0.710422	0.024140	29.42912	0.0000

R-squared	0.999998	Mean dependent var	27.61714
Adjusted R-squared	0.999998	S.D. dependent var	0.716272
S.E. of regression	0.001055	Akaike info criterion	-10.67898
Sum squared resid	3.56E-05	Schwarz criterion	-10.30283
Log likelihood	227.9191	Hannan-Quinn criter.	-10.54201
F-statistic	2303844.	Durbin-Watson stat	1.856942
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNGDP)
Selected Model: ARDL(1, 0, 0, 0, 0)
Case 2: Restricted Constant and No Trend
Date: 05/23/25 Time: 22:02
Sample: 1980 2023
Included observations: 43

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.678847	0.021336	31.81757	0.0000
LNGDP(-1)*	-0.997068	0.007140	-139.6549	0.0000
LNIM**	0.552890	0.006071	91.07018	0.0000
LNEX**	0.444896	0.005060	87.92112	0.0000
LNINVA**	-0.000477	0.007450	-0.064089	0.9492
LNTL**	-0.998431	0.009946	-100.3870	0.0000

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNIM	0.554516	0.004574	121.2399	0.0000
LNEX	0.446204	0.003728	119.6763	0.0000
LNINVA	-0.000479	0.007472	-0.064089	0.9492
LNTL	-1.001367	0.006437	-155.5685	0.0000
C	0.680843	0.021539	31.60911	0.0000

EC = LNGDP - (0.5545*LNIM + 0.4462*LNEX -0.0005*LNINVA -1.0014*LNTL + 0.6808)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	20991.85	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
Actual Sample Size	43		Finite Sample: n=45	
		10%	2.402	3.345
		5%	2.85	3.905
		1%	3.892	5.173
			Finite Sample: n=40	
		10%	2.427	3.395
		5%	2.893	4
		1%	3.967	5.455

Dependent Variable: LNINVA
Method: ARDL
Date: 06/02/25 Time: 11:32
Sample (adjusted): 1983 2023
Included observations: 41 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): LNTL LNGDP LNEX LNIM
Fixed regressors: C @TREND
Number of models evaluated: 2500
Selected Model: ARDL(3, 0, 1, 2, 0)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNINVA(-1)	0.707555	0.151730	4.663245	0.0001
LNINVA(-2)	0.118264	0.178780	0.661506	0.5135
LNINVA(-3)	-0.235664	0.116648	-2.020307	0.0527
LNTL	-0.803341	0.627123	-1.280995	0.2103
LNGDP	-0.032512	0.629370	-0.051658	0.9592
LNGDP(-1)	-0.668867	0.185315	-3.609359	0.0011
LNEX	0.414577	0.266680	1.554585	0.1309
LNEX(-1)	-0.122053	0.057070	-2.138651	0.0410
LNEX(-2)	0.124029	0.046714	2.655093	0.0127
LNIM	0.438985	0.347573	1.263001	0.2166
C	6.858004	3.152135	2.175670	0.0379
@TREND	0.013542	0.007081	1.912529	0.0657

R-squared	0.999537	Mean dependent var	26.29146
Adjusted R-squared	0.999361	S.D. dependent var	0.741136
S.E. of regression	0.018737	Akaike info criterion	-4.877581
Sum squared resid	0.010181	Schwarz criterion	-4.376048
Log likelihood	111.9904	Hannan-Quinn criter.	-4.694951
F-statistic	5686.936	Durbin-Watson stat	1.887553
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNINVA)
Selected Model: ARDL(3, 0, 1, 2, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 06/02/25 Time: 11:34
Sample: 1980 2023
Included observations: 41

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.858004	3.152135	2.175670	0.0379
@TREND	0.013542	0.007081	1.912529	0.0657
LNINVA(-1)*	-0.409845	0.146809	-2.791683	0.0092
LNTL**	-0.803341	0.627123	-1.280995	0.2103
LNGDP(-1)	-0.701379	0.678130	-1.034284	0.3096
LNEX(-1)	0.416554	0.281756	1.478420	0.1501
LNIM**	0.438985	0.347573	1.263001	0.2166
D(LNINVA(-1))	0.117400	0.143596	0.817574	0.4203
D(LNINVA(-2))	0.235664	0.116648	2.020307	0.0527
D(LNGDP)	-0.032512	0.629370	-0.051658	0.9592
D(LNEX)	0.414577	0.266680	1.554585	0.1309
D(LNEX(-1))	-0.124029	0.046714	-2.655093	0.0127

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 5: Unrestricted Constant and Unrestricted Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNTL	-1.960108	1.809140	-1.083448	0.2875
LNGDP	-1.711326	1.955340	-0.875206	0.3887
LNEX	1.016369	0.841656	1.207582	0.2370
LNIM	1.071099	0.986157	1.086134	0.2864

EC = LNINVA - (-1.9601*LNTL -1.7113*LNGDP + 1.0164*LNEX + 1.0711 *LNIM)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	3.132683	10%	3.03	4.06
k	4	5%	3.47	4.57
		2.5%	3.89	5.07
		1%	4.4	5.72
Actual Sample Size	41		Finite Sample: n=45	
		10%	3.298	4.378
		5%	3.89	5.104
		1%	5.224	6.696
			Finite Sample: n=40	
		10%	3.334	4.438
		5%	3.958	5.226
		1%	5.376	7.092

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-2.791683	10%	-3.13	-4.04
		5%	-3.41	-4.36
		2.5%	-3.65	-4.62
		1%	-3.96	-4.96

APPENDIX -II

For model 2: Ln_T.L. as Dependent Variable:

Dependent Variable: LNTL
Method: ARDL
Date: 05/23/25 Time: 23:19
Sample (adjusted): 1981 2023
Included observations: 43 after adjustments
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (2 lags, automatic): LNGDP LNIM LNEX LNINVA
Fixed regressors: C
Number of models evaluated: 162
Selected Model: ARDL(1, 0, 0, 0, 0)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNTL(-1)	-0.002443	0.002455	-0.995130	0.3261
LNGDP	-0.998258	0.006442	-154.9703	0.0000
LNIM	0.554883	0.002367	234.4660	0.0000
LNEX	0.446825	0.002495	179.1136	0.0000
LNINVA	-0.003049	0.007381	-0.413009	0.6820
C	0.673354	0.021704	31.02499	0.0000

R-squared	0.999996	Mean dependent var	-1.345928
Adjusted R-squared	0.999996	S.D. dependent var	0.557632
S.E. of regression	0.001148	Akaike info criterion	-10.57341
Sum squared resid	4.87E-05	Schwarz criterion	-10.32766
Log likelihood	233.3283	Hannan-Quinn criter.	-10.48278
F-statistic	1983133.	Durbin-Watson stat	1.920967
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNTL)
Selected Model: ARDL(1, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 05/23/25 Time: 23:19
Sample: 1980 2023
Included observations: 43

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.673354	0.021704	31.02499	0.0000
LNTL(-1)*	-1.002443	0.002455	-408.3404	0.0000
LNGDP**	-0.998258	0.006442	-154.9703	0.0000
LNIM**	0.554883	0.002367	234.4660	0.0000
LNEX**	0.446825	0.002495	179.1136	0.0000
LNINVA**	-0.003049	0.007381	-0.413009	0.6820

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGDP	-0.995825	0.006384	-155.9804	0.0000
LNIM	0.553531	0.002113	262.0150	0.0000
LNEX	0.445736	0.002191	203.4721	0.0000
LNINVA	-0.003041	0.007363	-0.413053	0.6820

EC = LNTL - (-0.9958*LNGDP + 0.5535*LNIM + 0.4457*LNEX -0.0030 *LNINVA)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	37515.04	10%	2.45	3.52
k	4	5%	2.86	4.01
		2.5%	3.25	4.49
		1%	3.74	5.06
Actual Sample Size	43		Finite Sample: n=45	
		10%	2.638	3.772
		5%	3.178	4.45
		1%	4.394	5.914
			Finite Sample: n=40	
		10%	2.66	3.838
		5%	3.202	4.544
		1%	4.428	6.25

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-408.3404	10%	-2.57	-3.66
		5%	-2.86	-3.99
		2.5%	-3.13	-4.26
		1%	-3.43	-4.6

APPENDIX III

For model 3: Ln_INVA as Dependent Variable:

Dependent Variable: LNINVA
Method: ARDL
Date: 05/23/25 Time: 23:36
Sample (adjusted): 1981 2023
Included observations: 43 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): LNGDP LNIM LNEX LNTL
Fixed regressors: C
Number of models evaluated: 16
Selected Model: ARDL(1, 1, 0, 0, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNINVA(-1)	0.649593	0.133209	4.876482	0.0000
LNGDP	-1.071243	2.903507	-0.368948	0.7144
LNGDP(-1)	-0.539067	0.163878	-3.289433	0.0023
LNIM	1.047801	1.605183	0.652761	0.5182
LNEX	0.891658	1.293104	0.689549	0.4950
LNTL	-1.829507	2.893445	-0.632294	0.5313
LNTL(-1)	-0.066083	0.044034	-1.500731	0.1424
C	1.525057	1.987127	0.767468	0.4479

R-squared	0.999430	Mean dependent var	26.23156
Adjusted R-squared	0.999316	S.D. dependent var	0.773433
S.E. of regression	0.020228	Akaike info criterion	-4.797208
Sum squared resid	0.014322	Schwarz criterion	-4.469543
Log likelihood	111.1400	Hannan-Quinn criter.	-4.676375
F-statistic	8766.418	Durbin-Watson stat	1.888752
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNINVA)
Selected Model: ARDL(1, 1, 0, 0, 1)
Case 2: Restricted Constant and No Trend
Date: 05/23/25 Time: 23:37
Sample: 1980 2023
Included observations: 43

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.525057	1.987127	0.767468	0.4479
LNINVA(-1)*	-0.350407	0.133209	-2.630504	0.0126
LNGDP(-1)	-1.610310	2.901414	-0.555008	0.5824
LNIM**	1.047801	1.605183	0.652761	0.5182
LNEX**	0.891658	1.293104	0.689549	0.4950
LNTL(-1)	-1.895591	2.900756	-0.653482	0.5177
D(LNGDP)	-1.071243	2.903507	-0.368948	0.7144
D(LNTL)	-1.829508	2.893445	-0.632294	0.5313

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGDP	-4.595534	8.573245	-0.536032	0.5953
LNIM	2.990236	4.738637	0.631033	0.5321
LNEX	2.544632	3.839091	0.662821	0.5118
LNTL	-5.409677	8.581613	-0.630380	0.5325
C	4.352239	5.965146	0.729611	0.4705

EC = LNINVA - (-4.5955*LNGDP + 2.9902*LNIM + 2.5446*LNEX -5.4097*LNTL + 4.3522)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	1.877630	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
Actual Sample Size	43	Finite Sample: n=45		
		10%	2.402	3.345
		5%	2.85	3.905
		1%	3.892	5.173
		Finite Sample: n=40		
		10%	2.427	3.395
		5%	2.893	4
		1%	3.967	5.455

APPENDIX IV

ARDL Error Correction Regression
Dependent Variable: D(LNGDP)
Selected Model: ARDL(1, 0, 0, 0, 1)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 06/02/25 Time: 11:43
Sample: 1980 2023
Included observations: 43

ECM Regression
Case 5: Unrestricted Constant and Unrestricted Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.172411	0.035660	32.87772	0.0000
@TREND	0.001208	6.86E-05	17.60619	0.0000
D(LNEX)	0.386191	0.012863	30.02398	0.0000
CointEq(-1)*	-0.988859	0.031251	-31.64203	0.0000

R-squared	0.966223	Mean dependent var	0.057442
Adjusted R-squared	0.963625	S.D. dependent var	0.025920
S.E. of regression	0.004944	Akaike info criterion	-7.693021
Sum squared resid	0.000953	Schwarz criterion	-7.529189
Log likelihood	169.4000	Hannan-Quinn criter.	-7.632605
F-statistic	371.8757	Durbin-Watson stat	1.986865
Prob(F-statistic)	0.000000		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	179.7058	10%	3.03	4.06
k	4	5%	3.47	4.57
		2.5%	3.89	5.07
		1%	4.4	5.72

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-31.64203	10%	-3.13	-4.04
		5%	-3.41	-4.36
		2.5%	-3.65	-4.62
		1%	-3.96	-4.96

APPENDIX V

ARDL Error Correction Regression
Dependent Variable: D(LNTL)
Selected Model: ARDL(2, 2, 1, 2, 2)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 06/02/25 Time: 11:46
Sample: 1980 2023
Included observations: 42

ECM Regression
Case 5: Unrestricted Constant and Unrestricted Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.712086	0.234255	7.308654	0.0000
@TREND	0.001576	0.000224	7.041905	0.0000
D(LNTL(-1))	0.457474	0.140133	3.264563	0.0030
D(LNGDP)	-0.910504	0.041339	-22.02546	0.0000
D(LNGDP(-1))	0.461234	0.142668	3.232915	0.0032
D(LNINVA)	-0.078422	0.036188	-2.167073	0.0392
D(LNIM)	0.557650	0.009035	61.71890	0.0000
D(LNIM(-1))	-0.249941	0.077657	-3.218515	0.0033
D(LNEX)	0.413360	0.011027	37.48646	0.0000
D(LNEX(-1))	-0.222414	0.064360	-3.455790	0.0018
CointEq(-1)*	-1.504651	0.206097	-7.300697	0.0000

R-squared	0.997218	Mean dependent var	0.031667
Adjusted R-squared	0.996321	S.D. dependent var	0.075995
S.E. of regression	0.004610	Akaike info criterion	-7.701268
Sum squared resid	0.000659	Schwarz criterion	-7.246164
Log likelihood	172.7266	Hannan-Quinn criter.	-7.534454
F-statistic	1111.306	Durbin-Watson stat	2.149161
Prob(F-statistic)	0.000000		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	9.284547	10%	3.03	4.06
k	4	5%	3.47	4.57
		2.5%	3.89	5.07
		1%	4.4	5.72

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-7.300697	10%	-3.13	-4.04
		5%	-3.41	-4.36
		2.5%	-3.65	-4.62
		1%	-3.96	-4.96

APPENDIX VI

ARDL Error Correction Regression
Dependent Variable: D(LNINVA)
Selected Model: ARDL(3, 0, 1, 2, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 06/02/25 Time: 11:36
Sample: 1980 2023
Included observations: 41

ECM Regression
Case 5: Unrestricted Constant and Unrestricted Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.858004	1.621644	4.229044	0.0002
@TREND	0.013542	0.003268	4.143666	0.0003
D(LNINVA(-1))	0.117400	0.118471	0.990960	0.3299
D(LNINVA(-2))	0.235664	0.101674	2.317841	0.0277
D(LNGDP)	-0.032512	0.228827	-0.142080	0.8880
D(LNEX)	0.414577	0.082368	5.033248	0.0000
D(LNEX(-1))	-0.124029	0.040769	-3.042234	0.0049
CointEq(-1)*	-0.409845	0.097078	-4.221834	0.0002

R-squared	0.725567	Mean dependent var	0.059756
Adjusted R-squared	0.667354	S.D. dependent var	0.030454
S.E. of regression	0.017564	Akaike info criterion	-5.072703
Sum squared resid	0.010181	Schwarz criterion	-4.738348
Log likelihood	111.9904	Hannan-Quinn criter.	-4.950949
F-statistic	12.46399	Durbin-Watson stat	1.887553
Prob(F-statistic)	0.000000		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	3.132683	10%	3.03	4.06
k	4	5%	3.47	4.57
		2.5%	3.89	5.07
		1%	4.4	5.72

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-4.221834	10%	-3.13	-4.04
		5%	-3.41	-4.36
		2.5%	-3.65	-4.62
		1%	-3.96	-4.96