

**Title:** An Exploratory Analysis of India's Foreign Trade

**Authors:** Praxal Patel - psp334, Dhara Mungra - dam797, Anjali Agrawal - aa7513

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## Abstract

The project focuses on analyzing the data for import and export of goods to gain insights about how a country's import and export relations with foreign countries have evolved over the years and the direction where the country is heading to. We have used several visualization tools for extracting useful insights regarding the Indian Trade and to identify any inconsistencies with prior extracted insights and knowledge.

## 1 Introduction and Motivation

India was a closed economy due to the high average tariffs and the extensive quantitative restrictions on imports, before the economic liberalization and foreign investment allowed only Indian ownership of businesses which had a huge impact on the country's economy. But India's economy has improved significantly since the liberalization because of the increased foreign trade. Thus, analyzing the import and export of goods since then would help us gain insights about the changing pattern of the country's import and export relations with foreign countries over the years.

## 2 Methodology

We have extracted the dataset available at [1] using web scraping tools such as Selenium [2] and Chromedriver to retrieve the import and export trade data from the years 1997-2020.

The website had a nested structure wherein the user needed to enter the country of his/her choice from the dropdown list and the year he/she needed the data for; and after submitting the query, the user was redirected to a page having results of the export/import trade for that particular country and year. The information on this page was in the structure of a table; thus we needed to extract the information from HTML table tag. We run a loop for the years 1997-2019 and all the countries present in the drop-down list to retrieve the data. We follow this procedure for both import and export data. Features used from the dataset are as follows- 1) HSCode [3] - Harmonized System (HS2) Code (internationally standardized system of numbers to classify traded products), 2) Commodity- Name of commodity as per HS2, 3) Country - Country where the commodity was exported to/imported from, 4) Year - Year of export/import, 5) Value - Value of export/import (in million US Dollar).

Data instances containing the missing values for the "Value" feature representing the value of import or export in US million dollars were removed as imputing them and replacing them with mean or median would be wrong. This is because they are not an accurate representation of the sample. We have removed the duplicates and the trades which corresponded to 0 value. To further understand the data better and identify the relations between various trade we have performed the uni-variate and bi-variate analysis of the variables by finding the statistical measures, correlation matrix and by using the data visualization tools such as the histogram and box plot. Since the dataset contains only 5 columns, we have engineered more features like annual "import growth rate", "annual export growth rate" and "trade deficit", "HScode section" to categorize all the products belonging to a particular category into the same category, and "Country Code" representing 3-digit ISO country code to visualize the export and import

values of each country to India. Further, we have performed animated visualization to show how the trend in export and import changes both country wise and commodity wise.

### 3 Results and Analysis

- Country-wise analysis

- The highest import of goods to India has been from some “Unspecified” countries for the years 2000-2005.
- The top 5 countries to which we export are same only their position changes. Our neighbors Bangladesh, Nepal, Vietnam, Sri Lanka are present in top 10 list, which shows the neighbour first policy of govt has started yielding fruits and their confidence in India is increasing and thus can be assumed that their dependence on china is decreasing which is good from point of geopolitics.
- USA is the major importer of Indian goods with highest value of export for almost all years. Also China is the top most country from which India import from 2010 and still the value import is rising.
- India was mostly dependent on Middle East Countries for it’s requirements of Crude Oil, but as India signed a deal with Venezuela and as India gained the ability of refining Venezuela’s inferior oil quality (ONGC refining) in the year 2010, India was Venezuela highest Asian Importer of Crude oil. This observation was found when Venezuela entered in the list of “Top Importers for India” in the animation provided in the Jupyter Notebook.
- In a recent statement, by the oil-rich Nigerian Government, it stated that India has replaced the United States as its largest crude importer, as it covered 20–25 percent of India’s domestic oil demand. This is quite evident from the data. But the interesting fact is that highest exported goods to Nigeria are “VEHICLES OTHER THAN RAILWAY OR TRAMWAY ROLLING” which includes vehicles for drilling, carrying goods, etc. An external analysis of led us to the fact that Nigeria allowed Indian companies to set up petroleum plants. We can infer that the required tools (drilling and heavy vehicles) were exported to Nigeria.
- When analyzing the trade relations with Nigeria, we observed that India was a prime exporter of Cereals to Nigeria. The exports significantly dropped for the year 2017-18 wherein a new prime importer of Cereals emerged. Iran became the top importer of Cereals after 2017. This came after the Trade Agreement between the Persian Gulf Nation and India.

- Commodity-wise analysis

- There is a noticeable shift in the export basket, from traditional sectors such as textiles and agricultural commodities. The share of engineering goods has increased significantly along with the increased export of medically important drugs making India the pharmacy of the world.
- There is decrease in the export of petroleum products because of measures like increasing domestic production, promoting the use of biofuel and energy conservation to reduce dependence on imported crude oil. Also the decrease in export of the petroleum products can be attributed to the increased usage of oil produced domestically.
- Increase in the demand for gems and mineral after 2015 can be attributed to the Gold Monetisation scheme which enables individuals, trusts, and mutual funds to

deposit gold with banks and earn interest on the same. Also, the increasing income of the middle class income is driving the demand for this products.

- The reduced demands for nuclear products towards the 2019 can be attributed to the government’s policies to open new uranium mines as soon as possible to reduce the dependence on the imported uranium.
- However it is important here to note that the official statistics often make foreign trade look more important than it actually is. The reason being more than 90 percent of the population in the country still depends on small-scale agriculture and/or employment in the informal sector which means that foreign trade has not really made a dent in mass poverty.
- While India does have internationally successful high-technology industries which provides means of livelihoods for hundreds of millions of people but compared with China’s stunning economic success, Indian development is disappointing.
- Another downside is India’s persistent trade and current-account deficits, indicating the vulnerability to external shocks. Also India’s foreign trade dependencies on the WTO rules adds to the problem as India has not been particularly active in bilateral trading field which is promoted by WTO, and has basically kept endorsing the multilateral approach for long time. Though there are many changes implemented by the country to increase the trade surplus, predicting the future has become even harder with the new policies implemented by the newly elected representatives.

## 4 Discussions

Our proposed methodology to analyze India’s import and export trade using various visualizations gives us insights about how the country’s trade with different countries and for various commodities has changed over the years. Moreover, our analysis about the change in the pattern aligns with the strategic decisions made by the country as discussed in the above section, thus indicating the strength of our proposed approach and its usefulness in making new policies.

The results could be further improved by making more in-depth analysis using HS-Code [3] as here we are just analyzing the change in trends of group of commodity and not any specific product. In-depth analysis would provide more details about the products whose import or export has increased or decreased over the years and would further help in decision making. Also, if provided with the data on quarterly basis and not just yearly we can also use regression analysis to predict future trends.

## 5 Conclusions

This work presents an attempt to use the various visualizations for the analysis of India’s Foreign trade. For the purpose of this project, we have scraped data from [1] website, followed by data cleaning, feature engineering to derive new features and visualization to identify trends and gain insights about country’s changing foreign trade relations over the years. We have further discussed our findings and the possible reasons for certain changes in the trends observed.

Analysis using HS-Code [3] to identify how the trade for any specific product has changed over the years can be considered as a future redirection. This data can further be used to make predictions about future export and import value using regression analysis. Hence, this can be considered as another future redirection.

## References

- [1] Government of India *Ministry of Commerce*. [commerce-app.gov.in/eidb/](http://commerce-app.gov.in/eidb/).
- [2] Selenium *PyPi*. [pypi.org/project/selenium/](http://pypi.org/project/selenium/)
- [3] Harmonized System Codes(*HS Code*). [www.foreign-trade.com/reference/hscod.htm](http://www.foreign-trade.com/reference/hscod.htm)