CS171 PROJECT PROPOSAL – INTERNATIONAL TRADE

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BACKGROUND AND MOTIVATION

In a globalizing economy, understanding international trade is important to understanding the economy as a whole. However, most data on international trade allots the total value of the final product to the country that manufactured it. This would be an accurate measurement if it were not for the fact that many countries do not produce the entirety of a product from raw materials, often importing components or labor from elsewhere. In this case, it is more useful to assign numerical values based on the percentage that has truly been contributed by that country, in order to show a different perspective on international trade and productivity than the traditional final product-focused data we are often presented with.

We will be looking at the Trade in Value Added initiative (more details under Data), which has brought together several existing areas of world trade to attempt to gain a better picture of flows and the overall economic impact – International Trade Statistics, Input-Output Tables and Bilateral Trade Database by Industry. The resulting database provides a substantive basis for some myth-busting analysis: e.g. how much of the value-added of your IPhone comes from China, and how much is actually value-added from other countries (such as design, research, raw materials, etc.).

Since the major database revision work has taken place only recently (in 2012) and completion took place in 2013, the database is relatively new. So far, it has not been effectively visualized, apart from a bubble and popup map here on OECD datalab: http://www.oecd.org/statistics/datalab/trade-in-value-added.htm. However, the database provides a wealth of opportunities to show connections and relative shares on maps, and importantly, the database is rich enough to start off small and to work up to a more complex visualization with more facets of connection/interaction, time permitting.

PROJECT OBJECTIVES

We want to understand the productivity of each country in the international economy, which we will measure by looking at the value of its exports. However, we also understand that this data is often skewed. Our project will give us a clearer picture of how countries do interact in the global economy. It will also allow us to watch trends in productivity among different countries, especially since the data we found does not have very good visualizations for it. In visualizing size of flows and linkages between countries, we will learn:

- How much of trade is value-added: and as source or receiver?
- What are the cross country linkages and how can we effectively show them on a map?
- What are the breakdowns by source country and by industry group (i.e. is there more value-added in services or raw materials?)?
- How can we visualize components and structural factors together to show those that are dominant – and that may go against accepted stylized facts?
- What are the special cases and details of trade in value-added flows?
- Are there 'trade in value-added' hubs? In what industries? How are they different from traditional 'trade' hubs?

DATA

We will be gathering data from the Organization for Economic Co-operation and Development (OECD)'s database on Trade in Value Added (TiVA), which are described on their site as "designed to better inform policy makers by providing new insights into the commercial relations between nations". The TiVA values reflect the value directly added by that country to their exports rather than the total value of the export, and, as a result, is a better economic indicator because it gives us a more accurate measurement of productivity. A link to the OECD page are using can be found here: http://www.oecd.org/sti/ind/measuringtradeinvalue-addedanoecd-wtojointinitiative.htm

The data is organized by various themes, but we will most likely be focusing on the following views:

1. DB: OECD-WTO Trade in Value Added (TiVA): Value added in gross exports by source country and source industry – Choropleth map + flows, click to indicate (Tooltips/symbology on share), – using industry selection, + symbology on content shares

2. DB: OECD-WTO Trade in Value Added (TiVA) - May 2013; full database [http://stats.oecd.org/index.aspx?r=151547]

3. With partner 'World': Basic decomposition of gross exports (Gross Ex. broken down; Domestic value-added embodied in Gross Ex.) – Choropleth map, click to indicate decomposition.

4. With partners – flow map (Total Gross Ex; Foreign value-added content of Gross Ex.)

5. By industry with partner World: Gross Exports and: domestic industry value-added content; Indirect value-added content; re-imported domestic value-added, foreign value-added content. – Choropleth map – using industry selection. + symbology on content shares

6. (if time) Revealed comparative advantage by country – Choropleth map using industry selection.

7. DB: OECD Global Value Chains indicators – May 2013: 3 indicators, (1) production stages, (2) distance to final demand, (3) participation index. By country and by industry. – Choropleth map – using industry selection. Symbology

DATA PROCESSING

The data we'll need to extract is mainly the TiVAs for each country. The OECD typically has very high quality data and the information is already presented in a query table on the OECD.stat

webpage, so they should not present processing difficulties. But there will be some overhead to get the databases via API. Databases can be static flat-files as csv, JSON, or SDMX XML. Acquisition of shapefiles and production of geo-datasets for mapping will require additional processing time.

VISUALIZATION

The visualization will be based around a map. The map will show the amount of gross exports for each country by shading the countries by a color scale. Since the color scale isn't good for quantitative comparisons, mousing over the countries on the map will display a tooltip displaying the quantitative data, and where relevant, symbology to reflect shares or breakdowns. We will also have a bar chart below the map for more direct comparisons between different countries. Since there is a large amount of countries, the bar chart will only display a subset of them to help keep the chart simple and readable. The user of the visualization can choose which countries to display on the bar chart by clicking on that country on the map.

We are considering a few different options for what to display on the bar chart. Possibilities include comparing gross exports to value added by either showing the amount of gross exports and value added or by showing percentage of domestic value added compared to the percentage of foreign value added for the country's exports. We can also compare what industries are most productive for each country by showing the exports by industry for each country. We can also show how exports grow by time. The dataset includes data for a few time periods (1995, 2000, 2005, 2008, and 2009) however the most recent periods are the most complete. Another possibility is to show how much each country trades with each other by breaking-down the exports by destination countries.

MUST-HAVE FEATURES

The choropleth data map and bar chart showing gross exports and value added are the must-have features for this project. Those components are necessary for our visualization to convey the information that we want it to show.

OPTIONAL FEATURES

Breaking-down the data by time period, industry, or by trade partners are optional features. These would be nice to have but aren't necessary for the main message we are trying to convey. We could incorporate this additional information into our visualization by including

- Arrows with country linkages (Value-added source or Gross-exports)
- Selection by bar chart indicating shares and with an industry group selector panel
- Year of data selection
- Since this is trade data, a chord graph or hierarchical edge bundle graph would have natural analytical value for presenting cross-country flow breakdowns.

Time permitting, more complex breakdowns of the data are possible with this dataset, for example using the chord diagram to select countries, and linked supplementary bar charts using auxiliary data. Additional features such as brushing / focus features on the map or bar charts are possible as is additional symbology to visualize specific aspects of trade flows by country.

PROJECT SCHEDULE

- Week of March 24: Process data, exploratory data analysis, start working on visualization
- Week of March 31: Finish implementing must-have features
- **Thursday April 10: Function project prototype due**

- Week of April 14: Project review with the TFs
- Week of April 21: Make last minute changes, create screencast
- **Thursday, May 1: Project due**