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Data Science Reflections on Comparative Advantage

Overview

During my junior year, I researched comparative advantage—the idea that countries specialize in certain sectors where they are most productive, and trade to obtain the products they produce least efficiently. Though a mainstay in the theory of international trade, I found current empirical evidence for global trade patterns lacking. My paper shows that current data is insufficient to indicate countries' trade patterns reflect comparative advantage.

Collect and analyze data in a reproducible and ethically responsible manner

My data comes from the United Nations and the US International Trade Commission. I use a "gravity model," common in trade research, which assumes that countries' trade volume depends on relative economic size and geographic distance, just like physical gravity.

Obtain data through searching, scraping, mining or experimental methods

I aimed to assess whether dissimilar economies—that is, economies that specialize in different kinds of production—trade more frequently than similar economies. The World Bank's data on country economic sectors proved critical in this analysis. A country's economy is divided into four sectors: manufacturing, service, agriculture, and industry. I calculate the economic difference between countries by finding the difference in percent concentration in each of these sectors.

Parse, transform and generate wide-ranging data sets for analysis

I focus my analysis on trade relationships where one of the parties is the United States, China, Japan, Germany, the United Kingdom, India, Brazil, and South Africa. The first six of these countries are the world's largest economies. The last two are large economies I included for geographic diversity, since the largest economies are in Asia and Europe. I focus on relationships where a large country is a party because they are likely to have the bilateral relationships and because gathering data from the UN's Comtrade and the USITC is very difficult. These countries should capture most trade relationships.

Statistically analyze data to summarize, draw inferences and make predictions

The data I gathered included 1,242 country pairs over 15 years, providing 16,154 observations. I used five different regression models to estimate the relationship between economic sector differences and trade volumes, finding that the two are either negatively related or not related at all. I include robustness checks by excluding high-income countries that could skew results due to their larger economies, and I add controls that mirror other papers in the literature.

Identify patterns and relationships in datasets using visualization and algorithms

The gravity model of trade uses logarithms when computing expected trade volumes. This makes coefficients on key variables hard to understand, and visualizing the findings was key to assessing the results. I included tables and charts to show that the relationship I found between economic sector differences and trade was negative, not positive as theory would suggest. I illustrated the relationship by applying the estimated coefficients to a hypothetical increase in the US and Sweden's sector differences, showing that trade between the two countries would decrease by 4% with a 10-percentage point increase in sector differences. The charts I created are key to better understanding the results of the paper.

Communicate data methods and conclusions to diverse audiences

International trade impacts everyone, and it's been a controversial political topic over the past decade. Current rhetoric questions the well-established theory that trade positively benefits economies due to comparative advantage. My analysis does not find strong evidence of comparative-advantage-based trade via the sector differences approach, but that doesn't mean it isn't there. I communicate clearly to the reader that my findings are a function of the data I have available—I implicitly assume that countries have only four sectors, when in reality thousands of products are traded daily in international markets. The real conclusion is that further research is necessary to establish a relationship between comparative advantage and trade patterns. Through charts, tables, and careful wording, I convey this information to readers from diverse disciplines to better inform the discussion on international trade.