Information Visualization on Wars and World Trade Datasets

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Abstract. The history of war is as old as the history of mankind [4]. Over the years, thousands of people have died as a result of major and minor wars between different countries. As a result of internationalization, many countries have now traded and communicated culturally. In this study, we address the question of whether or not there has been an increase in the number of wars over the years and explore the relationship between trade and war [2, 3, 6, 7, 9, 11]. By visualizing the Correlates of War datasets [1, 5, 12], which include data on Militarized Interstate Disputes, Wars, and Trade, we visually uncover how economic dependence on trade has affected the number of wars between countries.

Keywords: Information Visualization · D3.js · The Correlates of War Project · Wars data-set · Trade data-set · Militarized Interstate Disputes data-set

1 Introduction

Since the beginning of human existence, war, and the loss of human life that it leads to, has been a reality. After World War I and World War II, many countries traded and communicated culturally. We questioned whether the number of wars had increased or not and how the relationship of trade between each country affects this issue. By analyzing the Correlates of War (COW) datasets [8, 16], which includes Militarized Interstate Disputes, Wars, and Trade, we want to show how the number of countries at war and the number of militarized interstate disputes have changed. In addition, we show how the trade dependency between two countries has had an effect on wars with entire dyadic war records [2, 3, 6, 9, 10]. In addition, using a map, we show which area has had the most disputes, how the number of disputes has changed from 1816 to 2014 and, for each year, how many countries are at war. We also explore how these figures changed over time, whether they have increased or decreased, which countries take part in the major wars, and, for each war record between two countries, how many wars have occurred between the countries which have a trade dependency that is higher than 0.1%.

2 Data

2.1 Data Description on Militarized Intestate Disputes, Wars, and Trade

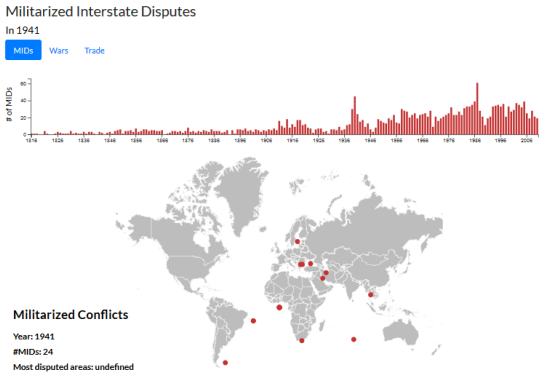
The data on Militarized Interstate Disputes (MIDs) which we use in this paper comes from the COW project, which is a huge dataset related to militarized disputes over the last century. The file name is Militarized Interstate Disputes v 4.2. This dataset is available for all years from 1816 to 2010. Each row includes fields, such as year, dispute number, and location. In the COW project, war is defined as a conflict with at least 1,000 deaths of military personnel. The war data set includes the war number, dispute number, two states, year, and battle deaths. The trade dataset has two kinds of versions. One file has national information, where each row has a country code, state name, state abbreviation, year, import, and export. The other trade file has dyadic information. Each row has a country code1, country code2, year, importer1, importer2, flow1, and flow2. Flow1 represents the export amount of importer2 to importer1 in US millions of current dollars and flow2 represents the export amount of importer1 in US millions of current dollars.

3 Approach and Development

In this section, technical parts of drawing charts will be explained. This explanation will help users to understand how the D3.js codes in each chart work. Readers are encouraged to read this technical explanation with the codes.

3.1 Bar Chart and Map

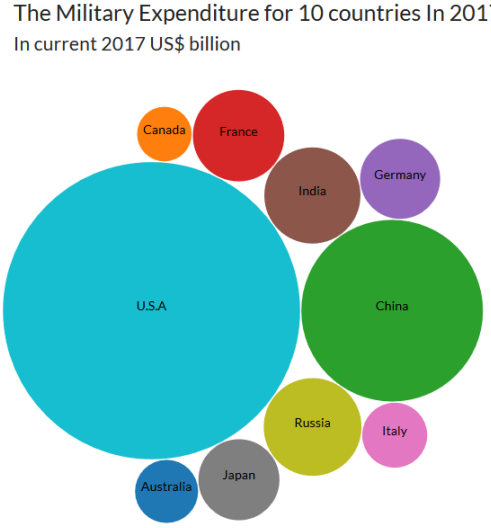
Fig. 1. Bar chart combined with map and scatter plot.



We used the geoMercator function to draw the map. Using the GeoJSON file, we created a projection and drew the path using data join. After completing the data join, we created the bars. When the user hovers their mouse over the bars, the militarized interstate disputes (MIDs) information appears and they can see where the outbreaks of MIDs occurred. We explain and show the corresponding information in the map. We also combine bar charts with the map, using the dots- drawMIDsDotOnMap function to do this. This function is called when the bar charts are clicked. When the users mouse hovers over the MID point, year and location information are shown. Using a similar process, we plot the bars and maps for the Wars and Trade datasets.

3.2 Bubble Chart

Fig. 2. Bubble chart on Military Expenditure.

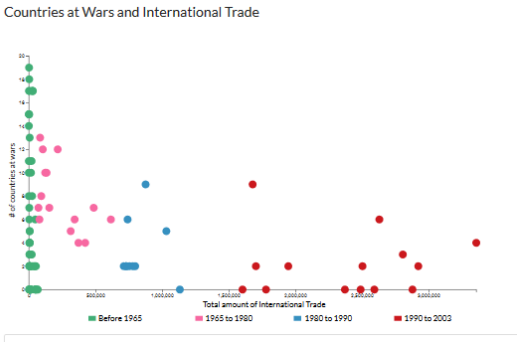


To create the JSON file for the bubble chart, we used the war and trade datasets. We named the JSON file: BothWarAndTradeInter10ForBubble.json. In each part, there are records about wars, trades, the names of major wars, and an explanation. In the JSON file, there are three parts, which are named BeforeWWone, BetweenWWoneWWtwo, and PostWWtwo. The file BeforeWWone includes three periods and each period contains the total number of countries at war during that period. For example, there were 30 countries at war during 18701883. During this period, the major war was the Franco-Prussian war. We uploaded the python file for processing the data named 554DataPreprocessing.py. Using this bubble chart, we explain how the number of countries at

war has changed over time and which wars were major events in each period of interest.

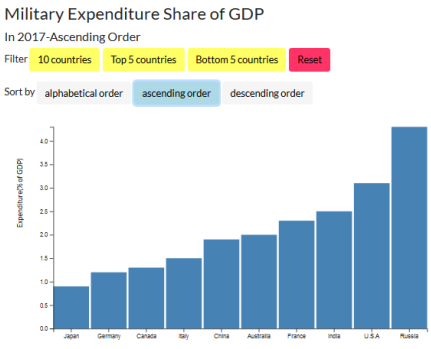
3.3 Scatter Plot

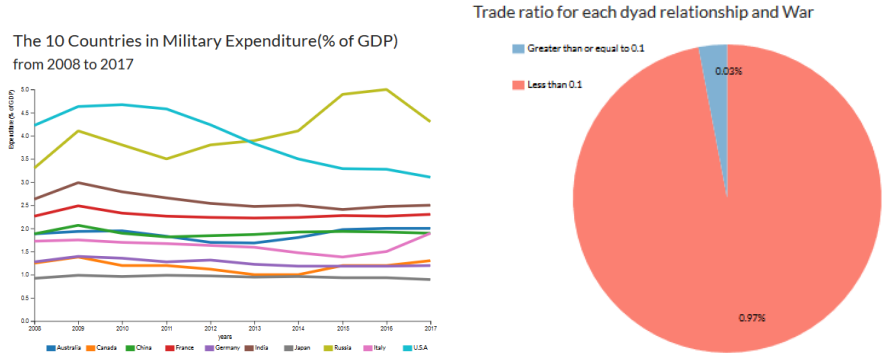
Fig. 3. The relation between trade and war.



For the scatter plot, the HTML code is located in scatter.component.html. To implement this code, we create a CSV file. In the code of the typescript file, we select the div with scatterChart1Div. Each circle was made by using a data join and filled based on the year. When the users mouse hovers over the circle, its edges change thick black and the corresponding year, the number of wars and total trade amounts are shown using a tooltip.

4 Other Visualizations





5 Design and Technical Considerations

We used a simple and clean layout with well-designed pages having a good story flow based on these references [1, 5, 12] and course materials. We made use of commonly used interactive, responsive charts, such as line charts and pie charts, which are popular with the average user. This was in order to make the information more accessible to people who are new to this domain and to grab the attention of the user initially, maintaining their interest so that they can explore novel and complex visualizations. For example, we made use of bar charts and maps together to show the multilevel, multidimensional visualization of information using D3.js [13, 14, 15, 17, 18]. Users can easily explore MIDs, war and trade datasets with a single click and find patterns and relationships between these entities. By showing different views at once, it is more informative and exploratory in nature to the user. These kinds of visualizations are very useful to political scientists or people who want to delve more into this subject.

6 Conclusion

The number of wars in recent years is significantly less than the number of wars a century ago. These days, international trade has had a material effect on the countrys economy. Therefore, many countries have developed their economy through international trade and, through trade, economic inter-dependency between countries have increased. In many cases, the developed countries hesitate to initiate or participate in wars because of the negative effect that it has on the country. For instance, they would need to spend a large amount of money to win the war, which could otherwise have been spent on developing their economy. Therefore, in our current era, participating in war has become an unreasonable decision for many developed countries. We observed that prior to 1965 very few countries had good trade relationships, and the number of countries at war was high. Presently, most of the countries have good trade relationships and the number of wars has decreased significantly. These charts and maps show international trade may be a major factor in deterring wars and maintaining peace

around the world. The future work will be to statistically analyze COW data, which complements the explanation of charts on the relationship between trade and war.

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