

The United States International Trade Process Book

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Background and Motivation:

There are a lot of people interested in the history and trend of the US international trade, especially in the election year. It is always a hot topic in the debates and the audiences are eager to get an idea about it. While they can easily find the numbers from the government report, a good visualization of the boring numbers however will assist them to appreciate and understand the information greatly. We would like to provide such a visualization with which people can easily understand what's going on vividly.

The questions we want to answer:

We try to answer the following focused questions:

- The general increasing trends of US international import and export trade in recent 10 years.
- What is the core goods or categories in US international trades? How do they distribute?
- Who are US's main trade cooperators and how much percentage covered by each?
- In vertical comparison, toward specific category, which country are the main cooperators? Towards specific country, which kind of goods/services attributes more?

Data:

We have acquired the data from the government resources:

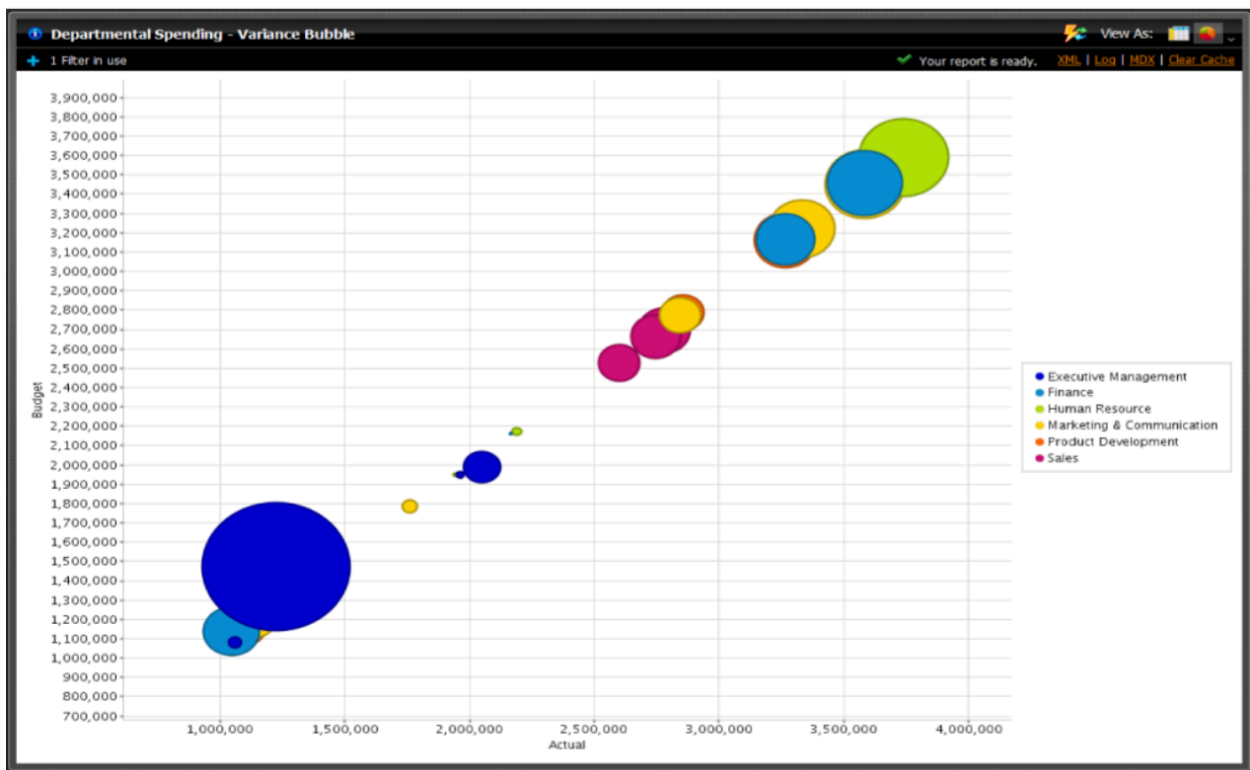
<http://catalog.data.gov/dataset?groups=businessusa4208&tags=international> and
<http://www.census.gov/foreign-trade/statistics/country/index.html>

We have reorganize the data to fit our needs by using Statistical analysis software SAS. The dataset contains very detailed data of export and import of thousands of

items such as wheat, rice, soybeans etc. It is unwise to show each of the thousands items. We categorized the items to a handful of clusters such as food, machinery etc. We write a python script to help us with this procedure. Since we don't know what is the best way to aggregate the data, making a script helps us when we make different decisions.

Design Evolution:

As discussed in our proposal, one of our visualizer which shows the import & export data for different countries would look like:



We planned to the plot dynamic (the circles moves as time lapses) to show the trend. During peer review, we got really good feedback on the drawbacks of this design. Bon and Ryan pointed out some problems:

1. As a matter of fact, most circles are going to be on the same 45° line, with bigger circles on the top and smaller ones to the bottom. This doesn't look very good although it reveals the true data.
2. If we show all the data for different countries, some circles are going to be very small. If we really want to do this, maybe we need to enable zooming.

- Since we only have 10 years' data, we don't expect to see a significant change in this visualizer. Such design is OK, but not visually attractive.

According to their suggestions and our concerns, we redesigned our visualization as described in the next section.

Final design and implementation:

We decided to use bipartite graph implemented by bar charts instead of circle to encode trading amount. The first plot looks like below.

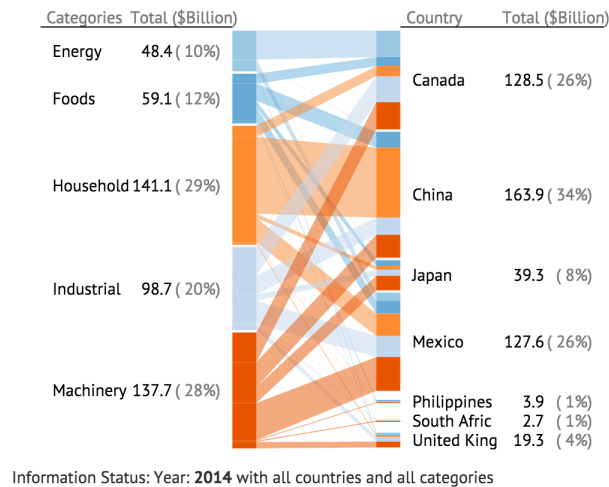


Figure 2: The bipartite graph between countries and categories

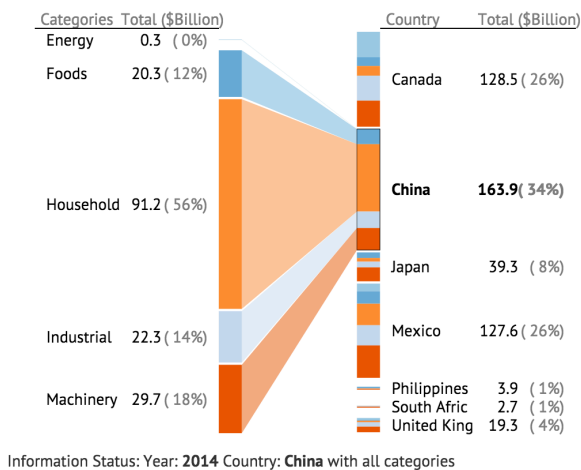


Figure 1 Select a country

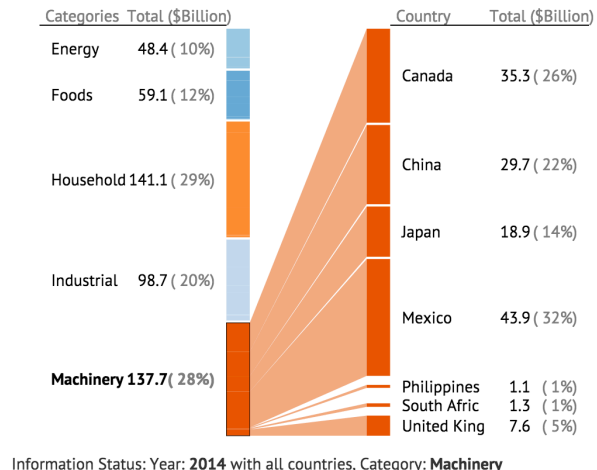


Figure 3 Select a category

As Figure 1, each bar on the left represents the trading amount of a category of goods. Each bar on the right side represents the trading amount of a country. Due to space limit, we only show a few representative counties. We also aggregate the data into main categories. In this way, the visualizer is more readable and more meaningful. The visualization is dynamic: clicking a bar on the country side will cause that country to be selected and the trading amount of the main goods categories for that country will be displayed on the left side, as Figure 2. Clicking a bar on the categories side will cause that good category to be selected and trading amount of that category with different country will be displayed on the right side as Figure 3.

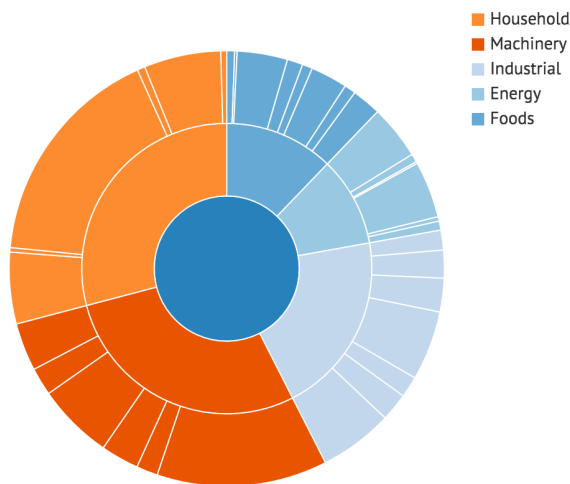


Figure 4 Detail information by a donut chart

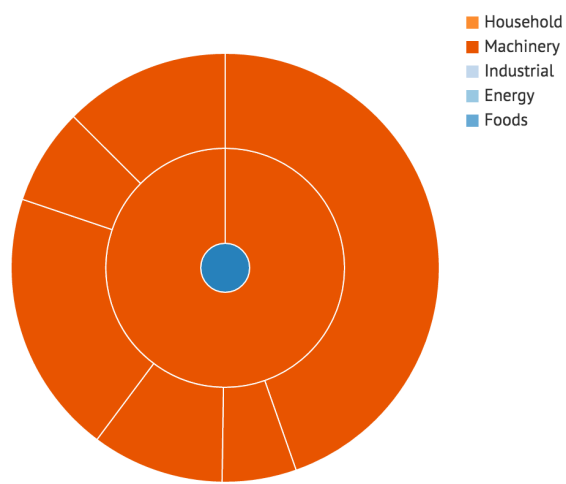


Figure 5 More detail in a specific category

People may want to know more detailed information. So we designed donut chart to display the details as Figure 4. The donut chart has 3 layers. The inner represent the total amount, and the middle one is separated to a few main categories and the outer layers are separated to more detailed categories. And click on one arc on the middle donut will cause that main category to be selected and detailed category for that selected main category will be displayed on the outer layer. The name of the category and its trade amount will be displayed when the mouse hover over the corresponding arc, as Figure 5.

There is an interaction between this donut chart and the bar chart: when a country is selected by clicking a bar on the left side of the bar chart, the donut chart will display detailed information for that selected country. After you select a country, you could further focus on a specific category by clicking one item in left side. And the detail figure will display the certain country and center category, as Figure 6. Further more, you could select different categories successively, and then the detail figure will represent that, too. When you want to see the information of all categories toward the selected country, you could click the “country name” again and it will go back to display the total detail. On the opposite, you could select the category firstly and then to compare trade number towards different countries as Figure 7. When you want to release selection any country or category, click the “Information status”, it will help.

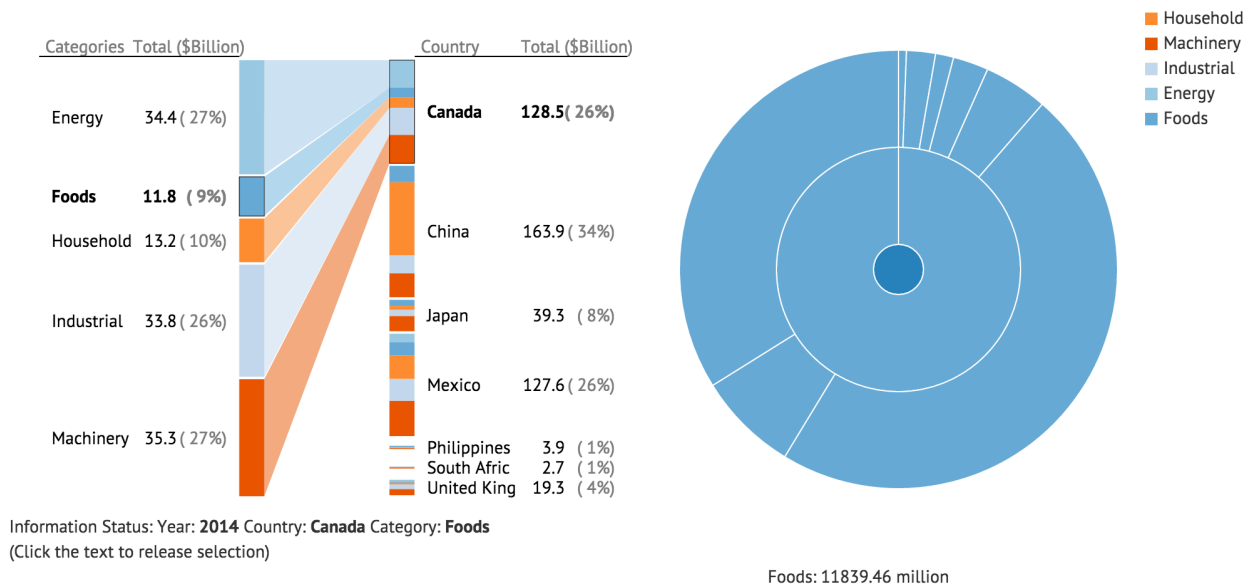


Figure 6 Interaction between two figures I

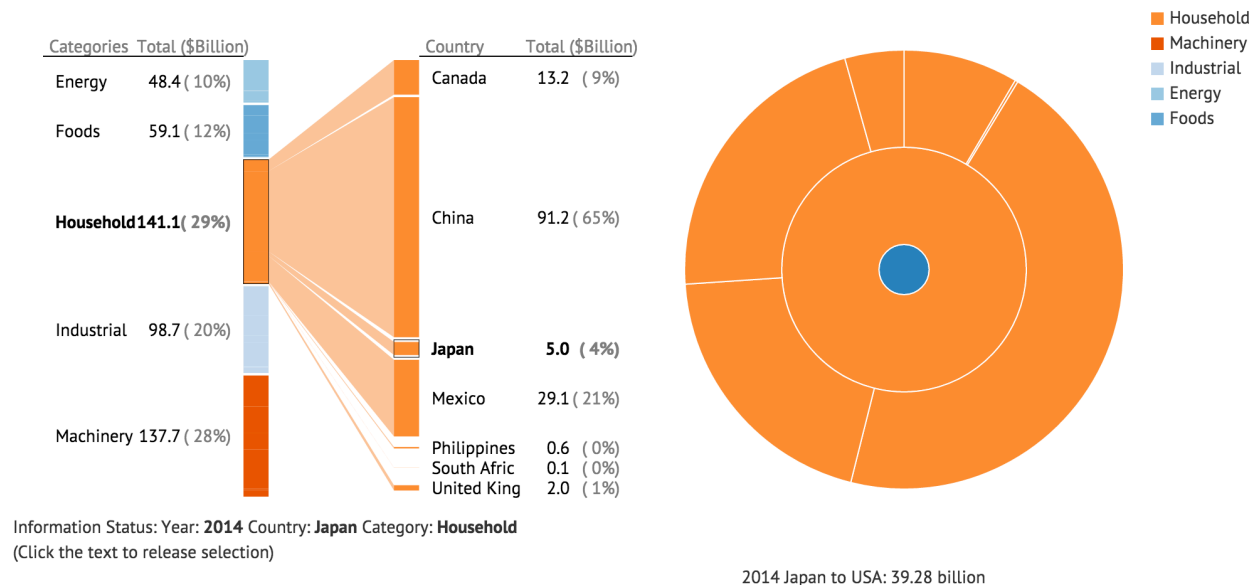


Figure 7 Interaction between two figures II

The top plot figure we designed is a simple line plot the show the trading trend as shown in Figure 8:

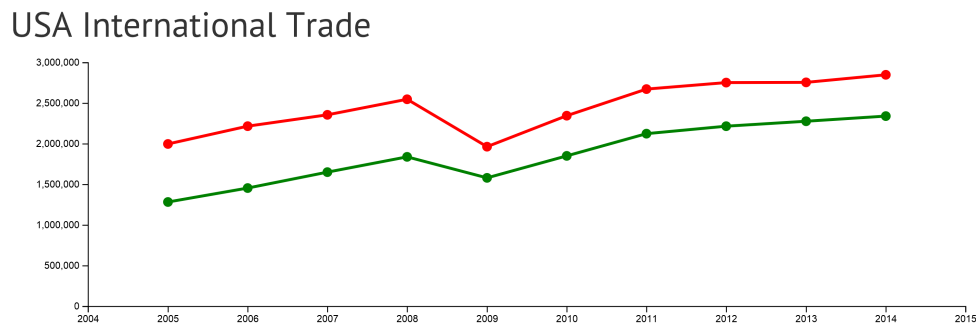


Figure 8 Trading trend in recent 10 years

There is an interaction between this plot and the bar chart and donut chart: clicking one point on the line will cause one year to be selected and the bar chart and donut chart will display information for that selected year.

Evaluation:

Based on our visualization tools, we easily get useful information. For example, the US international trade developed in a increasing trade with time move on. The main categories of international trade are Household, Industrial and Machinery. The main business partners are Canada, China and Mexico. In the business with

Canada, the main import and export trade is the Energy, Industrial and Machinery while with China, the main part is attribute by Household (more than 50%). And the percentage of trade with China keeps increasing. The list goes on.

The main purpose of the visualization is to assist users to appreciate and **understand** trading data. We implemented a rich set of interactive functions and therefor allow the users to make a lot of selections including year, country and category. So the users can easily to look at either the big picture or the details. The graphs are easy to understand.

To improve the visualization work further, we could improve the usage of the line chart to represent the modification trend of certain country, or certain category or both with time. Then it will easier to make a contrast in time.