

Report of the Number of Job Openings across Industries and Time in the United States

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1 Introduction

HireBeat is an HR software company providing enterprise Software-as-a-Service (SaaS) software that simplify talent recruiting and assessment with digital video interviewing and screening. It is an applicant tracking system and candidate sourcing software.

A Candidate Sourcing Software helps hiring managers and recruiters find potential employees proactively by searching through profiles, resumes, or other data about candidates. Therefore, as a to-business company, we need to target our attention to industries with the highest hiring demands. In this report, our main objective is to find the industries in the United States with the largest number of job openings, so that we could focus more on developing software suitable for businesses in these industries to maximize the demand of our potential clients.

In this report, we will use R to perform data cleaning and preliminary data analysis, and then use Tableau to perform the remaining data analysis and plot graphs to visualize data and draw conclusions.

2 Data Background

2.1 Data Source

In this report, we gathered data from the U.S. Bureau of Labor Statistics. The database "*Job Openings and Labor Turnover Survey*" (JOLTS) is used to quantitatively measure the number of job openings across industries, time and states. The JOLTS published industry estimated based on the 2022 North American Industry Classification System (NAICS). NAICS is the product of a collaborative effort between the United States, Canada, and Mexico. Sharing a common classification system allows, for the first time ever, direct comparison of economic data across borders in North America. NAICS is also a "clean slate" revision of the system used to classify establishments by industry.

NAICS-based estimates are available for December 2000 to the present. The JOLTS program published estimates by supersector (to be explained later) and selects sectors that are within scope of the JOLTS program; excluded are agriculture and private households. Publicly-owned establishments are classified in government.

2.2 Time Span and Seasonal Variation of Data

State industry employment time series can exhibit regularly recurring seasonal movements. Seasonal adjustment eliminates the part of the change attributable to the normal seasonal variation and makes it possible to observe the cyclical and other nonseasonal movements. Seasonally adjusted data contain this type of adjustment to enable comparisons of data across any point in time. We use the seasonally adjusted data from the JOLTS database. Since the data for the month February 2023 is preliminary data, we will not include them in the analysis of this report. This means that, we will only have data from January for the year 2023. Moreover, the JOLTS database only contains data in December for

the year 2000. Due to the seasonal variation of job openings, we will discard the data for December 2000 and January 2023 and only consider data in the time interval 2001 to 2022.

2.3 Industry Range

All the industries in the JOLTS database are non-farm industries. Under this umbrella, there are two classes of industries: private industry and government. Private industry contains sub-classes, for example retail trade, finance and insurance, etc. On the other hand, government is only divided by two industries: federal government and state and local government. Some sub-class industries are further divided into more classes, and there are 19 non-divisible industries for the non-farm industry, called the NAICS supersectors. (Although some supersectors can be further divided to sectors, the JOLTS database lack data of these divided sectors, so we will just treat these supersectors as non-divisible.) The lists of NAICS supersectors for private industry and government are shown in Figure 1 and Figure 2.

Mining and Logging	Construction
Durable Goods Manufacturing	Nondurable Goods Manufacturing
Wholesale Trade	Retail Trade
Transportation, Warehousing, and Utilities	Information
Finance and Insurance	Real Estate and Rental and Leasing
Professional and Business Services	Educational Services
Health Care and Social Assistance	Arts, Entertainment, and Recreation
Accommodation and Food Services	Other Services

Table 1: List of NAICS Supersectors for Private Industry

Federal Government	State and Local Government Education
State and Local Government, excluding Education	

Table 2: List of NAICS Supersectors for Government

3 Number of Job Openings across Industries

To begin with, we will analyze the total number of job openings in the last five years (2018-2022) across industries. This would give us an intuition about the distribution about job openings, although it cannot detect the industries imminent to expand.

In Figure 1, the numbers of job openings are measured in thousands of jobs. We can see that the top 4 industries in terms of job openings are: *Professional and Business Services*, *Health Care and Social Assistance*, *Accommodation and Food Services*, and *Retail Trade*. Among these four industries, Professional and Business Services and Health Care and Social Assistance have comparable job openings, and have much higher value than the last two. All the other 15 industries have much less job openings.

On the other hand, we may also notice that the supersector of Professional and Business Services is a wide-range terminology and is in fact composed of three sectors: Professional, Scientific, and Technical Services; Management of Companies and Enterprises; Administrative and Support and Waste Management and Remediation Services. Therefore, it is expected that this supersector has the highest job opening since it includes many subclasses of industries. However, due to the lack of more specified industry categories in the database, we do not have information on the number of job openings in each sector of Professional and Business Services. In contrast, the other three supersectors are well-specified industries and are in fact not combined by two or more sectors.

One disadvantage of combining five years' data in the analysis is that, some industries may be rapidly expanding in the recent few years, and averaging its job opening in five years would therefore dilute its expansion. However, these industries are just industries we would like to focus more on, because

Total Job Openings in the Last 5 Years by Industry

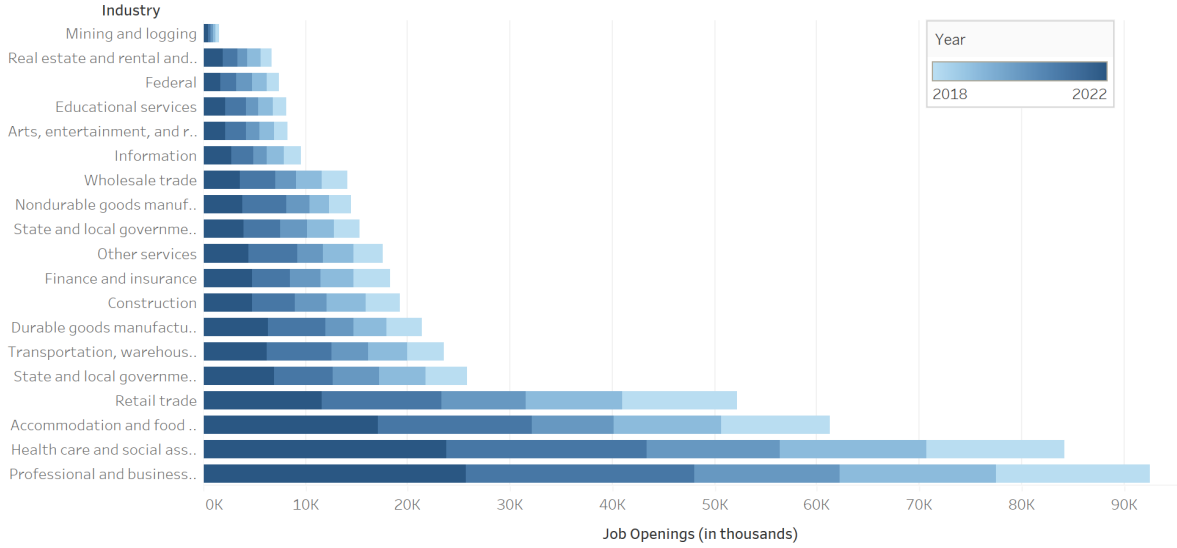


Figure 1: Job openings across the 19 Supersectors

they represent the future trend of job openings and the hiring industry. So, we could also look at the number of job openings in 2022 only. In Figure 1, the darkest blue parts for each industry are the number of job openings in the year of 2022. We can see that the ordering of job openings in 2022 did not change for the first few largest industries.

Since the industry *Professional and Business Services* is too board and is in fact not at the same level as the other three industries, we would like to investigate the biggest four supersectors found above at the same level. The figure is plotted at Figure 2. *Health care and social assistance* belongs to *Education and health services*; *Accommodation and food services* belongs to *Leisure and hospitality*; *Retail trade* belongs to *Trade, transportation, and utilities*.

Total Job Openings in the Last 5 Years at the Same Industry Level

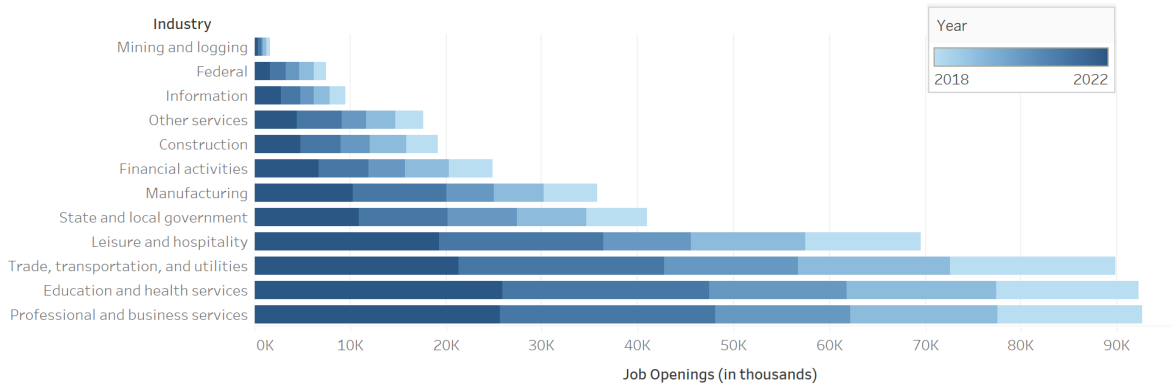


Figure 2: Job openings across industries at the same level

Figure 2 shows that, the four supersectors we identified above are still the largest four industries, and the ranking among the four only changed between *Accommodation and food services* and *Retail trade*. In this figure, *Professional and Business Services* and the industry that *Health care and social assistance* belongs to have similar number of job openings.

To summarize, in this section, we investigated the number of job openings across industries. There

are four largest industries in terms of the number of job openings: *Professional and Business Services*, *Health Care and Social Assistance*, *Accommodation and Food Services*, and *Retail Trade*. These industries have much more openings than any other industry both in the recent 5 years and in the year of 2022. Since the industry *Professional and Business Services* is too board, and does not have as many job openings as the other three if we compare the industries at the same level, we do not suggest to focus our attention to this industry right now. Therefore, we suggest three industries in terms of job openings to focus more in our software development: *Health Care and Social Assistance*, *Accommodation and Food Services*, and *Retail Trade*. The industry *Professional and Business Services* may need to be investigated further using more detailed data.

4 Number of Job Openings across Time

Our second task is to investigate how the number of job openings changes across time. This could give us an intuition about the future hiring market. We will first take a look at the total trend of job openings in all non-farm industries across years, shown in Figure 3

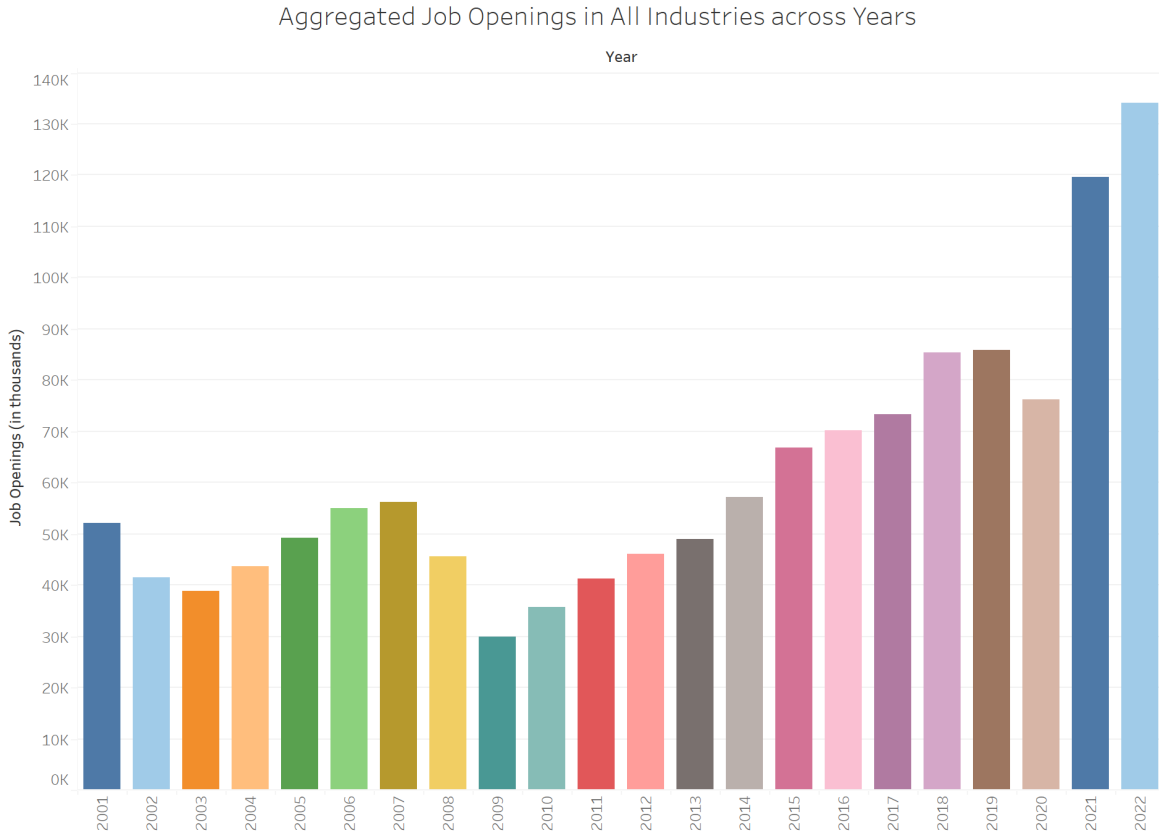


Figure 3: Job openings across industries across time

Based on Figure 3, the general trend of job openings is to increase. However, there are two major points of decrease: in the year 2008/2009 where the financial crisis occurred; in the year 2020 where COVID-19 occurred. Thus, the job openings generally obeys the economy situation and has an increasing trend.

We will in particular focus on the industries found to have large job openings in the previous section. This is illustrated in Figure 4. We can see that their relative rankings did not change a lot across the past 5 years: *Professional and Business Services* is always the highest, and *Health Care and Social Assistance* is always comparable with it. This suggests that, all the four industries are stabilized in these years, and thus are predicted to continue to be stabilized in the next few years.

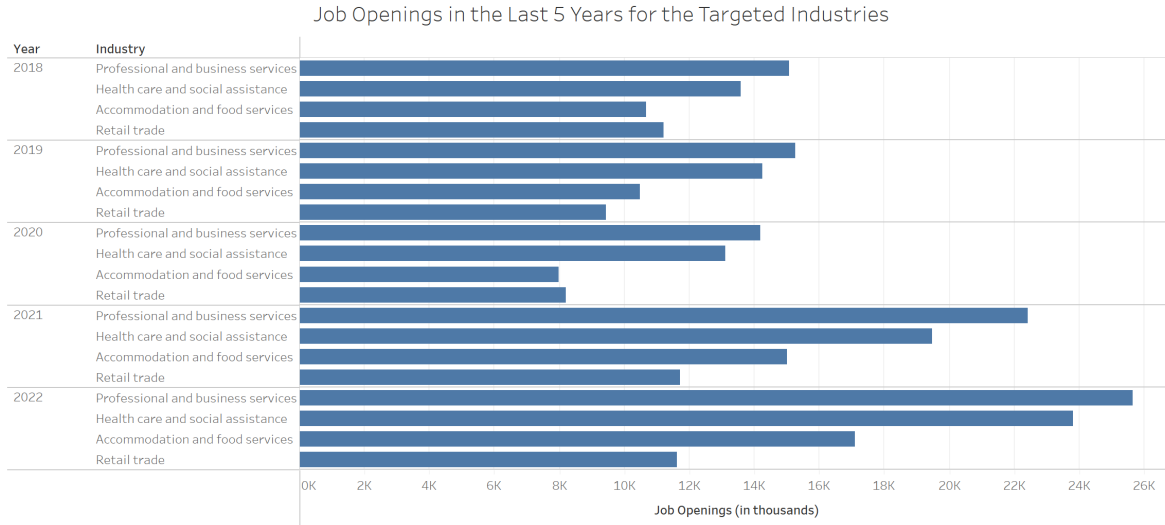


Figure 4: Job openings for targeted four industries across time

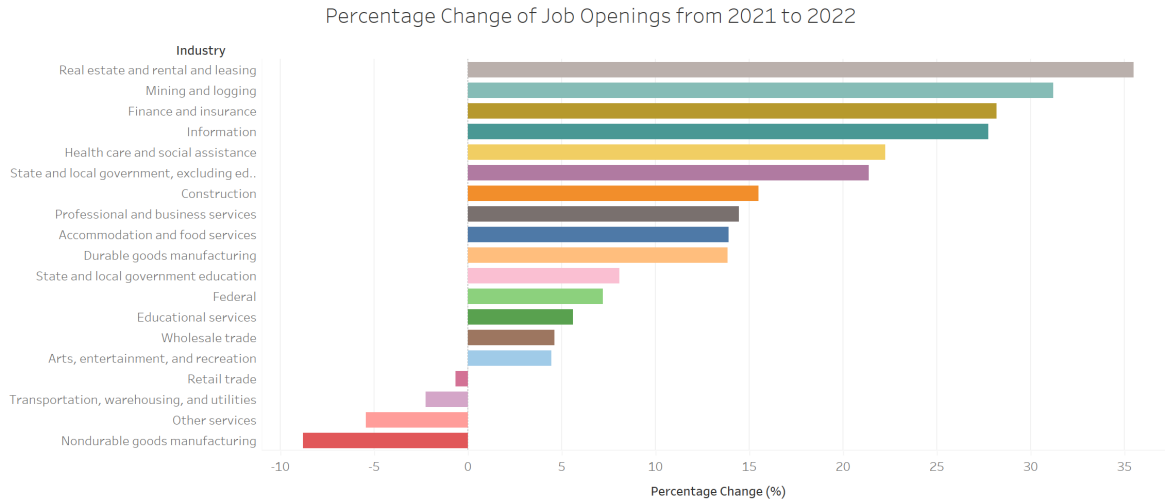


Figure 5: Percentage Change of Job Openings from 2021 to 2022

At last, we can compare the percentage change of job openings. Figure 5 shows the change from 2021 to 2022. Among the four industries we targeted to, three of them had positive change around 15% to 20%. Those are: *Professional and Business Services*, *Health Care and Social Assistance*, and *Accommodation and Food Services*. The only industry had negative change is *Retail Trade*. We can also see that the four industries having higher percentage increase than *Health Care and Social Assistance* all have small number of job openings based on Figure 1. Thus, we do not consider focusing on them further because the high increase may not lead to a large amount of hiring demand in total, and is even possible due to random chance of the year.

5 Conclusion

In this report, we aimed to identify industries with high hiring demand. This demand was quantitatively measured by the number of job openings from the JOLTS database. The database contains 19 supersectors, and we identified four of them to have large number of job openings: *Professional and Business Services*, *Health Care and Social Assistance*, *Accommodation and Food Services*, and *Retail Trade*.

The industry *Professional and Business Services* is too board and does not fall the same level as the other three. Moreover, its number of job openings did not exceed the other three industries a lot if they are compared at the same level. Therefore, although it has the largest number of job openings, we do not recommend our software development team to focus a lot on this wide industry.

The industry *Retail Trade* has the lowest number of job openings both in the recent 5 years and in 2022. More importantly, it is the only industry where the number of job openings was decreased. Therefore, we do not recommend our software development team to focus a lot on this industry.

The last two industries are *Health Care and Social Assistance* and *Accommodation and Food Services*. They both have large number of job openings and increase trend on job openings. The most recommend industry for more focus in the future is *Health Care and Social Assistance*, because it has larger number of job openings and a larger percentage increase in the last year (around 25%). *Accommodation and Food Services* is the second recommended industry.

In conclusion, the hiring demand is promising due to an increasing trend in the number of aggregate non-farm job openings. We also recommended two industries to further investigate: *Health Care and Social Assistance* and *Accommodation and Food Services*.