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PROJECT REPORT

Introduction

This project report reflects on data gathered from the U.S. Census Bureau's Annual Business Survey, which provides information on both economic and demographic characteristics for businesses and business owners. Survey responses are gathered into four census datasets: Company Summary, Characteristics of Businesses, Characteristics of Business Owners, and Technology Characteristics of Business. This report includes data only from the Characteristics of Businesses and Characteristics of Business Owners datasets.

Questions

The questions we focused on were:

1. How does firm payroll differ by educational attainment and race of the business owner?
2. Does educational attainment change the business structure?
3. What are the patterns of successful businesses and their owners?
4. What is the educational background of American business owners, how does it vary between industries, and does this variation correlate with any variation in firm characteristics across industries?
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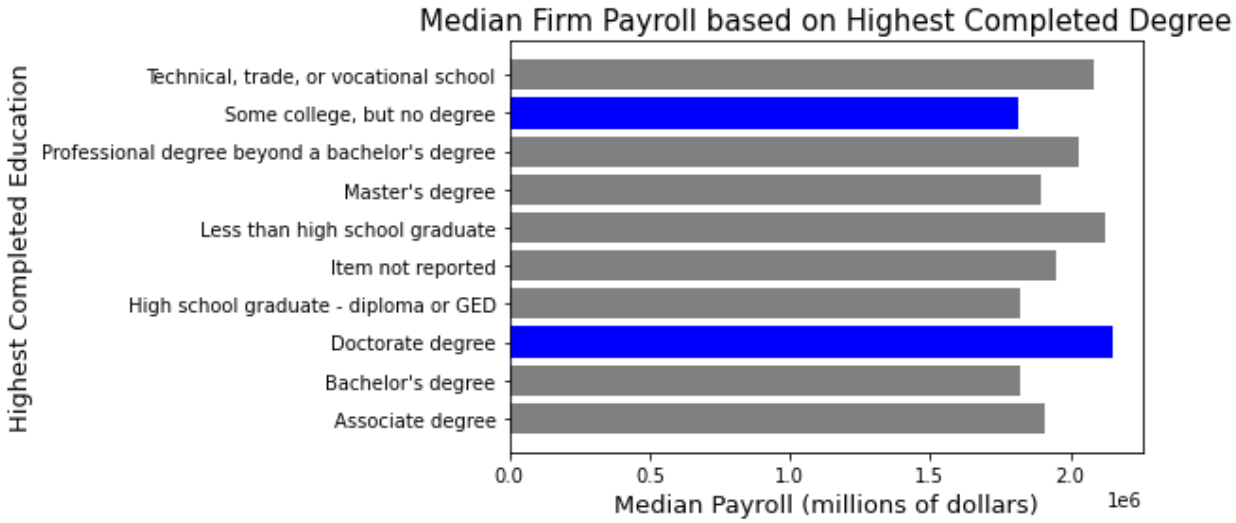
Findings

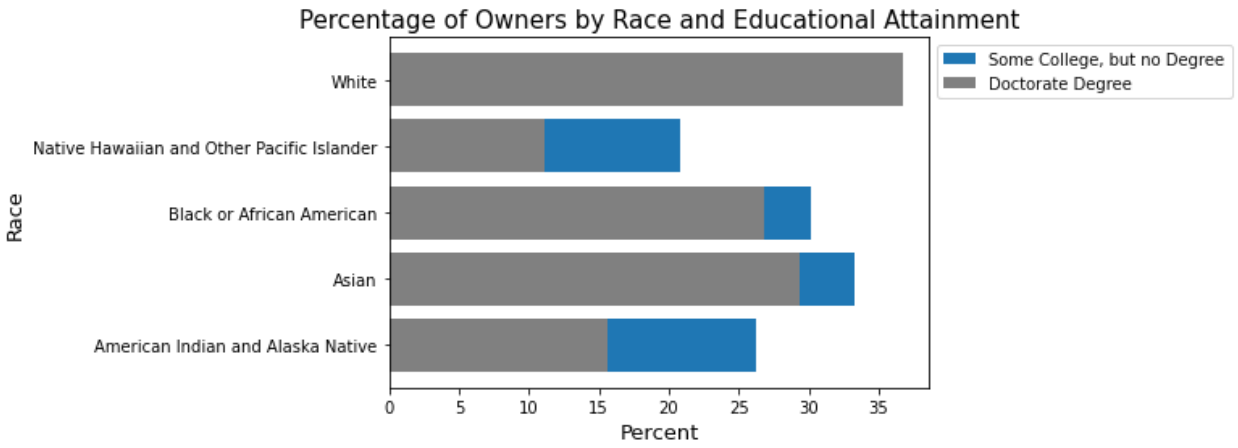
To answer the first question, we created a graph to show the median firm payroll based on the highest level of degree attained. Our hypothesis was that business owners with a doctorate degree are more likely to own more profitable businesses than those with less education as their businesses typically have larger annual payrolls. For the purpose of this

analysis, we use annual payroll as the criteria of the business' profitability. It could be the case that owners with a higher level of education would be put in leadership roles at bigger and more lucrative companies.

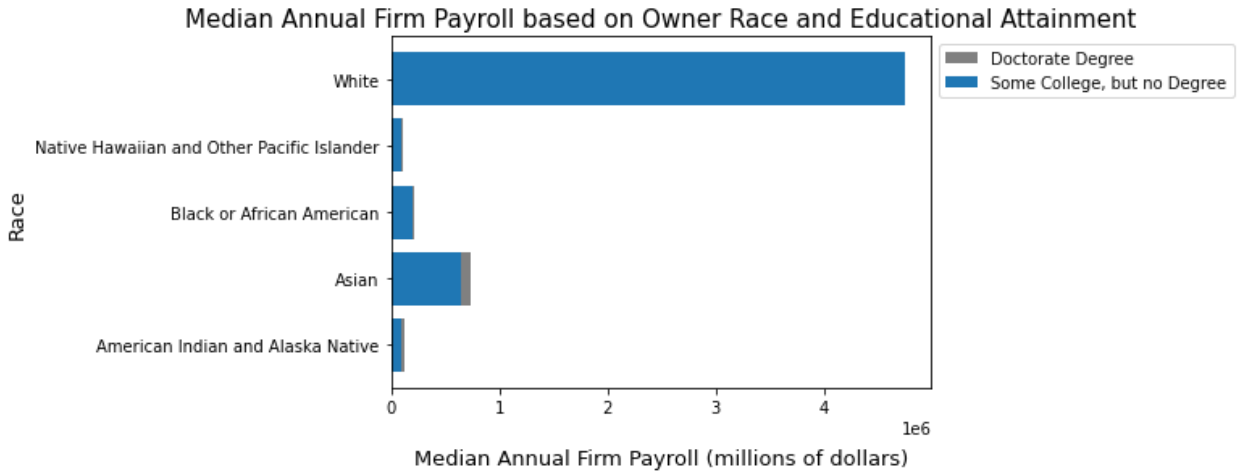


As shown in the graph above, owners with a doctorate level degree owned companies with the highest median firm payroll. This might only be the case for that specific group of owners, though. As you look into the other educational attainments, owners with less than a high school degree had the second greatest median firm payroll followed by owners with only a technical school education level. Another point of interest was the difference between annual payroll for owners who had some college versus those with a doctorate degree. Could there be differences in characteristics and structures of those firms?

To determine the characteristics of the firms, the data was subsetted to only owners who either had some college or a doctorate degree as their highest level of education. The graph below shows the percentage of the owners, based on race, and their highest educational attainment.

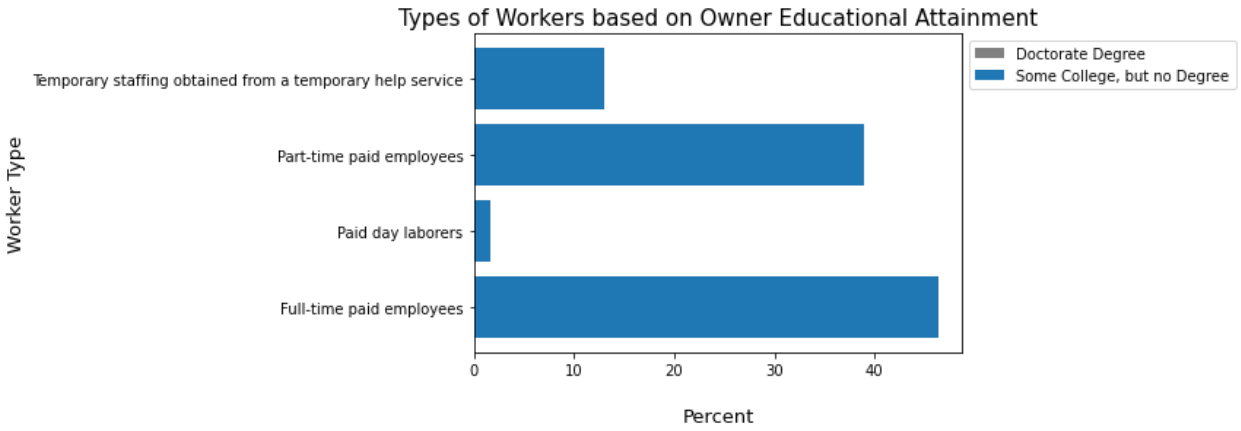


An important takeaway from the graph above is that of all the owners who received a doctorate degree, 29% are Asian, 27% are Black, and 37% are White. Further, a greater percentage achieved only some college, except for the people who are White. As we compare this graph to the graph below of annual payroll of the companies that they own, the results are surprising.



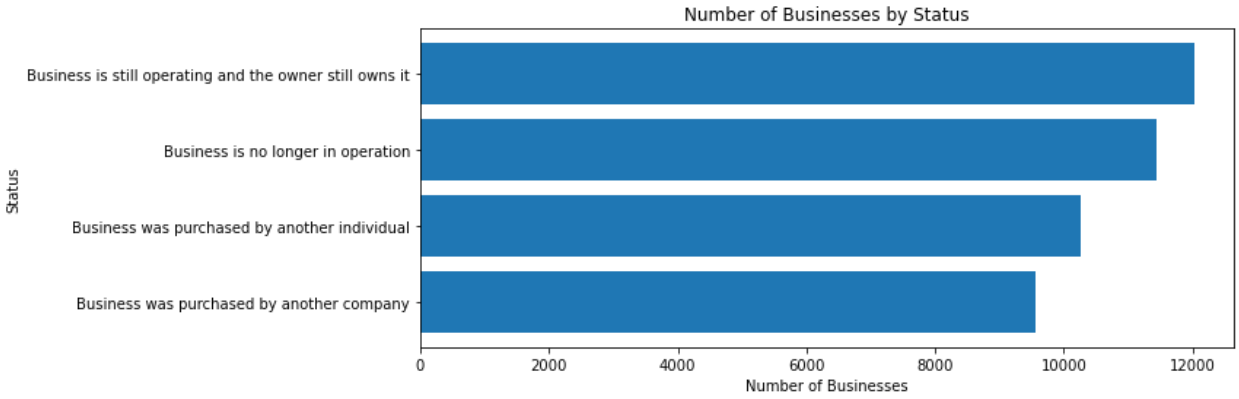
Businesses owners who are White owned companies with a larger annual payroll regardless of education. The same holds true for most other race groups besides those who are Asian. Having a doctorate degree provided only a slight opportunity to own businesses with a greater annual payroll. Therefore, perhaps owner education isn't as much of a contributing factor to the median annual payroll for a business as previously hypothesized.

We also wanted to look at business owners who had some college versus those with a doctorate degree to see if the difference in annual payroll would change the companies' worker types.



In the graph above, you can see what percentage of workers make up a business based on the owner's highest level of education. The percentages are exactly the same regardless of education.This leads us to believe that education attainment doesn't impact the types of workers the owners hire.

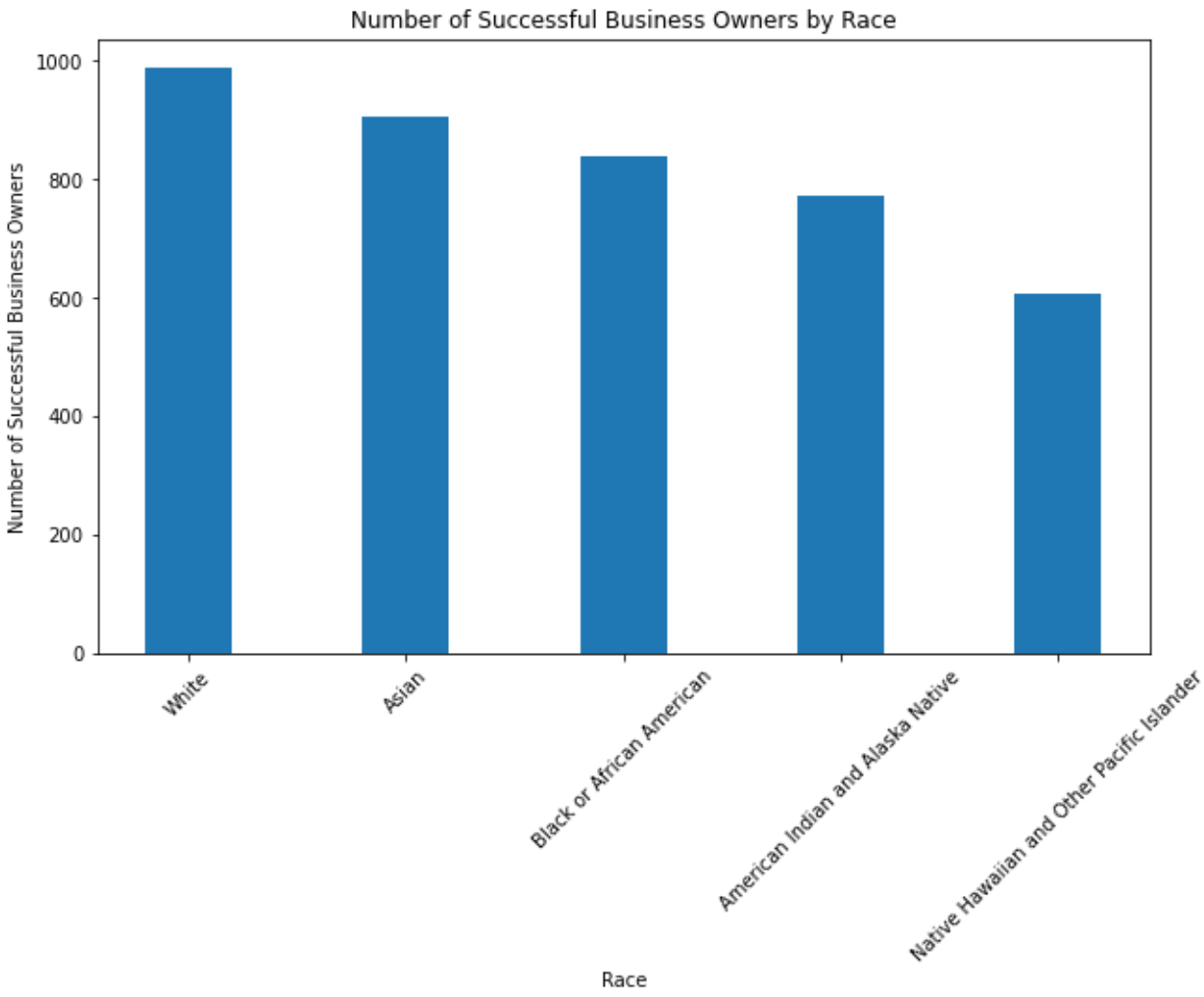
After looking at some of these characteristics of businesses and business owners, we decided to delve specifically into some of these characteristics for 'successful' businesses and business owners. In this analysis, we define 'success' as businesses that are still operating and owned by the initial owner. First, we created a bar chart to show the number of businesses by their status, as we wanted to see what portion of our data can be attributed to successful businesses and their owners.



As shown above, we find that there is a significant number of businesses no longer in operation and businesses purchased by another individual or company. However, what we focus on here is the number of businesses still operating under its initial owner, or as we deem, the successful businesses. This category consists of about 12,000 businesses, so the next four visualizations

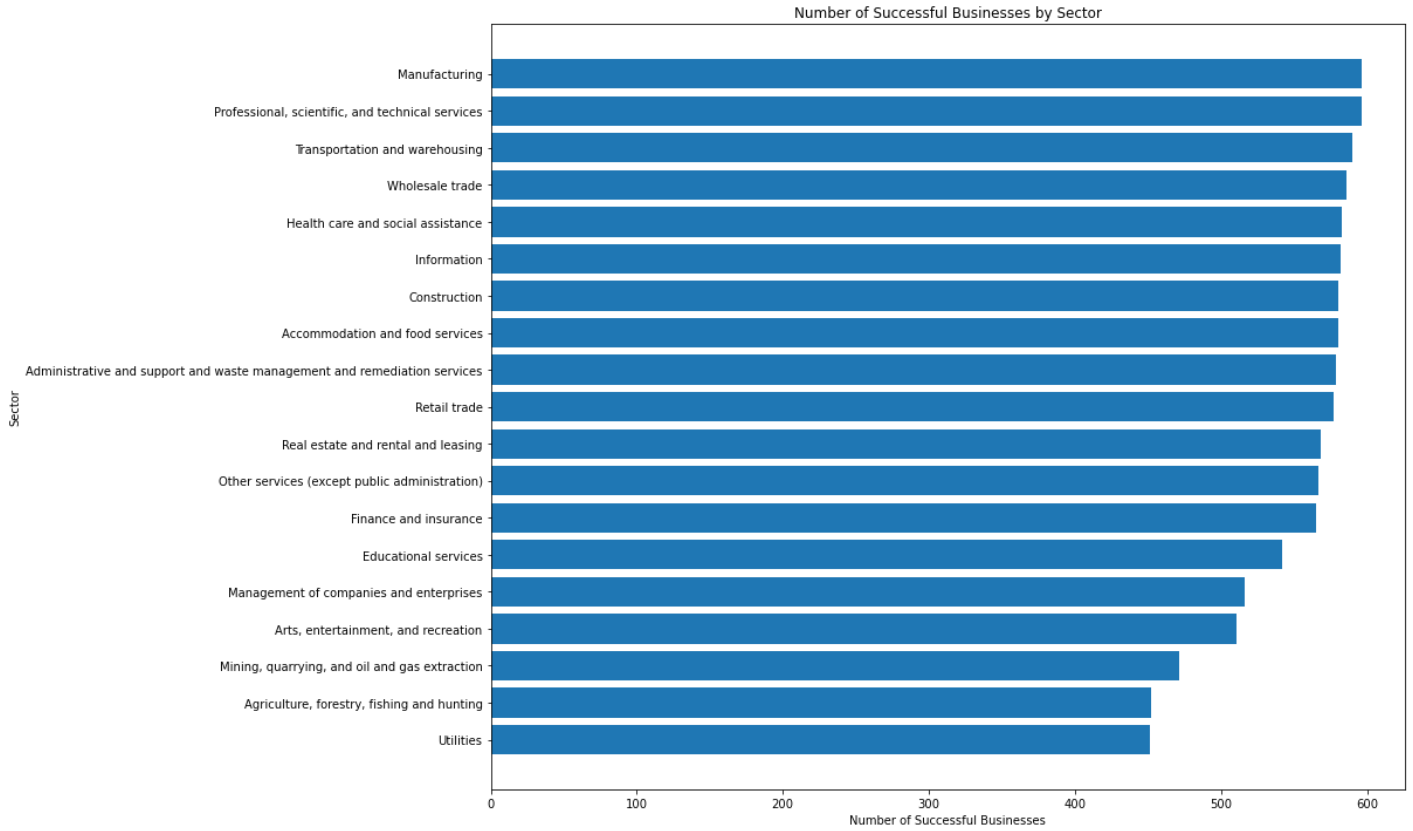
will focus on this subset of the data while analyzing characteristics of businesses and business owners.

What are some of the characteristics of successful businesses? Of successful business owners? To answer these questions, we looked at many different factors such as the business owners' race and sex, the businesses' sector/industry, and finally the businesses' categories and amounts of utilized worker types. While we created graphics for each of these variables, we exclude that for business owners' sex. This is solely due to the fact that variation of sex among successful business owners is not statistically significant as there is almost no difference in the number of male or female business owners. For each of the remaining aspects, we filtered the dataset to include only the column containing the examined variable and the column containing the position of the value in the dataset, which was used to count instances of values for each examined variable. First, we created a bar chart to visualize the race of these business owners, which proved to be rather telling.



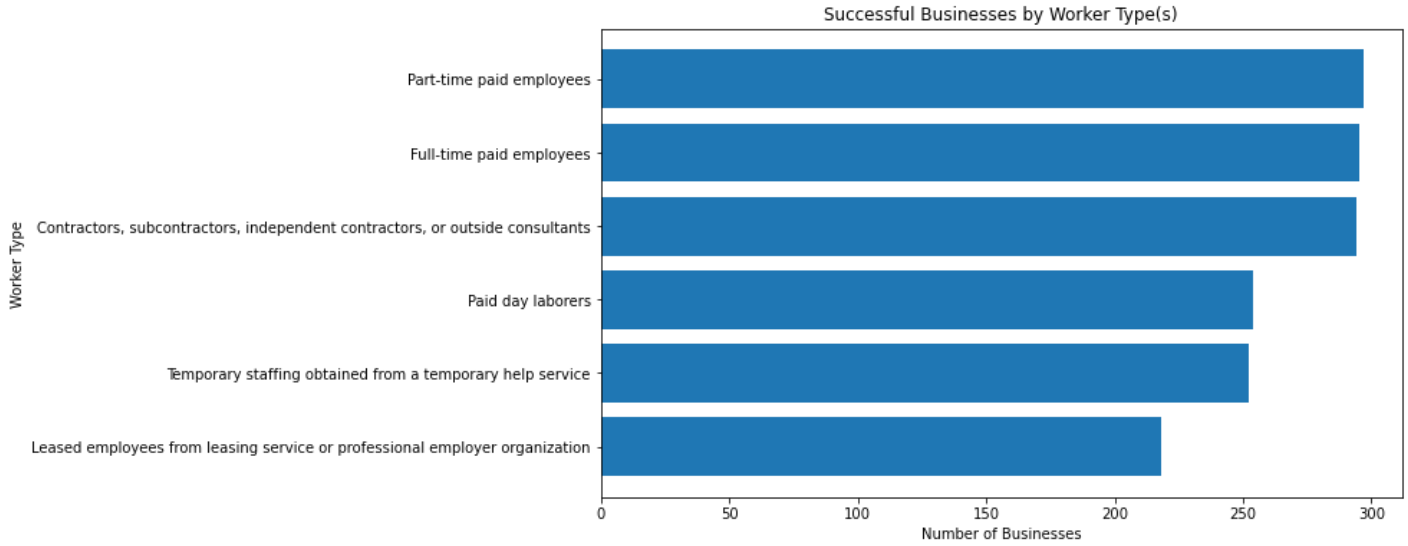
As can be seen above, the race group for the largest number of successful business owners is classified as white. Following white business owners are Asian and Black or African American business owners. Those that are American Indian and Alaska Native or Native Hawaiian and Other Pacific Islander represent smaller portions of overall successful business owners.

Next, we looked at what sectors/industries the successful businesses in this dataset represent, which we found are, for the most part, fairly consistent in terms of variation.

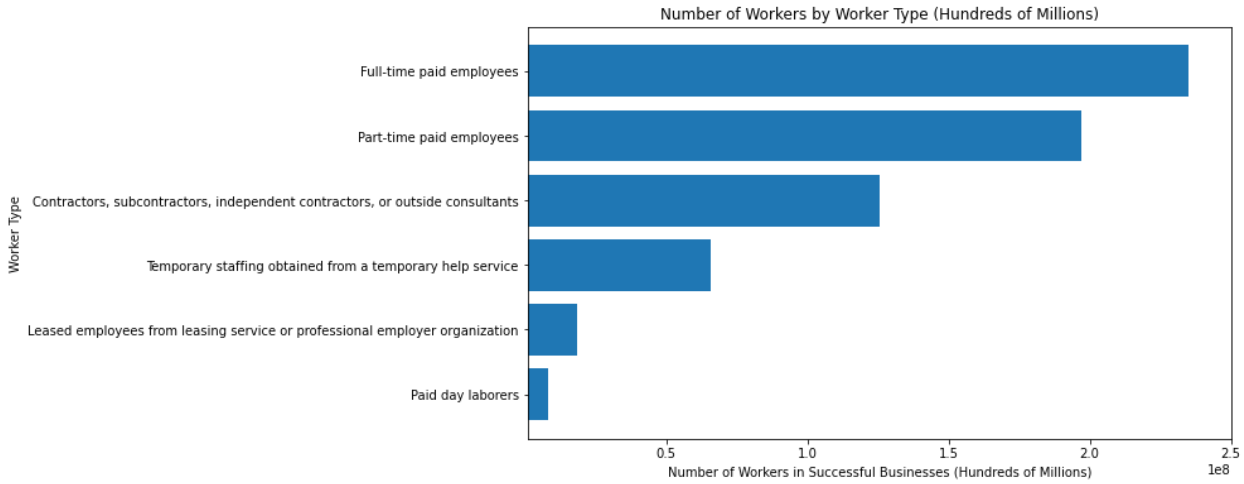


As displayed above, there is a relatively even spread of these successful businesses across various sectors. Manufacturing and professional, scientific, and technical services both represent the most common business sector from the roughly 12,000 businesses examined. There is some more variation towards the other end, where the number of successful businesses is lower; this horizontal bar chart suggests that there are less successful businesses in utilities, agriculture, forestry, fishing and hunting, and arts/entertainment.

We also wondered about what the workers looked like in terms of employment status at these businesses. To find this, we first looked at which worker types were represented by these businesses.



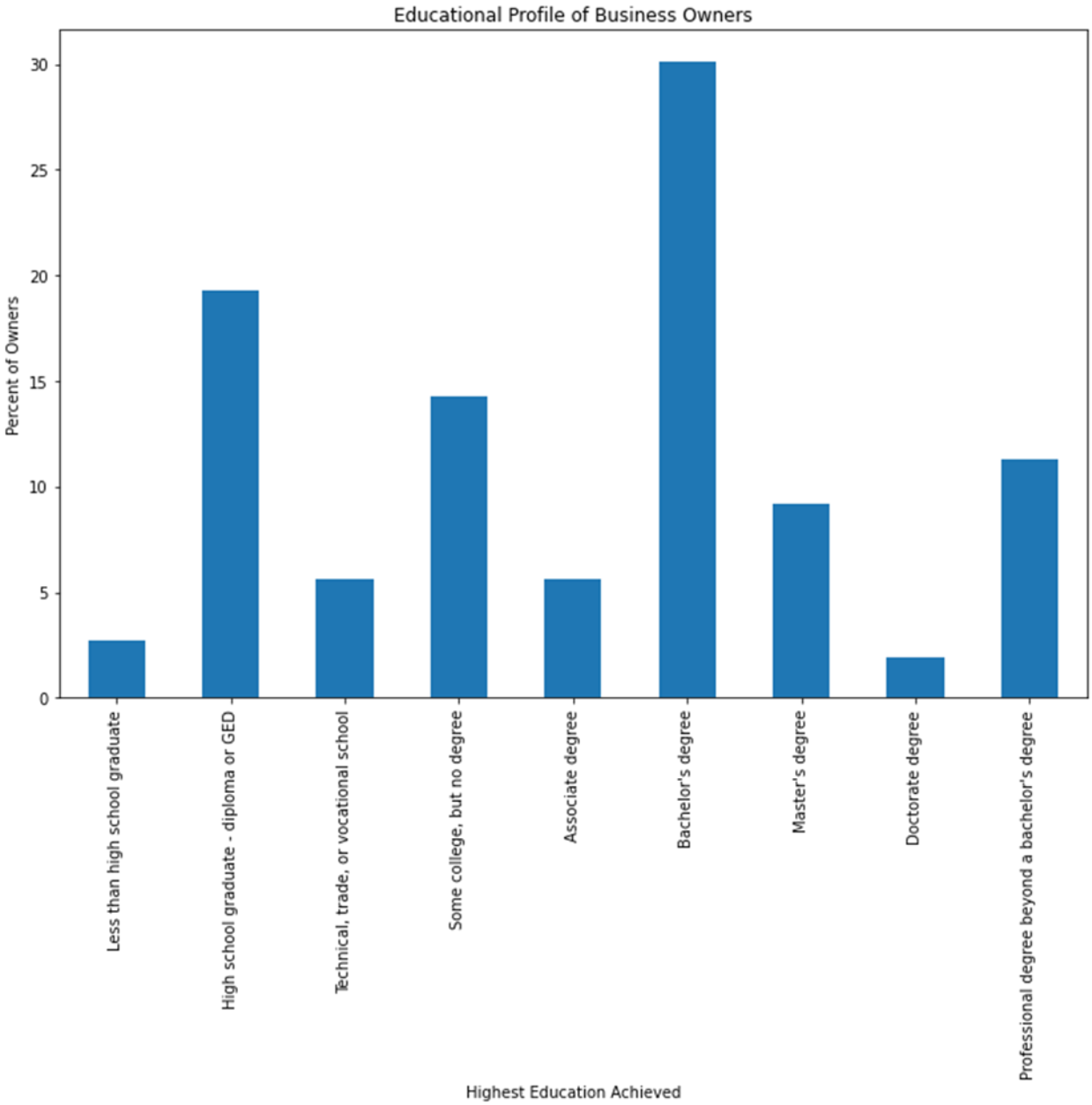
What we found interesting here is that the same number of businesses that use part-time and full-time paid employees also said they use contractors, subcontractors, independent contractors, or outside consultants. These represent the three most used types of workers, while less businesses use temporary workers. Overall, this chart suggests that contractors / outside consultants are also very valuable to businesses in addition to the standard part-time/full-time paid employees. We wanted to look at these worker types further, so we also created a chart to show how many workers of each worker type were used in these businesses.



From this, we found that while contractors / outside consultants are used across just as many successful businesses as part-time and full-time paid employees, there are far less contractors / outside consultants overall, suggesting that an individual business has many more part-time or

full-time paid employees rather than contractors / outside-consultants. Additionally, there are very few paid day laborers as this is the lowest utilized type of worker. However, from the previous chart we saw that they were used fairly often among businesses, suggesting that individual businesses used only a small number of paid day laborers.

Lastly, we examined the educational background of owners across all industries, as reported in the ABS Characteristics of Business Owners dataset. We visualize the data below:

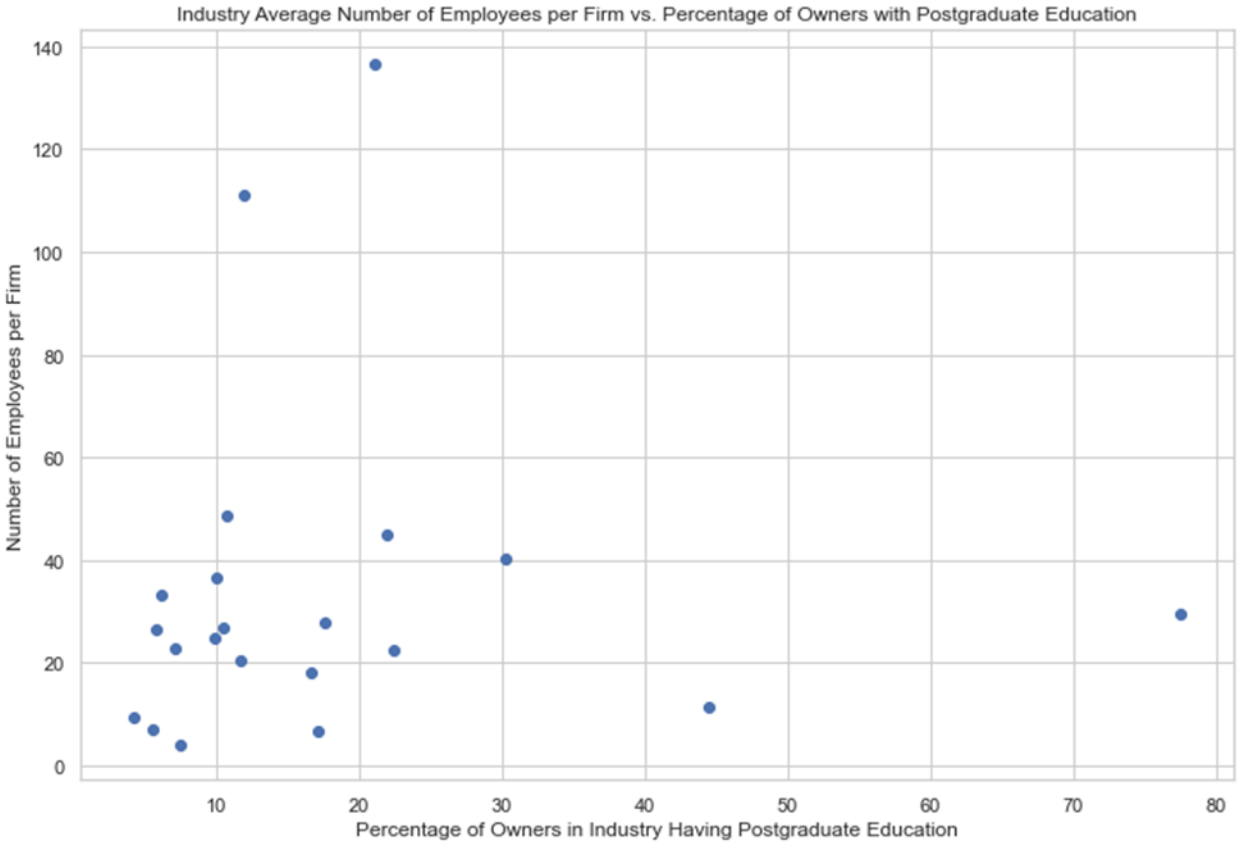


The most common educational rank achieved is a bachelor's degree, with 30% of business owners having obtained one. A high school diploma or equivalent is a distant second while the least common is a Doctorate degree, with only 1.9% of business owners having received this level of education.

For the next question, educational background across industries, we wanted to examine if the distribution of educational credentials obtained by the firm owner varied across industries. To analyze this, we produced the following heatmap.

In this graphic, each cell corresponds to the percentage of firm owners in that industry who have the level of education specified by the row. Thus, the percentages in each column sum to 100%, and by comparing differences within a row we can see any relative over- or under-representations of that education level in a particular industry. We see for the most part that there is not much variation in educational background of owners by industry, with the striking exception of “health care and social assistance”, where a majority (58.3%) of owners have a professional degree beyond a bachelor’s degree. This likely reflects the requirement of a postgraduate degree to become a practicing physician in the United States.

For the last question we created a scatter plot of industries, where the percentage of owners in that industry possessing a master’s, doctorate or professional degree beyond a bachelor’s was plotted on the x-axis, and the average number of employees per firm was plotted on the y-axis. In effect, we are examining whether a higher average education level of owners within an industry is associated with any change in average firm size as measured by the number of employees.



Overall, no strong trend can be seen. “Health and social assistance”, as well as “professional, scientific, and technical services” have much higher percentages of owners with postgraduate education than other industries, but the average number of employees per firm in these fields is well in line with the range for most other industries; conversely, “management of companies and enterprises” and “utilities” have far more employees per firm on average than other industries, while the percentage of owners with postgraduate education in these two industries lies within the typical range.

Conclusion

This report began by answering how firm annual payroll differs based on the highest level of education by the owner and by race. We hypothesized that business owners with a doctorate degree are more likely to own more profitable businesses than those with less education as their businesses typically have larger annual payrolls. However, our results contradicted this. Education of the owner did not appear to impact the annual payroll of a business. Moreover, business owners with a higher level of education hired the same types of workers as those with a lower education.

Overall, we found some interesting patterns of successful businesses and successful business owners described by this dataset. For instance, most successful business owners, according to this dataset, tend to be white or Asian. Additionally, they seem to hire primarily full-time paid employees with a fair amount of part-time paid employees, and occasionally contractors / outside-consultants. Regarding the businesses, the largest number of successful businesses are in the manufacturing or professional, scientific, and technical services industries.

This is a preliminary snapshot of the educational background of business owners, and how it relates to other kinds of variation in the business landscape, and there remain many avenues for further study. It would be interesting, for instance, to compare the educational background of business owners with that of American citizens more broadly, to see how this group differs from the country as a whole. It would also be interesting to examine if there have been any trends towards more education among business owners over time, as the percentage of Americans attending college has increased in recent decades.

For our last question on this topic, we also only examined one facet of firm size and structure, namely that of the number of employees. Differences in payroll or revenue were not considered, nor were any differences that might exist in geographic concentration or the average age of firms. While we saw no trend along the dimension we examined, it remains possible, if unlikely, that the percentage of owners with postgraduate degrees could systematically covary with one of these other variables not considered.

Sources

https://www.census.gov/data/developers/data-sets/abs.2019.html