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The New Era of Globalization for India

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Abstract

This study presents a sector-specific macroeconomic analysis of globalization's impact on India, focusing on Defense, Primary, Secondary & Tertiary, Energy, and Finance/FDI sectors. While globalization fosters foreign investment, market access, and technological growth, it also brings risks like over-dependence, trade imbalances, and strategic vulnerabilities. Existing studies largely emphasize GDP growth, FDI inflows, and employment trends but often overlook sector-level structural changes, policy shifts, and long-term implications. This research contributes to filling that gap by examining sector-specific transformations and broader patterns, especially amid rising deglobalization trends. Using a mixed-methods approach—combining descriptive and empirical tools like correlation and regression—the study highlights the need for nuanced policymaking. Key recommendations include strengthening regulatory frameworks, fostering self-reliance in critical sectors, and diversifying global partnerships. By offering sectoral insights and strategic directions, this paper supports more inclusive and sustainable economic development, addressing both the benefits and vulnerabilities globalization presents in India's evolving macroeconomic landscape.

Keywords; Globalization, Indian Economy, Sectoral Analysis

INTRODUCTION

Globalization has significantly shaped India's economy, impacting various sectors. This paper examines its effects, highlighting both opportunities and challenges. While globalization has driven market growth and foreign investments, it has also led to concerns like over-reliance, brain drain, and trade deficits. In recent decades, some nations have shifted towards deglobalization, adopting protectionist policies in response to economic imbalances.

Although globalization has facilitated economic development, it has disproportionately benefited developed nations, widened income inequality, and weakened local control. Many regions had better access to global brands like Pepsi and Coca-Cola than essential services like education and healthcare, prompting a revaluation of open-market policies (Kornprobst & Wallace, 2021). Deglobalization, often seen as a reaction to Western economic dominance, promotes national self-sufficiency and local empowerment.

Walden Bello framed deglobalization as a means to counter Western neoliberalism, emphasizing national control over economies (Bello, 2005). Critics argue that globalization primarily favors Western economies and multinational corporations, exacerbating inequalities in the Global South.

In the most recent times, the Trump Factor is affecting the global equations adversely. Papanikos (2024) argues that globalization is a persistent long-term trend, resistant to political, economic, and pandemic shocks. Using KOF indices and U.S. data, he shows that even during Trump's first term—despite anti-globalization rhetoric—globalization increased. He concludes that any attempts to reverse it are unlikely to succeed, as globalization benefits GDP growth and aligns with democratic and technological progress.

HISTORICAL BACKGROUND

India has historically been a center of knowledge and trade. Ancient universities like Nalanda and Takshashila attracted global scholars, while major religions such as Hinduism, Buddhism, Sikhism, and Jainism originated here, with Buddhism still influential abroad. India was a major hub for economic exchange, exporting goods like cotton, gold, spices, silk, muslin, medicinal herbs, perfumes, indigo, ivory, and precious stones to Mesopotamia, Egypt, Rome, China, Malaya, Sri Lanka, Southeast Asia, and the Arabian Peninsula. Evidence of organized maritime and overland trade networks existed from the Harappan era to the Chola period, linking India with global empires (Grover & Singh, 2022).

In medieval times, European traders arrived, seeking Indian goods, but repeated invasions disrupted trade. During British colonial rule, India's economy suffered exploitation, leading to a decline in its global market share. Post-independence, India focused on economic reconstruction through five-year plans and later embraced liberalization, fostering global integration (Datta, 1999).

However, globalization has faced significant disruptions in recent decades. The 2008 Global Financial Crisis led to trade restrictions and exposed vulnerabilities in economic interdependence. The Russia-Ukraine conflict further destabilized supply chains, particularly for wheat and fossil fuels. The COVID-19 pandemic accelerated deglobalization, increasing trade imbalances, populism, and nationalism (Tooze, 2020). While globalization has driven urbanization and cultural shifts, it has also eroded traditional practices and heightened social tensions (Nayyar D. , 2008). India's strategic position in global supply chains makes it both a beneficiary and a vulnerable participant in these shifts.

LITERATURE REVIEW

Globalization has significantly influenced India's economy, society, and industries, bringing both growth and challenges. Mittal (2024) highlights its role in economic expansion and employment generation, particularly in IT and services, but also notes rising income inequality and rural unemployment. Similarly, Chaudhuri (2024) discusses globalization's impact on urbanization, middle-class expansion, and consumer culture, while also addressing rural distress and labor precarity.

The "Make in India" initiative has been a key aspect of globalization in India. Sharma (2024) analyses its effects on

trade, FDI, and technology while acknowledging concerns like cultural homogenization and economic disparities. Sureshbabu and Vinitha (2019) also examine FDI trends post-2014, finding significant inflows into manufacturing, services, and infrastructure due to liberalized investment norms.

India's small-scale industries (SSIs) have faced mixed outcomes. Venkatesham (2021) finds that while liberalization boosted exports and FDI, it led to employment declines and structural difficulties due to foreign competition, necessitating policy interventions for sustainability. Kumar (2024) studies LPG reforms in agriculture, noting export growth and technological advancements but also regional disparities, emphasizing the need for equitable policies and sustainable farming.

Kumar K. (2022) highlights globalization's role in increasing private participation in India's defense sector through liberalized FDI policies, enhancing self-reliance and efficiency. Sejati et al. (2024) compare U.S. and Indian defense diplomacy strategies in UN peacekeeping, noting India's emphasis on personnel deployment and soft power. Singh and Jana (2024) examine India's rising crude oil import dependency, emphasizing renewable energy for economic sustainability.

FDI's broader role in India's economy is analyzed by Sengupta & Puri (2018) who confirm its positive influence on GDP. However, Agrawal & Khan (2011) compare India and China, showing that China benefits more from FDI due to superior policies and infrastructure. Chandrachud & Gajalakshmi (2013) further highlight FDI's role in India's post-liberalization growth but caution against jobless growth and uneven sectoral benefits.

Globalization, while fostering economic integration, often negatively impacts labor markets in developing countries like India and Nigeria, leading to job displacement, wage disparities, and poorer employment quality. However, it also highlights that strong national policies and technological advancements can mitigate these adverse effects (Nasser, Sisodia, & Mohnot, 2025).

This article argues that despite policies promoting reshoring due to rising global production costs, its prevalence remains limited as global value chains are "sticky" for large firms, while smaller firms may reshore as a survival strategy (D'Ambrosio & Lavoratori, 2025).

This study found that while globalization boosted economic integration, it worsened job displacement, wage disparities, and poor employment quality in developing countries, particularly India and Nigeria, primarily due to weak labor protections and untimely policy responses. However, it also noted that robust national policies and technological advancement can mitigate these negative effects (Mittal, et al., 2025).

Yadav and Hassan (2025) analyze de-globalization trends in BRICS nations using KOF indices. They find that income inequality, political factors, and manufacturing imports contribute to de-globalization, while economic globalization still promotes trade openness (Yadav & Hassan, 2025).

RESEARCH GAP

Despite extensive studies on globalization's effects on emerging economies, significant gaps persist in understanding its sector-specific impacts on India's economic and strategic development. While broad macroeconomic analyses by Rodrik (2011), Stiglitz (2002), Nayyar (2008), Agrawal and Khan (2011), Lundsgaarde (2018), Kumar V. (2024), Singh and Jana (2024), and others highlight globalization's systemic risks, they often overlook sectoral nuances. Similarly, Kumar K. (2022) addresses defense privatization, but further research is needed on globalization's strategic impact. Singh and Jana (2024) discuss India's energy security concerns but lack comprehensive policy recommendations. Most studies focus on GDP growth, FDI inflows, and employment generation, yet detailed insights into sector-specific transformations—such as the long-term impact on India's secondary sector, MSME competitiveness, and financial sector volatility—remain underexplored.

This study analyses globalization's impact on key sectors—defense, primary, secondary & tertiary, energy and finance & FDI—to understand its role in shaping India's economy. It fills research gaps by examining sector-specific effects and emerging deglobalization trends. Using empirical data and socioeconomic insights, it highlights opportunities and challenges, aiding policy development to balance strategic autonomy with globalization's benefits for sustainable and inclusive growth.

Here, a major question arises about the compatibility of globalization in the growth of Indian economy.

OBJECTIVES

To evaluate the sectoral impacts of globalization on India, and assess policy frameworks to align globalization with national development.

RESEARCH METHODOLOGY

This study employs a mixed-methods approach, integrating descriptive and empirical analysis to evaluate globalization's impact on India's key sectors: Defense, Agriculture & Allied, Secondary & Tertiary, Energy, and Finance & FDI. The quantitative analysis (2014–2025) applies statistical methods where relevant—correlation and regression analysis in Defense, Agriculture & Allied, and Secondary sectors, while correlation and descriptive analysis are used in Energy. The Finance & FDI sector is analyzed qualitatively without statistical tools.

To enhance model accuracy, **regularized regression techniques (Ridge and Lasso) are employed, selecting the best-fit model based on error metrics.** The general regression framework follows:

$$Y_{it} = \beta_0 + \sum_{j=1}^n \beta_j X_{j,it}$$

where Y represents the dependent variable, X are the independent variables, β are the estimated coefficients, and ϵ is the error term.

For empirical data analysis and visualization, Python has been utilized, employing correlation analysis, regression (including error metrics and alpha value optimization for Ridge and Lasso), and plotting techniques.

While commodities analyzed originate in the secondary sector, their cross-border movement falls under tertiary services; thus, sectoral analysis focuses on commodity imports and exports, while empirical analysis considers total trade (merchandise + services) to ensure a comprehensive assessment.

To ensure consistency in empirical analysis for the Defense sector, imports (TIVs) have been converted from calendar year (CY) to financial year (FY) using Averaging Method for alignment with other economic indicators. Accordingly, the converted FY values are used throughout the analysis. This adjustment enhances the robustness and accuracy of the study.

This approach provides policymakers with holistic insights to maximize benefits and mitigate risks.

Now, let's dive into the sectoral analysis.

1. Defense

According to (PIB, 2025), India's defense budget has significantly increased from ₹2.53 lakh crore in 2013–14 to ₹6.81 lakh crore in 2025–26, underscoring a commitment to national security and self-reliance. This growth integrates private industry and prioritizes innovation in indigenous platforms, advanced technologies, and defense corridors for long-term preparedness.

Over the past eleven years, India's defense manufacturing has transformed dramatically, with production soaring by 174% from ₹46,429 crore in 2014–15 to a record ₹1.27 lakh crore in 2023–24. Furthermore, in 2024–25, the Ministry of Defense secured an unprecedented 193 contracts valued at ₹2,09,050 crore, with 177 of these, totaling ₹1,68,922 crore, awarded to domestic industries.

According to the defense minister of India, Mr. Rajnath Singh, India has witnessed a 34x increase in defense exports, from ₹686 crore in 2013-14 to ₹23,622 crore in 2024-25 (DD-News, 2025). With 88% of self-production of ammunition, India is aiming to reach defense exports worth ₹50,000 crore by 2029 (Hindu, 2024).

India's Ministry of Defense plans to sign ₹2 trillion (~US \$24 billion) in defense contracts for FY 26—matching the record ₹2.09 trillion signed in FY 25—with **81% awarded to domestic firms**. This shift reflects a deepening of the “Make in India” and Atmanirbhar Bharat agenda, aiming to **reduce import dependence**, enhance **self-reliance**, and stimulate integration of India's defense industry into global supply chains, ultimately strengthening its strategic position internationally (Kumar B. , 2025).

Imports of India throughout the years:

India was the world's top arms importer for the period 2019-23 with imports having gone up by 4.7% compared to the period 2014-18, according to the Swedish think tank, Stockholm International Peace Research Institute (SIPRI) (Peri, 2024)

The data tables used to produce the figures are provided in Online Resource 1 Table A1.

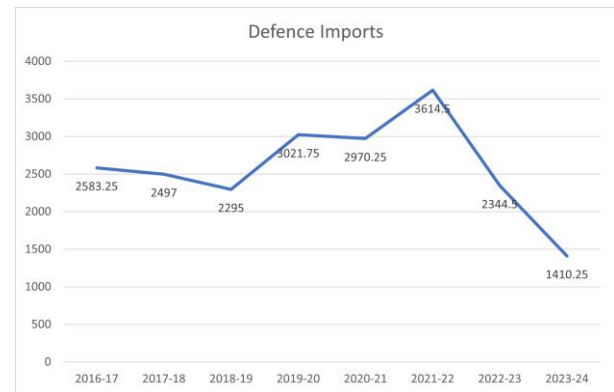


Figure 1: India's Defense imports

As shown in the figure 1, India's defense imports have shown a declining trend, peaking at 3614.5 units in 2021-22 and dropping to 1410.25 units in 2023-24. Significant and steady declines in 2022-23 and 2023-24. This reduction aligns with India's push for indigenization through initiatives like "Make in India" and "Atmanirbhar Bharat," promoting domestic production via public-private partnerships and technology transfers.

India's Exports throughout the years:

The data tables used to produce the figures are provided in Online Resource 1 Table A2.

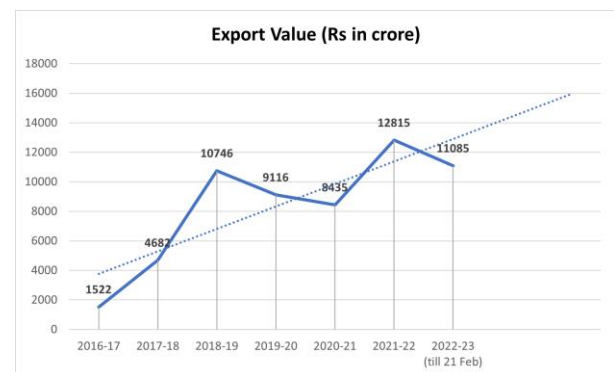


Figure 2: India's Defense Exports

Figure 2 represents India's defense export value (in crores of rupees) over a series of financial years, from 2016-17 to 2022-23 (till February 21st) (Ministry of Defence, 2023). Here's a detailed analysis:

The export peaked in the FY 2021-22 at ₹12,815 crores. There's a decline in the export in the FYs 2019-20 and 2020-21 after a sharp increase in FY 2018-19 at ₹10,746 crores, possibly due to global or domestic disruptions (e.g., economic slowdown or the COVID-19 pandemic). The

export also decreased in the FY 2022-23 at ₹11,058 crores. Still, there's a clear inclining trend, indicated by the dotted trendline.

Empirical Analysis and Results

Dependent Variable (Y): Indigenous Defense Production (₹ crore)

Independent Variables:

- X_1 : Defense Imports (TIVs)
- X_2 : Budgetary Allocation (₹ crore)
- X_3 : GDP Growth (%)

Model Used:

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + \beta_2 X_{2,it} + \beta_3 X_{3,it}$$

Correlation Matrix:¹

The dataset used for this analysis is provided in Online Resource 1 Table A1.

Table 1 Correlation Matrix of Defense Sector

	Indigenous Production	Defense Imports	Budgetary Allocation	GDP Growth
Indigenous Production	1.000000	-	0.932989	0.318468
Defense Imports	-0.561596	1.000000	-0.356577	-
Budgetary Allocation	0.932989	-	1.000000	0.042737
GDP Growth	0.318468	-	0.042737	1.000000

NOTE: Lasso Regression was chosen as it has the lower RMSE, making it the better fit for the data.

For additional details, see Online Resource 1 Table A3 and Online Resource 1 Table A4.

Regression Summary:

Table 2 Regression Summary of Defense Sector

Variable	Coefficient
Defense Imports	-3007.62
Budgetary Allocation	14092.07
GDP Growth	3330.08

¹ Note: Due to the small sample size, some correlation values appear extreme and should be interpreted with caution.

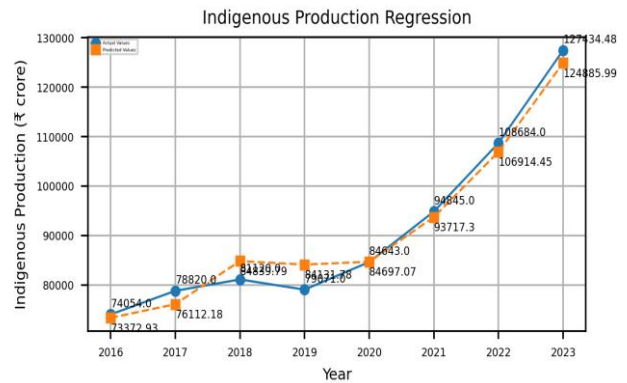


Figure 3: India's Defense Indigenous Production Predicti

The correlation matrix shows that Indigenous Production has a strong positive correlation with Budgetary Allocation (0.93) but a negative correlation with Defense Imports (-0.56). Lasso Regression results indicate that Budgetary Allocation has the highest positive impact (14092.07), while Defense Imports negatively affect the sector (-3007.62). This suggests that increasing budgetary allocation boosts indigenous production, while higher defense imports hinder it.

1. Primary

During the 19th century and before, when Europeans came to India to purchase spices, globalization helped farmers earn more due to international demand and higher price offers. Even today, agriculture and allied sectors remain the largest source of livelihood in India. Global demand continues to influence Indian farmers' choices. For example, if global crude oil prices remain high, the demand for biofuel may rise significantly.

India, being a major producer of bioenergy crops like sugarcane (Swati, 2023), corn (DACNET, 2020, as cited in ICAR, 2023), mustard (Rai, 2023), soybean (SOPA), and wheat (FAO), can benefit from this trend in global trade. However, many Indian farmers still rely on outdated farming methods. Limited access to information, lack of awareness, and resistance to change hamper the adoption of modern agricultural practices.

As per FAO (2024), India is the top producer of raw cattle milk and a joint top producer of rice, while also

ranking second in the production of wheat and sugarcane. It is among the top producers of rapeseed, seed cotton (unginned), and coconuts. Additionally, India holds the top rank globally in the production of milk, pulses, and jute, and the second rank in cotton, rice, wheat, fruits, and vegetables. It is also among the leading countries in spices, fish, poultry, and livestock production (Pathak, 2024).

In the field of critical minerals, India launched the ₹34,300 crore *National Critical Mineral Mission*

(2025) to secure key minerals for green tech and reduce import dependency. It boosts exploration, processing, and R&D, supports global tie-ups (like lithium in Argentina), and encourages overseas mineral asset acquisition to ensure strategic autonomy (PMINDIA, 2025).

Trade Surplus

The data tables used to produce the figures are provided in Online Resource 1 Table B1.

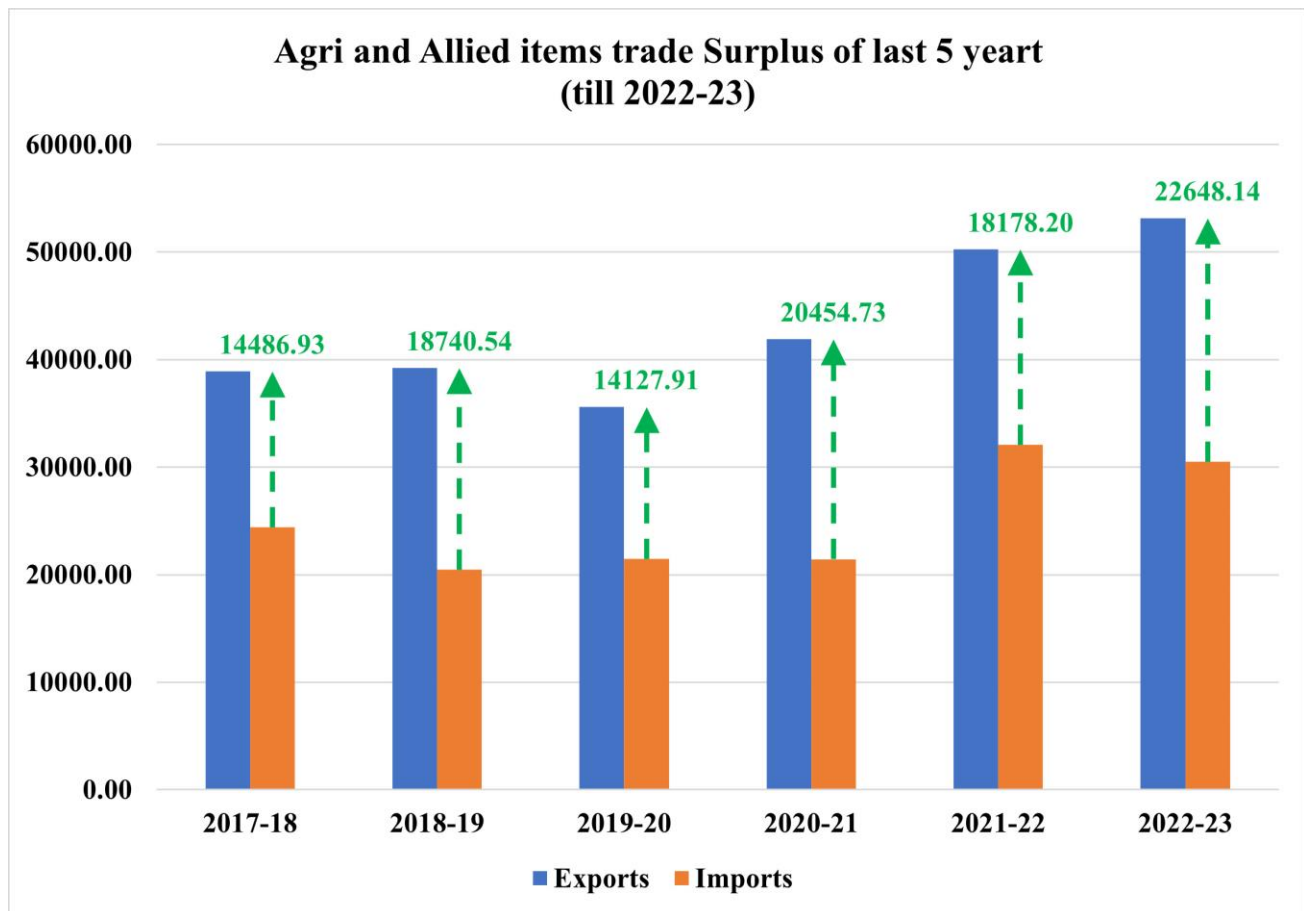


Figure 4: India's Trade Surplus of Agri and Allied Sector

As shown in the figure 4, India's agricultural trade surplus grew from ₹14,486.93 crore in 2017-18 to ₹22,648.14 crore in 2022-23, reflecting strong exports and stable imports (Department of Agriculture and Farmers Welfare, 2023). Despite a dip during COVID-19 in 2020-21, the sector rebounded due to policy support, mechanization, and technology adoption. Key drivers include rising demand for rice, spices, and processed foods, along with initiatives like the Agriculture Export Policy 2018 and PLI schemes. While the surplus boosts forex

reserves, rural income, and GDP, challenges like climate change and global market volatility remain.

Empirical Analysis and Results

Dependent Variable (Y): Trade Surplus (₹ crore)

Independent Variables:

- X_1 : Imports (₹ crore)
- X_2 : Exports (₹ crore)
- X_3 : Budget Allocation (₹ crore)

Model Used:

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + \beta_2 X_{2,it} + \beta_3 X_{3,it}$$

Correlation Matrix:²

The dataset used for this analysis is provided in Online Resource 1 Table B1.

Table 3 Correlation Matrix of Agri and Allied sector

	Trade Surplus (₹ crore)	Exports (₹ crore)	Imports (₹ crore)	Budget Allocation (₹ crore)
Trade Surplus (₹ crore)	1.000000	0.740626	0.363556	0.330355
Exports (₹ crore)	0.740626	1.000000	0.895199	0.387352

Imports (₹ crore)	0.363556	0.895199	1.000000	0.317923
Budget Allocation (₹ crore)	0.330355	0.387352	0.317923	1.000000

Lasso Regression was chosen as it has the lower RMSE, making it the better fit for the data.

For additional details, see Online Resource 1 Table B2 and Online Resource 1 Table B3.

Regression Summary:

Table 4 Regression Summary of Agri and Allied Sector

Variable	Coefficient
Exports (₹ crore)	6353.69
Imports (₹ crore)	-4582.40
Budget Allocation (₹ crore)	0.25

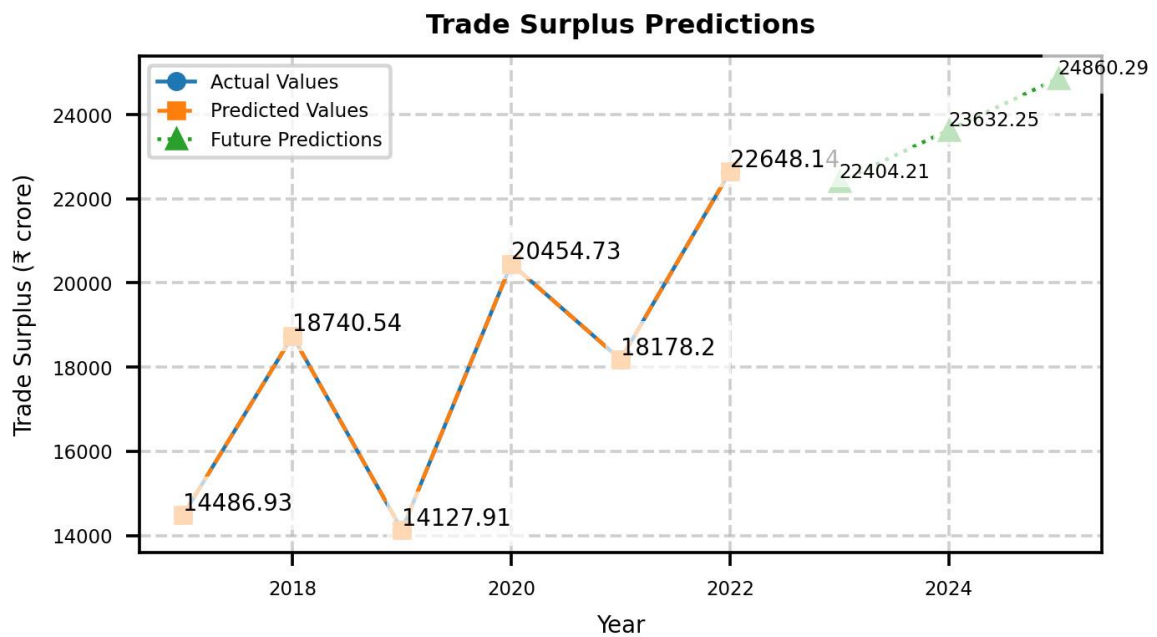


Figure 5: India's Agri and Allied Sector's Trade Surplus Prediction

As shown in the figure 5, the future predictions for the trade surplus (₹ crore) (2023-2025) are as follows:

- **2023:** 22,404.21
- **2024:** 23,632.25

- **2025:** 24,860.29

As per the table 3 and table 4, Agriculture has shown consistent growth in trade surpluses, reflecting India's global

² Note: Due to the small sample size, some correlation values appear extreme and should be interpreted with caution.

competitiveness in this sector. However, the future natural and manmade hazards are to be taken into consideration.

Regression results show that exports positively impact the trade surplus, while imports have a negative effect. Budget allocation has a minor but positive influence. Future projections indicate a steady increase in the trade surplus, emphasizing the need to strengthen export strategies while managing imports efficiently.

Policies like the Agriculture Export Policy and technological advancements have boosted exports, contributing to surplus growth. However, challenges such as climate change, market volatility, and infrastructure gaps pose risks to sustained progress.

However, the potential for deglobalization could limit access to advanced farming techniques like vertical farming. Additionally, inadequate agricultural extension services, modern technologies, and scientific research hinder innovation. Overcoming these challenges requires better knowledge dissemination, targeted training, and affordable technology solutions tailored to farmers' needs (Nayyar A. , 2023). Greater liberalization, subsidies, and lower loan interest rates on key crops would reduce costs, fostering growth in both agribusiness and renewable energy sectors.

FDI in the primary sector remains low, with the government prioritizing the service and manufacturing sectors by allowing up to 100% FDI. Moreover, India's primary sector is largely unorganized, meaning FDI benefits mainly reach those in the organized sector.

1. Secondary and Import-Export

India's secondary sector, which comprises manufacturing and industrial activities, has long been a vital component of the country's economy and is deeply intertwined with global trade. For centuries, India has been an active player in international commerce, exporting textiles and spices while importing machinery, raw materials, and advanced technology. Today, this dependence on imports remains significant, despite government initiatives such as **Atmanirbhar Bharat & Make in India**, which aims to promote self-reliance in manufacturing. In 2022, India imported goods worth approximately **\$714 billion**, including essential items such as electronic components, crude oil, and defense equipment (Ministry of Commerce and Industry, 2023).

This heavy reliance on imports has exposed critical vulnerabilities during crises. For instance, during the COVID-19 pandemic, India experienced a severe shortage of ventilators because a large proportion of its supply came from foreign manufacturers, particularly Vietnam (The Economic Times, 2020).

To address these challenges, the government has implemented several policies under the **Atmanirbhar Bharat** campaign. These include **Production-Linked Incentive (PLI)** schemes to encourage domestic manufacturing in sectors such as electronics, renewable energy, and pharmaceuticals. Support for Micro, Small, and Medium Enterprises (MSMEs) has also been increased to enhance local production capacities. While these measures have contributed to reducing dependency on imports, the sector continues to rely heavily on foreign inputs, making it crucial to build resilience. A strategic balance between boosting domestic production and maintaining global trade relations is essential to ensure the long-term sustainability and growth of India's secondary sector.

Imports

The data tables used to produce the figures are provided in Online Resource 1 Table C1.

As shown in the figure 6, India's import trends for 2022–2024 reflect shifts in economic strategies and dependencies (Department of Commerce, 2024). A decline in mineral fuel and petroleum crude imports suggests progress toward energy self-reliance, influenced by global crude price fluctuations (Ministry of Commerce and Industry, 2023). Conversely, rising imports of electrical machinery indicate continued reliance on foreign technology despite *Make in India* initiatives.

Jewelry manufacturing remains import-dependent, with increased imports of pearls, precious stones, and gold driven by cultural and investment demand. Meanwhile, reduced coal and organic chemical imports suggest higher domestic production and industrial efficiency improvements.

These patterns highlight a dual trend: decreasing energy imports signal self-reliance, while rising machinery and raw material imports expose vulnerabilities to global supply disruptions. Policies promoting innovation, technology transfer, and industrial self-sufficiency are key to ensuring sustainable growth.

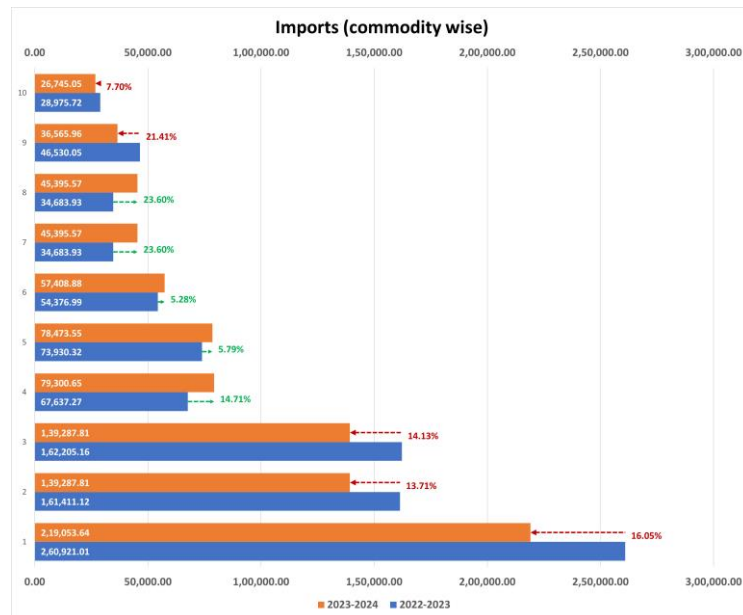


Figure 6: India's Top 10 Imported Commodities compared to previous year

Exports

The data tables used to produce the figures are provided in Online Resource 1 Table C2.

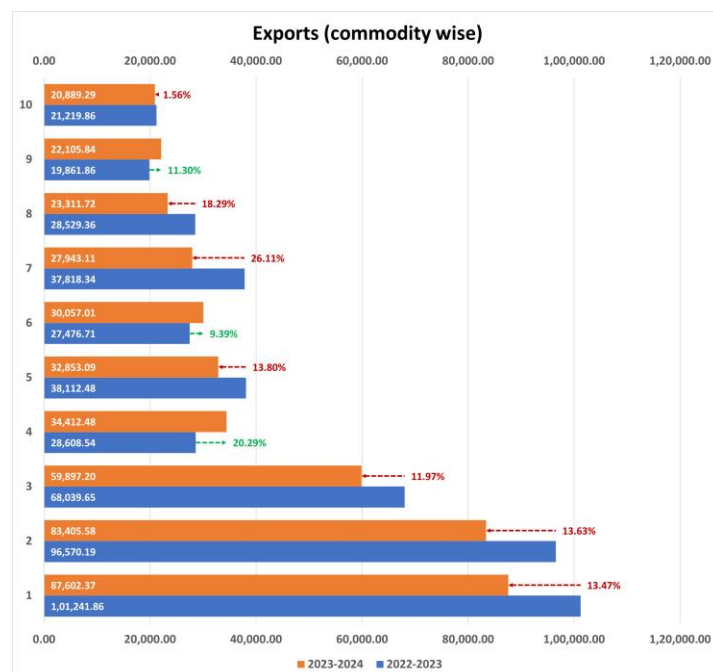


Figure 7: India's Top 10 Exported Commodities compared to previous year

As shown in the figure 7, India's export trends for 2022–2024 reflect shifting global demands and strategic trade adjustments (Department of Commerce, 2024). A sharp decline in automotive diesel and petroleum oil exports

highlights the global transition toward clean energy and increased domestic consumption. Similarly, reduced mineral fuel exports align with India's resource conservation efforts and fluctuating global crude markets.

Conversely, rising exports of electrical machinery, mechanical appliances, and pharmaceuticals signal India's strengthening position in high-value industries, supported by *Make in India* and its pharmaceutical dominance. However, falling exports of pearls, precious stones, and metals indicate weakened global luxury demand.

These trends emphasize India's growing focus on technology-driven exports while revealing vulnerabilities in traditional high-value sectors. Diversifying export markets and reinforcing innovation-led industries will be crucial for sustained trade growth.

Empirical Analysis

Dependent Variable (Y): Trade Openness (US\$ Billion)

Independent Variables:

- X_1 : Exchange Rates (Annual Average)
- X_2 : FDI Inflows (% of GDP)
- X_3 : GDP Growth (%)

Model Used:

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + \beta_2 X_{2,it} + \beta_3 X_{3,it}$$

Correlation Matrix:³

The dataset used for this analysis is provided in Online Resource 1 Table C3.

Table 5 Correlation Matrix of Secondary Sector

	Trade Openness (US\$ Billion)	Exchange Rates (Annual Average)	FDI Inflows (% of GDP)	GDP Growth (%)
Trade Openness (US\$ Billion)	1.000000	0.844991	-0.765015	0.264770
Exchange Rates (Annual Average)	0.844991	1.000000	-0.491604	-0.126112
FDI Inflows (% of GDP)	-0.765015	-0.491604	1.000000	-0.623864
GDP Growth (%)	0.264770	-0.126112	-0.623864	1.000000

Ridge Regression was chosen as it has the lower RMSE, making it the better fit for the data.

For additional details, see Online Resource 1 Table C4 and Online Resource 1 Table C5.

Regression Coefficients (Ridge Model):

Table 6 Regression Summary of Secondary Sector

Variable	Coefficient
Exchange Rates (Annual Average)	147.9611
FDI Inflows (% of GDP)	-95.7647
GDP Growth (%)	24.8258

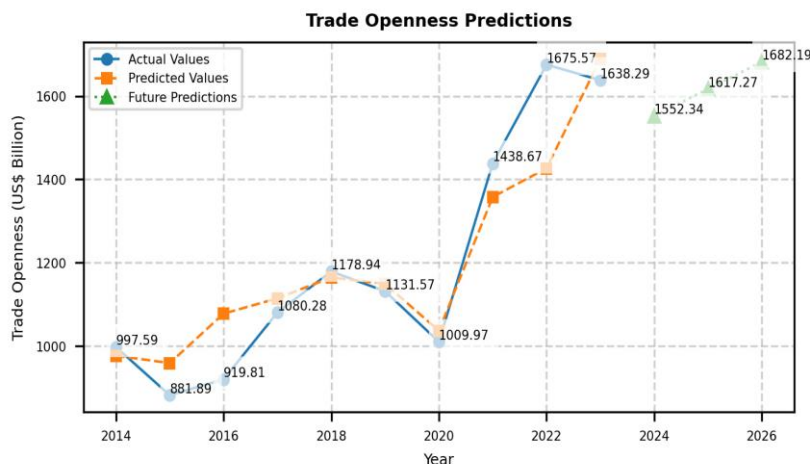


Figure 8 Prediction of Trade Openness in India

³ Note: Due to the small sample size, some correlation values appear extreme and should be interpreted with caution.

As per the figure 8, the Future Predictions of trade openness (US\$ Billion) (2024-26) are as follows:

2024: 1552.34

2025: 1617.27

2026: 1682.19

As per the table 5 and table 6, the correlation matrix shows strong positive correlation between Trade Openness and Exchange Rates (0.845) and a negative correlation between Trade Openness and FDI Inflows (-0.765). The Ridge regression model indicates that Exchange Rates positively influence Trade Openness, while FDI Inflows negatively impact it, with GDP Growth having a modest positive effect.

Energy

India's energy sector is deeply tied to global economies, covering electricity, coal, natural gas, crude oil, and petroleum products. Excessive reliance on foreign partners poses risks if supply disruptions occur, potentially halting national functions.

Between 2012–13 and 2022–23, India's import dependency on natural gas and crude oil grew, with the energy import ratio rising from 34.2% to 41% (International Energy Agency). Globalization aids supply chain efficiency, resource access, and sustainable transitions, ensuring long-term energy security and economic growth.

Hon'ble Minister Nitin Gadkari stated on July 7, 2022, in Maharashtra, "With full faith, I want to say that petrol will vanish from the country after five years. Your cars and scooters will either be on green hydrogen, ethanol flex fuel, CNG, or LNG." Additionally, replacing coal plants with renewables could save India ₹54,000 crore (US\$ 8.4 billion) annually (PTI, 2017).

Renewable energy promises economic growth, self-sufficiency, and climate mitigation, but challenges remain. Issues include unclear Renewable Purchase Obligations (RPOs), tariff opacity, third-party sales restrictions, and financial gaps. Regulatory and financial reforms are vital, including penalty mechanisms, state rating systems, mandatory renewable investments, a national merit order list, and legally binding power purchase agreements (Kumar C. R., 2020).

As already discussed in the primary sector analysis, India is a major global producer of the bioenergy crops. By the

optimization of production, process and usage, India not only can satisfy its own needs, but can be a global powerhouse.

The energy sector's transition from fossil fuels to renewables faces strategic and economic complexities. While the National Energy Policy (NITI Aayog, 2021) acknowledges global dependence, its impact on India's renewable ambitions requires greater focus.

For that, the Indian government has taken an initiative of National Green Hydrogen Mission.

National Green Hydrogen Mission:

The Union Cabinet approved the National Green Hydrogen Mission on January 4, 2023, with an outlay of ₹19,744 crores, aiming to position India as a global hub for green hydrogen production. By 2030, the mission targets the development of at least 5 MMT (Million Metric Tons) of green hydrogen production capacity annually, supported by an additional 125 GW of renewable energy capacity. The initiative is expected to attract over ₹8 lakh crores in investments, create more than 6 lakh jobs, reduce fossil fuel imports cumulatively by ₹1 lakh crore, and abate nearly 50 MMT of annual greenhouse gas emissions. This transformative mission aligns with India's climate goals and its commitment to energy self-reliance and sustainability.

India is accelerating its green hydrogen mission with global partnerships, aiming for 5 MMT annual production and major investments by 2030. International-standard truck trials, electrolyzer manufacturing, and pilot projects show how India is integrating with global clean energy efforts (PIB, 2025).

India is using green hydrogen as a strategic tool for energy security, economic growth, and international positioning. With global partnerships (EU, Japan, Gulf, Quad), export ambitions, and industrial plans, India is turning green hydrogen into a symbol of tech-powered globalization and climate leadership (Gili & Blasio, 2024).

India's other major energy sources are discussed as below.

Coal

The data tables used to produce the figures are provided in Online Resource 1 Table D1.

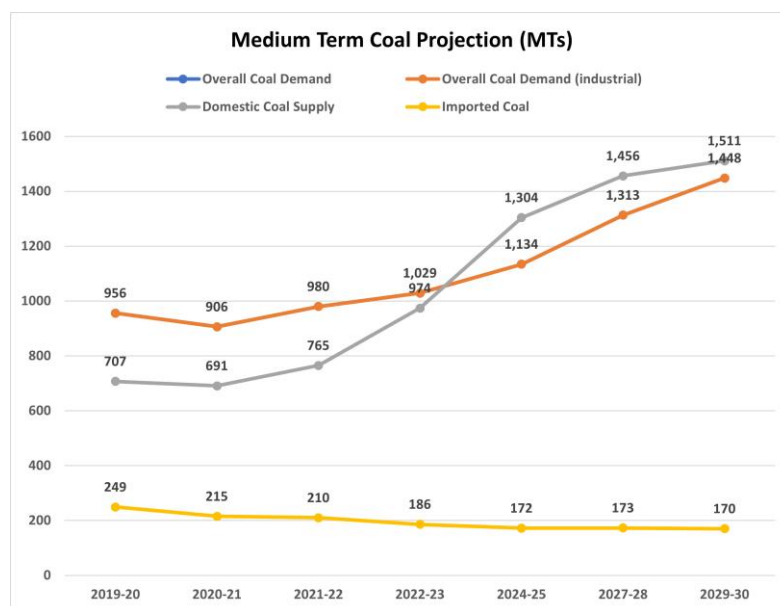


Figure 9: India's Medium Term Coal Projection

The figure 9 projects India's coal demand and supply trends from 2019-20 to 2029-30 (Ministry of Coal, 2022). Both overall and industrial coal demand are rising, while domestic supply is expected to surpass demand by 2023-24, reducing import dependence. Imported coal shows a steady decline, reflecting self-reliance and aligning with India's energy strategy. The growing supply-demand gap suggests potential for coal exports. However, balancing energy security with environmental goals requires investments in cleaner coal technologies and renewables to ensure

sustainable growth. Recent years have seen low coal imports relative to demand and usage.

As per the government's planning, due to the "National Green Hydrogen Mission 2030" the imports of the fossil fuel will be **reduced by Rs. 1 lakh crore**.

Electricity

The data tables used to produce the figures are provided in Online Resource 1 Table D2.

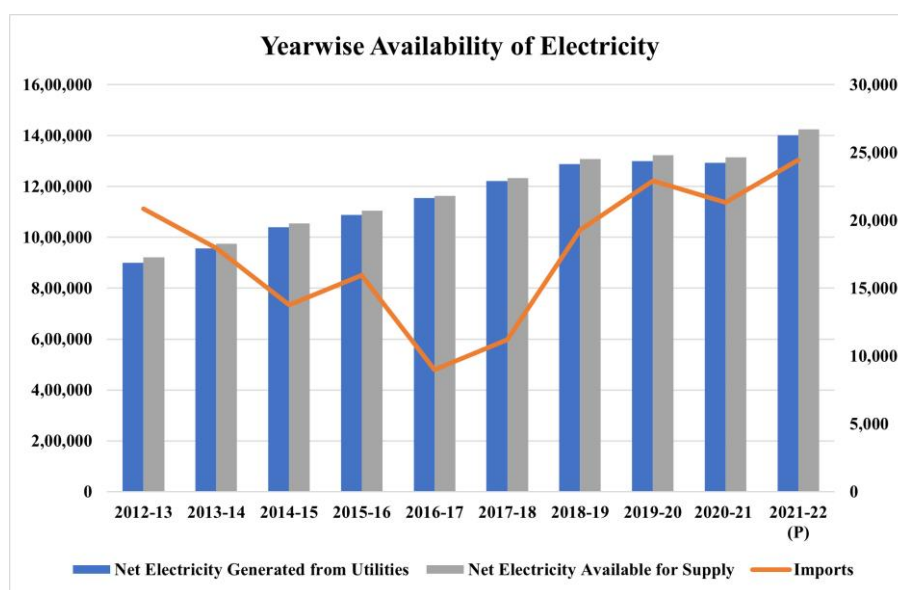


Figure 10: Year wise Availability of Electricity in India

The figure 10 shows a steady increase in net electricity generation and availability from 2012-13 to 2021-22, indicating rising demand. Both parameters have a high positive correlation, reflecting self-reliance despite fluctuating imports (Ministry of Statistics and Programme Implementation, 2023). The trend highlights India's progress in meeting energy needs due to population growth, industrialization, and urbanization. Optimizing domestic production, reducing imports, and investing in renewables,

grid infrastructure, and storage are crucial for long-term energy security and sustainability.

Year wise availability of Crude Oil, Petroleum Products and Natural Gas

The data tables used to produce the figures are provided in Online Resource 1 Table D3.

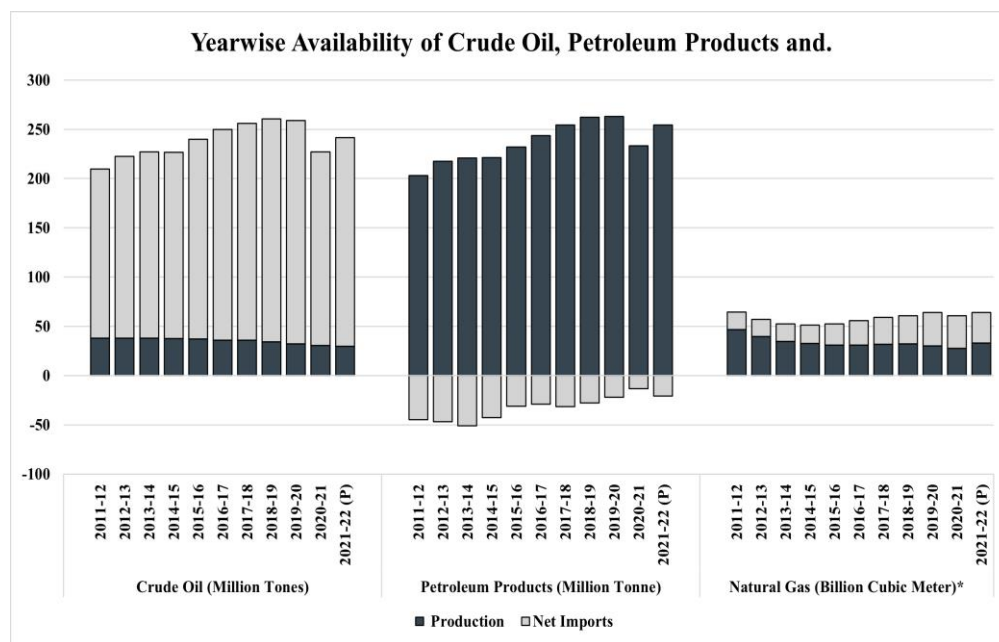


Figure 11: Year wise availability of Crude Oil, Petroleum Products and Natural Gas in India

As per the figure 11, India is having almost the same number of imports and production of Natural gas (Ministry of Statistics and Programme Implementation, 2023). We can see the identical charts of the crude oil imports and petroleum products exports. Though it is true that India has **negative net imports** of petroleum products with having significant amount of domestic production, it is totally dependent on the import of the crude oil.

Theoretical & Empirical Analysis

Correlation of Crude Oil and Petroleum Products: ⁴

The dataset used for this analysis is provided in Online Resource 1 Table D3.

Table 7 Correlation Matrix of Crude Oil Imports and Production of Petroleum Products

	Crude Oil Imports (Million Tonnes)	Production of Petroleum Products (Million Tonnes)
Crude Oil Imports (Million Tonnes)	1.000000	0.984054
Production of Petroleum Products (Million Tonnes)	0.984054	1.000000

⁴ Note: Due to the small sample size, some correlation values appear extreme and should be interpreted with caution.

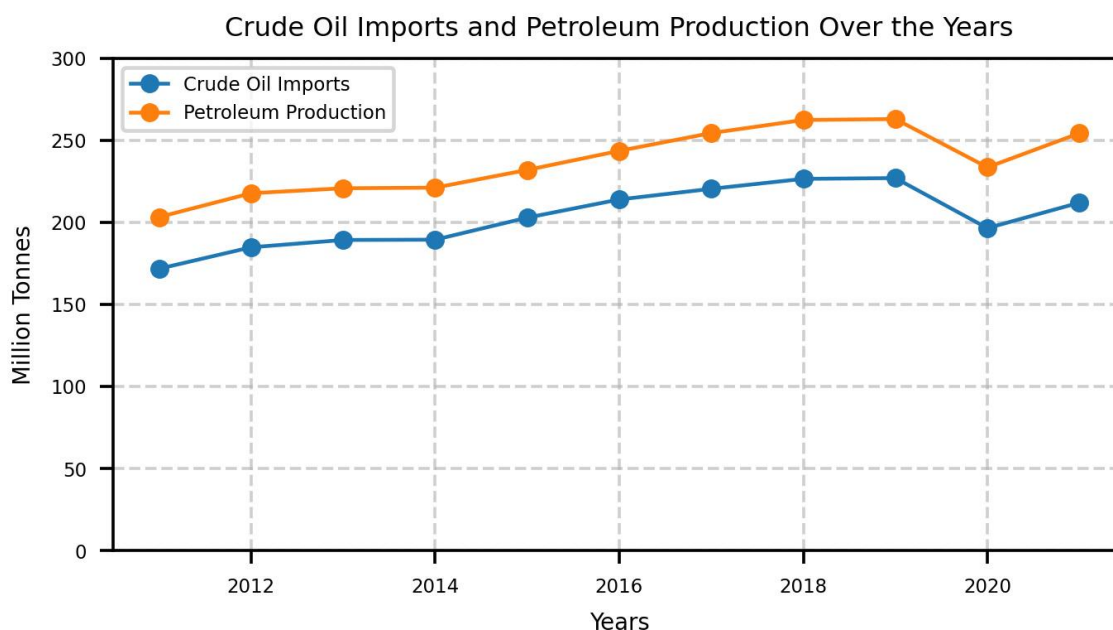


Figure 12: Crude Oil Imports and Petroleum Production comparison over the years

India shows both aspects of dependent and self-reliance in the energy sector. It is self-reliant for coal, having a surplus in the domestic production on one hand and is highly dependent for petroleum on foreign supply.

India's crude oil production has stagnated, while net imports have steadily increased, making the energy sector vulnerable to global price fluctuations and geopolitical risks. Similarly, natural gas production has seen minimal growth, with imports meeting rising demand from power, fertilizer, and transport sectors.

Petroleum product production is improving, leading to a high trade surplus, but remains dependent on imported crude oil, highlighting the need for greater exploration, energy diversification, and renewable adoption to reduce import reliance.

As per the table 7 and figure 12, a strong positive Pearson correlation (0.984) exists between crude oil imports and petroleum product production, indicating that higher crude imports drive output. However, this reliance reflects India's heavy spending on crude imports instead of increasing domestic production.

The National Green Hydrogen Mission aims to not only achieve self-reliance but also shift demand from crude oil to green hydrogen, reducing long-term dependency on fossil fuels.

1. Finance & FDI

Banks are the primary source of funds for any economy. In India, globalization allows banks to expand internationally and boost profitability but may shift focus from domestic markets.

According to an RBI report, India's GDP is projected to rebound, creating investment opportunities across sectors. However, while globalization increases competition among Indian banks, deglobalization could restrict foreign capital inflows. Trade liberalization and reduced barriers further strengthen their global presence.

A key concern is security risks from bank servers operating in multiple countries, increasing the potential for payment system weaponization. Maintaining a balance between global expansion and domestic financial stability remains crucial. Deglobalization, however, can promote data localization to prevent foreign data surveillance and better enforce data protection laws. [Personal Data Protection Bill, 2019] (Sharma A. B., 2021).

India's self-made digital payment systems, UPI and RuPay, have achieved global recognition, with digital public infrastructure gaining attention from G20 nations and international organizations—an opportunity enabled by globalization.

Recent deglobalization trends, such as the USA's withdrawal from the Trans-Pacific Partnership and Brexit, signal a pullback from major free trade agreements. While India was not part of these agreements, their indirect effects on global trade could impact its economy.

Weakening global growth and trade present mixed effects on India's external sector. While lower exports may widen the current account deficit (CAD)⁵, falling commodity prices could reduce import costs, helping narrow it. So far, these opposing forces have balanced out, improving India's external sector stability.

Also, there are many major updates in the field of FDI.

FDI limit for insurance sector raised from 74 to per cent to augment our growth potential and global competitiveness during the next five years (PIB, 2025).

India received USD 81.04 billion in FDI in FY 2024–25, with the services sector leading at 19%, followed by software & hardware (16%) and trading (8%). From 2014–25, India attracted USD 748.78 billion in FDI—a 143% rise over 2003–14—accounting for nearly 70% of total inflows in the past 25 years (PIB, 2025).

FDI (Country-Wise)

The data tables used to produce the figures are provided in Online Resource 1 Table E1.

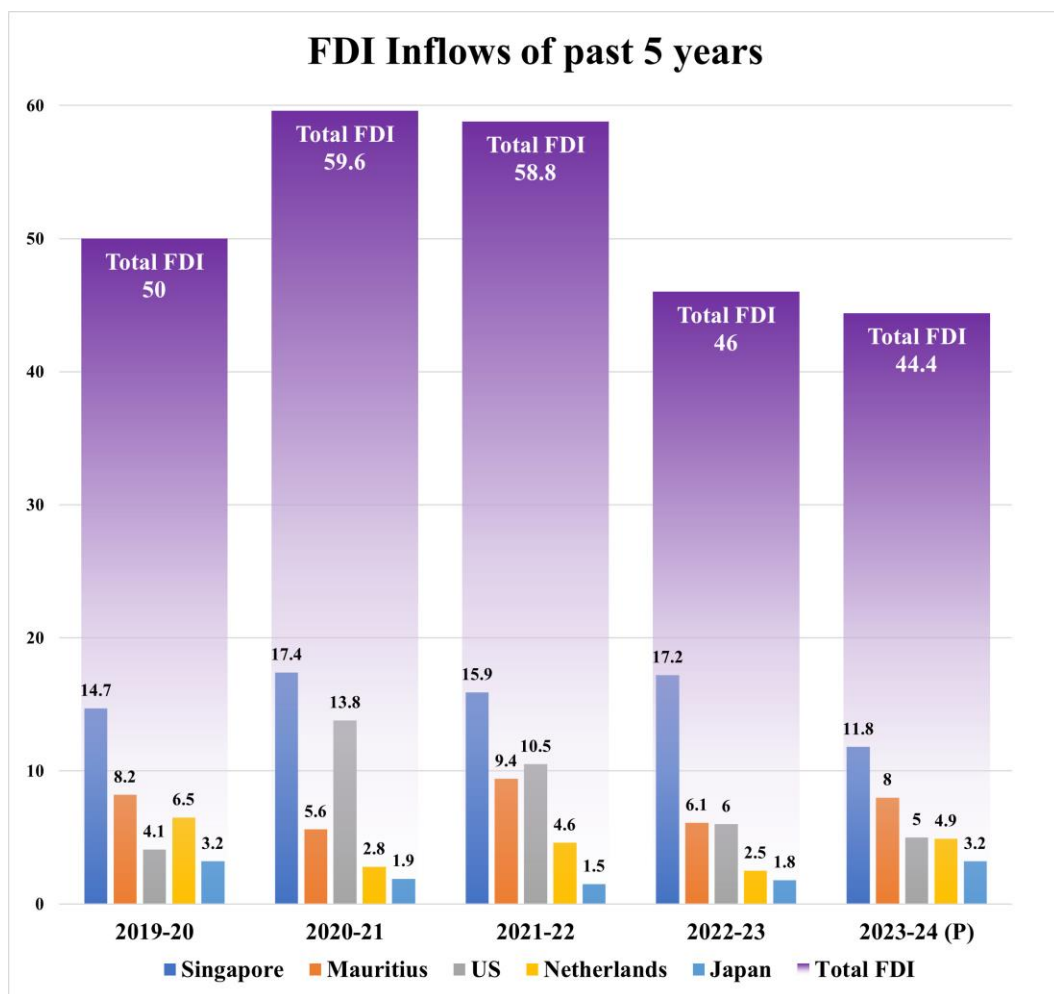


Figure 13: India's FDI Inflows (country wise) of past 5 years

⁵ CAD is the situation where a country's imports of goods, services, and transfers exceed its exports, leading to a net outflow of foreign exchange.

As per the figure 13, Foreign Direct Investment (FDI) inflows to India have fluctuated over the past five years, peaking at \$59.6 billion in 2020-21 before declining to \$44.4 billion in 2023-24 (RBI, 2024). This drop reflects global economic disruptions, policy shifts, and investor sentiment changes.

Singapore remained the top investor, benefiting from its tax-friendly policies, though its contributions fell from \$17.4 billion in 2020-21 to \$11.8 billion in 2023-24. Mauritius maintained a steady presence, while US investments dropped sharply from \$13.8 billion to \$5.0 billion, possibly due to geopolitical factors. The Netherlands and Japan

showed moderate fluctuations, while the UAE and other emerging investors contributed steadily.

Despite the peak during the COVID-19 pandemic, FDI has since declined, necessitating policy reassessments, diversification of investment sources, and sectoral improvements to ensure long-term stability.

FDI (Commodity-Wise)

The data tables used to produce the figures are provided in Online Resource 1 Table E2.

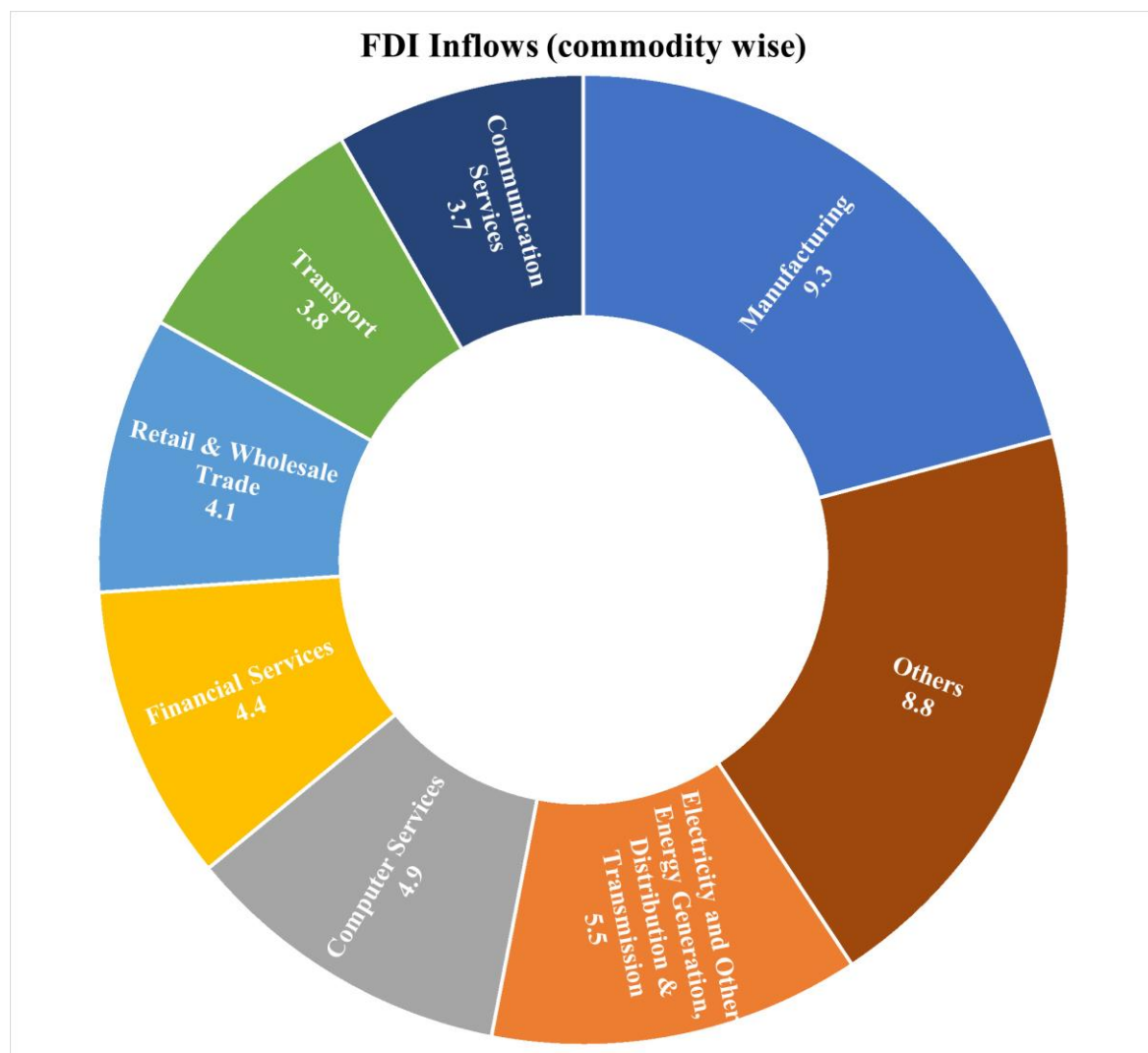


Figure 14: India's FDI (commodity wise) Inflows in 2023-24

The figure 14 highlights sector-wise FDI inflows into India from 2019-20 to 2023-24 (provisional), revealing key trends in investment distribution (RBI, 2024).

Manufacturing remained the top recipient, peaking at \$16.3 billion in 2021-22 before declining to \$9.3 billion in 2023-24, indicating challenges requiring policy attention. Energy, especially electricity and renewables, saw steady

growth from \$2.8 billion in 2019-20 to \$5.5 billion in 2023-24, driven by India's green initiatives.

Computer services surged in 2020-21 with \$23.8 billion but dropped sharply to \$4.9 billion in 2023-24, signaling a potential slowdown in IT investments. Financial services grew moderately, reaching \$4.4 billion in 2023-24, while retail and wholesale trade remained stable at around \$5 billion annually.

Communication services peaked at \$9.2 billion in 2020-21 but declined to \$3.7 billion in 2023-24, suggesting shifts in telecom investments. Education, research & development peaked at \$3.6 billion in 2021-22, reinforcing India's innovation potential. Construction and real estate remained minor contributors, with room for growth through targeted policies.

Overall, manufacturing, energy, and IT services continue to drive FDI, but sustained growth across sectors requires policy support for innovation, infrastructure, and green energy to attract stable investments.

We can clearly see that how is India dependent on the foreign investments, as countries around the globe are. But a noticeable thing here is that how strategic are the equations. It is the Indian entrepreneurship that is going to Singapore and then again investing in India itself

India's financial sector is closely linked with global markets. Banks are expanding abroad, and digital systems like UPI and RuPay are gaining global reach. FDI has supported key sectors like manufacturing, energy, and IT, though recent declines in some areas show the need for better policies and more sectoral focus. Country-wise data shows that much of the FDI, especially from Singapore, often comes from Indian entrepreneurs investing back into India. This highlights both global dependence and the need for stronger domestic systems, data protection, and a wider base of investment sources.

1. Other

India's PSLV has become a global platform for satellite launches, boosting India's role in the international space industry. By launching satellites for countries like the USA, UK, and others, and enabling cost-effective access to space, PSLV exemplifies how India's space program integrates with and supports global cooperation in science and technology. This success story also highlights how globalization can work in India's favor—combining

domestic innovation with global partnerships to create mutual benefits in space exploration (Mane, 2024).

India's space journey reflects technological self-reliance and strategic globalization. Through missions like Mangalyaan and NavIC, and partnerships with NASA, ESA, and JAXA, India globalized its space tech footprint while using it for domestic development—showcasing how globalization can boost national innovation, prestige, and socio-economic gains.

In 2025, India and the US advanced ties through high-level talks covering strategic, economic, and technological cooperation. A key outcome was the launch of the COMPACT initiative (Catalyzing Opportunities for Military Partnership, Accelerated Commerce & Technology) under the iCET framework, aimed at boosting collaboration in defense innovation, clean energy, semiconductors, and emerging technologies through joint R&D and resilient supply chains.

The talks also addressed regional security, counter-terrorism, and a shared commitment to a free, open Indo-Pacific and a rules-based global order. The Indian government highlighted these developments as steps toward long-term strategic and technological alignment (PIB, 2025), while media coverage emphasized the growing depth and trust in bilateral relations amid shifting global dynamics (Hindu, 2025).

CONCLUSION

So far, it is evident that globalization has brought a mixed set of outcomes for India—serving as a catalyst for growth while also introducing certain vulnerabilities. In the defense sector, maintaining self-reliance remains vital for national security, yet foreign collaborations and greater R&D investment offer key avenues for modernization. In agriculture, while globalization facilitates wider trade access, internal inefficiencies continue to challenge consistent surplus generation. The secondary and tertiary sectors, deeply linked with global markets, are particularly sensitive to exchange rate movements, requiring prudent policy oversight. The energy sector shows strength in domestic coal and petroleum production, though heavy reliance on crude oil imports and the uncertain future of alternative energy remains pressing concerns. In finance, FDI inflows are concentrated in a few countries—particularly routed through Singapore—highlighting both increasing global ties and strategic dependencies. These sectoral insights reveal a landscape where opportunities and vulnerabilities coexist, shaped by global shifts and domestic

preparedness. As India adapts to evolving global dynamics, especially amid China's changing trajectory, its potential as a manufacturing and strategic hub becomes increasingly evident—underscoring the need for carefully balanced policymaking.

Until the 1990s, India remained a largely closed economy and relatively isolated in global affairs. In the early 2000s, global hesitation to engage with India was still visible following the 1998 nuclear tests. Soon after, the world was shaken by the 2008 Great Recession, which deeply impacted the Western economies. At the same time, the rise of the Chinese model influenced many developing nations—often at the cost of India's strategic interests.

While the world has witnessed the risks of excessive globalization—seen in the 1929 Great Depression and the 2008 recession—it has also observed the downfall of the Soviet economy in the late 1980s and China's economic slowdown since the 2010s. In contrast, India represents a unique socio-economic model, blending market principles with welfare schemes.

However, India has since made significant strides. It now champions the idea of a multipolar world and actively supports the Global South in challenging colonial-era stereotypes and systemic biases. India provided COVID-19 vaccines to over 150 countries and is leading initiatives like Neighborhood First, Extended Neighborhood, and *Vasudhaiva Kutumbakam*. As noted by Jaishankar (2024), India has engaged actively in global diplomacy through forums like the Quad, FIPIC, I2U2, BRICS, IMEC, and the India–Nordic Summit, alongside collaborations with ASEAN, the EU, Africa, and Latin America. It supports the Global South via grants and soft loans across 78 nations. Skilled migration, especially through H1B visas, has strengthened India–US ties. India also promotes concepts like *Vasudhaiva Kutumbakam*, *Reformed Multilateralism*, and *One World, One Health*, reflecting its commitment to inclusive global governance and UN reforms.

In pursuing global partnerships, India must remain mindful of preserving strategic autonomy. This underscores the importance of balancing collaboration with caution in an unpredictable global landscape. *A party capable of misleading others for your interests can also mislead you when interests no longer align.*

Currently, India is shaping policies that shield its economy from external shocks while tapping into global opportunities. A policy of full deglobalization is neither

feasible nor beneficial—extreme trade barriers could trigger inflation, currency volatility, and diplomatic strains. A more balanced and sustainable path lies in gradually reducing external dependencies by strengthening domestic industries, diversifying trade links, and enhancing foreign exchange buffers to weather global uncertainty. This strategy aligns with the idea of “Slowbalisation” as a route to Re-Globalization.

In essence, it promotes Protected Globalization—a model of Firewall Globalization that ensures continued global engagement while insulating critical sectors from external turbulence. To thrive in the evolving global order, India must remain outward-looking and aim to become a key pole of influence. With a vast workforce and a strong intellectual base, the country is well-positioned to lead with resilience and purpose in this new global paradigm.

Limitations and Scope for Further Research

Despite precautionary measures, this analysis faces limitations due to data gaps and evolving geopolitical uncertainties, making long-term predictions challenging. Sector-specific effects often lack comprehensive or up-to-date data, restricting precise policy recommendations.

Future research should explore emerging technologies like AI and blockchain to enhance trade efficiency, assess climate change's impact on agriculture and energy security, and examine regional trade agreements to mitigate deglobalization risks. Additionally, addressing socioeconomic dimensions—such as income inequality and regional disparities—remains crucial for inclusive development, as emphasized by Bhagwati (2004). Integrating these perspectives will ensure equitable benefits from globalization and a more resilient economic framework.

Statements & Declarations

1. Funding

The authors declare that no funds, grants, or other support were received for the preparation of this manuscript.

2. Conflict of Interests

On behalf of all authors, the corresponding author states that there is no conflict of interest.

3. Ethical Approval

This is an observational study, and no ethical approval was required.

4. Consent to Participate

Not applicable.

5. Consent for Publication

Not applicable.

6. Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

7. Authors' Contributions

Both authors have thoroughly articulated and reviewed the manuscript.

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