

Network Analysis of Trade and Investment Flows between India and its Major Partners

Abstract:

This study aims to apply graph theory methods to analyze the patterns and dynamics of trade and investment flows between India and its major economic partners, such as the United States, China, the European Union, Japan, and others. The study will construct a weighted directed network, where the nodes represent countries and the edges represent the volume and direction of trade and investment flows. The study will use various network metrics, such as degree centrality, closeness centrality, betweenness centrality, clustering coefficient, assortativity, modularity, and community detection, to measure the structure and evolution of the network over time. The study will also examine the impact of various factors, such as trade agreements, tariffs, sanctions, geopolitical events, and COVID-19 pandemic, on the network properties. The study will provide insights into the opportunities and challenges for India's economic integration with the global economy.

Research Questions:

- How has the network of trade and investment flows between India and its major partners changed over time?
- What are the key characteristics of the network in terms of its size, density, connectivity, heterogeneity, and robustness?
- How does India compare with other countries in terms of its network position and role?
- What are the main drivers and barriers of trade and investment flows between India and its partners?

- How do external shocks, such as trade wars, sanctions, geopolitical conflicts, and pandemics, affect the network structure and dynamics?
- What are the implications of the network analysis for India's economic policy and strategy?

Data Sources:

The study will use data from various sources, such as the World Bank⁷, the International Monetary Fund^[10], the United Nations Comtrade, the World Trade Organization, and the World Investment Report. The data will cover the period from 2000 to 2022.

Methodology:

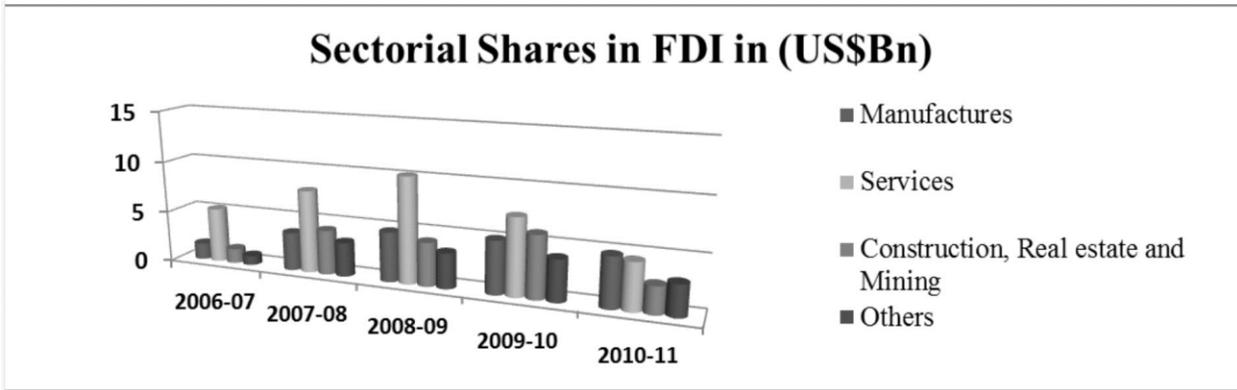
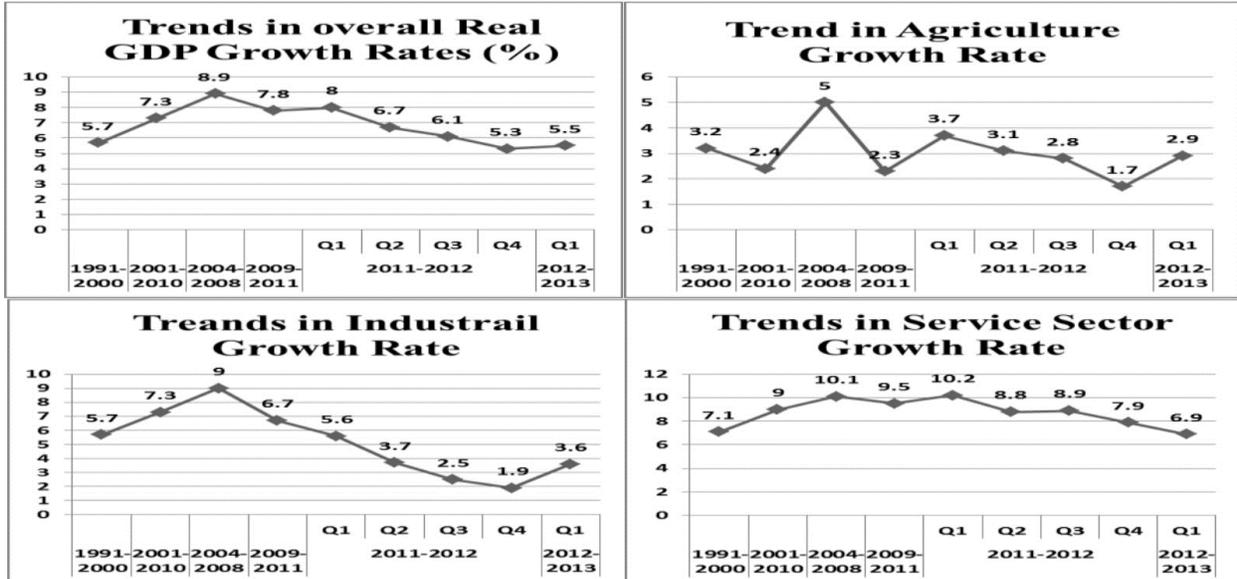
The study will use a combination of descriptive statistics, network analysis, econometric modeling, and scenario analysis. The study will use Python and R programming languages and libraries, such as NetworkX, igraph, statnet, and Gephi, for data processing, network construction, visualization, and analysis. The study will also use Stata or EViews for econometric modeling and forecasting. The study will follow the steps below:

Data collection:

The study will collect data on bilateral trade and investment flows between India and its major partners from various sources. The data will be cleaned, harmonized, and aggregated at the country level.

The growth dynamics altered the structure of the Indian economy with a decline in the share of agriculture from 28.4 per cent in the 1990s to about 15 per cent in 2009-11. There was corresponding gain in the share of services, including construction, from 52 per cent to 65 per cent during the same period. What is, however, of concern is that the share of industry has remained unchanged at around 20 per cent of GDP. This suggests that India's growth acceleration during the last two decades has been dominated by the services sector. The pace of

average annual industrial growth had nevertheless picked up from 5.7 per cent during the 1990s to 9 per cent during 2004-08 before being interrupted by the global financial crisis.



Network construction:

The study will construct a weighted directed network for each year from 2000 to 2022. The nodes will represent countries and the edges will represent the volume of trade or investment flows from one country to another. The edge weights will be normalized by the total trade or investment flows of each country.

Network analysis:

The study will compute various network metrics for each year and compare them across time and countries. The study will also identify subnetworks or communities within the network using modularity optimization or other methods.

Econometric modeling:

The study will estimate gravity models or other models to examine the determinants of trade and investment flows between India and its partners. The study will also test for the effects of various factors, such as trade agreements, tariffs, sanctions, geopolitical events, and COVID-19 pandemic, on the network properties.

Scenario analysis:

The study will simulate different scenarios of trade and investment flows under different assumptions or shocks. The study will compare the outcomes of different scenarios in terms of their impact on the network structure and dynamics

Expected Outcomes: The study expects to find that:

The network of trade and investment flows between India and its major partners has grown in size, density, connectivity, heterogeneity, and complexity over time.

- India has become more central, influential, and integrated in the network over time. However, India also faces more competition, vulnerability, and uncertainty in the network.

- Trade agreements, tariffs, sanctions, geopolitical events, and COVID-19 pandemic have significant effects on the network properties. Some factors enhance cooperation and integration while others induce conflict and fragmentation.

- Network analysis can provide useful insights for India's economic policy and strategy. For example, network analysis can help identify potential markets or partners for trade or investment diversification or expansion. Network analysis can also help assess the risks or opportunities of different policy scenarios or external shocks.

Limitations: The study acknowledges some limitations in terms of data availability, quality, reliability, comparability, timeliness,

and coverage. The study also recognizes some limitations in terms of methodological assumptions,

validity,

robustness,

and generalizability. The study will address these limitations by using multiple data sources,

methods,

and sensitivity analyses.

Source:

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