Gender Inequality In The Workplace: An Interactive Data Visualization Application

You Zhang, Zihao Tan, and Yifan Yang

University of Southern California, Los Angeles CA 90007, USA,
zhangyou@usc.edu
zihaotan@usc.edu
yang578@usc.edu,
Visualization Page: http://www-scf.usc.edu/ yang578/

Abstract. The basis of this project was to create an interactive data visualization application using JavaScript and HTML in order to demonstrate the social problems around gender gap in the working environment. Three main visualization graphs are included in this project: a bubble chart, a choropleth map, and a stacked bar chart. The overall approach was to create an easy-to-understand vision of current situation on gender inequality within workplaces for young professionals as well as leaders in organizations. Upon completion of the assignment, the researchers found that gender equality is a long way off at most U.S. companies as of the gap of income and leadership position. . . .

Keywords: gender inequality, data visualization, bubble chart, choropleth map, bar chart, women education, gender labor force, income gender gap, leadership

1 Introduction

Gender inequality is one topic which has been openly deliberating among civilizations for quite a long time. The imbalances in the workplace being standout amongst the most are begging to be addressed today. To look into this circumstance, the researchers attempt to study the foundation of the issue, by comprehending the sociological factors such as education level, openings of labor opportunities, and income level. The general public has been formed as male-dominated for decades, therefore organization executives may remain their biases about women. With the rapid development of technology and the trend of big data, it is a great opportunity for researchers to address the problem by various kinds of visualization. The goal of this project is to examine the gender gap in wages and leadership positions, and to present it to female and male professionals, especially to leaders in organizations. Company leaders such as VP and executives are the targeted audiences, because these people have the power to actually take the action and make a difference.

2 Research

This project has been divided into four sectors: education, labor force participation rate, income level, and percentage of leadership positions.

2.1 Gender Gap In Education and Labor Force

According to Shavit from Oxford [5], varying institutional characteristics of educational systems have significant effects on occupational outcomes. The research examined the interface between education and entry into the labor force in 13 countries, showing that the level of educational attainment has direct association with the the odds of entering the labor force in different occupational classes. Thus, in this section, the main factor to be examined is the relationship of post-secondary education and labor force of men and women.We used United Nation data [6] as it is one of the most authoritative open database on-line. The data source was clean and well-organized, including various information around gender issue. We spent three days on data wrangling and turned it into a Gender Inequality Index by nations. We extracted two sets of data - Population with at least some secondary education (ages 25 and older) and labor force participation rate (ages 15 and older). Both of the datasets respectively represents our focus on different part of gender inequality.

Related Work. From a research in Feminist Economist in 2009 [2], researchers used cross-country gender inequality index and panel regressions to investigate gender gaps in education and employment, and how it reduced the economic growth. Base on their research, we refreshed the dataset with most recent UN data and transformed the theories to intuitive visualization graphs.

Bubblechart (Figure 1). We used an interactive bubble chart to show the comparison because it creates a contrast concisely and efficiently. In this chart, we used colorful dots to represent different countries. Users can check the name of each country and their corresponded gender by hovering their mouse on the dot. On the top of the screen, there are category bars that can help users compare different distribution of 122 countries (all countries in data source) on related categories. The dynamic effect of moving bubbles is eye catching, which may help user extend user attention span and draw interests for them to play around the bubbles. To demonstrate the inequality level in education, we adopted the index we learned from The Impact of Gender Inequality in Education and Employment on Economic Growth [2]. The index level represents the level of inequality between male and female groups. Specifically, "high" means gender inequality index level is greater than 80, "moderate" means gender inequality index is between 60 to 80 and "low" means gender inequality index is smaller than 60. To demonstrate the inequality level in labor force, we adopted the participation rate index also from The Impact of Gender Inequality in Education and Employment on Economic Growth (2009). We also divided different index level bubbles into

high (greater than 60), moderate (40 to 60), low (smaller than 40). Finally, the rating category is an important part of our chart because it divides the countries into 5 levels of equality in the data source: ranking from rating category 1 which represents very good equality to rating category 5 means very poor equality. This chart shows that although women and men are getting same level of education, men are getting more opportunities to get a job offer in most of the countries.

2.2 Income Gender Gap

Statistics shows that in 2016 [4], the difference between median earnings of men and women relative to median earnings of men for full-time employees is only 18.1 percent. This means that the median wage of men is earns more than 20 percent than women. Based on National Bureau of Economic Research in 2000, the relatively large gender pay gap in the U.S. compared to a number of other advanced countries seems primarily attributable to the very high level of U.S. wage inequality. The pay gap affects women from all backgrounds, at all age, and of all levels of educational achievement, although earnings and the gap vary depending on a womans individual situation. So we devoted into this problem as one of our main focus.

Related Work. Based on National Bureau of Economic Research in 2000 [1], the relatively large gender pay gap in the U.S. compared to a number of other advanced countries seems primarily attributable to the very high level of U.S. wage inequality. We selected the data from an UNData [6], which demonstrated the gender income difference in the United States in 2016, and pictured it in a choropleth map, together with an animated bar chart.

Choropleth map (Figure 2). We decided to use choropleth map to visualize this data because the data is indicated by state and choropleth map is one of the best way to display data on the map. In addition, we used bar charts to visualize the earnings of women and men. In the choropleth map, we drew the color based on the earning ratio (females earning to males earning). The higher the ratio, the darker the red is. In this dataset, the ratio ranges from 66 percent to 88 percent, which indicates that average mens earning is always higher than average womens. We used tooltip in the choropleth as well, when we hover the mouse over a particular state, a tooltip will appear and show detailed information about womens and mens average salary. And two bar charts will come up in animation, which gives an insight of the difference in gender pay gap.

2.3 Leadership Gap In US

Gender inequality remains a major barrier to human development. The disadvantages facing women and girls are a major source of inequality. All too often,

women and girls are discriminated against in health, education, political representation, labor market, etc. - with negative consequences for development of their capabilities and their freedom of choice. [7] So, leadership gap became an issue we have to analyze when studying gender inequality.

Related Work. As stated by KPMG Womens Leadership Study, women who were encouraged to be leaders growing up are more likely to aspire to be a senior leader of a company or organization and to aspire to be on a board of a company in the future than those who did not receive that encouragement growing up. [?] In the study, KPMG researchers explained the hesitation women are facing within the organization, but did not include the data of how many women are actually leading. So we choose to highlight the current situation and show it in a stacked bar chart.

Stacked Bar Chart (Figure 3). This bar chart shows the index aggregated by male and female earning and leadership power ratio in their work, the bars have been sorted by states, we can easily find the amount of people from different age groups. From this bar chart, we could see that even if women and men start working at the same level, the pay gap and leadership gap soon increases, and it became wider over the years. The GII is also an inequality index that we have studied. It measures gender inequalities in three important aspects of human development reproductive health, measured by maternal mortality ratio and adolescent birth rates; empowerment, measured by proportion of parliamentary seats occupied by females and proportion of adult females and males aged 25 years and older with at least some secondary education; and economic status, expressed as labor market participation and measured by labor force participation rate of female and male populations aged 15 years and older. The GII is built on the same framework as the IHDI to better expose differences in the distribution of achievements between women and men. It measures the human development costs of gender inequality. Thus the higher the GII value the more disparities between females and males and the more loss to human development.

Interactivity and Responsiveness. The application is fully interactive, that users can hover over the mouse and look into the detailed information within the graphs. The web page is responsive to any size of browser. However, the graphs are not designed to be responsive, since the dataset are too large to be fit into smaller screens.

3 Implications

This application aims to bring public attention to the problem of gender inequality within the working environment. At the same time, we attempt to encourage women to stay courage and step forward. In the future, we would like to research more on how to apply actual actions in order to solve the problem. For example, study about psychology and sociology on the work-life balance of female workers.

References

1. Blau, F. D., Kahn, L. M. : Gender differences in pay. Cambridge, MA.: National Bureau of Economic Research.(2000)
2. Klasen, S., Lamanna, F. : The Impact of Gender Inequality in Education and Employment on Economic Growth: New Evidence for A Panel of Countries , Feminist Economics, 15(3),2009,91-132. (2009)
3. KPMG: KPMG Womens Leadership Study Moving Women Forward into Leadership Roles, Retrieved from KPMG.com/WomensLeadership. (2017)
4. OECDData: Earnings and wages - Gender wage gap. Retrieved from https://data.oecd.org/earnwage/gender-wage-gap.htm. (2017)
5. Shavit, Y., Muller, W., Tame, C. : From school to work a comparative study of educational qualifications and occupational destinations. Oxford: Clarendon Press. (2003)
6. UNData. From http://data.un.org/. (2017)
7. UNData: Gender Inequality Index (GII), Retrieved from http://hdr.undp.org/en/data. (2017)
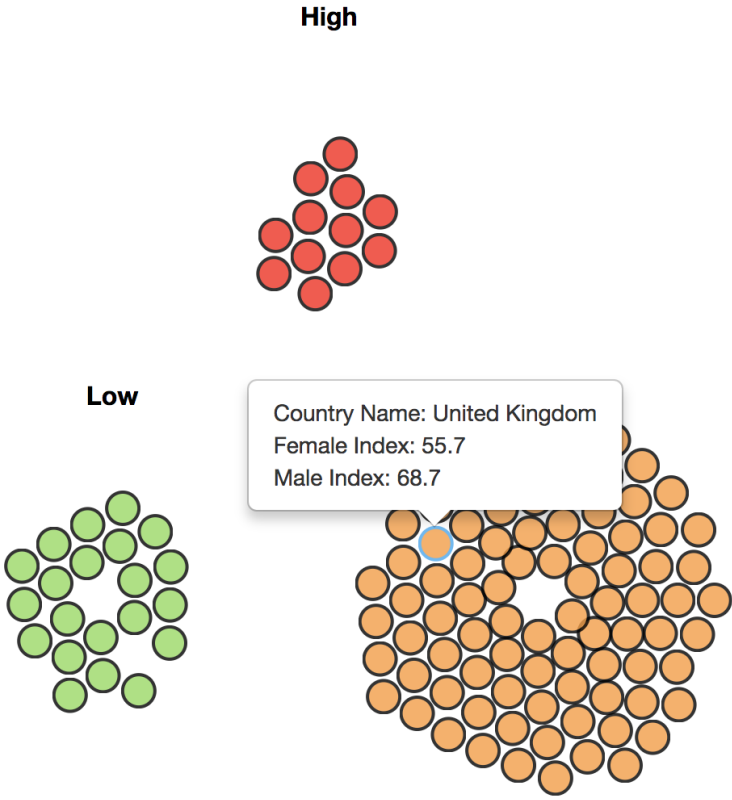
Figures

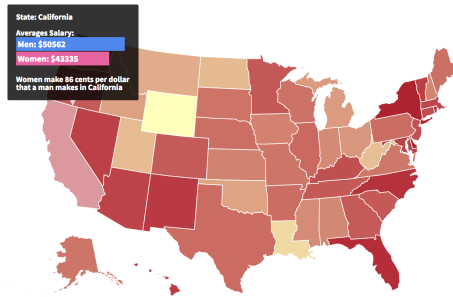**Fig. 1.** Bubble Chart - Education Level and Labor Force.
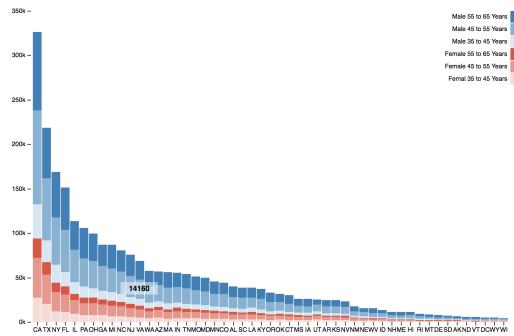
Fig. 2. Choropleth map - Gender Income Gap Within US.

Fig. 3. Stacked Bar Chart - Leadership Positions in US.