Project Report

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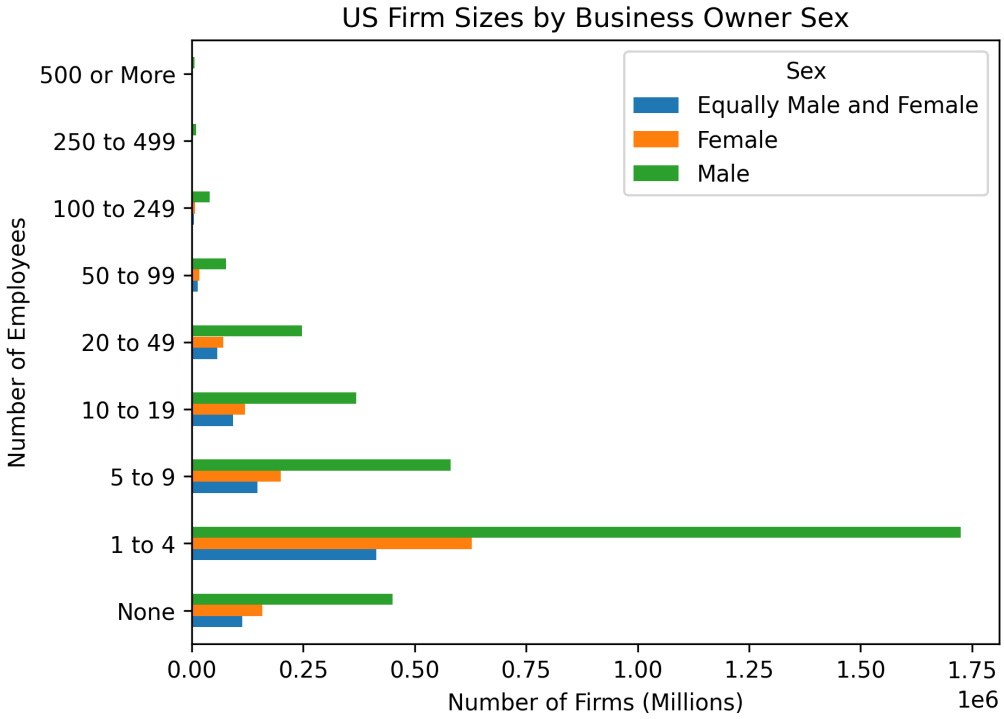
Our investigation sought to analyze the demographic and technological characteristics of companies within the United States. Our analysis focused on whether the race or sex of business owners has some relationship with that business's size, revenue, ownership structure, or access to technology. We searched for any relationship between a company's size or revenue and the demographics of its owners on a national and state level. After an initial analysis revealed minority-owned businesses are more prevalent in certain industries, we also wanted to learn which race demographics are prevalent in those industries. Furthermore, we assessed how owner characteristics compare across industries: specifically, whether the owner's racial and gender composition has a bearing on the number of owners a business has. Finally, we also took a look at the types of technologies companies use in various parts of the United States. We sought to understand if the access a company has to certain technologies is related to their revenue or size; whether the gender within the industry has an impact on production factors; and whether a correlation exists between a company's size, industry, and revenue.

To answer these questions, we needed a dataset that includes revenue totals, employment figures, and other characteristics for a variety of U.S. companies and industries. The Census Bureau's 2018 Annual Business Survey (ABS) fit our needs because it includes demographic, structural and performance data for firms (Census

2021).The ABS collects information from the US population about company characteristics. Survey questions assess properties of the company itself, owners, and the technologies businesses use. Characteristics include things like sex and race of owners, revenue, employment size and more. Our investigation began with general statistical analyses to uncover questions about the data. We looked at trends across industries and demographics before homing in on data pertinent to our questions.

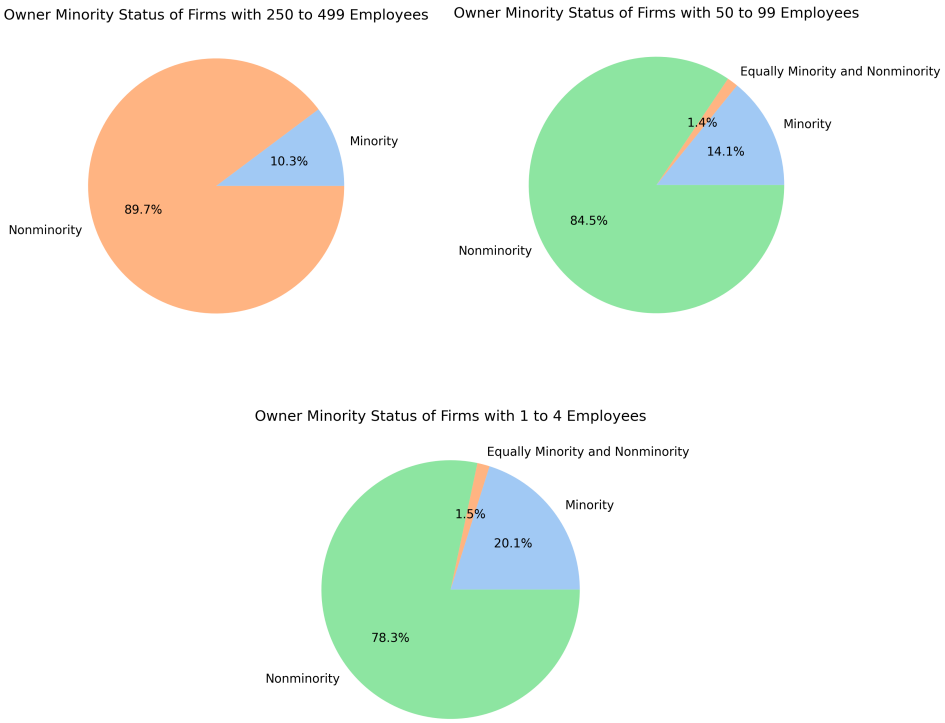
In order to answer our questions related to the company summary, we began by looking at national breakdowns for company employee counts by owner gender. With this information we could see if there was an overall relationship between the amount of companies in a firm and the gender of the owner. One thing we also incorporated into our analysis was looking at companies with shared ownership equally owned by males and females.



We can see from the figure above that companies from any range of employee counts are heavily male dominated and companies equally owned by males and females closely follow companies owned by only females. With this observation we were interested in if states with large cities followed this pattern or deviated in any way. We looked at New York and California as these states could give us a representation of states with large cities on both the East and West coast. After creating and observing similar visualizations for these states we saw that they followed the patterns of males dominating each firm size shown on the national level.

We were also interested in seeing if there was a relationship between an owner's sex and company annual revenue. Findings on a national level were similar to that of comparing owner sex to number of employees: all fields were heavily male dominated, with companies equally owned by males and females closely following companies owned by females only. Again we were interested if things looked different at a state level, but looking at New York and California revealed patterns similar to those on a national level.

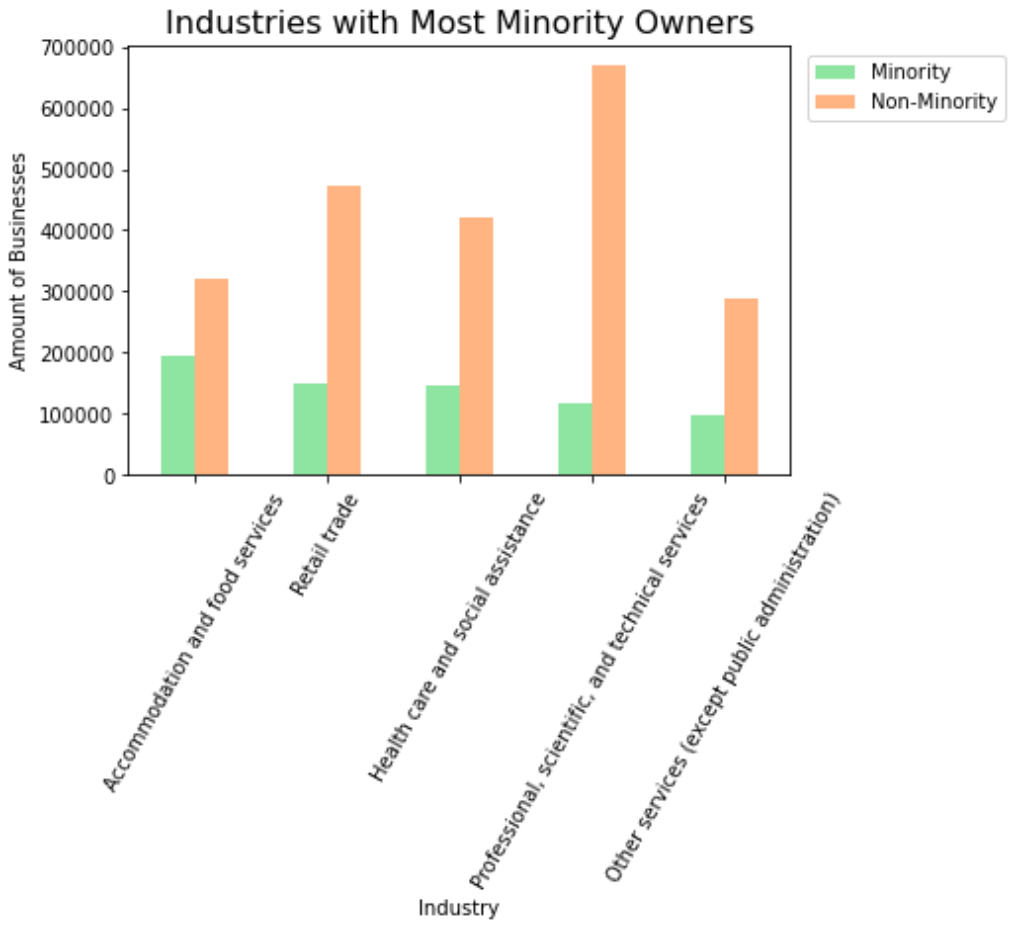
We then looked into relationships between race and employee counts and revenue. For this question we decided to specifically look at minorities and non minorities, as well as companies owned equally by minorities and non-minorities. Looking at the national level we saw that minorities make up about a fifth of company ownership.



In the figures above it is shown that the likelihood of a company being owned by a minority increases as the number of employees working for that company decreases. Another interesting note is that there are no companies equally owned by minorities and non-minorities with 250 to 499 employees. We also found a trend on the national level, albeit not as strong, that as company revenue increases, so does the likelihood of the company being owned by a minority. This was not what we expected to be the case, but considering this relationship was not very strong it was not completely surprising.

Shifting our analysis to differences across industries, we created a breakdown of minority and non-minority-owned businesses across all industries. This allowed us to get an overview of the size of minority-owned firms by employee numbers. Minority-led firms make up less than a fifth of all firms. We needed a deeper analysis for extra context. Specifically, we investigated the industries with the most minority-led

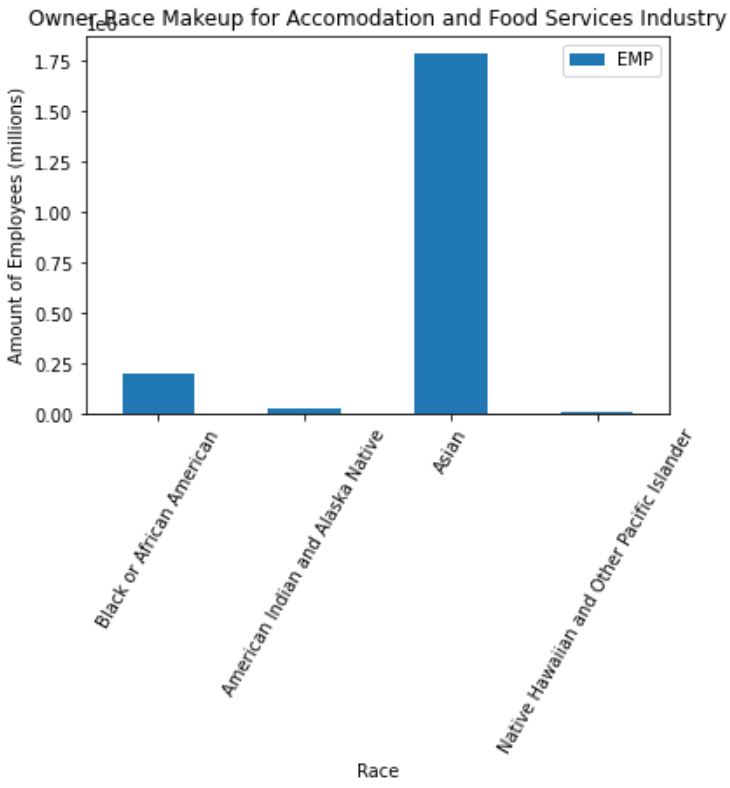
businesses. To achieve this, we extracted all rows that summarized all firms within an industry and which contained the total firm count for minority and non-minority race groups; then we pivoted that table to create a clustered column table. We sorted industries by amount of minority firms to reveal the top five industries for minority-owned businesses.



As shown by our figure, minority-owned businesses make up more than a third of all businesses in the accommodations and food services industry. This contrasts with the diminutive presence minority-owned businesses exhibit in most other industries.

Nevertheless, minority-owned businesses also appear most in the retail trade and health care and social services industries.

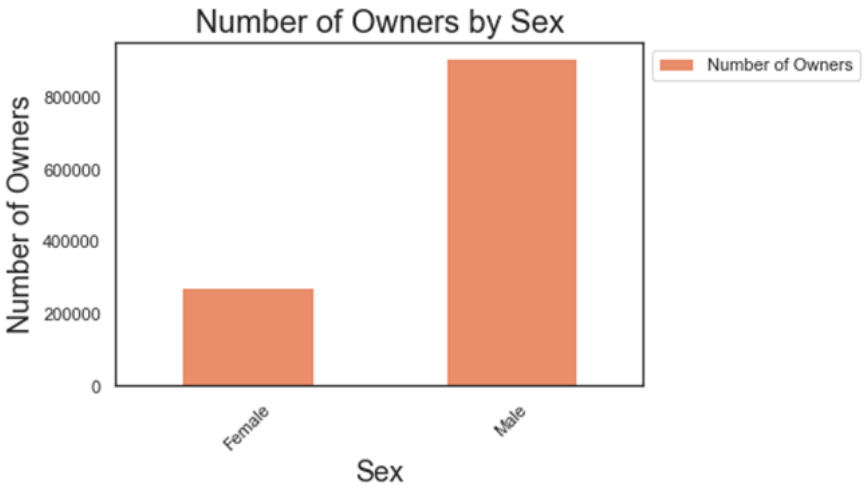
Drilling further into the top industry for minority ownership required filtering out race categories that were not Black, American Indian, Asian or Native Hawaiian. We discovered that Asian businesses employ more food industry employees than all other minority-owned businesses combined.



The story is similar for the healthcare industry, although in this sector Black and African American businesses represent a large source of employment. In the retail industry, Asian-owned businesses again contribute to the majority of jobs.

Considering the prevalence of Asian-owned businesses among minority-led firms, we sought to understand other characteristics of this cohort. To do this, we used the census characteristics of the business table's company ownership responses. Our investigation showed that a third of all Asian-owned companies are owned by two or more family members. Almost half of all Asian-owned firms were owned by two to four people.

Throughout our analysis of this dataset, we began to look at the number of business owners and how many owners correlate to each gender. We wanted to group our dataset together based upon the gender of the owner of the business. From there we were forced to remove any rows that contained "All owners of respondent firms" since this was not specific to the results we were looking to obtain. Once we had grouped the data by gender, we were able to use the sums of the owners for each gender and create a bar chart based upon our results.

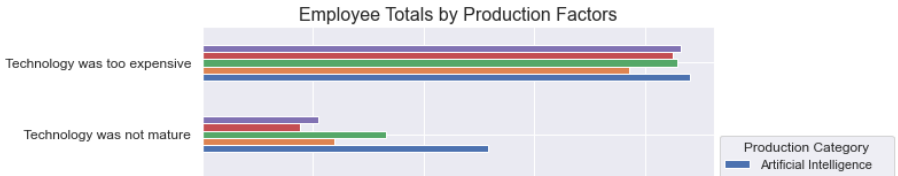


From this chart we can see that the number of male business owners is almost triple the number of female business owners. This shows us that a business is far more likely to have a male owner than female.

From these results, we began to wonder what the top firm sectors were if we were to base it upon the number of owners by gender. We were interested to see what the top 10 results would be from this grouping.

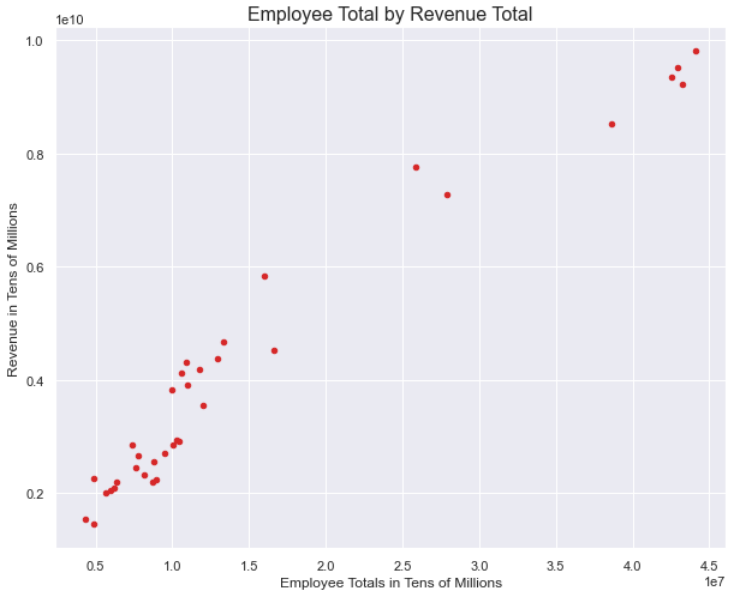
As expected, 9 of the top 10 firm sectors by gender have male owners. We can see that the number of male owners in the construction sector is the top result. The one female result that we came across was in the retail trade sector.

From investigating the technology characteristics of businesses table from the Annual Business Survey, we were interested to see if there is a difference between the employment size of a business and their access to technology. We subsetted the original data set into 5 different data frames that focused on the different production factors; artificial intelligence, cloud-based, robotics, specialized equipment, and specialized software. We then removed the factors that included ‘Total Reporting’,

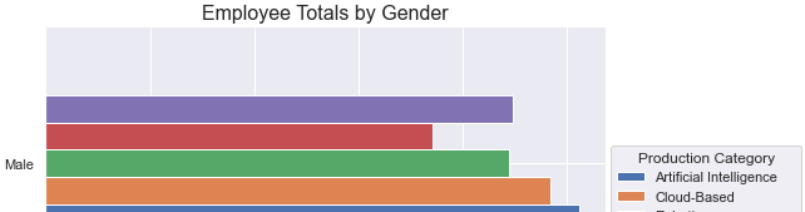


‘Technology not applicable’, and ‘Required data not reliable’ before merging all factors back together to create visualizations.

From the graph above, we can see that the most contributing factor to why businesses didn’t produce the technology is that it was too expensive. After seeing that was the highest factor, we then wanted to look into revenue and see if the correlation between employment size and revenue has an effect on production factors.



From the graph above, we can see there is a positive correlation between revenue and employee size. Therefore, businesses who have more employees can generate more revenue and use that revenue to invest in newer technologies. We then continued with our analysis and looked into gender by employee size and revenue to see if there was a difference of genders within the production factors and which factor is



the most relevant. After completing this analysis, it is clear that there are far more males in the workplace than females, especially in the artificial intelligence field.

After performing our in-depth analysis of the census data, we can now use our results to formulate conclusions. Firstly, we found that any amount of employee count is dominated by companies that have male ownership. We also found that the number of owners based upon sex is almost triple the amount of female business owners. From this information we can conclude that males are more likely to own a business than females are. We then broke down the top 10 employer firm sectors based upon how many owners were in the industry and broke that down specifically by gender. From here we concluded that males are most likely to be a business owner in the construction industry, where females are most likely to be a business owner in the retail trade industry.

Next, we investigated race and employee count's effect on revenue. After breaking the groups into minorities and non-minorities, we found that minorities make up about a fifth of company ownership overall on a national scale. The results also showed that with fewer employees, companies are more likely to have a minority owner. From these results we can say that companies are most likely going to be owned by a non-minority, however the smaller the company is the more common a minority owner is. We then began to investigate the industries with the most minority owners based upon the employee numbers. The industry that was most prevalent with minority owners was the accommodation and food services industry as it made up more than a third of all business here. We can conclude that the accommodation and food services industry along with retail trade and health care and social assistance industries are most likely to

have a minority owner. Then, we broke down the accommodation and food services industry by these minority races to see which would include the greatest number. We found that the Asian race was the most prevalent in this industry.

Finally, we investigated technology characteristics of businesses to see how different companies look at technology. The data we found showed that the most common reason for not producing a technology type was because it was too expensive. We can conclude that businesses generally are more likely to accept technologies that are cheaper in comparison to the competitors. We also compared companies based upon revenue. We found that companies generating the most revenue either had no factors affecting their technology decisions or were companies where technology was not applicable to the business. From this we concluded that companies are more likely to use specific technologies if they are producing more revenue than companies producing less.

References

U.S. Census Bureau. (2021, October 14). *Annual Business Survey (ABS) apis*. Census.gov. Retrieved September 2, 2022, from https://www.census.gov/data/developers/data-sets/abs.2019.html