

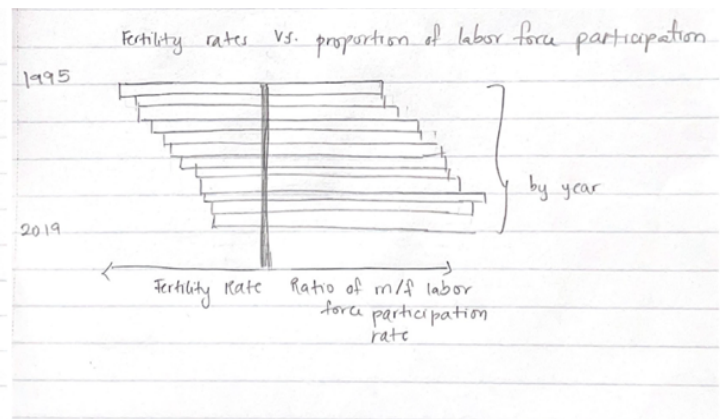
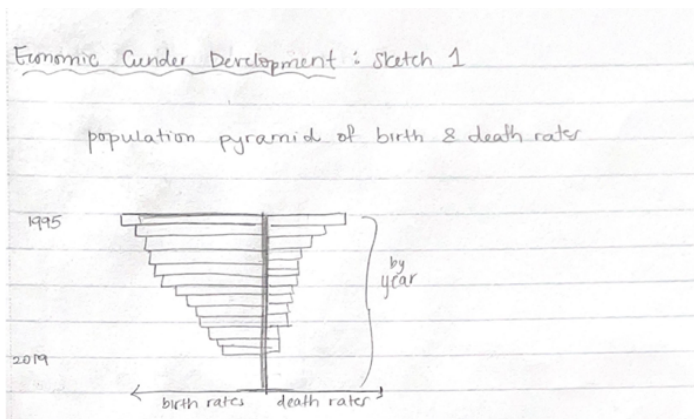
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Final Project Reflection

For my final project, I wanted to visualize the effects of female education and employment on overall country development. In the past, I researched the importance of female empowerment through education, and its long-lasting effects on economic growth. I wanted to use this project as a case study for gender development to investigate what role female employment plays in the socioeconomic status of a country.

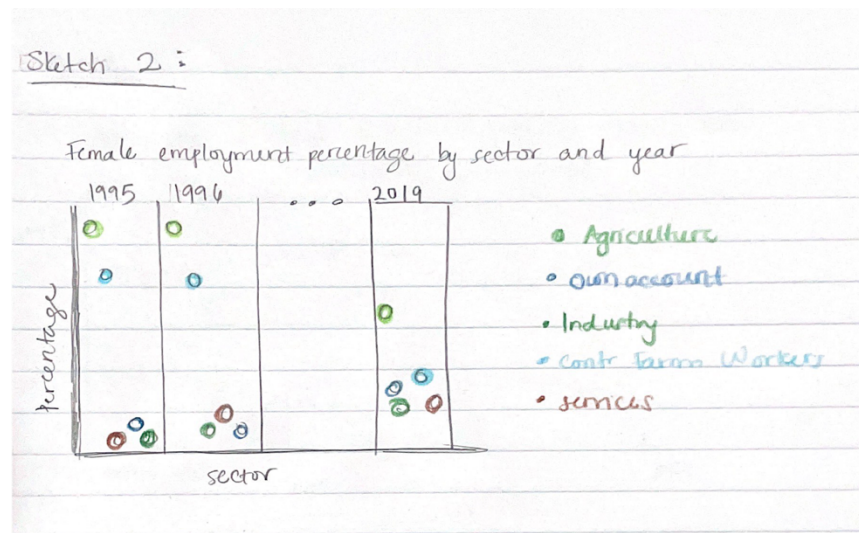
The dataset I am using for this is from Kaggle and is called Female Employment versus Socioeconomic Factors<sup>1</sup>. It is based on a survey of the population of Bangladesh and spans from 1995 to 2019. The dataset was mostly clean aside from two missing values for fertility rate in 2018 and 2019, which I manually filled in. Because birth rate and death rate are both important indicators of country development, I decided to manually add those in as columns into the dataset. I found the values for these rates on the World Bank website<sup>2</sup>. In this case, I am using birth rate crude and death rate crude, per 1,000 people. Since this dataset did not contain any features that were indicative of female education, I added in adult female literacy rate as another feature<sup>3</sup>. Lastly, I found two variables that I thought conveyed socioeconomic status and manually filled them in: gross domestic product in billions of dollars<sup>4</sup> and life expectancy<sup>5</sup>.

I initially came up with three sketches of graphics I wanted to include in my visualization. Each sketch was motivated by the goal of representing development through different contributing factors.

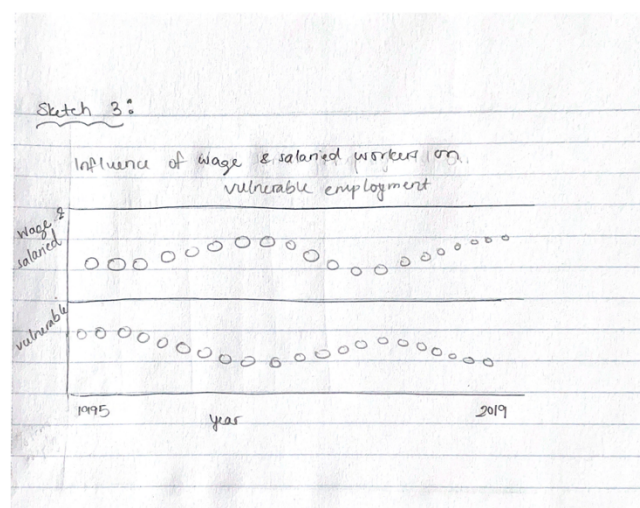
The first sketch I came up with was based on my previous research of country development. Population pyramids are useful indicators of country development over time. Aside from birth rate and death rate, I thought it would be interesting to look at fertility rate (births per woman) and the ratio of female to male labor force participation rate. My overall goal with this chart was to uncover the negative correlation in female to male labor force participation rate and fertility rate, birth rate, and death rate. See below for an idea of what I envisioned this graphic to look like.



For my second sketch, I wanted a graphic that displayed the breakdown of sectors occupied by female employment. Essentially, this would show the percent of female employment in various sectors over time, capturing the distributions of which industries females were more/less concentrated in. Through this, I would be able to see which sectors have a higher female labor force participation rate, and how these distributions change over time. My preliminary hypothesis was that I would observe a convergence of these values towards 50% throughout the years, as the country develops. Below is a sketch of my second graphic.



My final sketch was of a visual that aimed to show the inverse relationship between percentage of female wage salaried workers and vulnerable female employment percentage. In this case, vulnerable employment refers to contributing family workers and own-account workers as a percentage of total employment. In this graphic, I wanted to depict fertility rate as a third variable but was unsure of whether to encode it by size or color, so it was left vague for the time being. This sketch was one which I was the most unsure about and ended up changing completely by the end of my project. Nonetheless, my initial idea is displayed below.



As I developed my visualizations, I found the most difficulty in layering the features the way I wanted. I had other ideas of creating line graphs or area graphs that fell in the same plot but was unable to make them overlap in tableau. For this reason, I had to compromise or develop new ways of overlaying features by forcing only a few to display at once or by using a different type of chart than I had originally envisioned. However, I felt that I was able to closely replicate my first two sketches within my visualizations.

I was the most satisfied with the population pyramid, as I was able to reverse the axes, so the four features were displayed as I had planned for. I also added in life expectancy as a fifth variable, encoding it by color. This emphasized how these indicators showed the country was developing over time. For my second visual, I also ended up adding a new feature, gross domestic product. Ideally, I wanted to have GDP as just a label in three or four locations on the graph, but since tableau somewhat dictates how the labels appear, I decided to use size instead. While I like how it turned out, I found it to be less meaningful that all the circles increase in size in the exact same dimensions because GDP is not specific to a sector. The sectors I included in this visual were agriculture, industry, services, contributing family workers (which refers to women who hold self-employment jobs in an establishment run by a relative or someone living in the same household), and own-account workers (self-employed). My third visual was the one I struggled with the most. I wanted to display all features included in this in one plot but could not figure out how to do so. Instead, I coded a drop-down menu that allows the user to toggle which feature to display along with female literacy rate. The goal of this visual was to show the correlation of female literacy rate with other variables indicative of development. Therefore, I used percent female employee (the employment to population ratio, as a percentage, of women 15 and older), vulnerable employment (percent female employment) which includes self-employed workers, and life expectancy. Although this graph is not what I originally envisioned, I like it slightly better as it incorporates an interactive element and allows the observer to focus on fewer variables at a time.

I wanted my static visual to incorporate all three of these graphs but also wanted to take advantage of the ability to add annotations to it to display more information. Specifically, there were some facts I wanted to incorporate in my dashboard that I was not able to find room for, so I decided to add them in as notes in my static visual instead. The one feature I had to compromise in my static visual was the interactive aspect. Exporting it out of tableau forced me

to pick just one feature for the interactive graph and made it impossible for observers to hover over different points to see nuances and details.

Overall, I was happy with how my static and dynamic visualizations turned out. They accomplished the goal I was hoping for, which was to provide key insights about the effects of gender development on the socioeconomic status of a country. This case study showed me just how important female education and employment is in improving these various development indicators. Each graph in my visual extracted new information regarding these insights. For the population pyramid, the convergence of birth rates and death rates was clearly visible across time. The monochromatic color scale also displayed an increase in life expectancy as the country developed. I noticed that this is directly related to a decrease in fertility rate and an increase in female employment, as the female to male employment ratio increased substantially. In the “Distribution of Female Employment by Job Sector” visual, I found the convergence of the percentage of female employment towards 50% to confirm my original hypothesis. It was also insightful to see that there were large percentages of women as compared to men in the agriculture and contributing family sectors in 1995, and very small percentages of women as compared to men in the services, industry, and own account sectors in 1995. As female labor force participation increased and Bangladesh developed, more women became self-employed, and participated in the industry and services sectors while fewer women joined the agriculture and contributing family sectors. For the last component of my visual, I wanted to show the effect of female literacy rate on improving vulnerability indicators, of which I chose life expectancy, percentage of females vulnerably employed and percentage of female employment. From this visual, I learned that adult literacy rate relates to an increase in female employment which results in fewer vulnerably employed females and an overall higher life expectancy for the entire country. With this dashboard, I was able to gain significant insight on the importance of female education and I hope this type of project can be used to gain funding for female education all over the world.

## References:

- <sup>1</sup>Bandit, Pontiac. "Female Employment vs Socioeconomic Factors." *Kaggle*, 16 Mar. 2022, <https://www.kaggle.com/mdmuhtasimbillah/female-employment-vs-socioeconomic-factors>.
- <sup>2</sup>"Bangladesh - Literacy Rate 2018." *Countryeconomy.com*, Follow Us, 1 June 2020, <https://countryeconomy.com/demography/literacy-rate/bangladesh>.
- <sup>3</sup>"Bangladesh GDP 1962-2022." *MacroTrends*, <https://www.macrotrends.net/countries/BGD/bangladesh/gdp-gross-domestic-product>.
- <sup>4</sup>"Bangladesh Life Expectancy 1950-2022." *MacroTrends*, <https://www.macrotrends.net/countries/BGD/bangladesh/life-expectancy>.
- <sup>5</sup>"Birth Rate, Crude (per 1,000 People) - Bangladesh." *Data*, <https://data.worldbank.org/indicator/SP.DYN.CBRT.IN?locations=BD>.