Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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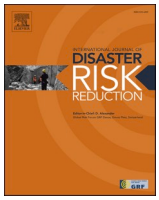

Bend or break? Small business survival and strategies during the COVID-19 shock

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ABSTRACT

This manuscript studies the impact of the exogenous COVID-19 pandemic shock on small businesses in the United States. We provide early evidence on how small business owners were affected by COVID-19 and the implementation of the Coronavirus Aid, Relief, and Economic Security (CARES) Act. We collected online survey data from a national sample of 463 small business owners across the United States. The survey was conducted in June 2020, eight weeks after the passage of the CARES Act and the Paycheck Protection Program and Health Care Enhancement Act. The survey data include information about business characteristics, financial well-being, current response to the crisis, beliefs about the future of their business survival, and the business-owning family demographic information. There are three main themes that emerge from the results. First, drivers of income loss were not necessarily associated with time to recovery. Second, businesses that were undercapitalized were more likely to suffer higher income loss, longer time to recovery, and less likely to be resilient. Resilient was operationalized as a scale merging perceived success, potential for growth, and perceived profitability. Third, business model changes were necessary due to the pandemic but not all adaptive strategies led to better business outcomes. The results from this research study will lead to a better understanding of key vulnerabilities and adjustments that small businesses make to fully recover from economic shocks.

1. Introduction

The ongoing COVID-19 global pandemic is not only having an adverse impact on public health but also on the labor market in the United States (US). Due to the closures or reduction in operations of non-essential businesses, disruption of supply-chains, stay-at-home orders, work-from-home orders, etc., businesses and individuals are experiencing loss in business, employment, and income. In this manuscript we investigate how the economic disturbance created by COVID-19 has impacted small business resilience and the adjustment strategies used by small businesses to survive. We also study the effect of federal aid provided by the Coronavirus, Aid, Relief, and Economic Security (CARES) Act and the Paycheck Protection Program (PPP) and Health Care Enhancement Act on business owners' perceptions of future business survival and success.

Small businesses are the backbone of the US economy, comprising 98% of all firms [1]. Small businesses employ almost 50% of the labor force and outperformed their larger counterparts in net job creation in 2019 [2]). However, small businesses are also more likely to be severely affected by nonnormative shocks [3,4]. The unprecedented 2019 coronavirus pandemic (COVID-19) and the subsequent economic shock has caused major disruptions to small firms. Small businesses are heavily concentrated in the service sector, such as retail and hospitality, have higher credit constraints [5] and were severely affected by the COVID-19 response measures. Results from the Small Business Pulse survey conducted between April and June 2020 by the US Census Bureau show that 90% of small business owners stated that COVID-19 had a large or moderate negative effect; in June that number had only slightly declined to 83% of small businesses [6].

Federal disaster loan assistance to small businesses is not novel, yet research on its effect on small businesses is scant. Researchers that have studied federal loan assistance to small businesses have yet to reach consensus regarding the short- or long-term effect of disaster loans. Several studies have found positive associations between disaster loan assistance and business outcomes [7–10]. Those that have found zero or negative effects [11]; 2002 [12]; often state the added burden of increased liabilities to already distressed businesses. The PPP, enacted to help small businesses through the COVID-19 crisis, was different from

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previous disaster loans. It, in essence, provided forgivable loans to small businesses including non-employer businesses not usually eligible for Economic Injury Disaster Assistance Loans (EIDL).

An important contribution of our research is the inclusion of non-employer businesses. Four in five small businesses in the US are non-employer businesses [13]), that is, they have no paid employees. Non-employer owners tend to be younger, more diverse than employer owners and 40% rely on the business as the primary source of income [14]. Non-employer firms are rarely captured in Census Bureau analyses such as the Small Business Pulse that surveyed only employer firms with less than 500 employees. Our study provides unique insight into the processes used by these main street businesses in response to the COVID-19 pandemic.

A cadre of researchers have focused on small business survival and resilience from natural disasters (e.g. Doern 2016; [15–18]. Researchers have examined what happens to small businesses in the aftermath natural disasters and what factors predict survival their survival (Doern 2016 [19]; Lam et al., 2009 [4,20–22]; Webb & Gilbert 2016; [12]. Few studies related to small business survival, resilience, and extreme events have focused on, and been conducted during a pandemic. These handful of studies have used business activity [23] instead of primary data, to determine economic impact and understand business processes and adjustments during a pandemic. There has been scant research focused on the strategies that small business owners used respond to the ongoing pandemic. Our research contributes to this stream of literature by collecting primary survey data from small business owners to study small business resilience amidst a pandemic. Results provide understanding of how uncertainty with no end in sight impacts small businesses and identify management strategies that are feasible in the short term to "buy time" in this longer adjustment term horizon, thus avoiding a "tipping point".

The data for this manuscript comes from an online national survey of small business owners across the US. Small businesses are defined as non-employer businesses and those with less than 100 employees. We collected data about business owner characteristics including demographic characteristics, perception of business success before and during the COVID-19 pandemic, time preferences, and risk perception. We also collected data on business-level outcomes such as financial losses, time to recovery, and business resilience. The data also includes business characteristics such as business wellbeing, financial wellbeing, cash flow, number of employees, business sector, type of customers served, etc.

Three main themes emerge from the results. First, drivers of income loss were not necessarily associated with time to recovery. Second, businesses that were undercapitalized were more likely to suffer higher income loss, longer time to recovery, and less likely to be resilient. Third, business model changes were necessary due to the pandemic but not all adaptive strategies led to better business outcomes. The results contribute to a better understanding of key vulnerabilities and adjustments that at-risk small businesses make to fully recover from nonnormative shocks. The results are important for designing policies that help the most affected businesses and individuals. Programs such as the PPP that provide forgivable loans seem especially important for small businesses that are more likely to suffer cash flow problems and cannot survive short- or long-term closures. These programs provide relief without adding to existing liabilities to businesses already in crisis.

2. Background on COVID-19 and CARES act

On March 11, 2020 the World Health Organization declared that COVID-19 could be characterized as a pandemic. The first stay-at-home orders directing closing of non-essential businesses went into effect in California on March 19, 2020. By March 30th, 30 states had instituted stay-at-home orders and the closing of non-essential businesses (Kaiser Family Foundation 2020). Stay-at-home orders continued to be implemented through April 6th, and most orders were extended through May 15 or May 30th. However, states such as Alaska, Nebraska, South Dakota, North Dakota, and Arkansas never issued stay-at-home orders.

These COVID-19 related shutdowns impacted small businesses leading to business closures and employee layoffs. For every three new hires, ten layoffs occurred [24]. According to the Atlanta Federal Reserve survey, 70% of businesses requested some form of financial assistance from a bank, family, friends, or other sources. Only 45% of small businesses surveyed by National Federation of Independent Business (NFIB) reported in July 2020 that they were operating above 75% capacity; 55% of businesses were operating at or below 75% capacity compared to pre-pandemic levels [25]).

The CARES Act signed March 27, 2020 provided $376 billion for the PPP to support small businesses. According to this Act, small businesses that applied for PPP and met certain conditions, could have the amount of their loan forgiven if it was spent on expenses such as payroll, utilities, rent, or mortgage interest for the eight weeks since the loan origination date. The first round of PPP funds was exhausted in the first few days of accepting applications. The Paycheck Protection Program and Health Care Enhancement Act signed April 24, 2020 provided additional $321 billion funding for PPP. This act also reserved $60 billion funds for small, midsize, and community lenders (including minority lenders). It also provided $50 billion for Economic Injury Disaster Loan (EIDL) and $10 billion for EIDL grants.

3. Literature review

3.1. Small business adjustment strategies

Small business owners play an important role in helping communities rebound after disasters [26]. Thus, is it important to study the impacts, strategies, and barriers that small business owners encounter in their bid to survive and recover from such disasters. It is particularly imperative to understand the business model changes used by small business owners to survive a nonnormative shock such as an ongoing pandemic. Business model changes can include new strategies to create value, take advantage of new opportunities [27,28], or decrease impacts from disasters. More specifically, business model changes may include strategies such as changes in the supply chain, changes in how a business delivers products to customers, or changes in marketing strategies. Business model changes are related to firm adaptation during economic downturns and crises and were found to be positively related to firm outcomes [29].

Few researchers have addressed the adaptive strategies used by small business owners in the context of disaster events. In the last decade, researchers have focused on small business recovery based on business characteristics, disaster assistance, and damage [19–21,30]. [19] demonstrated that across all types of disasters, management strategies were associated with business survival. Marshall and Schrank [10] found that financial management strategies such as financial intermingling and SBA loans used by small businesses led to both short-term and long-term recovery from Hurricane Katrina. Lee and Stafford [31] and Lee et al. [32] established the importance of small business adjustment strategies to business success during normative disruptions. Few researchers have had the opportunity to study small business adjustment strategies and their impact on small business outcomes during nonnormative disruptions such as a pandemic. Our study contributes to this stream of literature by revealing the impact of not only business owner adjustment strategies but also simultaneous government intervention on small business outcomes during nonnormative disruptions.

3.2. Small business disaster recovery

Marshall and Schrank [33] proposed that small business recovery is not a dichotomous outcome, but a process. After a disaster, those businesses that never reopened differ from those that reopen but ultimately do not survive, and those that survive may not be fully recovered or

resilient [20,21]. The small business disaster recovery (SBDR) framework proposed by Marshall and Schrank [33] categorized businesses post disaster over three periods as: demised, survived, recovered, and resilient. Demise is defined as a permanent closure and differentiated from not-operating which may be temporary. Survival is defined as operating at lower levels than pre-disaster and recovered is defined as operating at the same level as pre-disaster. Marshall and Schrank [33] defined resilient businesses as those that were operating at higher levels than pre-disaster and may have adapted to reduce exposure to future disasters. In the SBDR framework "levels" may be operationalized as revenue, profits, growth, or perceived success [20,21,34].

3.3. Current research on COVID-19 and small business recovery

Current research has studied the economic impact of COVID-19 on small businesses [35] and how the effect has evolved since the passage of the CARES Act [36]. Bartik et al. [35] found that the majority of small businesses in their sample had less than two-months of cash on hand during the pandemic and that their perception of firm survival was linked to their cash flow status.[1] They found that approximately 70% of their sample interviewed in March–April 2020, was interested in applying for PPP loans. Recent research shows that the percentage of small business owners dropped by 22% in April 2020, the early onset of restrictions related to COVID-19 pandemic [23]. In Japan, the COVID-19 anti-contagion policies led to a decrease of the average sales in firms by 5% [37].

However, these studies were conducted at the onset of the COVID-19 pandemic, most of them surveying small business owners in March 2020, thus not allowing enough time to study the adjustment strategies adapted by the businesses nor business resilience. We were able to collect information about small business owners' resilience and adjustment strategies adopted by them through the pandemic including the effect of CARES Act in June and July 2020. This motivates better understanding of the distribution of COVID-19 economic shock by comparing the impact of COVID-19 and CARES Act on small businesses. We study and model the process of recovery and resilience of small businesses from the impact of COVID-19. The results are important as they provide real-time information about the effect of public health and economic policies on the survival of small businesses. This information is crucial in informing further governmental policies to support and assist small business owners.

4. Survey design

We conducted a nationally representative survey of 2019 households in the United States through Qualtrics® during June and July 2020[2] and at least 20% of our sample had to be small business owners. To qualify for the small business portion of the survey, respondents had to own a small business. Our final sample consists of 463 small business owners or 23% of the household sample.[3] This is similar to the share of small business owning families in the 2018 small business data, in which according to our calculations approximately 25% of United States households were small business owning households [38]). Our survey was conducted in the month of June and July 2020, eight weeks after the passage of the CARES Act, the PPP and the Health Care Enhancement Act. Individuals and small businesses in particular can be hard to survey during and after a natural disaster [4,39]. Researchers that have studied small business disaster recovery using primary data collection have used sample sizes ranging from 282 family businesses [8] to 251 micro-enterprises [40]) to 499 and 541 small businesses [20,41].

The Small Business Administration (SBA) defines small businesses as those with less than 500 employees. According to the United States Census Bureau data, in 2017, 98% of small firms had less than 100 employees and 89% had less than 20 employees [1]. The CARES Act also included non-employer firms and contractors in the PPP loan process. The small business owners sample includes survey respondents from forty-eight states; the two states not represented are Wyoming and New Mexico.[4]

The goal of the survey was to better understand how small business owners have been affected by COVID-19, their response to the growing economic uncertainty, and the impact of the CARES Act PPP on business sustainability and resilience. We collected information about firm characteristics and business revenue and profit before and during COVID-19. We also collected information about business owner demographics, household income sources, their beliefs about the impact of COVID-19 economic shock on their business well-being, ways they have innovated during COVID-19, and their awareness about the availability of help from federal programs. The survey questions were based on previous literature on small business disaster recovery (e.g. Refs. [8,20,21,33,42].

5. Empirical model

We analyze the predictors of business and financial losses in a regression framework. We estimate linear probability models focusing on the business losses during COVID-19 using equation (1) below.

$$Y_i = \beta_0 + \beta_1 (Cashflow\ problems)_i + \beta_2 \boldsymbol{X}_i + \beta_3 \boldsymbol{Y}_i + u_i \quad (1)$$

In the above equation, Y_i represents the outcome variables for a small business i. The outcome variables were based on two questions: (1) Approximately how long do you think it will take you to recover from losses due to the Coronavirus Pandemic? By recover, we mean your sales/revenue are back to pre-pandemic levels; and (2) Please estimate what percent of the business's income has been lost because of the Coronavirus Pandemic? $Cashflowproblems_i$ is an indicator variable that equals to 1 if the business indicated experiencing cashflow problems during COVID-19 and 0 otherwise. $\boldsymbol{X}_i$ is a vector of business owner characteristics, such as gender, marital status, education, income, if in rural areas, and percent of income earned from the business. $\boldsymbol{Y}_i$ is a vector of business characteristics, such as number of employees, if family-owned business, sector, operated from home, proprietorship, number of years in business etc. The standard errors are estimated using the Huber-White estimate of variance to correct the biased estimates due to presence of heteroskedasticity in the model [43,44]. Variables for each model were selected based on the literature review as factors that could affect income loss and perceived time to recovery [20,21,33,34].

6. Results

6.1. Firm and business owner characteristics

Table 1 summarizes the business owner and business characteristics. Our sample consists of employer (77%) and non-employer businesses (23%). Almost 73% of the firms have fewer than five employees as compared to the 60% of the firms in the Census of United States

[1] [35] surveyed 5800 small businesses that were members of the Alignable business network, a platform focused on small business ecosystem. Their sample is drawn from California, the New York region, Florida, and Texas. Their sample had a wide range of industries including retail, entertainment, restaurant and hospitality etc.

[2] The research study and data collection process has undergone the Institutional Review Board's review and approval process at the authors' university.

[3] This approach of data collection from businesses owned by families is adapted from the National Family Business surveys [61].

[4] This study is a random sample of 48 states and based on our sample size of 463 small businesses, state level effects cannot be determined. Alaska, Nebraska, South Dakota, North Dakota, and Arkansas never issued stay-at-home orders; five observations come from those states.

Table 1
Survey summary statistics (N = 463).

Variables	Mean/Frequency
Business owner characteristics	
Female-owned business	0.52 (0.50)
Married/In a relationship	0.52 (0.50)
Household income ($)	76,560.48 (51,504.24)
Education: College and above	0.52 (0.50)
White	0.83 (0.38)
Rural areas	0.14
Percent of household income comes from business	0.53 (0.31)
Business characteristics	
Family-owned business	0.40 (0.49)
Number of employees	22.37 (33.13)
Operated from home	0.55 (0.50)
Service sector	0.31 (0.46)
Manufacturing and Construction sector	0.21 (0.40)
Profitable before COVID-19	0.87 (0.32)
Sole proprietorship	0.58 (0.49)
Number of years in operation	18.12 (22.87)
Direct-to-consumer business	0.73 (0.44)
Changes in business operations due to COVID-19	
Closed for more than 24 h due to COVID-19	0.51 (0.50)
Number of days closed due to COVID-19	30.19 (44.80)
Changed how served customers	0.63 (0.48)
Changed how procured supplies	0.56 (0.49)
Increased business social media presence	0.49 (0.50)
Changed to online sales	0.41 (0.49)
Percentage of sales changed to online due to COVID-19	0.55 (0.38)
PPP and EIDL Loans	
Applied for PPP loans	0.30 (0.46)
PPP loan approved	0.70 (0.46)
Amount of PPP loan ($)	139,825.40 (212,511.50)
Applied for EIDL loans	1.18 (0.38)
Business owner perception about business sustainability during/after COVID-19	
Perceived time to recover losses due to COVID-19 (months)	7.00 (8.00)
Percent of lost income perception	0.379 (0.298)
Percent of firms with cash flow problems due to COVID-19	0.77 (0.41)

Percentages are reported for dichotomous variables. Means and standard deviations are reported for continuous variables. Standard deviations are in parentheses.

Businesses [1]). Women-owned businesses made up 52% of the businesses and minority-owned businesses made up 17% of the sample. According to the SBA [13]; women and minority-owners were 20% and 18% of small employer businesses, respectively. Women and minority-owners were 40% and 32% of non-employer businesses, respectively [13]). The average household income was $76,560 and on average 54% of household income came from the business. Almost 40% of the sample consisted of family-owned businesses. Thirty-two percent of firms were in the service sector and 21% in the manufacturing and construction sector. The average number of employees was 22 and 73% had less than 20 employees.

On average the firms in the sample have been in operation for 18 years. The majority of firms (87%) indicated that they were profitable before COVID-19, however only 62% of the firms indicated that they had potential for being profitable during COVID-19. Almost half (51%) of the firms indicated being closed for more than 24 h due to COVID-19 and on average the firms were closed for 30 days. The maximum number of days closed that respondents could choose was 180 which was the maximum up to the time the survey was conducted.

Almost 30% of the firms applied for PPP loans and 70% of these firms were approved for a loan of average amount of $139,825. Firms reported that the average time it may take them to recover losses due to COVID-19 to be 7 months, with a loss of 38% of income; and 73% of the firms indicated cash flow problem due to COVID-19. Most firms changed their business operations. For example, 63% of the firms changed how they served customers, 56% of the firms changed how to procure supplies, and 49% of the firms increased their social media presence with only 41% changing to online sales.

6.2. Predictors by business characteristics

Table 2 shows results where the binary outcome variables indicate businesses that have experienced income loss (Column 1) and businesses that perceive a recovery time of more than a month (Column 2) due to COVID-19 shutdown. Results suggest that for every ten days of business closure during the COVID-19 shutdown, the probability of the business having income loss increased by 3% and the probability of a business taking longer than a month increased by 1%. These results concur with Sydnor et al. [21] who found number of days closed had a negative, but small statistically significant effect on recovery.

It is important to note that where a small business is located could have an impact on its ability to stay open. Not all states declared stay at home orders. On average the businesses in the sample were closed for 30 days. Almost half the businesses were not closed at all (49%). For those that did close, the majority (60%) were closed over 60 days. Delays in reopening and the number of days to reopen have been found to decrease the likelihood of small business survival and resilience [7,21, 45]. From our results and previous literature, it can be implied that income loss from extended delays in reopening seem to be more than small businesses can bear when they are often already undercapitalized and underinsured for such disruptions.

Results show that businesses operated from home have higher probability of income loss. Home-based businesses make up 55% of the businesses in the sample, and 65% of these employ less than five employees. This continues to show the vulnerability and financial fragility of home-based businesses (Haynes et al., 2018; [7]. This is important because home-based businesses make up 52% of small businesses and are more likely to be operated by women [38]) who are less likely to survive exogenous shocks. To further understand how small businesses owners deal with undercapitalization and financial vulnerability, we asked them about how they raised funds to support their business during the COVID-19 crisis.

Cash flow problems increases the probability of income loss and time to recover. The results indicate that the probability that a business will experience income losses and require a longer time to recover increases

Table 2
Predictors by business characteristics (N = 463).

	(1)	(2)
	Businesses experiencing income loss due to COVID-19 shock	Business reporting time to recover from COVID-19 shock to be more than a month
Service sector	0.075 (0.054)	0.039 (0.038)
Manufacturing sector	−0.036 (0.055)	0.067 (0.042)
Direct-to-consumer	−0.096* (0.050)	−0.017 (0.039)
Sole proprietorship	−0.036 (0.044)	−0.029 (0.033)
Cash flow problems during COVID-19	0.200*** (0.043)	0.429*** (0.049)
Zero to 5 employees	0.030 (0.047)	−0.136*** (0.035)
Family business	0.047 (0.044)	0.052 (0.033)
Operated from home	0.104** (0.044)	−0.057 (0.036)
Number of years operating	0.001 (0.001)	0.001 (0.001)
Number of days closed COVID-19	0.003*** (0.00)	0.001*** (0.00)
Female-owned business	0.047 (0.043)	0.013 (0.034)
Rural	−0.063 (0.055)	0.003 (0.001)

Linear probability model estimates are shown in both the columns. The coefficients reported are probabilities. Standard errors in parentheses are corrected for heteroskedasticity. *, **, ****p < 0.01, 0.05, 0.001. The estimates in both columns are results of a linear probability model. The regression includes business owner characteristics such as race, age, marital status, education, and region of residence.

by 20% and 43%, respectively. Businesses that had cash flow problems during the pandemic would be less likely to be able to pay their employees and continue operations during the shutdown. Decreased cash reserves can explain the prevalence of employee layoffs and permanent business shutdowns for small businesses. Our results concur with other studies that found cash flow problems affected not only business success [46] but also the strategies that businesses adopt during a crisis [42], [47], [48]. It is not surprising to see that the probability of having income losses and the probability of longer time to recovery increase with the increase in the number of days a business was closed due to the COVID-19 shutdown. It is also intuitive that the forced shutdown caused cash flow problems that increased the probability of income loss and time to recovery. These results provide direct evidence of credit constraints in small businesses and the threat of COVID-19 shutdown to their survival. Now we turn our attention toward the adjustment strategies adopted by these firms and whether these strategies reduced the risk posed by the crisis to these businesses.

6.3. COVID-19 adjustment strategies

We asked business owners about their adjustment strategies as a response to the COVID-19 crisis. The specific adjustment strategies were derived from the small business research literature [32,49–51]. In our survey, approximately 62% of business owners mentioned using household savings to raise cash, 38% mentioned using a family asset such as a car to support the business, 22% mentioned selling a family asset, 34% borrowed funds, and 16% initiated crowdfunding campaigns to raise funds to support their business.

We analyze the impact of those adjustment strategies on the business level outcome variables by estimating a linear probability model. Table 3 shows the results where the binary outcome variables indicate businesses that have experienced income loss (Column 1) and businesses that perceive a recovery time of more than a month (Column 2) due to the COVID-19 shutdown. We used variables depicting changes to online sales, changes to how businesses procured supplies, changes to how businesses serve customers, if businesses increased their social media presence, if they applied for PPP loan, and if they applied for EIDL loan as the measures for COVID-19 adjustment strategies used by businesses. Results show that firms experiencing cash flow problems during the COVID-19 crisis had higher probability of income loss and longer time to recovery. The inclusion of variables for adjustment strategies decreased the magnitude of estimated coefficient for cash flow problems by 4.5% for the probability of income loss. This implies that only 4.5% of the relationship between the cash flow problem and the income loss can be attributed to the heterogeneity among the adjustment strategies used by small businesses as a response to COVID-19 related shutdown. Similarly, inclusion of adjustment strategy variables decreased the magnitude of estimated coefficient for cash flow problems by 16% for the probability of time to recover more than a month. This implies that only 16% of the relationship between the cash flow problems and time to recover can be attributed to the heterogeneity among the adjustment strategies adopted by the businesses as a response to COVID-19 related shutdown.

Table 3
Impact of COVID-19 adjustment strategies (N = 463).

	(1)	(2)
	Businesses experiencing income loss due to COVID-19 shock	Business reporting time to recover from COVID-19 shock to be more than a month
Service sector	0.080 (0.049)	0.060* (0.036)
Manufacturing sector	−0.025 (0.055)	0.095** (0.040)
Direct-to-consumer	−0.084* (0.050)	−0.024 (0.037)
Sole proprietorship	−0.041 (0.044)	−0.039 (0.032)
Cash flow problems during COVID-19	0.191*** (0.046)	0.359*** (0.048)
Zero to 5 employees	0.039 (0.050)	−0.090*** (0.033)
Family business	0.043 (0.044)	0.038 (0.033)
Operated from home	0.114*** (0.046)	−0.017 (0.033)
Number of years operating	0.001 (0.001)	0.001 (0.001)
Number of days closed COVID-19	0.002*** (0.000)	0.001*** (0.001)
Female-owned business	0.049 (0.043)	0.018 (0.032)
Rural area	−0.053 (0.056)	0.028 (0.048)
Changed to online sales	0.029 (0.053)	0.027 (0.036)
Changed how procured supplies	−0.014 (0.047)	0.064* (0.038)
Changed how serve customers	0.087* (0.052)	0.204*** (0.042)
Increased business social media presence	−0.097* (0.049)	−0.070* (0.036)
Apply PPP loan	0.032 (0.054)	0.060* (0.033)
Apply EIDL loan	0.069 (0.064)	0.092*** (0.030)

Standard errors in parentheses are corrected for heteroskedasticity. *, **, ***p < 0.01, 0.05, 0.001. The estimates in both columns are results of a linear probability model. The coefficients reported are probabilities. The regression also includes variables for business owner characteristics such as race, age, marital status, education, and region of residence.

One important result to note is that the manufacturing and service sectors had a higher probability of longer recovery time as compared to businesses in other sectors. Our results are supported by the results from the literature on disaster studies that found small businesses in the service and manufacturing sectors are not fully prepared for disasters and less likely to recover [12,22,52]. The nature of the pandemic non-pharmaceutical interventions, such as stay-at-home orders and social distancing, disrupted both the demand for products and the ability of suppliers to adjust to new requirements. A survey by the National Association of Manufacturers indicated that 53% of the supplier companies anticipated a change in operations and 36% faced supply chain disruptions [25]).

Adjustment strategies had a varied impact on income loss and perceived time to recover. Changing to online sales was not statistically significant in either model. Firms that were forced to change how they procured supplies had a higher probability of longer time to recovery. Firms that were forced to change the way they served customers experienced higher probability of income loss and anticipated longer time to recovery. This could be expected as changes in business models such as the way a business serves customers would take an additional investment during a time of crisis and lead to income losses and increases in recovery time. In contrast, firms that increased the use of social media and online tools for promoting and conducting their business had lower probability of income loss and lower probability of longer time to recovery. This is similar to the previous results that found use of social media increased small business viability and sustainability [53].

Applying for a PPP or EIDL loan were not statistically significant in the income loss model, but did have a significant effect on perceived time to recover. Applying for a PPP or EIDL loan increased the probability of longer time to recovery by 6% and 9%, respectively. It is intuitive that businesses that applied for a these government loan programs would anticipate a longer time to recovery.

The results indicate that business model changes were necessary due to the pandemic but that not all adaptive strategies led to better business outcomes. Changes in the way that businesses procure supplies and serve customers may pay off in the long run, but in the short run they can be costly disruptions and investments that increase income loss and time to recover. The results also indicate that increasing the firm's presence on social media had a positive effect on business outcomes implying that decreasing the digital divide for small businesses is crucial to their recovery.

6.4. Resilience to COVID-19

We apply the small business disaster recovery (SBDR) framework

[33] to the COVID-19 pandemic context. As the current disaster event is still ongoing, we adapt the SBDR framework and operationalize 'resilience' with a *resilient scale.* The scale is comprised of three items that ask business owners if the business's success, growth, and profit will be worse off, the same, or better off, respectively. This is important from a policy perspective in that small business owner perception of their ability to recover may be a more realistic measure of business recovery from the pandemic and subsequent recession given that they employ over 60% of services, real estate, food services, and construction sectors [35].

Table 4 shows the distribution of the three variables for our sample; 38% of business owners believe that the success and profitability of their business after the pandemic will be worse as compared to before the pandemic. As this survey was conducted while the COVID-19 crisis was still ongoing (June–July 2020), we adapted the SBDR framework to construct a resilient scale using the three items described in Table 4. This scale measures the resilience of businesses to respond during the crisis. The three item scale ranges from 0 (worse off), 1 (same), to 2 (better off). The average value of the resilience scale is 0.78. The higher the value of the scale for a business the higher the resilience of the business in time of crisis. The Cronbach alpha[5] is 0.85 indicating high reliability and consistency of the resilience scale.

We estimated the relation between the business resilience and business characteristics and COVID-19 adjustment strategies adapted by the businesses (Table 5). Businesses that belonged to the service sector, were direct-to-consumer businesses, had cash flow problems due to COVID-19 crisis, and were owned by women were also lower on the resilience index. Results show that businesses that adapted by increasing online sales and social media presence have higher resilience index than those businesses that did not pursue these digital media options. Similarly, those businesses that changed the ways they procured supplies or served their customers were lower on the resilience index. Brown et al. [41] found that disruptions to service and delivery to customers after a disaster had the most impact on recovery. The resilience results are consistent with the loss of income and time to recovery results presented in the previous section. Business model changes in the way that businesses procure supplies and serve customers that were necessary during the pandemic can be costly disruptions and investments that increase income loss and thus, decrease resilience.

Applying for government disaster loans had a positive effect on resilience. Applying for a PPP loan did not have statistically significant effect on resilience; however, applying for an EIDL loan did have a positive and statistically significant effect on resilience. One would expect that business owners who applied for EIDL loans would anticipate that they would need a longer time to recover. They may also have higher perceptions of business resilience since they would need to pay back the EIDL loans. In contrast, anticipated present or future growth of the business would be unnecessary for PPP loan applicants because PPP loans were essentially grants, given that these loans could be forgiven if spent on certain required expenses.

Table 4
Distribution of owner's perception about business performance after the pandemic (N = 463).

Performance Measure	As compared to before the COVID-19 pandemic		
	Worse	Same	Better
Success	37.80%	49.89%	12.31%
Growth potential	33.91%	50.97%	15.12%
Profitability	37.58%	47.08%	15.33%
	Mean	Min	Max
Resilience scale	0.78 (0.60)	0	2

[5] Cronbach alpha is calculated by $\frac{kc}{v+(k-1)c}$ where k is the number of variables over which alpha will be calculated, c is the average covariance, and v is the average variance.

Table 5
Relation between resilience scale and business adapting strategies (N = 463).

	Resilience scale
Service sector	−0.148** (0.058)
Manufacturing sector	−0.070 (0.072)
Direct-to-consumer	−0.089 (0.058)
Sole proprietorship	0.085 (0.055)
Cash flow problems during COVID-19	−0.184*** (0.058)
Zero to 5 employees	0.016 (0.061)
Family business	−0.021 (0.057)
Operated from home	−0.001 (0.001)
Number of years operating	0.001 (0.001)
Number of days closed COVID-19	−0.001*** (0.000)
Female-owned business	−0.127** (0.054)
Rural area	0.029 (0.073)
Changed to online sales	0.125* (0.070)
Changed how procured supplies	−0.135** (0.064)
Changed how serve customers	−0.195*** (0.064)
Increased business social media presence	0.183*** (0.063)
Apply PPP loan	0.065 (0.068)
Apply EIDL loan	0.161* (0.087)

Standard errors in parentheses are corrected for heteroskedasticity. *, **, ****p < 0.01, 0.05, 0.001. The estimates in the column are results of a linear probability model. The coefficients reported are probabilities. The regression also includes variables for business owner characteristics such as race, age, marital status, education, and region of residence.

The results not only support our earlier analysis on income loss and time to recovery, but also previous studies on disaster recovery. Previous research studies have demonstrated that cash flow problems decreased resilience after natural disasters [10,46]. Cucculelii and Peruzzi (2018) indicate that firms that instituted post-crises business model changes, such as investment in intangible assets, were more likely to survive a recession. Our study contributes to this literature by clearly articulating the effect of firm adjustment strategies on business outcomes. Specifically, increasing social media presence increased small business resilience.

These results portray the business owners' expectations of future recovery and may explain the prevalence of layoff and shutdowns. Our results are similar to the recent literature on the COVID-19 pandemic. Humphries et al. [36] found that more than 50% of firms reported that their businesses will not recover in the next two years and the proportion of businesses expecting to recover within the next two years decreased by 0.7% points per day.

6.5. Responses to CARES act

In this section, we study the response of small businesses to the CARES Act and the PPP. Only 30% of the businesses in our survey sample applied for the PPP loans and 70% of those who applied were approved. Only 17% of businesses owners in our sample applied for the SBA EIDL program. According to the Census Bureau's Small Business Pulse [54]; as of August 2020, 73% of their sample received PPP loans and 22% received EIDL loans. The SBA reported that 5.2 million loans were approved, with an average loan size of $100,729 [2]). Approximately 20% of all PPP loans were made in rural areas.

We did not ask the reason for not participating in the CARES Act in our survey and hence are not able to distinguish reason for non-participation. The important aspect of the PPP loans is that they are fully forgivable if 75% of the loan amount is spent on payroll to maintain employee salary or rehire workers [55]. Twenty-five percent of the businesses in our sample are non-employer businesses, who may have found it difficult to calculate the payroll expenditure required by the financial institutions for PPP applications. Given the PPP program fee structure, financial institutions had little incentive to help non-employer small businesses [56]. Moreover, non-employer businesses could not

apply for PPP loans until April 10th, one week after the program began. Hence, these businesses may have shied away from participating in the program. Previous research shows that small business owners presented with a hypothetical CARES-like loan program refused to take the CARES assistance because they didn't think they would qualify (30%) or they didn't trust the government to forgive the debt (20%) [35]. Research also shows that awareness of the program was an important criterion for willingness to apply for the PPP loans. In our sample 61% of the businesses employ fewer than 5 employees. Businesses with larger number of employees applied for PPP loans earlier as they learnt about the program sooner, whereas businesses with less than 5 employees became aware of the program at a slower rate and the gap in the knowledge increased with the exhaustion of the initial PPP funding [36]).

7. Conclusion

We studied small businesses impacted by governmental policies implemented in response to the COVID-19 pandemic. We analyzed the relationship between the adjustment strategies adopted by small business owners and business outcomes. In addition, we studied the impact of small business disaster aid provided by the federal government through the CARES Act and the PPP on small business resilience. Businesses with little capital liquidity were more likely to endure income losses, expect that they would need longer time to recover, and displayed lower resilience index. This research provides real-time evidence of how the economic disturbance created by COVID-19 has impacted small business resilience and the adjustment strategies used by small businesses to survive.

One of the main results is that firms adjusted their business operations to adapt to the changing times, such as changing the way they served customers, procured supplies, and increased social media presence. These changes were important and essential for survival during the pandemic, but not all the adaptive strategies improved business outcomes. For instance, the adjustment strategy of changing to online sales did not have an effect on business outcomes. However, increasing social media presence decreased the probability of income loss and time to recovery. These results are similar to the reports in the media about the increasing divide between traditional businesses and businesses that deal with customers online [57]. These results also bring into focus the increasing need to bridge the digital divide inhibiting small business viability and growth [58].

Overall, applying for government disaster loans had a positive effect on resilience. PPP and EIDL loans did not have significant effects on income loss; but both were significant for predicted time to recovery of more than one month. Business were more likely to have higher resilience scores if they received an EIDL loan. One would expect that business owners who applied for EIDL loans would anticipate that they would need a longer time to recover. They may also have higher perceptions of business resilience since they would need to pay back the EIDL loans. PPP loans had no impact on resilience. One may expect that anticipated growth and profitability of the business would be unnecessary for PPP loan applicants because PPP loans were forgivable loans.

The impact of the COVID-19 pandemic was unequal, especially for smaller firms with lower number of employees. We saw that firms with less than five employees have a lower probability of taking more than a month to recover from the economic losses as compared to firms with more employees. We also find that female owned businesses were less resilient. This may emphasize the need for policy makers to take into account the heterogeneity of small businesses, particularly as defined by the SBA.

The results also demonstrate how the closure of non-essential businesses impacted direct-to-consumer firms such as small main street retailers and restaurants. Direct-to-consumer firms were less likely to experience income loss as compared to business-to-business firms but showed significantly lower resilience index. Direct-to-consumer businesses are mainly service and retail firms operating in areas of hospitality and food services. These sectors were the most affected by the COVID-19 public health policies and mandates leading to a change in consumer behavior.

This study is policy relevant as it underlines the significance of designing and implementing economic and public health policy measures that are accessible to all. Only 30% of the businesses in our sample applied for the PPP loans and only 17% for the SBA EIDL program. Advertising the availability of programs such as PPP and EIDL, providing information, and generating awareness in small business owners that may be more susceptible to financial volatility is crucial for the success of federal programs, the businesses and the economy. The implementation of PPP loans was uneven and its fee structure may have incentivized financial institutions to prioritize large loans over small loans adding to an already chaotic process for small business owners. Therefore, a critical aspect in the design of government aid programs, is understanding how these programs can be effectively implemented at the local level.

Forgivable grants have been advocated by researchers as a way to enhance small business recovery after a disaster. Even if the first distribution of PPP loans was not equitably distributed, it is clear that small businesses benefitted from having cash infusions as demand decreased and they needed to invest in different business models. Disaster loans such as EIDL have tended to add more liabilities to businesses already in crises. Future distributions of disaster funds should continue to include non-employer businesses that have not been able to access disaster loan programs in the past. Not only are these businesses the majority of small businesses, but also more diverse in terms of gender, and race.

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Author' contributions

All authors contributed equally to this work.

Declaration of competing interest

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