Nuances of Globalization: A Complete View of Post-WWII International Trade in Data

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Motivation: Since the end of World War II, countries have seen overwhelmingly positive effects from trade. After all, theory dictates that when countries engage in a global value chain (GVC), they specialize in areas of production where they hold a comparative advantage, making global production more efficient and giving consumers a greater variety of products at lower prices. From 1990 to 2017, the global poverty rate fell from 36 percent to 9 percent (some 1 billion people lifted out of poverty) as developing countries increased their share of global exports from 16 to 30 percent. However, economic globalization has not been perfect. The loss of domestic manufacturing jobs to cheaper foreign jobs, the increased vulnerability to global supply chain disruptions, and environmental harm have all been attributed to unrestricted trade. This sentiment has called for governments to question the benefits of free trade, prompting major countries to raise barriers to trade and protect domestic industries. We thus want to develop an interactive dashboard to help analyze international trade's benefits as well as costs.

Project Goals/Questions: Our project aims to create an interactive dashboard that visualizes the nuanced effects of economic globalization. In particular, the dashboard will help answer:

- **What** goods have been traded by countries since WWII?
- **How** has trade impacted national economies, how have impacts trended over time and differed amongst countries?
- **Who** are the countries or industries that have been the most helped, or hurt, by trade?
- **Why** do countries trade more with some countries than others (determinants of trade)?

Type: Interactive dashboard with various data visualizations

Medium: A Microsoft Power BI dashboard with integrated background datasets that will be displayed as charts, tables, etc. This dashboard will be published to the cloud and thus accessible via a public website. The visualizations will include dynamic filtering, where users can select specific categories or years for which to display data through UI features like sliders and dropdown options.

Size and Scope: Our project will have two main components. First, we will gather between 3 to 10 datasets on trade, covering the time period from the end of WWII to now (1945-2025), and process them in R. Second, we will load the data into Power BI and create an interactive dashboard. The dashboard will have 2-4 pages, with at least 2 visualizations on each page and 1 interactive element (i.e. a slicer for filtering) shared throughout the different pages of the dashboard. The types of visualizations used will vary depending on the data being represented (e.g. line charts for trends over time, scatter plots for association of variables, pie charts to show proportional contribution to a whole, etc.).

Description/Sketch of Final Product: As mentioned in the Size and Scope section, our dashboard will be logically divided into 2-4 pages. **The dashboard's visualization of data will be used to answer the questions.** Below is a potential design involving 3 pages:

- Page 1 (answering **what**): Visualize global trade measures (exports/imports volume, value-added trade, number of trade agreements, FDI) by industry and country over time.
- Page 2 (answering **how** and **who**): Visualize regression relationship of macroeconomic variables (employment, inflation, production) against trade. Rank countries with most extreme regression estimates.
- Page 3 (answering **why**): Visualize regression relationship between trade measures and common determinants of trade (GDP of the trading partners, distance between countries, geopolitical controls), empirically verify gravity model of trade.
- Each page's data visualizations will incorporate sliders and drop-down menus, allowing users to visualize data for specific decades or specific groups of countries. This contributes to more granular analysis for the central questions.

Background Material: The data that the PowerBI dashboard will use will be cleaned and aggregated from its raw state using R. We will create a central github repository where we will upload all code, original data, and final datasets. Although the PowerBI dashboard is only viewable via a website link, we will also download the PowerBI report underlying the dashboard and upload it as a .pbix file to the github repository. Our final submission will include a link to our dashboard and a link to the github repository with our code, data, and PowerBI file. Data on

trade and economic outcomes will be collected primarily from intergovernmental organizations such as the World Trade Organization (WTO) and World Bank (WITS), as they provide datasets covering each country over different years. This ensures both high interoperability of data as these organizations tend to use the same definitions/codes and ensures the data is accessible as CSV files (compared to other collection methods like web scraping).

Possible Challenges: One potential challenge is gathering complete and accurate data. Since some of the information we seek could be quite niche (e.g. trade for a particular industry or small nation), data could be sparsely distributed or not publicly available. Different organizations may also have different frameworks (definitions of certain terms, regions, etc.) or varying ways of calculating the same metric, so we will need to make decisions about which sources to use and how to join data without compromising its integrity. We can mitigate this issue by searching mainly from intergovernmental organizations that provide datasets with common, well-documented frameworks. Another potential challenge is choosing relevant and appropriate variables to include in our dashboard and data visualizations. Without adequate awareness of the strengths and limitations of each variable (e.g. trade in value added, GDP, etc.), it is possible that we will compare variables inappropriately and make visualizations that are not meaningful, or worse lead to faulty conclusions. We can face this challenge by reviewing data visualizations and past literature on international trade, which could help inform us on what metrics are important and suitable for each of our research questions.

2 Project-Specific Rubric Items:

Grade	Item 1: Utility of the dashboard ● Does the data answer our research questions? ● Is the data reliable and complete? ● Is the project scope met?	Item 2: User-Friendliness and Clarity ● Is it clear what variables each visualization shows? ● Are all visualizations and text readable? ● Are the dashboard pages and interactive components easy to navigate?
10% (full score)	-User can draw informed insights for all of the research questions posed in the “Project Goals” section -Data is taken from authoritative	-Labels (graph titles, axis titles, etc.) or supporting notes clearly indicate what each visualization is displaying -No text or visualizations are obstructing

	sources, and any lack of data is minor and properly documented (notes are displayed explaining when data is missing/inadequate) -All aspects of the project scope are met: 3-10 datasets integrated to display different factors/aspects of international trade, 2-4 pages in the dashboard with multiple visualizations on each page, 1 interactive element included (e.g. filtering by time or country)	each other or too small/dense to read -A clean professional interface allows users to effortlessly navigate through different pages and use interactive components
9%	-Users can answer most but not all of the research questions using the dashboard -Data sources seem reliable and lack of data is not severe, but these are not well documented -1 aspect of the project scope is not met (e.g. fewer than 3 datasets used)	-Labels or supporting notes exist but do not clearly explain every visualization -Text and visualizations are occasionally not adequately shaped/positioned, making reading slightly difficult -the interface looks somewhat tight or unprofessional, but navigation is still fully functional and clear
7-8%	-Users can answer only half or the research questions using the dashboard, or can only give bare-bones responses for all questions -Some data does not seem reliable, or a meaningful portion of data is missing without notice -2 aspects of the project scope is not met (e.g. only 1 page in the dashboard and no interactive component to change filters)	-Labels are missing for some visualizations, making them difficult to understand -Text and visualizations are often not adequately positioned (e.g. some cover each other), making reading difficult -Navigation is confusing but possible
6% or lower	-Users can answer few or none of the research questions using the dashboard -Data is drawn from biased or unreliable sources, or joined in an inappropriate way. -More than 2 aspects of the project scope is not met	-There are labels and supporting notes for few/none of the visualizations, leaving users completely unclear on what the visualizations display -It is hard to read most or all of the visualizations due to obstruction or shape -Navigation through the dashboard pages/interactive component is not possible