A Tumultuous Job Market: The Effects of the COVID-19 Pandemic on the US Labor Market

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Problem Definition:

COVID-19 has undeniably revolutionized the way people work and transformed the way people think about work. One specific phenomenon brought about by this change is the Great Resignation, in which a labor shortage is fueled by millions of Americans voluntarily quitting their jobs (Cook). Although the Great Resignation is definitely a highly debated topic in the news and in social media today, its details are often thrown under the catch-all term that is its name. As a result, both employers and employees alike, may not fully understand where and why this labor shortage is happening. To address this issue, our group aims to characterize the Great Resignation by looking specifically at labor market statistics, especially in relation to the COVID-19 pandemic. Ultimately, we would like to answer these questions:

1. Which industries are affected the most?
2. To what extent are vaccination rates playing a role in the Great Resignation?
3. How is the Great Resignation affecting different regions?

Description of Background:

Many labor practices were forced to change in order to accomodate the COVID-19 pandemic, which started in the United States in March 2021. These changes vary from industry to industry and are therefore hard to generalize. For instance, many healthcare workers started experiencing longer and harder hours due to a massive boom in patients needing treatment for COVID-19. Meanwhile, many employees of the tech industry began working from home in response to the pandemic. The pandemic changed the way people work as well as the way people approach the idea of work. Perhaps, the dramatic change in labor practices allowed people to think more critically about work and life. In any case, there is undeniably a sharp rise in quits (i.e. number of people who quit their jobs) following the onset of the pandemic (see Figure 1).

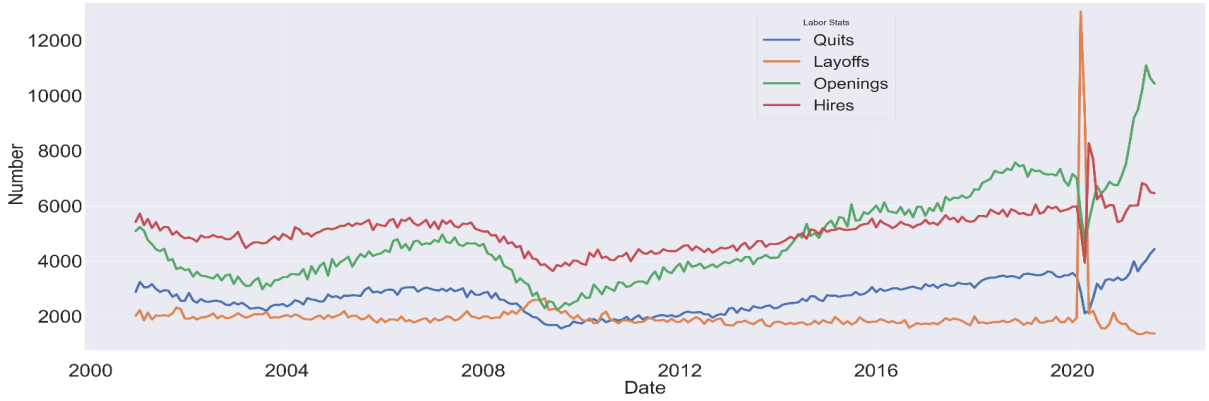

Figure 1: Total Quits, Layoffs, Openings and Hires in the US from Jan. 2000 to Sept. 2021

According to Harvard Business Review, "4 million Americans quit their jobs in July 2021" (Cook). This massive spike in quits starting in March 2020 is coined the "Great Resignation". While Harvard Business Review identifies the tech and healthcare industries as leaders in quits, other research has shown that service workers, especially low-wage employees, have the highest number of quits (Cook; Bartik). As of the writing of this report, the Great Resignation is still ongoing and with no clear end in sight. However, by having a stronger understanding of the Great Resignation, perhaps solutions can be made that better tackle the underlying issues that led to the Great Resignation in the first place, alleviate the stress the Great Resignation is causing on the economy, and or allow for preventative measures to stop the Great Resignation from going out of control.

Description of Datasets:

Our project uses the U.S. Bureau of Labor Statistics's Job Openings and Labor Turnover Survey (JOLTS) dataset in addition to COVID-19 datasets on vaccination rates, deaths, and cases. Information for each dataset can be seen below:

*JOLTS dataset (*https://download.bls.gov/pub/time.series/jt/*):*

Available in ".txt" format, this dataset includes data on job openings, layoffs, quits, and etc. across multiple industries, states, and years. It contains the most current and accurate information on the labor market for public use. The JOLTS dataset comes with its own encoding system and therefore, decoding must be done in order to extract meaningful information. Several mapping files are included alongside the JOLTS dataset to assist with the decoding process.

COVID-19 cases and vaccinations

*(*https://catalog.data.gov/dataset/united-states-covid-19-cases-and-deaths-by-state-over-time *https://www.kaggle.com/paultimothymooney/usa-covid19-vaccinations):*

Available in ".csv" formats, these two datasets collectively contain monthly COVID-19 cases, deaths, and vaccination rates for each state.

Description of Method Used:

In addition to preparing the datasets as described in the previous section, we also had to group the data by month such that comparisons can be made between the datasets via data visualization and regression analysis. The downside of this grouping was that we were left with fewer data values which in turn affected our analysis in the end. Nevertheless, this was inevitable as the number of quits in the JOLTS data set are reported monthly.

Data visualization is the main method used to analyze the datasets. By looking at visualizations of data, we can identify trends and correlations that help us better understand the Great Resignation. The Seaborn and Matplotlib libraries are used to create our visualizations. Since we want to observe changes in the labor market and COVID-19 statistics over time, we visualized many time series. Other visualizations that we created, but may not be shown in this report, include heatmaps, box plots, and etc. The additional visualizations can be found in attached codes under folders with the same titles.

Regression analysis was performed between labor data and COVID-19 data in order to find whether the two are correlated or not. Moreover, we performed another regression analysis on quits and layoffs to find further correlations. For this method, we are particularly interested in the coefficient of determination and the p-value, both of which will indicate the strength of a correlation or lack thereof. Nevertheless, by skimming the data we predict that since we do not have an extensive dataset specifically for the number of quits, regression analysis will not yield promising results. The results for this analysis are included in the last part of Analysis Results under Regression Analysis.

Analysis Results:

Quits and Layoffs:

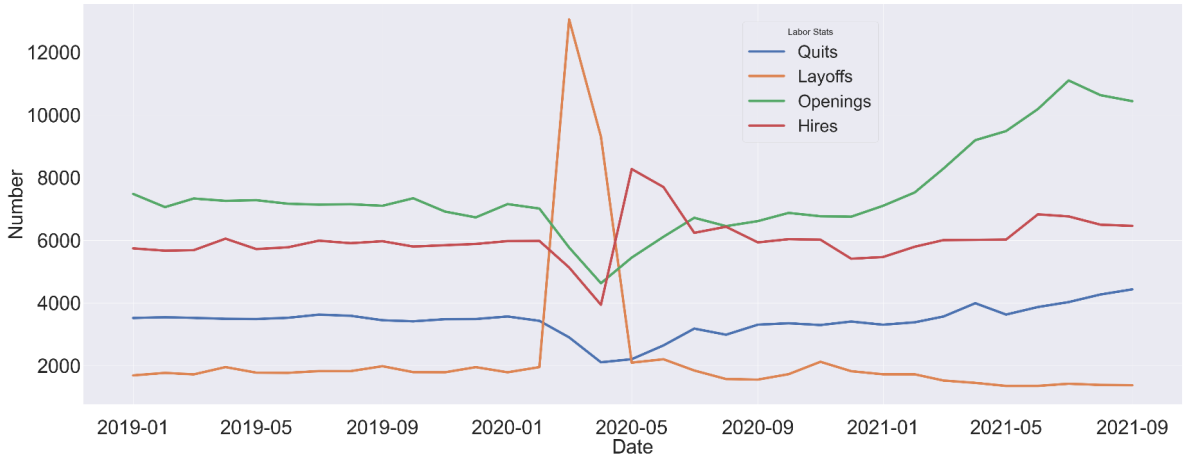

Figure 2: Total Quits, Layoffs, Openings and Hires in the US from Jan. 2019 to Sept. 2021

Our findings (see Figure 2) show that the Great Resignation is characterized by a widening gap between quits and layoffs as well as job openings and hires. The gradual decrease in the number of layoffs and the dramatic rise in the number of job openings indicate a strong demand for employees. However, the number of hires fails to satisfy the demand. In addition, the level of quits is rising at the same rate as the level of hires, which exacerbates the labor shortage. The catalyst of it all appears to be the massive rise in layoffs in March 2021, which created a large imbalance in the labor market that is yet to stabilize.

According to our results (see Figure 3), the industries[1] that are affected the most by the Great Resignation are, at a glance, "leisure and hospitality" (which includes "arts, entertainment, and recreation" and "accomodation and food services") and "retail trade" as shown in Figure 3. The rate of quits in these industries rose by 3.2% and 1.9% respectively between March 2020 and September 2021. These industries come as no surprise since they are directly impacted by the various COVID-19 restrictions put in place by governments around the world. With multiple lockdowns, vaccines restrictions, and with no end in sight for the pandemic, one can speculate that in addition to the massive layoffs in March 2020, likely pay cuts and stagnant growth in the industry may have caused more and more people to quit.

[1] Additional graphs for different industries can be found in the folder titled (PNGs) or their corresponding Python notebooks.

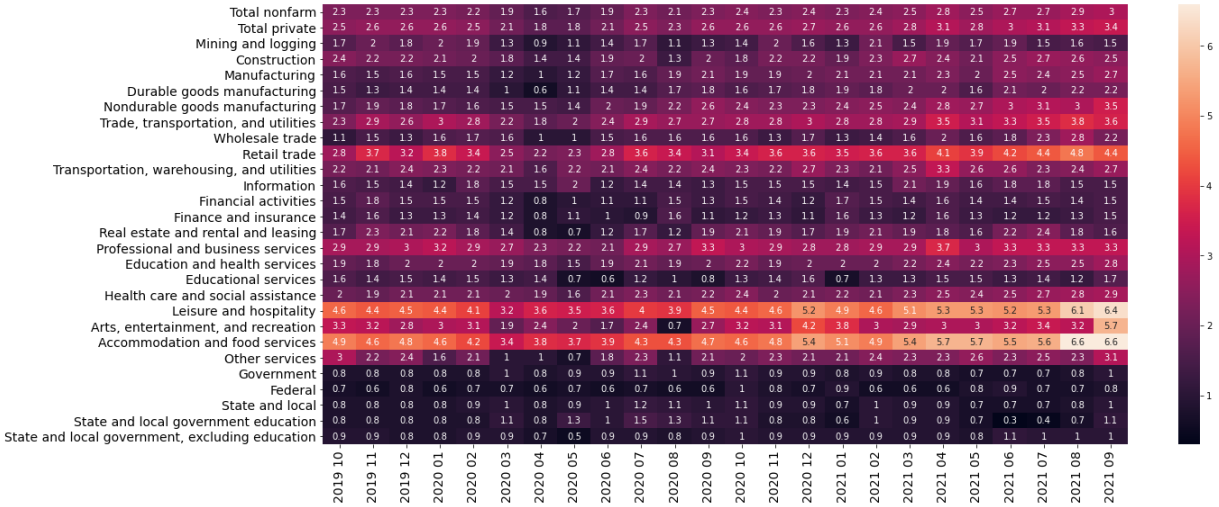

Figure 3: Rate of Quits Across Different Industries from Oct. 2019 to Sept. 2021

Another important thing to note is that both of the aforementioned industries have some of the lowest union memberships and representations as well as the lowest average hourly wages of all industries listed by the U.S. Bureau of Labor Statistics (U.S. Bureau of Labor Statistics). Perhaps the combination of a long-stagnant minimum wage that fails to match inflation rates and harsh work conditions with little to no career growth in these industries led to a collective realization of the need for a living wage (Vesoulis). Powered by a social media-fueled "decentralized union", workers in these industries are quitting in droves to force higher wages and better benefits from their employers.

On the contrary, government jobs have remained relatively stable throughout the pandemic. Unlike the private sector, government jobs tend to be more stable. Since businesses in the private sector may experience rapid growth and decline depending on the economy, jobs within the private sector are prone to these fluctuations. Government jobs have much greater stability because it is extremely unlikely that the government fails when compared to private businesses.

Aside from the initial spike in the first couple of months from the onset of the pandemic, layoffs are much more stable in general. Additionally, since the start of this year, we can see two interesting events in terms of the layoffs. The first one is that government layoffs spiked twice while other industries only had one spike. We know that the initial spike is the onset of the pandemic but the second government layoff spike may be attributed to the second outbreak that

started roughly at the beginning of fall 2020. The second interesting event in layoffs seems to be happening with the healthcare industry. During the recent months all layoffs have a downward trend except the healthcare industry. This can be attributed to the more rigorous vaccine mandates in this industry. This is reasonable because employees do not want to voluntarily quit their jobs but many have become seriously against vaccines that are willing to lose their jobs or even careers over vaccine mandates or are fighting them in courts.

Vaccinations:

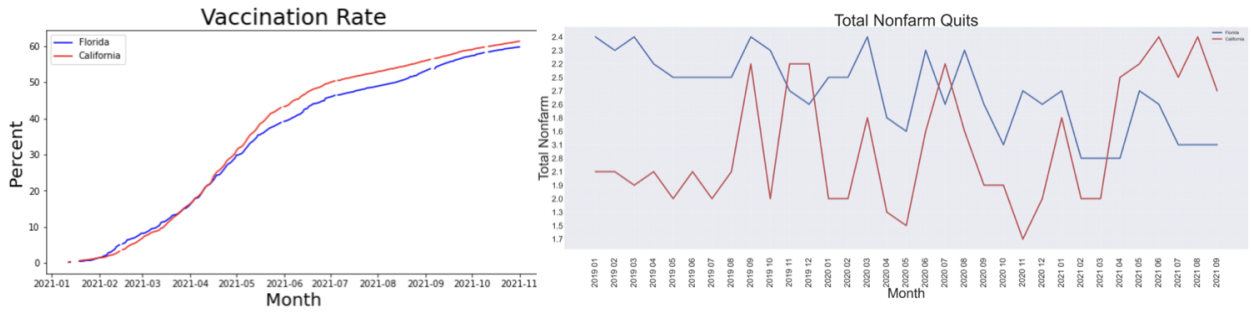

Figure 4: Vaccination Rate and Quits in Florida versus California

When looking at the relationship between how the number of vaccinations may affect the numbers of quits in a state with a high versus low vaccination rate, we were expecting a positive correlation. However, what these graphs show is that the opposite occurred. We decided to compare California and Florida as examples of states on two opposite ends of the spectrum when it comes to perception of vaccines. California has a higher vaccination rate, and has had a higher rate throughout the months. However, California also has a larger number of quits, especially when looking at the data after February 2021. This becomes even more evident when looking at the pre Covid data of the graph on the right. Florida, historically, has had more quits than California leading up to the point where vaccine data became available (Jan 2021). Although this rejects our initial hypothesis, this could be due to underlying factors not represented in these graphs. Perhaps looking at different industries and different parts of Florida where vaccination rates are especially low would yield different results. Another potential reason could be the increase in remote workers in a variety of industries. When people are able to work from home, they are not subject to the same level of exposure an in-person environment would provide and employers are less likely to enforce a vaccine mandate. Unfortunately, we were unable to

conduct such analysis given the sparse data we were able to obtain but it leaves room for future research.

Regression Analysis:

Even though we know that there must be a connection between people quitting their jobs and the current pandemic, after working with the data for a while we predicted that we will not be able to find any correlations between covid cases and number of people quitting their jobs. We think the reason is somewhat related to the fact that when the COVID hit, most countries were not ready to combat its effects despite many warning signs coming from experts. Consequently, some of the decisions made in the initial stages were because of an initial panic. We also think that the recent trend of quits has a story of its own which is related to the COVID pandemic and its aftermath but only indirectly. The general lack of enough data is a third reason why this correlation cannot be established easily. We also agree that the complexity of the current situation requires multivariate analysis or other methods with data from previous pandemics and economic recessions for better results. However, we decided to move forward with single regression analysis if only for proving its inability to predict our current situation.

In terms of missing values since our data is constrained to the last 2 years on a monthly basis, the only missing values we had were the lack of concrete data for the last 2 months which were easy to eliminate. Additionally, since these months are significant, we have decided against imputation since it would be difficult to predict values for them.

In terms of outliers, there is only one value on the layoffs data which is for the 3rd month of 2020. This number is significant in and of itself because March is the first month that the news of COVID had already spread and countries including the US started to implement lockdown measures.

A quick drawing of a scatter plot[2] of "the number of quits" versus "new covid cases" to get an initial feel for the data hardly shows a line that can be used to interpret the results and gain meaningful insights from the data.

Additionally, with a skewness measure of -0.304 we can say that the data is close to being normal but with a kurtosis of about 2.7 we can conclude that we have a platykurtic distribution although we cannot conclude anything on its magnitude.

[2] Scatter plot of Quits vs New Covid Cases and Quits vs Layoffs can be found in the notebook titled Main.

Finally, with an R squared value of 0.047 and a p-value of 0.371 which is well above 0.05, we arrive at our initial prediction that there is no correlation between new covid cases and number of people quitting each month. We also ran a regression model through quits and layoffs and generated an R squared of 0.603 which is better than the previous regression, but still not statistically significant.

Observations and Conclusion:

In conclusion, the Great Resignation definitely had an impact on the labor market. While some industries, like the "leisure and hospitality" and "retail trade" industries, were hit hard by the Great Resignation, others, like the government industry, remained relatively unfazed. Moreover, we conclude that even though the COVID pandemic had a clear effect on the changes to the job market, we cannot understand how persistent this effect is and even though we were able to speculate some reasons for the tumultuous job market through our analysis, it became increasingly clear that in order to make a concrete prediction we need more data.

When looking at vaccination data, we were unable to gather any conclusive evidence that states with higher vaccination rates have fewer quits. This may be due to sparsity in our data, but could also be due to underlying factors we overlooked when first hypothesizing this theory. Although many people are quitting due to noncompliance with mandates, a large proportion of the workforce has entered remote working environments that do not require vaccination.

While we hope to remain optimistic about the pandemic and the labor market, we speculate that the trend of increase in the number of quits and decrease in the number of layoffs will continue in the near future given that there are no major external factors.

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