Economic and Demographic Factors Influencing Business Success in the United States

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Introduction

The US Census performs different types of surveys to gain a greater understanding of the challenges facing people and businesses across the United States. The Census produces a number of ways with which to consume this data, one being the Census Data API. This API allows us to pull relevant data through the use of various endpoints, which can be used through Python to create dataframes and visualizations by way of the Pandas data science package. The specific surveys used for this project came from the 2019 Annual Business Survey, which contains characteristics of businesses (typically referred to as employer firms in the documentation) and business owners, offering information such as business industry type or owner demographics like sex, race, ethnicity and much more.

The subset of the ABS we focused on was the Characteristics of Business dataset. This project investigated factors which could lead to business success such as firms by industry type, number of firms by owner sex and race, and number of firms by customer type, such as civilian or government suppliers. We also decided to look at the national level as well as two states, Wisconsin and Minnesota. Our objective was to compare the data that was found both at the national level and state level to see how each state was performing in regard to the four factors posed above.

The questions we wanted to answer include:

- What is the breakdown of firms by industry type? How do these breakdowns compare across different geographies, and what can this tell us about a state's business landscape?
- Does the breakdown of customer types for the specific states Minnesota and Wisconsin differ from the breakdown of customer types for the United States as a whole?
- How does the number of firms owned by different sex groups differ between Wisconsin, Minnesota, and across the United States?

To this end, we produced visualizations utilizing Python and a number of packages, including Pandas, matplotlib and seaborn. We extracted the data from JSON objects returned by the API and performed cleaning and transformation steps to get the data ready for plotting. These figures and results are contained in their respective sections. Finally, we discussed some of our findings and observations while working with this API, as well as the difficulties and limitations that we faced in this project.

Methods

Data

Data were extracted from the 2019 *Company Summary* and *Characteristics of Business Owners* APIs from the United States Census Bureau Annual Business Survey (United States Census Bureau, 2021). This was distributed to employer businesses in the United States in the year 2019, and gathered economic and demographic information about the businesses and associated business owners for the year 2018 (United States Census Bureau, 2021). Data extraction, cleaning, and transformation were all performed in Jupyter using the pandas package.

Relevant data from the 2019 *Company Summary* contain information about business industry sector, business customer type, business owners' sexes, and business owners' race groups and the number of corresponding employer businesses (United States Census Bureau, 2021a). Relevant data from the 2019 *Characteristics of Business Owners* contain information about business owners' highest levels of education achieved prior to becoming business owners and the number of corresponding employer businesses (United States Census Bureau, 2021b). For each relationship that this project addressed, the appropriate API was sourced to gather data for the United States, Wisconsin, and Minnesota.

Analyses

All analyses were performed in Jupyter using pandas, matplotlib, and seaborn packages. Analyses consisted of horizontal bar plots comparing the topic of interest (business industry sector, business customer type, etc.) with the number or percentage of corresponding employer businesses for the given location (United States, Wisconsin, Minnesota).

Results

Business Characteristics

Industry Sector. One of the variables available from the Census API is the NAICS 2017 labels for industry type. This denotes what type of industry the firm belongs to and is assigned to them by various agencies other than the US Census Bureau. This differs from the rest of the questions contained in this report, as those were mostly coming from responses to the survey. Some of these classifications include fields such as agriculture, manufacturing, retail trade, administration and many more. The NAICS system uses both a code and label to provide information about a firm's role, and can be obtained from the API easily by putting the NAICS 2017 label as part of the get request. The visualizations obtained show the percentage breakdown of the firms by industry type. Figure 1 shows this data for the US as a whole, Figure 2 shows data for Minnesota, and Figure 3 shows the breakdown for Wisconsin.

The first observation that jumped out from the data was that the number of firms providing educational services was quite low for both states and the greater US. Inversely, the number of construction firms was quite high for all locations. Another observation that can be made is the relatively higher percentage of businesses in Wisconsin that offer accommodation and food services. An area where Wisconsin does not excel in is the fields of professional, scientific and technical services, lagging behind both Minnesota and the rest of the US. Overall, both Minnesota and Wisconsin fall in line with the US percentages for the most part, excluding the divergences listed above.

Customer Type. As part of the Annual Business Survey (ABS) for 2019, companies were asked the question “In 2018, which of the following types of customers accounted for 10% or more of this business’s total sales of goods and/or services? Select all that apply”. The answer options available were: Federal government, State and local government (including school districts, transportation authorities, etc.), Other businesses (including distributors of your product), Other organizations, and Individuals. This report focuses on the nationwide responses to that question as well as the responses for Minnesota and Wisconsin (Figure 4, Figure 5, Figure 6).

On the nationwide level (Figure 4), over two million businesses responded to the question and approximately half a million chose not to respond. Of the businesses that responded, the majority of customer types are of the Individuals category. The rest of the customer category types, by highest response to lowest response, are Other businesses, State and local government, Other organizations, and Federal government.

The customer type breakdowns for the states Minnesota (Figure 5) and Wisconsin (Figure 6) are nearly identical with the Individuals type being the highest and the remaining, in descending order, being Other businesses, State and local government, Other organizations, and Federal government. The major difference in these breakdowns is that Minnesota had a little over fifty-thousand businesses respond while Wisconsin had a little under fifty-thousand businesses respond.

Business Owner Characteristics

Owner Sex. In Wisconsin, the number of firms owned by a majority of female people was 16,951, which made up 16.3% of the total firms reported. The number of firms owned by a majority of male people was 61,071, which made up 58.9% of the total firms reported. The number of firms owned by an equal number of male and female people was 18,587, which made up 17.9% of the total firms reported (Figure 9).

In Minnesota, the number of firms owned by a majority of female people was 19,984, which made up 17.6% of the total firms reported. The number of firms owned by a majority of male people was 69,609, which made up 61.2% of the total firms reported. The number of firms owned by an equal number of male and female people was 16,404, which made up 14.4% of the total firms reported (Figure 8).

Across the United States, the number of firms owned by a majority of female people was 1,141,410, which made up 19.9% of the total firms reported. The number of firms owned by a majority of male people was 3,496,959, which made up 61.1% of the total firms reported. The number of firms owned by an equal number of male and female people was 860,754, which made up 15.0% of the total firms reported (Figure 7).

Owner Race Group. Owner race group refers to the race group represented by the majority of owners for a business. For example, a business with three owners, two White and one Asian, would be represented in the Nonminority and White race groups.

For all geographies (United States, Wisconsin, Minnesota), the top three most prevalent individual business owner race groups from greatest to least are : White, Asian, Black or African American. For all geographies, American Indian and Alaska Native and Native Hawaiian and Other Pacific Islander-owned businesses are severely underrepresented and are not even detectable in the visualizations. For employer businesses with multiple owners, for all geographies, Nonminority owners are the most prevalent. Minority-owned businesses are the second most prevalent, and Equally minority/nonminority-owned businesses are either not detectable (Wisconsin, Minnesota) or barely represented (United States). Although the trends are consistent across geographies, Asian, Black or African American, Minority, and Equally minority/nonminority-owned businesses are more represented in the United States compared to in Wisconsin and Minnesota.

Owners' Highest Levels of Education. Owner's highest level of education refers to the highest level of education represented by the majority of owners for a business. For example, a business with three owners, two with Bachelor's degrees and one with a Doctorate, would be represented as obtaining a Bachelor's degree.

For all geographies (United States, Wisconsin, Minnesota), the most prevalent business owner's highest education level prior to becoming an owner is a Bachelor's degree, followed by High school graduate. In the United States, the third most prevalent highest level of owner education is Some college, but no degree, followed by Professional degree beyond a bachelor's degree, and Master's degree. In Wisconsin and Minnesota, the third most prevalent is Technical, trade, or vocational school, followed by Some college, but no degree. The next most prevalent in Wisconsin are Professional degree beyond a bachelor's degree and Master's degree. For Minnesota, the next most prevalent are Master's degree followed by Professional degree beyond a bachelor's degree.

Discussion

Business Characteristics

Industry Sector. One of the interesting findings in the data was the low number of educational services across the survey as a whole. This could be due to the sample properly representing the population of firms in the US or it could be possible that this sample oversampled industry groups such as construction firms or retail trade while undersampling others such as arts and educational services. The educational services sector is unsurprisingly composed mostly of colleges and schools and relatively similar learning environments, while the construction sector as an example contains three diverse subsectors, which may be responsible for their greater number in this survey. Without access to the specifics, it is difficult to make an assumption on these observations. Another area of difference between the three locations was in the accommodation and food services industry. Wisconsin had an edge over both Minnesota

and the greater US by about 2-3%. This observation seems to support the idea that there are a higher quantity of breweries, bars and pubs which can be found in Wisconsin, all of which fall under this sector of industry. Finally, there is a lack of mining firms as part of this survey, which seems unrealistic but could be due to a small group of firms performing most of the mining in these states.

Customer Type. The main use in gathering data from the United States as a whole is to see if the distribution of customer types is similar in the states Wisconsin and Minnesota. To analyze this, a percentage was generated from the number of firms that responded to a specific customer type and dividing it by the total number of reporting firms. On the national level (Figure 4) this breakdown is: Individuals make up 71%, Other businesses 42%, State and local government 8%, Other organizations 5%, Federal government 3%. For Minnesota (Figure 5) the breakdown is: Individuals make up 68%, Other businesses 45%, State and local government 9%, Other organizations 6%, Federal government 2%. For Wisconsin (Figure 6) the breakdown is: Individuals make up 73%, Other businesses 40%, State and local government 9%, Other organizations 5%, Federal Government 3%. The data shows that the breakdowns are similar, within five percentage points of each other.

By analyzing this result a number of theories as to how one could increase their business can be formed. For example, the data shows that the majority of customers for each geographic breakdown are individuals. If someone were to start a business it may be beneficial to cater to the individual consumer as opposed to the Federal Government which makes up a small percentage of the customers. On the other hand, maybe the small percentage of Federal Government customers indicates an untapped market that could be taken advantage of.

Business Owner Characteristics

Owner Sex. The United States had the largest percentage of firms owned by a majority of female people, with 19.9%. The difference in percentages between male and female-owned firms across the United States was 41.2% (Figure 7).

Wisconsin had the smallest percentage of firms owned by a majority of female people, with 16.3%, and firms owned by a majority of male people, with 17.9%. Wisconsin also had the largest percentage of firms owned by an equal number of male and female people, with 17.9%. The difference in percentages between male and female-owned firms in Wisconsin was 42.6% (Figure 9).

Minnesota had the smallest percentage of firms owned by a majority of female people, with 14.4%. Minnesota also had the largest percentage of firms owned by male people, with 61.2%, just barely above the United States value of 61.1%. The difference in percentages between male and female-owned firms in Minnesota was 46.8% (Figure 8).

These findings show that both Wisconsin and Minnesota have a larger difference between male- and female-owned firms than across the United States. Between the two states, Minnesota had the largest difference with 46.8%, which is 5.6% more than the United State's value of 41.2%.

Overall, the percentages of firms owned by a majority of male people and an equal number of male and female people was relatively evenly distributed across Wisconsin, Minnesota, and the United States. However, both Minnesota and Wisconsin have significantly fewer firms owned by a majority of female people than the United States.

Owner Race Group. The racial group demographics for business owners is not representative of the actual race demographics in the United States, and suggests that owner race has a large effect on business success. It is possible that Minority-owned businesses are not as successful due to societal racism. It is also possible that different business owner race groups may cluster in different neighborhoods with differential circumstances for success. There

are a multitude of factors that could explain why the demographic representation seen in business owners does not reflect the demographic representation of the population in total. It is likely that a number of factors are acting in combination. However, more research would be needed to investigate this.

Owner Highest Level of Education. The trends for business owner education demographics are not consistent across the different geographies. This suggests that the factors influencing education level and business success vary by region. For instance, Wisconsin and Minnesota have larger representations of Technical, trade, or vocational school business owners than the United States. It may be that the community needs for these kinds of services are greater for these states than for the nation. It may also be that not all regions have equal access to differing levels of education, or that the local resources demand different types of businesses that align differentially with education levels. More research would be needed to address this.

Limitations

One limitation we faced when extracting and visualizing this data was inconsistent and unhelpful groupings of data. Some of the data groupings for a dataset are very broad and some are very specific, leading to data that is not very useful. For example, owner sex was grouped by “Male”, “Female”, and “Equally male/female,” with “Male” and “Female” representing firms with a majority of owners having male and female genders, respectively. This is very broad and it would be more useful to see the groups broken down into smaller bins. Also, “Equally male/female” is too specific and doesn't provide much useful information because only a small percentage of businesses are owned by an exact even split between male and female people. This data would be a lot more useful if there were bins with ranges of male/female percentages, as it would show a more detailed breakdown of the firm owners’ genders.

Another limitation we faced with the data was values in a dataset not adding up to the total value. This indicates that some data is being omitted from these datasets, which questions the accuracy of this data.

Some explanations for omitted data are discovered when examining the structure of the API. For most variables that return quantitative data there is a corresponding flag variable, usually indicated by VARIABLENAME_F. When the data returned is zero, it is most likely that this flag variable will tell part of the problem. For example when exploring revenue data, many zeros are returned when examined at the state level. If we include the flag variable it returns alphabetic characters such as “U” or “W”. These indicate revenue ranges as opposed to the explicit revenue due to companies being unwilling or unable to provide the information.

Conclusion

This project used data from the United States Census Bureau 2019 ABS to investigate whether industry sector, customer type, owner sex, owner race group, owner and education level affect business success, as measured by number of firms. The results indicate that each of these factors does influence business success, and that state trends typically follow national trends. This information is useful for aspiring entrepreneurs who need ideas for what industries and customers to serve, and may also be used by governments to better understand economic and demographic characteristics so that they can better serve their communities. The findings in this project are only trends without explanatory data or causation. More research would be needed to investigate why these factors affect business success.

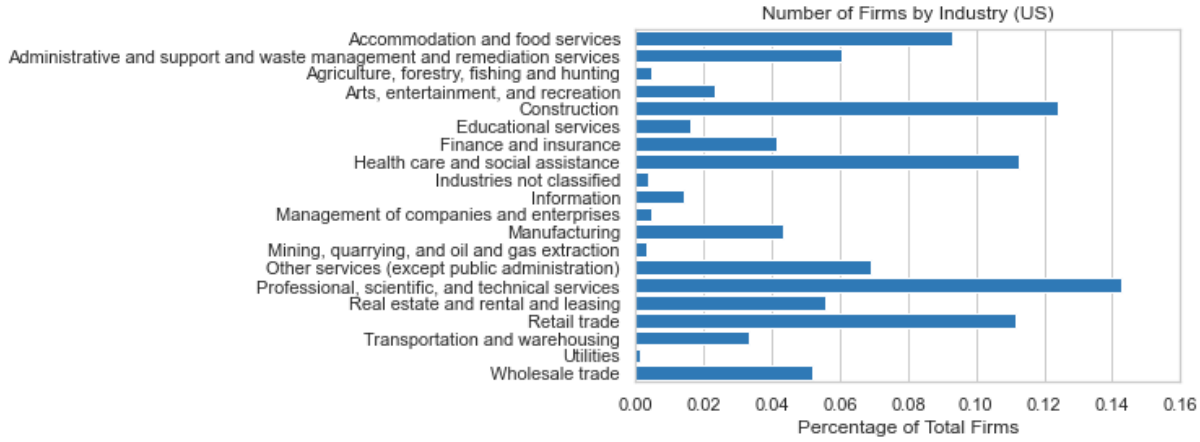
References

United States Census Bureau. (2021a). *Company summary* [API Data set]. Retrieved January 14, 2021 from https://www.census.gov/data/developers/data-sets/abs.2019.html.

United States Census Bureau. (2021b). *Characteristics of business owners* [API Data set]. Retrieved January 14, 2021 from https://www.census.gov/data/developers/data-sets/abs.2019.html.

Figures

Figure 1: Firms by Industry for the United States



Figures 2: Firms by Industry for Minnesota

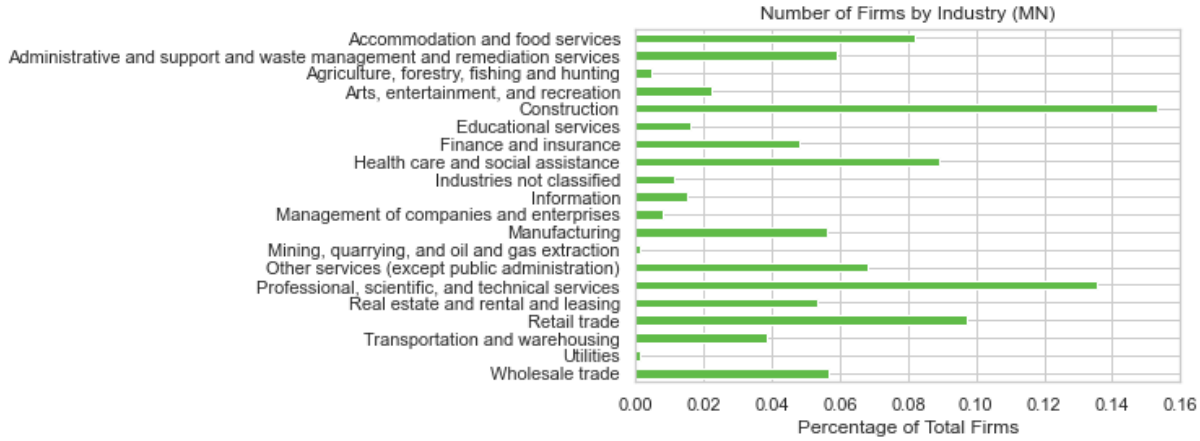


Figure 3: Firms by Industry for Wisconsin

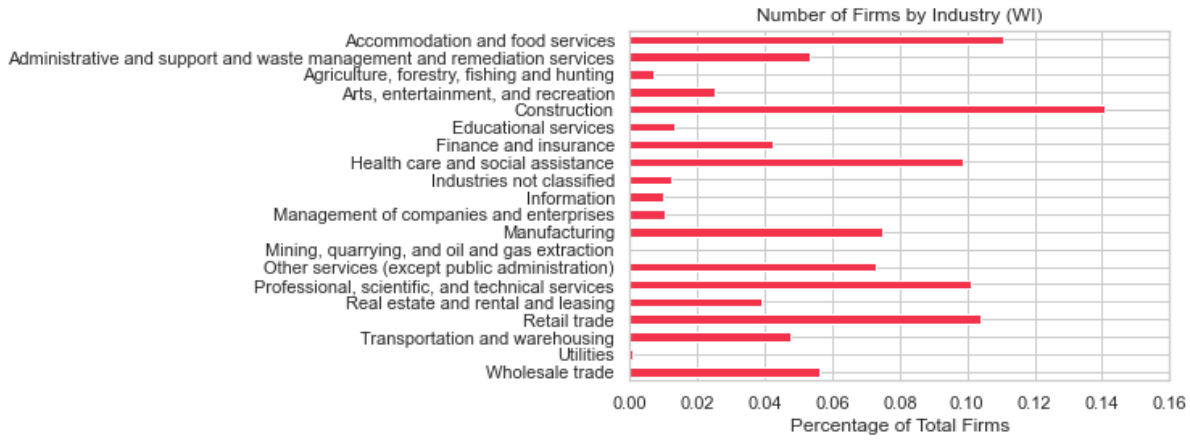


Figure 4: Firms by Customer Type for the United States

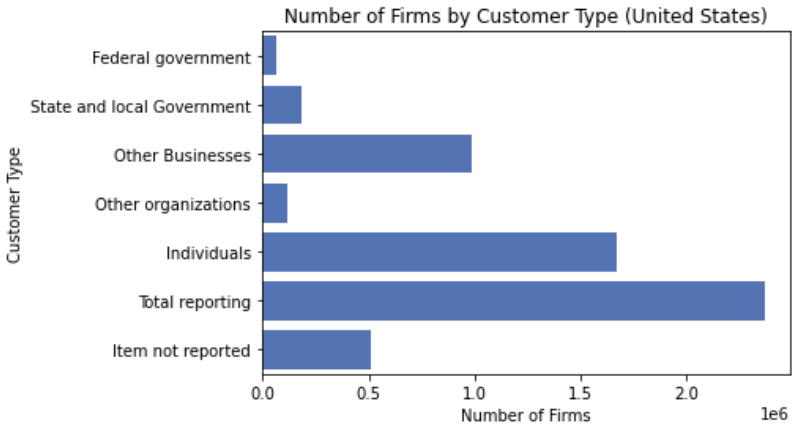


Figure 5: Firms by Customer Type for Minnesota

Figure 6: Firms by Customer Type for Wisconsin

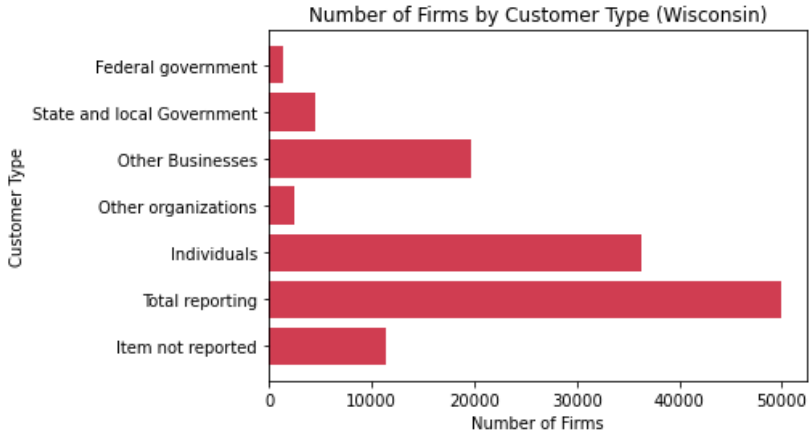


Figure 7: Firms by Owner Sex for the United States

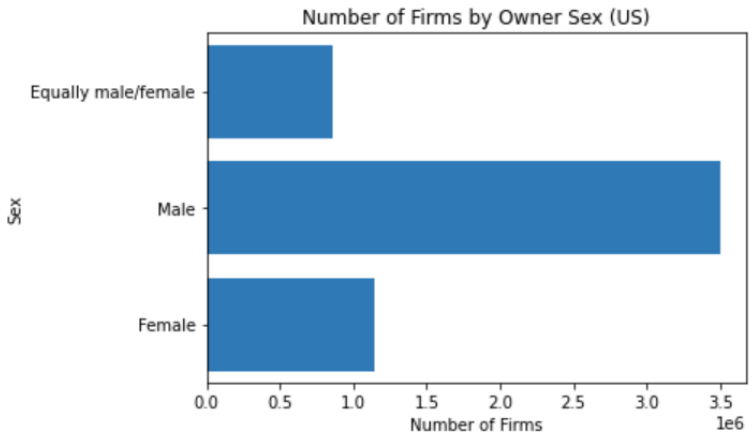


Figure 8: Firms by Owner Sex for Minnesota

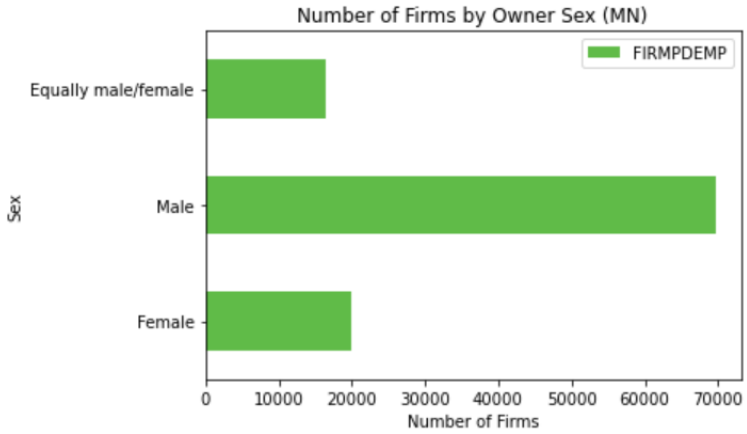


Figure 9: Firms by Owner Sex for Wisconsin

Figure 10: Firms by Owner Race Group for the United States

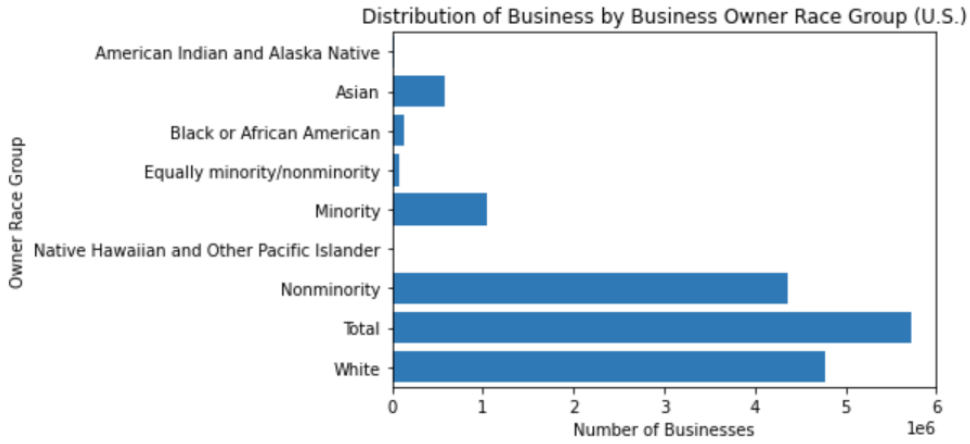


Figure 11: Firms by Owner Race Group for Minnesota

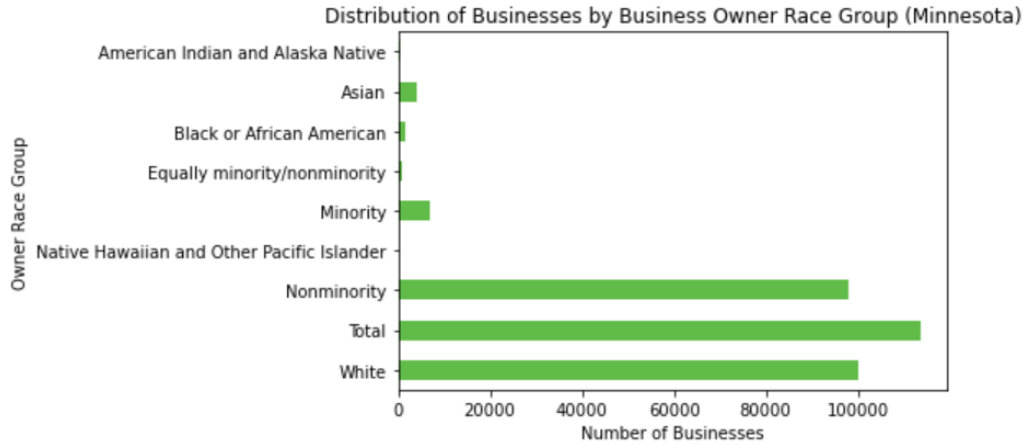


Figure 12: Firms by Owner Race Group for Wisconsin

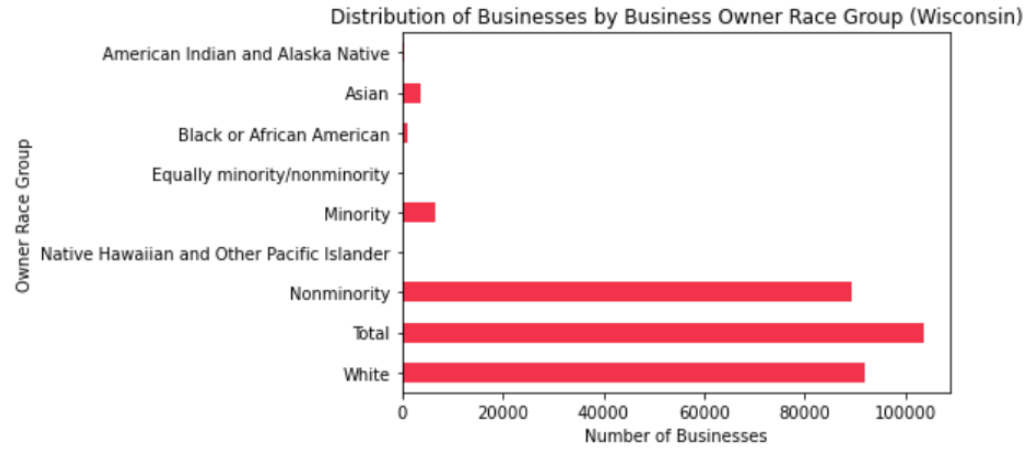


Figure 13: Firms by Owners' Highest Levels of Education for the United States

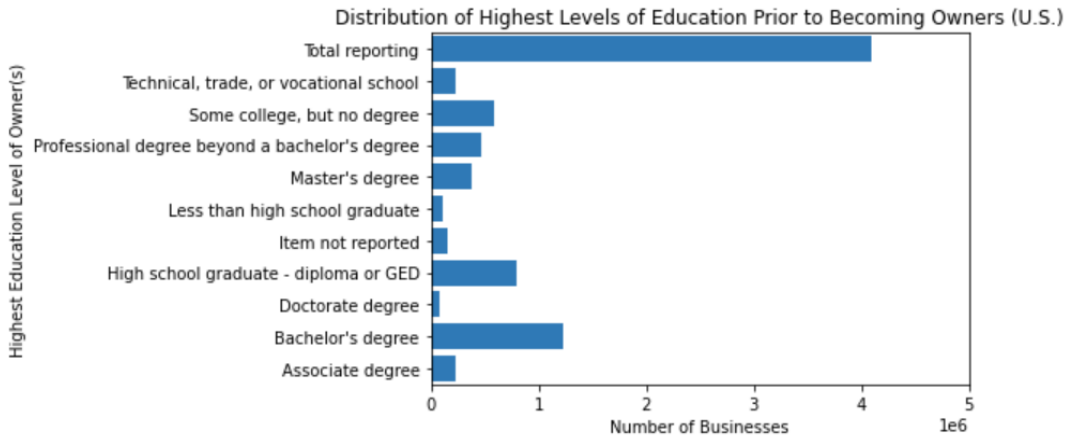


Figure 14: Firms by Owners' Highest Levels of Education for Minnesota

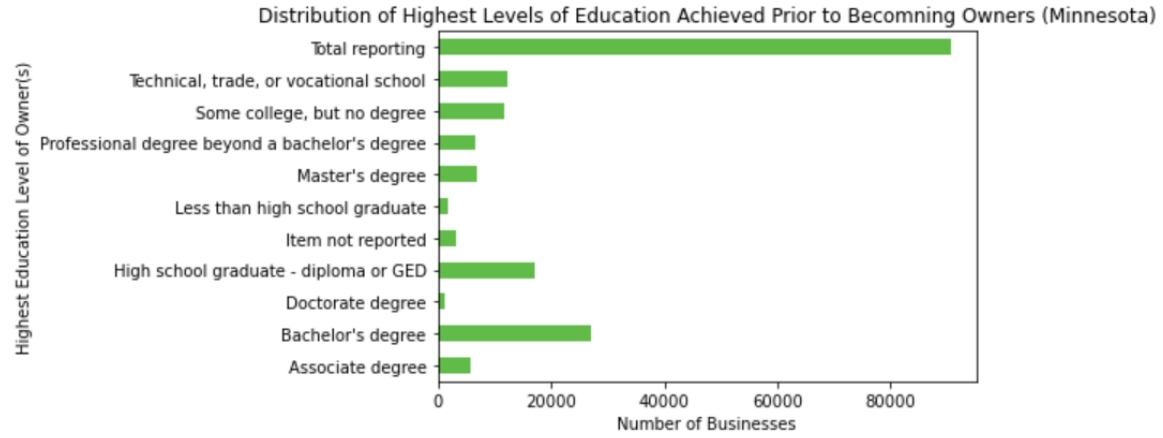


Figure 15: Firms by Owners' Highest Levels of Education for Wisconsin