Financial Impact of Lockdown on Big Business Versus Small Business based on Data Analytics

Brady Wilkinson
George Mason University
bwilki13@gmu.edu

Bach Le Xuan
George Mason University
ble26@gmu.edu

Rohit Varma
George Mason University
rchekuri@gmu.edu

Abstract—Though everyone was affected by the COVID-19 pandemic in their own ways, some suffered harder financial loss than others. Smaller-sized businesses that once thrived from crowds of people faced a sudden disappearance in those same people that kept the business financially alive. With little other resources to keep afloat, many small businesses faced heavy losses. Big businesses also faced difficulty, some industries more than others. While airports were empty and airline companies like United and JetBlue faced heavy losses, companies like Amazon or Google seemingly thrived. The different financial impacts that big and small businesses endured will be analyzed in this paper.

The material will be presented in several steps. First the topic will be introduced, followed by an analysis of related work. Next, the problem is defined, followed by outlining the scope and analysis techniques. Analysis follows the analysis techniques description, with work to do and conclusion sections following.

Index Terms—Finance, Machine Learning, Data, Lockdown

I. INTRODUCTION

According to an article from the Houston Chronicle, "the U.S. Small Business Administration . . . does not consider a business with more than 500 employees or $7 million in total annual receipts to be a small business [1], [2]. There was no doubt that small businesses and big businesses in the US alike were suffering badly from being closed for business or operating at a very limited capacity. But small businesses face significantly higher expenses in a normalized comparison against big businesses. Expenses including but not limited to property rent, internet and telephone bills, loan interest, and bank fees impact small businesses proportionally higher. With significantly less extra capital than big businesses, these expenses can rapidly drag small businesses into debt. Another point to consider is whether opening at a limited capacity will continue to bring down small businesses. Could it have been perhaps better to bail out small businesses instead of potentially causing a slow bleed in small businesses?

II. RELATED WORK

The literature was selected based on availability and the potential to provide guidance in our analysis.

In [1], the authors want to review the impact of Covid – 19 on small businesses in several aspects with the nationwide range. They want to work on this problem because the pandemic created a significant economic shock while focusing on three questions. Social media in finance applications [3]–[20] [?].

In recent years, social media has taken up a large part of people's daily lives, keeping up with real-time news, expressing their opinions and financial impact of COVID-19 [21] etc [22] [23]–[30].The three questions that have been discussed in the paper were: "First, how did small businesses adjust to the economic disruptions resulting from Covid–19? Second, how long did businesses expect the crisis to last, and how do expectations affect their decisions? Third, how might alternative policy proposals impact business and employment resilience?" [1]. The method that has been used in surveying. The survey was done with the partnership with Alignable, a network-based platform which focuses on small business in the US. There are approximately around fifty thousand to seventy thousand members taking surveys on the platform [31]–[35]. Furthermore, to increase the degree of accuracy, three criteria were set; was: "1) They are firms that have chosen to join Alignable, 2) they are Alignable firms that have chosen to stay actively engaged taking surveys, and 3) they are the set of firms that are active within Alignable that chose to answer our survey." [1]. Besides, the authors mentioned one aspect of the CARES Act PPP: the "Small Business Paycheck Protection Program," the fund was used to pay interest on mortgages, rent, and utilities [4]. They also analyze and find the reaction of businesses before and after the program ran. After all the analysis, the authors delivered that many firms had little cash, which meant that they would have to cut their expenses drastically, add more dept, or even go bankrupt. The different industry also reacts differently, with some of the most affected retail and service industry ones. The CARES remained unclear about its effectiveness, whenever it will help most small businesses in America survive, or its impact is believed overly optimistic.

In [2], R. Fairlie discussed the impact of Covid – 19 on small businesses, with continued losses and the partial rebound in May 2020. This article was the following research about the exact problem throwback in April 2020. The social distancing and demand shifts destroy many businesses, with 22 percent of small business owners were inactive in April 2020 with disproportionate impacts on African-American, Latinx, immigrant, and female business owners [5]. The questions were concern after [5] was the happen in the second month of social distancing restrictions, and is there any further closed or rebounded [2]. It delivered the analysis of the impact of the pandemic on several small active businesses. The data was

used is monthly Current Population Survey (CPS) microdata. Using the monthly microdata in May 2020, the author measures the self-employed business ownership at the individual owner level. Other sources that were being used are national government datasets, such as Survey of Business Owners (SBO), Census PUMS files, and the American Community Survey (ACS) [2]. The losses due to Covid – 19 from February 2020 remain high at around 15 percent [2], but not all of the active business was opened in April closed permanently. Although it is the light for the dark ages, the future was not properly shining because of the substantial decrease in business activity over a short period of time. Furthermore, industry distributions placed some groups at higher risk of closures in the pandemic; business scale differences are likely a significant cause of excessive losses among minority-owned businesses, more minor on average [6]. Larger businesses are more likely to have the resources, business, legal structure, and returns to scale to implement procedures to address social distancing regulations for operating and re-opening during the pandemic [2]. Small companies' permanent closures can make a dramatic fall in employment rate, equity income and contribute to a prolonged recession.

The sources that we used for small businesses suggest that the pandemic affected those companies with a significant closing percentage. It is not the same with different categories, and the distinguished varies from the industry side to ethnic group. [1] focus more on the industry side, with three unique questions, followed up with the CARES program. [2], [3] and [5] are from the same author, Robert Fairlie, with three stages of researching small-size commercialization in the middle of Covid – 19. It focused more on the ethnic group, with the examination of different nationalities.

III. BACKGROUND

There were many factors to consider in this situation of whether to reopen businesses. Is it better to bail out small businesses and remain shut down? Or is it worth it to risk spreading the virus and move forward with opening businesses? The general consensus in the news and on social media trends was that reopening businesses will benefit the economy and small businesses. Since May 2020, states slowly allowed restrictions to relax to allow for businesses to operate at a very limited capacity. Big and small businesses began to have traffic albeit limited, and to non-business owner citizens, life seemed to grow relatively normal again. But did small businesses actually benefit from this reopening push? One argument that was heavily pushed by many different parties is that reopening businesses will directly benefit small businesses. Gavin Newsom, the current governor of California, even gave a press conference at a small business discussing the next steps in reopening businesses[8], utilizing the pathos surrounding small businesses to seemingly spark some hope in his audience. But did small businesses really recover as planned?

IV. PROBLEM DESCRIPTION

This project aims to answer the question using comparisons between small business performance and big business performance as well as an analysis on anecdotal survey data from small businesses.

Why is the analysis important?

Small businesses are often touted as "the backbone of the economy"[9]. When thinking about small businesses, people often imagine the small mom-and-pop stores run by a hard-working and honest family. Given the cultural significance of small businesses in the US, it makes sense that they were used as a main reason for reopening after nationwide lockdowns. Disheartening images of empty stores and reported hardship rallied many in support of small business.

V. HARVESTING AND DATASET TOOLS, TECHNIQUES, AND APPROACHES

A. Small Business

The data collected on the impact of COVID-19 on US-based small businesses are a combination of research articles, government reports, andFinancial Impact of Lockdowns on Big Business Versus Small Business surveys. The businesses that have been most affected by COVID-19 are the small and state-based local brands. The major source of information for this project is a collection of survey data called the Small Business Pulse Survey (SBPS).

The Small Business Pulse Survey (SBPS) measures the impact of changing business conditions during the novel coronavirus pandemic on the country's small and private companies. SPBS data is highly reliable, as it is collected and handled by the United States Census Bureau (USCB). SBPS information supplements existing U.S. Census Bureau information collections by giving high recurrence, point by point data on the difficulties independent ventures are facing during the Coronavirus pandemic. The study includes data on independent company activities and funds, demands and receipt of help, antibodies, capital consumptions, and assumptions for recuperation. Information is accessible by area and state for the fifty most crowded Metropolitan Statistical Areas (MSAs). Furthermore, the data helps organizations in settling on financial choices and helps researchers contemplating the impacts of the pandemic.

The Small Business Pulse Survey is being gathered in stages to obtain data on the developing conditions in which organizations are working. The survey questions might be addressed depending on the encounters or personal experiences of the business owners, just as on factual or real events.The first stage of pulse survey starts with collection of detailed information about small businesses, their finances, transactions and deliverables. The second and third periods of the Small Business Pulse Survey retain the core of the main of the study, yet incorporate refreshed substance to show the changing conditions faced by small businesses. The substance for the fourth stage again holds the center ideas from past stages, while adding covid vaccinations and causality data. This four

Fig. 1. List of sampled companies

Fig. 2.

step process results in a thorough and to a large extent, foolproof data. The dataset from this survey consists of data segregated on a weekly basis, every week from April 2020 which is the beginning of the COVID pandemic. The data includes questionnaires, their responses, and the percentages of businesses affected.

B. Big business

Since the available data for small businesses is in an aggregated and anecdotal form, comparing this to big business performance may be difficult. Since no direct normalized metrics can be compared, big business and small business performance for 2020 will be indirectly compared to the closest the available data will allow.

Big businesses often have much more concise and quantitative data available than small businesses. Quarterly reports are available for all publicly-traded companies, as required by the U.S. Security and Exchanges Commission. "The SEC form 10-Q is a comprehensive report of a company's performance that must be submitted quarterly by all public companies to the Securities and Exchange Commission (SEC)"[11]. Each company's report can be downloaded as a Microsoft Excel file, where the data of interest is located in the 'Condensed Consolidated Income" section of the report. There the net loss/gain of the company for the specified quarter can be extracted.

Though the topic has since moved away from focusing on US stock market data, the data provides the opportunity for secondary analysis after analyzing the 10-Q data. If a company shows significant difference in earnings reports throughout 2020, the stock prices of that company can be used to analyze the trends that the company went through for 2020. The data
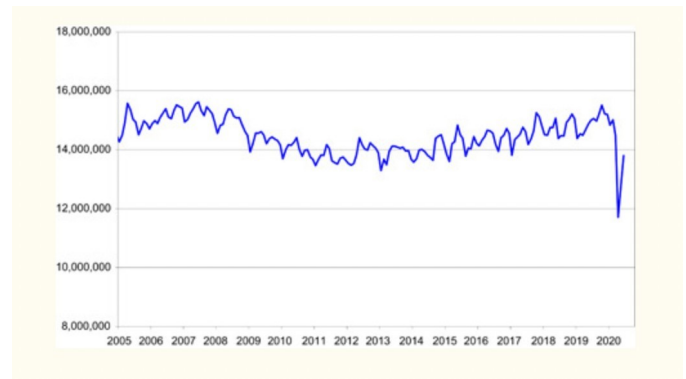
class within the pandas_datareader Python library allows users to obtain stock data, parameterized by the stock abbreviation and a start and end date. The data contains attributes pertaining to the parameterized stock's prices, including high and lows for the trading day, as well as the opening, close, and adjusted close prices. The number of stocks traded is also included.

VI. SMALL BUSINESS ANALYSIS

The widespread shutting down of stores and businesses in the United States and all around the world due to the coronavirus is unprecedented. Many of these closures may be permanent because of the inability of owners to pay ongoing expenses and survive the shutdown. The impact of COVID-19 on small businesses in the US and around the world is likely to be severe and the effects could possibly be felt for years to come. This CPS (Figure 2) or Current population survey shows the number of active business owners in the US by year. From the above graph, a kind of decline not witnessed in almost two decades can be seen, and this being towards the mid 2020 is due to the ongoing Covid pandemic during that period.

The given graph in Figure 3 is regarding the size of a business. '¡5' refers to businesses with less than 5 employees, hence considering them as small businesses. The results of this study from the Economic census shows that over 60% of the businesses in the market could possibly be small businesses.

The graph in Figure 4 shows the revenues and expenses of small businesses during the early stages of Covid. As the National emergency was announced on March 13th 2020, an increase in expenses can be observed, which were taken to survive the sudden closures, which resulted in a sharp decline in revenue that continued to decline with time.

The above graphs describe the national average in revenue by sectors that include small businesses. The early stages of COVID (April 2020) had small businesses practically unaffected as the national average was around 74%. Comparing this to the situation in the midst of the pandemic (August 2020 - September 2020), the drop in the change in national average is more than half, which shows the catastrophic impact the closure and restrictions have had on the small businesses. The latest data (April 2021) shows the change in revenue national
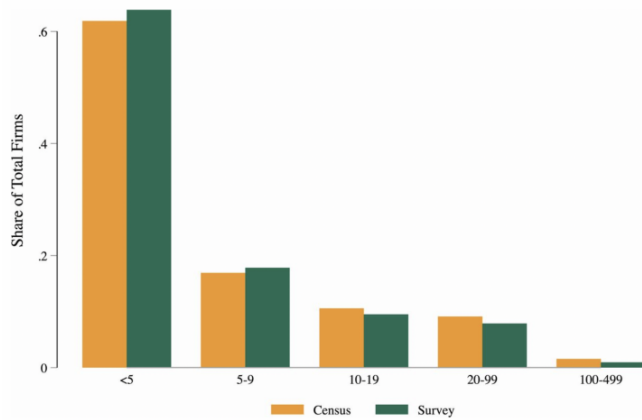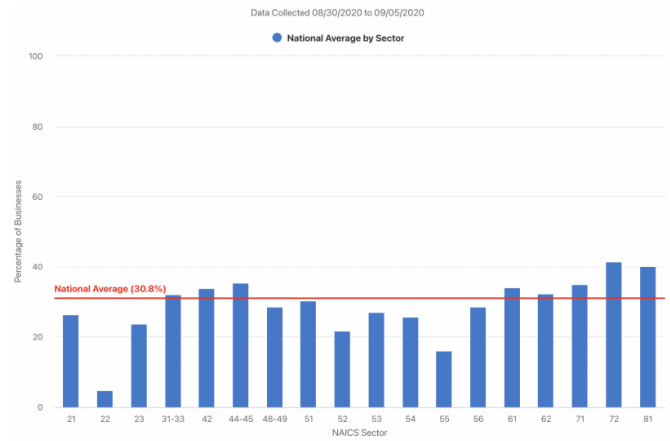
Fig. 3.

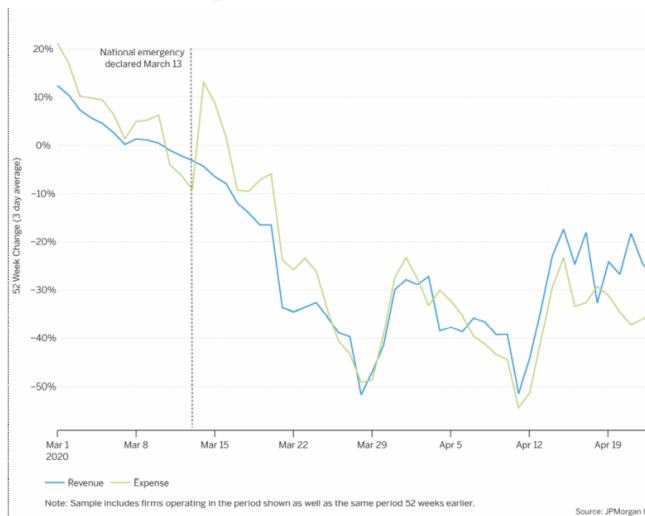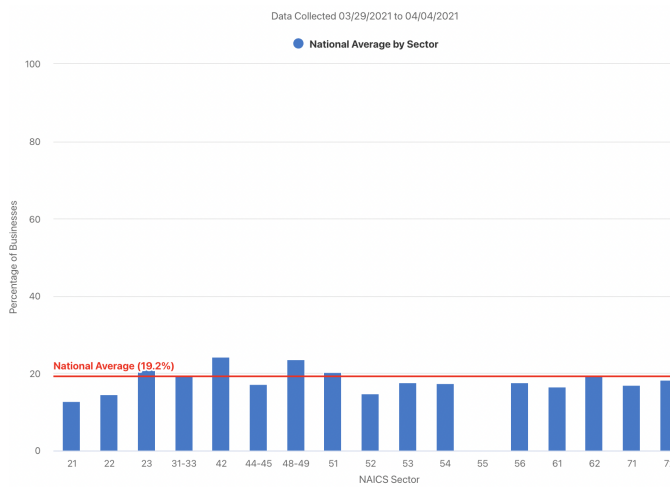Fig. 6. In the midst of the pandemic

Fig. 4.

Fig. 7. Latest data (April 2021)

average to be around 19%. These graphs show the long term impact COVID can have on small businesses and the inability of most of them to recover or cope.

VII. BIG BUSINESS ANALYSIS

Looking at the big business data, three time periods are defined: pre, meaning that the data came from financial reports around the beginning or before the beginning of lockdowns (up to March 31, 2020). Next, mid describes the data at or right after the heaviest lockdown restrictions were imposed (around July 2020). Last, post describes a time where some months have passed since the heaviest lockdowns were lifted.

The figure below shows the mean net income across all sampled big businesses for the three time periods. The mid time period shows the most obvious low mean net income for the three time periods, whereas the pre and post times are relatively similar.

Mean total revenue across each time period were relatively similar, with some noticeable difference with *pre* being greater than *mid* and post. In future iterations of analysis, significant
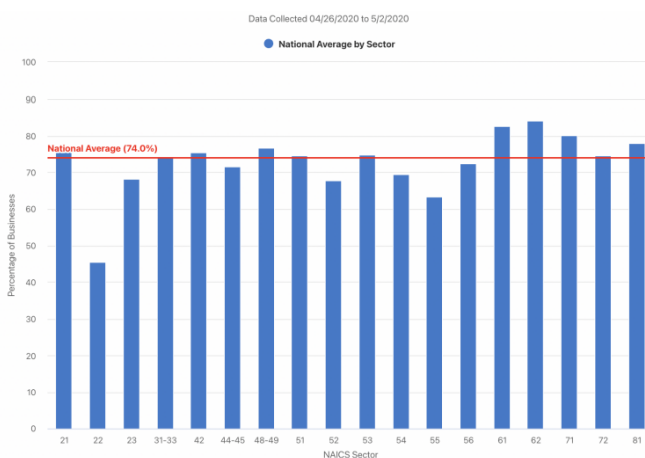

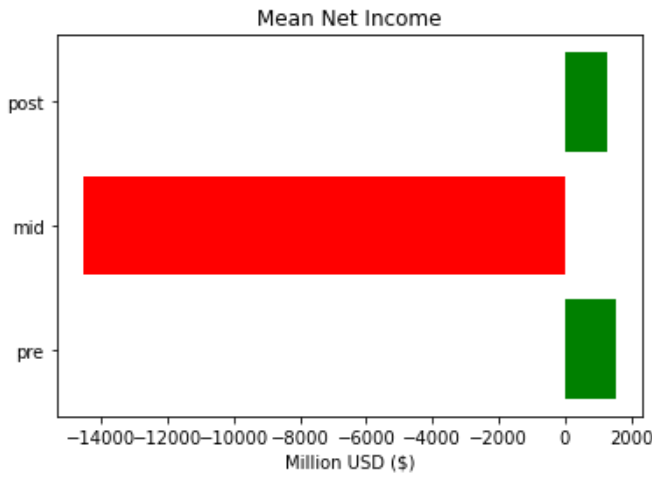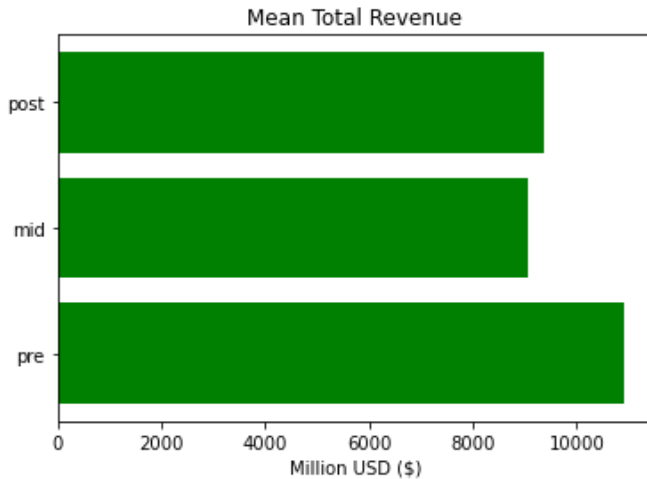Fig. 5. Before COVID and early stages

Fig. 8.

Fig. 9.

differences in mean total revenues and mean net incomes will be tested for using ANOVA to determine if any time period had significantly different means than the others. Given significant findings, regression using stock prices will be applied to industries with significant change to analyze the magnitude of change.

VIII. Project challenges

One difficulty faced when collecting revenue and net income data for big business analysis was navigating each corporation's uniquely-formatted 10-Q documents. The inconsistent quarters across the sampled businesses made it difficult to identify exact dates for analysis.

IX. Analytical conclusion

At this point, work still needs to be done in determining big business' response and the comparison between big business and small business recovery. However, it is clear that both big

and small business took significant hits from the pandemic, and the work to do will explore this.

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