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Information frictions and access to the Paycheck Protection Program☆

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ABSTRACT

The Paycheck Protection Program (PPP) extended 669 billion dollars of forgivable loans in an unprecedented effort to support small businesses affected by the COVID-19 crisis. This paper provides evidence that information frictions and the "first-come, first-served" design of the PPP program skewed its resources towards larger firms and may have permanently reduced its effectiveness. Using new daily survey data on small businesses in the U.S., we show that the smallest businesses were less aware of the PPP and less likely to apply. If they did apply, the smallest businesses applied later, faced longer processing times, and were less likely to have their application approved. These frictions may have mattered, as businesses that received aid report fewer layoffs, higher employment, and improved expectations about the future.

1. Introduction

The coronavirus epidemic has had a broad impact on public health in the United States, with 3.7 million cases and more than 139 thousand deaths reported by July 19th, 2020 (Center for Disease Control, 2020). In response to the public health emergency, most states have introduced strong social distancing measures, including stay-at-home orders and closure of non-essential businesses. These measures are likely to have severe effects on small and medium enterprises, as they tend to be more concentrated in sectors directly affected (e.g. retail and services) and are typically more credit constrained than larger businesses.[1] As a response to the crisis, on March 27th the U.S. Congress passed *The Coronavirus Aid, Relief, and Economic Security (CARES) Act*, which included 349 billion dollars (later expanded to 669 billion dollars) to fund the Paycheck Protection Program (PPP). The PPP was designed to support small businesses by extending government-backed loans that can be partially or fully forgiven if certain conditions are met.

This paper provides evidence that, despite the unprecedented amount of aid, the combination of information frictions and the PPP's "first-come, first-served" design disadvantaged the smallest businesses. This disadvantage in receiving aid may have large implications. While we cannot claim causality, we show that businesses that received aid report fewer layoffs and improved expectations about their businesses survival and recovery, with smaller firms showing the largest improvements. However, our results also show that the smallest businesses were less aware of the PPP and less likely to apply. Among businesses that applied for the PPP, smaller businesses applied later, faced longer processing times, and were less likely to have their applications approved. Taken together, this evidence suggests that information frictions, as well as other frictions in the application process, may have disadvantaged small businesses.[2]

Our data come from daily surveys that began on March 28th, the day after the CARES Act was passed, and continued through May 16th. Early respondents were also asked to complete follow-up surveys that began on April 19th, the day that the PPP exhausted its initial funding, and continued through May 16th. Survey participants were recruited via social media ads targeted at small business owners across the United States that had been affected by COVID-19. The sample includes data from more than 14,000 small business owners in the U.S., with follow-up surveys for almost 3000 small business owners. The surveys collected information on initial firm size, layoffs, beliefs about businesses' future prospects, and their awareness of existing government relief programs that could help their firms. In addition, we collected information about

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[1] These businesses make up the majority of companies in the U.S., and are responsible for a substantial fraction of employment. Firms with fewer than 20 employees account for 89% of firms and 16.4% of employment (2017 Census of US Businesses).

[2] By information frictions, we mean impediments to awareness of the program, including awareness of how the program and forgiveness of the loans work, who is eligible, and how to apply.

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their experiences seeking aid, the current status of their applications, and difficulties they faced during the application process.

We document four key facts. First, respondents' expectations about the future are generally negative and deteriorated over the three to four weeks following the passing of the CARES Act. In the first week of the survey, 64% of respondents believed their businesses would recover within two years, but this number steadily decreases until late April, when it levels out or slightly reverses. The latter movement corresponds to the period of time when it was clear that the PPP would continue to be funded. However, after a short period, most outcomes continue to deteriorate. In the last week of the survey, only 48% of firms report that they expect their businesses to recover within two years. We observe the same patterns for the proportion of respondents who think their businesses will ever recover. These results hold when controlling for a rich set of covariates and when using changes over time within firm.

Second, the smallest businesses were slower to become aware of government programs.[3] The day after the CARES Act was passed (March 28th), businesses with fewer than 10 full-time equivalent (FTE) employees were much less likely to know about any government programs designed to support small businesses when compared to larger firms with 10 to 50 employees. Despite large initial information differences, the proportion of businesses with 5 to 9.5 FTE employees that knew about government programs rapidly increased, reaching levels similar to larger firms (above 90%) a day or two after the program started accepting applications. In contrast, around 68% of businesses with fewer than five employees reported knowing about government programs that could help their business when PPP applications were open, and this share remained below 80% through April 16th, when the PPP exhausted its initial funding. Given the "first-come, first-served" nature of the program, information asymmetries early on may have resulted in smaller firms missing out on the first round of PPP loans.

Third, the smallest firms were less likely to apply for the PPP and, conditional on applying, they applied later, waited longer for their application to be approved, and were less likely to get approval. Firms with 0 to 4.5 FTE employees were 23 percentage points less likely to apply for PPP loans compared to firms with 10 to 50 employees. Conditional on applying, businesses with fewer than five employees applied two days later, and were 27 percentage points less likely to have received approval. Conditional on receiving a PPP loan, businesses with 0 to 4.5 employees waited around two days longer for their application to be approved. These patterns, in particular longer wait times, are also consistent with other frictions in the application process, such as differential access or differing existing relationships with banks that made a larger number of PPP loans (see Granja et al. (2020)).

Fourth, businesses that received a PPP loan report more employees, lower probabilities of closure or bankruptcy, and higher probabilities of recovering in the next two years. While it is difficult to establish causality, this finding holds after controlling for the characteristics of the business, the owner, and location dummies. Conditional on applying for a PPP loan, those that are approved are, on average, 12 percentage points more likely to report that they will recover in the next two years, and reported probabilities of bankruptcy or closure that are 8 percentage points lower. They are also 9 percentage points less likely to report having fewer workers than in January. All of these effects are stronger for smaller businesses (with fewer than 10 employees).

Taken together, the four facts indicate that information frictions hindered the ability of small businesses to access PPP resources. These frictions may have been driven by differential awareness of the PPP program early on, but uncertainty about eligibility criteria or the forgivable aspect of the loan likely also contributed. Even if only present during the beginning of the PPP, these frictions may have had real negative consequences for small businesses. Firms' expectations about the future fell sharply in the first month of the survey, which may have led firms to lay off the majority of their workers or shut down completely within this short time frame. These actions may be costly to reverse, especially since the CARES Act also increased unemployment insurance benefits by $600 per week. Since full loan forgiveness requires firms to maintain payroll at pre-crisis levels during the eight weeks following initiation of the loan, firms that failed to apply for the PPP early on may no longer benefit from it. Moreover, since payroll is the main forgivable component of the loan, this could have further reduced the attractiveness of the subsequent second round of PPP funding that is set to close in early August.

1.1. Related literature

This paper contributes to a small but rapidly growing literature on the economic impacts of COVID-19 on small businesses. Closely related work by Bartik et al. (2020) surveys 5800 U.S. small businesses through Alignable, a network-based platform for small businesses. Their survey reached somewhat larger businesses and found that the majority planned to seek funds through the CARES Act, which is consistent with our findings for the larger small businesses (over 5 employees) in our sample. Fairlie (2020b) and Fairlie (2020a) similarly provides evidence on the impact of COVID-19 on small businesses using the April and May Consumer Population Surveys – a population-representative data set – and shows that the number of active small business owners fell by 22% from February to April 2020, with a partial rebound in May.

Another set of recent papers specifically studies the impact of the PPP. Granja et al. (2020) use administrative data on the distribution of PPP loans and high-frequency micro-level employment data to evaluate how well the CARES Act targeted businesses in need. They conclude that funds flowed to areas that were less impacted by the economic crisis in terms of declines in hours worked or business shutdowns. Their results also indicate that access to banks that participated heavily in PPP lending may be an important determinant of access to the program. While we argue that our results imply that information frictions play a central role, some of our facts are also consistent with smaller businesses facing larger frictions in the application process that are related to access to banks (such as lower application rates, and longer processing times).

Chetty et al. (2020) studies the impacts of a number of stabilization policies using data from private companies and finds little evidence that PPP loans affected employment. However, they analyze firms much larger than those in our sample, focusing on firms around the 500 employee cutoff for PPP eligibility. In contrast, less than 1% of firms in our sample have more than 50 employees. Compared to these larger firms, those in our sample may have fewer sources of liquidity, smaller reserves, and less extensive existing relationships with banks. They are also less likely to have dedicated human resources or accounting staff who may help determine the requirements of PPP loans and how to apply.[4] Autor et al. (2020) uses a similar design to study the impacts of the PPP. Using payroll processing data from ADP, the paper studies the impacts of the PPP using high-frequency employment data and estimates the PPP increased employment by 2.3 million.

Other work has focused on the effects of COVID-19 on employment. Adams-Prassl et al. (2020) uses real-time survey evidence to analyze the impacts of the COVID-19 containment measures on workers in the U.S. and the U.K. Most relevant for the results discussed in this paper, they document substantial negative effects on workers in the U.S. in their first wave of data (collected on March 24–25, 2020), which is

[3] Throughout this paper, we divide firms into three size bins based on the number of full-time equivalent employees: (1) 0–4.5 FTE employees, (2) 5–9.5 FTE employees, (3) 10–50 FTE employees.

[4] Cororaton and Rosen (2020) also study the PPP, but focus on utilization of PPP loans by publicly traded companies. The paper studies the 273 public firms that received almost one billion dollars in PPP loans in April. The paper finds that, among publicly traded firms, those that received funds tended to be smaller and in counties with more COVID-19 cases.

consistent with the strong effects on lay-offs that we document here.[5] Kahn et al. (2020) show that job vacancies fell more than 30% compared to the beginning of 2020 and align closely with the number of new UI claims filed across the U.S. Cajner et al. (2020) use payroll processing data to show that aggregate payroll fell 21% by late April with a small recovery through late May, with the largest impacts among lower-paid workers. These results are consistent with Coibion et al. (2020), who use surveys of households in the Nielsen Homescan data to document that over 20 million people lost their jobs by early April and that many were not seeking new employment (with a seven percentage point drop in labor force participation).[6]

The paper is also related to a large literature studying how broadly defined information frictions, behavioral biases, and transaction costs can affect the take-up and targeting of social programs. Theoretical and empirical evidence suggest that ordeal mechanisms or transaction costs associated with applying for aid can improve targeting of social programs (Besley and Coate, 1992). Yet, there is also ample evidence that even individuals who would greatly benefit from government assistance programs may not take advantage of them due to a lack of information, sophistication, or ability to optimize. For example, Bettinger et al. (2012) provide evidence that low income students are more likely to access financial aid and attend college when they receive limited assistance with filling out FASFA applications. Bhargava and Manoli (2015) show that low awareness and understanding of EITC benefits lead to lower take-up. Importantly, Bhargava and Manoli (2015) highlight that information frictions also include knowledge of how EITC works and who is eligible, and not just knowledge of the program's existence. Finkelstein and Notowidigdo (2019) similarly show that improving information and reducing transaction costs can lead to higher take-up in the case of food stamps, but also lead to reduced targeting. While not focused on information frictions, this paper is also related to Zwick and Mahon (2017), which studies barriers to program take up for firms. Studying a temporary policy which allows for bonus depreciation of capital, the paper finds evidence of financial frictions or fixed costs affecting firms' utilization of the policy.

2. Institutional background and data

2.1. The Paycheck Protection Program (PPP)

The Coronavirus Aid, Relief, and Economic Security (CARES) Act was passed by Congress and signed into law on March 27th, 2020. This large relief package (over USD 2 trillion) established the Paycheck Protection Program (PPP), which was aimed to provide small businesses with a temporary source of liquidity in the form of forgivable loans. These loans are designed to help cover payroll costs and additional fixed expenses during the COVID-19 pandemic.

The maximum loan amount in the program is the minimum between 2.5 times the average monthly payroll costs and ten million dollars. The interest rate on all loans is 1% and their maturity is two years. The loans are forgivable when used to cover payroll costs, mortgage interest, rent, or utilities, with the additional requirement that 75% of the total forgiven amount must be payroll.[7] The loans do not require collateral or personal guarantees, and can be deferred for six months. To get access to these funds, firms must apply through an authorized Small Business Administration (SBA) lender.

A key aspect of the PPP is that the loans are forgivable only if the employer maintains the number of employees and salary levels at pre-COVID-19 levels, or if those are restored by June 30, 2020. If the number of employees or salary levels are reduced, the amount forgivable is also reduced.[8] The PPP started accepting applications on April 3rd, and the initial funding of $349 billion was exhausted by April 16th. New legislation was signed on April 24th, which included an additional $320 billion dollars in funding for the PPP after the program reopened to applications on April 27th. Appendix A provides additional details on the PPP.

2.2. The small business survey data

We collect new survey data on small businesses in the U.S. to understand the impacts of the COVID-19 crisis, and the challenges it created. We recruited the sample of participants via social media ads targeted at small and medium sized business owners in the United States who had been affected by the COVID-19 crisis.[9] Recruitment began on March 28th, one day after the CARES Act was passed, and we continuously received baseline responses through May 16th. The responses are distributed relatively uniformly throughout the sampling period, though there are fewer respondents in the first four days and last week of the survey. Appendix Table 3 reports the number of survey responses by day.

The core of the baseline survey contains a set of questions about firm characteristics, including size (as measured by the number of full- and part-time employees) and the number of laid-off employees since January. The survey also asks small business owners to report their beliefs about the future. More specifically, we ask owners how many employees they expect to lay off within the next two months, if they believe their businesses will recover in the next two years, if they think their businesses will ever recover, and the probability that they will shut down or go bankrupt within the next six months. We also measure awareness of existing state and federal programs available to help small businesses cope with the COVID-19 crisis.[10] On April 27th, the baseline survey was expanded to include a broader set of questions, with a particular focus on respondents' access to the PPP. We ask if and when the respondent applied and about the outcome of their application. The overall baseline sample consists of 14,208 adult small business owners in the U.S. who completed the survey by May 16th, 2020.[11] Of those, 11,104 completed the short baseline survey and 3,104 completed the expanded baseline survey.

A follow-up survey was launched on April 19th targeting those who completed the short baseline survey. It repeated questions about employment and expectations, and included the more comprehensive set of questions used in the extended baseline survey about the PPP. The follow-up survey was completed by 2,768 of the respondents.

While we did not construct the survey to be representative of the population of firms in the U.S., the size distribution in the data is similar to the firm size distribution in the 2017 Census of U.S. Businesses, as shown in Fig. 5 in the Appendix. The survey includes responses from all 50 states and the District of Columbia. The states with the most responses were New York, California, Pennsylvania, Michigan, Illinois, Florida, and Texas, but there are over 30 responses from each state (including Alaska and Hawaii).[12] New England, the upper mid-west, and

[5] As part of their main analysis, the authors document substantial inequality in the observed effects, as workers without a college degree and women are more severely affected. Beland et al. (2020) find similar results for the US using data from the Current Population Survey (CPS).

[6] See also Barrero et al. (2020), which discusses the reallocation effects of the shock, and specifically discusses the impacts of increased unemployment insurance benefits.

[7] The Paycheck Protection Program Flexibility Act, signed into law on June 5th, changed the requirement from 75% to 60%. Similarly, it changed the maturity date from two to five years.

[8] More detailed information is available at https://home.treasury.gov/policy-issues/cares/assistance-for-small-businesses.

[9] The Appendix Section 5 provides more details about the survey and contains the survey instrument.

[10] Specifically, the survey asks "Are you aware of any federal or state programs that could help your business during this crisis?" and, thus, likely captures both awareness of the program and comprehension of how the program works and who is eligible.

[11] We include responses where the respondent consented to the survey and completed at least the initial questions regarding employment in January, layoffs to date, and planned layoffs.

[12] Appendix Figure 4 maps the distribution of survey responses by state.

the Northwest are somewhat over-represented in the survey relative to the number of firms with fewer than 500 employees in each state, while California and the south are somewhat under-represented (see Appendix Fig. 6). Using the U.S. Census Small Business Pulse Survey, Appendix Figs. 7 and 8 also show that trends in obtaining PPP loans and beliefs about recovery by firm size are similar in our survey and the Census's nationally-representative sample, though firms in our survey have slightly lower PPP acquisition rates and worse beliefs about recovery.

For the analysis in this paper, we restrict our sample to respondents who report having 50 or fewer FTE employees in January 2020 and who completed at least the employment portion of the survey (firms larger than 50 employees represent only 1% of respondents). Appendix Table 4 summarizes the baseline survey responses. The table shows that, on average, respondents had 4.88 FTE employees in January, though the number of employees is right skewed, with a median of 2.5. 79% of the sample expects to recover eventually, with 57% expecting to recover in the next two years. Finally, on average, awareness of government programs to help businesses was high (79%), but lower for programs specifically designed to help business cover wages of their employees (68%). The bottom panel of the table summarizes the additional outcomes from the follow-up and expanded baseline surveys. Using this subsample, 53% applied for a PPP loan and 37% of those who applied were approved.

3. Results

This section outlines four sets of results. First, we document how layoffs and expectations of small businesses evolved from March 28th to May 16th. Second, we provide evidence that the smallest businesses were substantially less informed about available government programs that could help their business, and that this gap remains large throughout the sampling period. Third, smaller businesses were less likely to apply for the PPP and, conditional on applying, they applied later, were less likely to get approval, and waited longer for their application to be approved. Fourth, we document that receiving a PPP loan is associated with a notable improvement in expectations about the future and a small increase in current employment.

3.1. Evolution of layoffs and expectations

The first set of results investigates the evolution of responses for the 50 days after the CARES Act was passed. We chart the responses over time, which provide a repeated cross section of respondents. This provides insights into how businesses have adjusted to the disruption and how their expectations about the future have evolved. Overall, we see that employment fell sharply in the first two weeks after the passage of the CARES Act, and has largely leveled off or slightly improved since mid-April. While employment has improved, expectations for the future have not, with a continued decline over the length of the survey.

Fig. 1 summarizes the trends over time using daily survey responses. The top panel provides evidence on how employment decisions have changed for small businesses. The top left plot shows the time trend for whether businesses have laid off any workers since January while the top right figure shows the proportion of workers from January currently employed at the firm. The black line is loess regression fit to the data with the grey region showing the 95% confidence interval. The blue line plots a moving average over 250 responses. The light red vertical lines show key dates: when the CARES Act was signed, when PPP applications opened to most businesses, when PPP applications opened to the self-employed and independent contractors, when the initial funding for the PPP was exhausted, and when legislation was signed to replenish PPP funds. In the first three weeks, there was an upward trend in the proportion of small businesses that had to lay off employees – increasing by approximately 10 percentage points. The top right figure provides similar evidence by plotting the proportion of employees from January who are still employed. This figure shows a decline of more than 10 percentage points from late March through mid-April. In the last three weeks, the proportion of firms that have laid off employees levels off, while the proportion of workers from January currently working changes sign and moderately increases.

While layoffs were concentrated in the first three weeks, expectations about the future declined over the entire fifty days. The bottom row of Fig. 1 shows the trends for the proportion of firms that expect to recover in the next two years (left), and the proportion that expect to ever recover (right). Both expectations sharply declined by more than 10 percentage points through late April. Expectations temporarily leveled off before then declining further in the last two weeks of the survey.

One concern with the visual evidence presented above is that the sample of respondents may change over time. To address this concern, we provide three pieces of evidence in Appendix D. First, the composition of firm size – based on employment in January – has remained consistent across the survey. Second, we show that these trends hold when controlling for state dummies, cubic polynomials for full-time and part-time employment in January, and the day of the week on which the survey was taken.[13] Third, we use the follow-up survey to directly measure changes within firms and to control for additional firm characteristics. Appendix Table 6 uses the follow-up survey to regress within-firm change on the elapsed number of days between the baseline survey and the follow-up. The regression controls for full-time and part-time employment in January, state dummies, day of the week when the baseline survey was taken, owner's years of education, sex, age group, dummies for the type of firm, dummies for sector, and dummies for the week the baseline survey was taken. The table shows that for each elapsed day the probability of recovering in the next two years falls by 0.004, the probability of ever recovering falls by 0.002. The probability of past layoffs shows a large initial increase in layoffs (0.076 for the week of April 1st), which then levels off or slightly decreases in later weeks – similar to what is shown in Fig. 1. These results thus confirm that the trends in Fig. 1 are not likely driven by changes in sample composition over time.

3.2. Information frictions

In contrast to the declining expectations of respondents over the first three to four weeks of the survey, small business owners rapidly became aware of programs that could help them. Yet, the levels and trends in awareness differ substantially by the initial size of the business. The survey question asks specifically about awareness of aid that could help the respondent's business, and thus it captures a combination of awareness as well as comprehension of existing programs.

The top panel of Fig. 2 shows the time trends in survey respondents' awareness of any federal state programs that could help their businesses. Awareness increases substantially over the first three weeks, with over 70% of businesses reporting that they were aware of programs when PPP applications opened, increasing to over 80% on April 16th when the PPP exhausted its initial funding. In late April, we see a slight downturn in awareness, which may be related to the fact that the awareness question specifically asks if individuals are aware of programs that "could help your business". Thus, this slight downturn could be reflecting businesses realizing the PPP may not help them if they had already laid off their employees.[14]

[13] Barrios and Hochberg (2020) show that some states were less likely to implement or comply with preventative health measures such as social distancing. They show that these behaviors are correlated with perceived risk, and show that places with more support for President Trump were less likely to follow preventative health measures. State fixed-effects provide proxies for persistent differences in behaviors and perceived risks across states.

[14] Appendix D.1 provides similar results specifically for programs that provide subsidized loans and programs that help cover payroll.

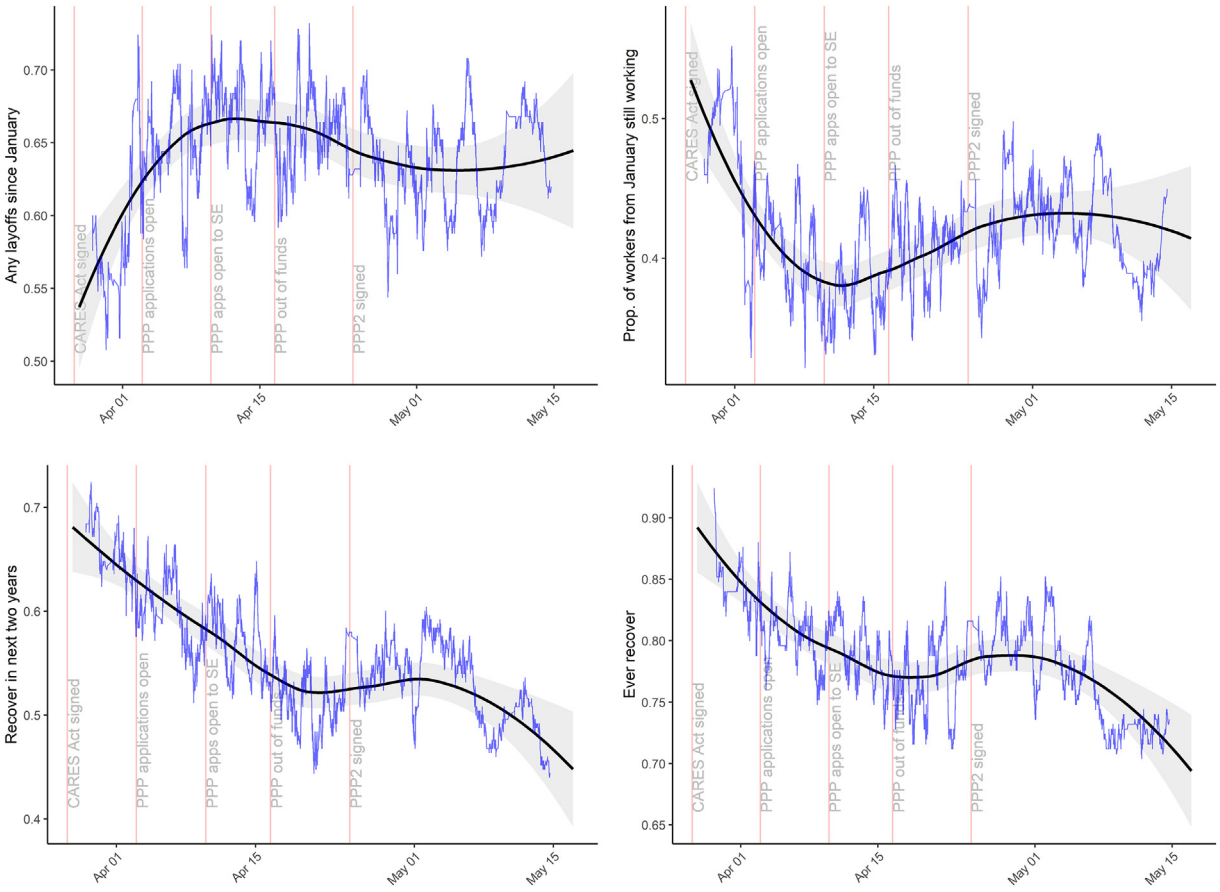

Fig. 1. Responses over time. Note: The figure shows survey responses to key questions from March 28th, 2020 to May 16th, 2020. The thick black line is fit using locally weighted smoothing regression, with the grey region showing the 95% confidence interval. The thin blue line shows a centered moving average over 250 responses. The vertical red lines reference the dates of key events related to the Paycheck Protection Program.

The lower panel of Fig. 2 breaks out the trends by business size, showing the trends for businesses with fewer than five FTE employees, five to 9.5 FTE employees, and ten to fifty FTE employees. There are substantial gaps in awareness across firm size bins from the onset, as well as marked differences in their evolution over the first three weeks. Businesses with 10–50 FTE employees were highly aware of programs that could help their business throughout the sample. In comparison, businesses with 0 to 4.5 and 5 to 9.5 employees were much less likely to be aware of programs immediately after the CARES Act was passed. Yet, these two groups had very different trends in awareness over time. Businesses with 5 to 9.5 employees rapidly became more aware of programs, reaching similar levels as those of larger businesses around the time the PPP opened for applications. In contrast, businesses with fewer than five employees learned about programs much more slowly, with a large gap persisting through when the PPP exhausted its initial funding and never closing completely.

In late April, we see awareness of programs falling for the smallest businesses. One explanation for this decline is that, as details of how forgiveness of PPP loans worked became more widely known, small businesses realized that the program would not (or no longer) be helpful to them. Specifically, two characteristics of the PPP are key: (i) 75% of the forgiven amount of the loan was required to be payroll; and (ii) employment levels were required to be at pre-crisis levels.[15] If small businesses had already laid off their employees, qualifying for forgiveness would be more challenging.[16]

Overall, the patterns are consistent with smaller businesses facing larger information frictions, where we define information frictions as impediments to awareness of the program, including awareness of how the program and forgiveness of the loans work, who is eligible, and how to apply. Although the above patterns may seem consistent with smaller firms having less need for assistance and thus remaining less informed, our data does not support this conclusion. Compared to firms with ten or more employees in the baseline survey, firms with fewer than five employees were only one percentage point less likely to report that they expected to ever recover, and reported probabilities of bankruptcy or permanent closure two percentage points higher.

3.3. Frictions in receiving PPP loans

Consistent with the differential rates of awareness, we also find that larger businesses were much more likely to apply for PPP loans, and to get approved conditional on applying. Using the follow-up survey and the extended baseline survey described in Section 2.2, we collect information on whether the business applied for a PPP loan, when the application was submitted, the outcome of the application, and how long it took for the application to be approved. Table 1 shows how these outcomes are predicted by firm characteristics. The first column reports results from regressing an indicator for receiving a PPP loan on firm characteristics.[17] Businesses with fewer than five employees were 23 percentage points less likely to apply than businesses with ten to 50 employees, while

[15] See Appendix A for details on the PPP and additional changes to the rules introduced in June.

[16] While we cannot provide direct quantitative evidence on these mechanisms, they are consistent with several of the open-ended responses collected at the end of survey.

[17] All regressions in this table control for firm size, firm type, firm sector, the respondent's years of education, an indicator for being female, age bins, state dummies, and the date the survey was taken. The final column controls for the date the application was submitted and the week the survey was taken.

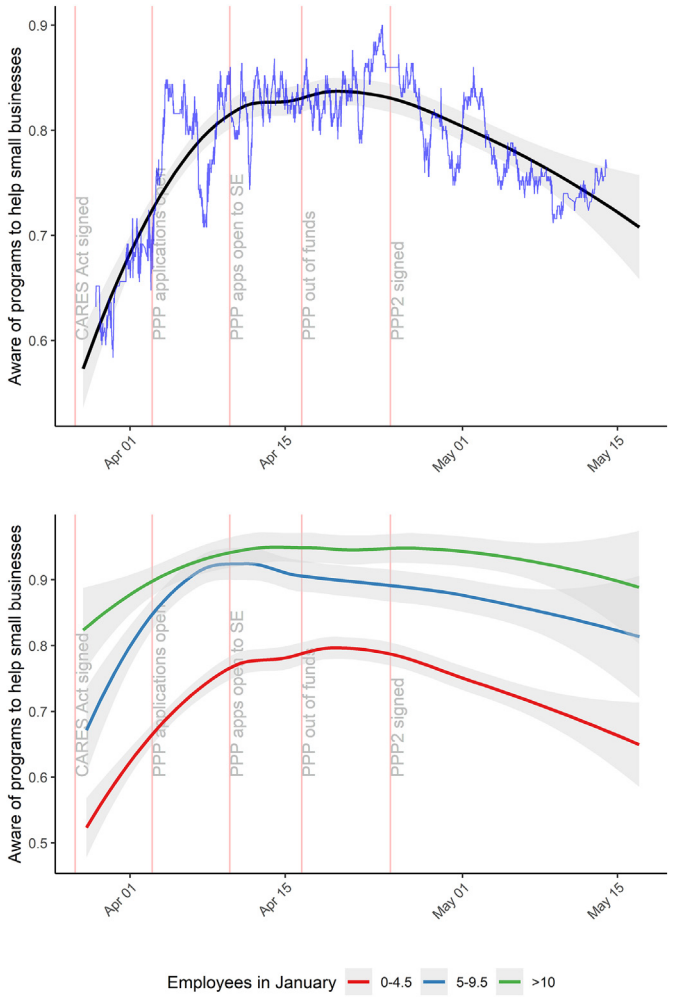

Fig. 2. Are you aware of any federal or state programs that could help your business? Note: In the top panel, the thick black line is fit using locally weighted smoothing regression, with the grey region showing the 95% confidence interval. The thin blue line shows a centered moving average over 250 responses. The bottom panel shows loess regression lines over time by business size bins based on the number of FTE employees in January 2020. Estimates are based on the response to the question "Are you aware of any federal or state programs that could help your business during this crisis?" and thus may capture a combination of awareness of the program as well as comprehension of how the program works, who is eligible, and how to apply.

firms with five to 9.5 employees applied at approximately the same rate as these larger businesses. Those with more education were more likely to apply, and – compared to omitted category of C-Corps and S-Corps – the self-employed, sole proprietorships, and partnerships were substantially less likely to apply.

The first column shows that firm size and sophistication were important predictors of receiving a PPP loan, which combines the decision to apply and the outcome of the application. The second and third columns report the same regression for the decision to apply, and receiving a PPP loan conditional on applying, respectively. Both the decision to apply and getting approved conditional on applying are positively correlated with firm size, years of education, and the type of firm. While we do not have exogenous variation in the decision to apply, it is informative that larger firms were more likely to have their PPP loans approved even after conditioning on those who applied and controlling for a rich set of firm characteristics.[18]

Table 1
PPP timing by firm characteristics.

	Got PPP	Applied to PPP	Got PPP (cond.)	Days to apply	Days to approval
Jan. FTE Emp 0–4.5	−0.266 ***	−0.229 ***	−0.266 ***	1.808 ***	1.886 *
	(0.020)	(0.020)	(0.025)	(0.556)	(1.024)
Jan. FTE Emp 5–9.5	−0.116 ***	−0.011	−0.141 ***	0.156	0.599
	(0.024)	(0.022)	(0.027)	(0.572)	(1.074)
Years of schooling	0.010 ***	0.017 ***	0.009 **	−0.064	0.228
	(0.003)	(0.003)	(0.004)	(0.109)	(0.201)
Type: LLC	−0.079 ***	−0.082 ***	−0.063 ***	0.964	2.711 **
	(0.018)	(0.020)	(0.024)	(0.601)	(1.115)
Type: other	−0.013	−0.148 **	0.090	3.405 *	−3.306
	(0.055)	(0.059)	(0.078)	(1.911)	(2.694)
Type: self-employed	−0.192 ***	−0.286 ***	−0.214 ***	1.905	4.596
	(0.022)	(0.038)	(0.050)	(1.620)	(2.825)
Type: sole prop or part	−0.159 ***	−0.228 ***	−0.169 ***	1.220 *	2.781 **
	(0.016)	(0.020)	(0.024)	(0.644)	(1.229)
N	4996	4996	2662	1338	525
R^2	0.165	0.131	0.212	0.114	0.408

Note: *** Significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level. The first four specifications control for the date the survey was taken. The final regression controls for the day the first PPP loan application was submitted and the week of the survey. All regressions also include controls for industry, age groups, and gender, but coefficients were largely not statistically significant nor large and are not displayed as they largely did not predict the outcomes. All regressions additionally control for state of residence. The omitted category for firm type is C-Corps and S-Corps. The omitted category for firm-size bins is firms with 10 to 50 FTE employees. Columns 4 and 5 have fewer observations as many respondents did not provide the dates of their application and approval. Alternative specifications of these results are included in Appendix E. These include a table replicating these results controlling for additional state and ZIP code level characteristics, results controlling for baseline beliefs of the firms, and results separating firms with zero employees from firms with 0.5–4.5 employees.

Consistent with information frictions differentially affecting smaller businesses, we also find that smaller firms applied later. The fourth column of Table 1 runs the same regression, but on how many days it took the firm to apply (conditional on applying). The results show that firms with fewer than five employees applied an average of 1.8 days later. Finally, the fifth column of the table regresses the average wait time for approval on firm characteristics among the firms that were approved. The smallest firms waited, on average 1.8 days longer for approval, while firms with five to 9.5 employees waited 0.6 days longer, though this second coefficient is not statistically significant. The final column also shows that the self-employed waited substantially longer for approval.

While our results are largely consistent with information frictions playing a central role, other mechanisms are also consistent with lower rates of receiving a PPP loan conditional on applying, and longer delays when waiting for approval. For example, Granja et al. (2020) show that access to banks which participated heavily in PPP lending may have been an important determinant in receiving a PPP loan, which would be consistent with some of the facts we document. Nevertheless, Appendix Table 7 provides some evidence that geographic proximity to financial institutions offering PPP loans are not confounding the estimates on firm size in Table 1.[19] Another possibility is that the self-employed reported that they were unaware of programs until the PPP program opened to self-employed workers on April 10th. Fig. 2 shows that awareness of programs was still substantially lower on April 10th for the smallest firms. Appendix Table 9 additionally breaks out firms with 0 employees (which are more likely to be sole-proprietors or self-employed), and we show that firms with 0.5 to 4.5 employees remain much less likely to apply for PPP loans compared to larger firms.

[18] Given that the survey ran through May 16th, some of the differences in approval rates (conditional on applying) are likely due to loans having not yet been approved, rather than applications being rejected. This is consistent with column 4 of Table 1, which shows smaller firms applied later.

[19] Along with local demographic information and state case and death counts, Appendix Table 7 additionally controls for the minimum distance from the centroid of the respondent's ZIP code to the closest SBA approved lender, the number of SBA approved lenders within 10 km. Adding these controls have little effect on the coefficients.

Table 2
PPP loans and business outcomes.

	Recover in next 2 years							
	All		0–4.5 FTE		5–9.5 FTE		10–50 FTE	
PPP	0.080 ***		0.114 ***		0.086 **		−0.010	
	(0.019)		(0.027)		(0.039)		(0.044)	
PPP (cond)		0.117 ***		0.135 ***		0.157 ***		−0.008
		(0.022)		(0.032)		(0.047)		(0.057)
N	4949	2662	3357	1493	916	660	676	509
	Prob of closure or bankruptcy							
	All		0–4.5 FTE		5–9.5 FTE		10–50 FTE	
PPP	−0.084 ***		−0.085 ***		−0.091 ***		−0.078 ***	
	(0.009)		(0.014)		(0.019)		(0.021)	
PPP (cond)		−0.109 ***		−0.107 ***		−0.118 ***		−0.104 ***
		(0.011)		(0.016)		(0.023)		(0.026)
N	4949	2662	3357	1493	916	660	676	509
	Current employment							
	All		0–4.5 FTE		5–9.5 FTE		10–50 FTE	
PPP	0.554 ***		0.233 ***		0.806 ***		0.882	
	(0.168)		(0.070)		(0.216)		(0.717)	
PPP (cond)		0.548 ***		0.255 ***		0.856 ***		0.848
		(0.185)		(0.077)		(0.252)		(0.880)
N	4949	2662	3357	1493	916	660	676	509
	Past layoffs							
	All		0–4.5 FTE		5–9.5 FTE		10–50 FTE	
PPP	−0.086 ***		−0.115 ***		−0.057		−0.068 *	
	(0.018)		(0.027)		(0.038)		(0.037)	
PPP (cond)		−0.112 ***		−0.137 ***		−0.085 *		−0.059
		(0.021)		(0.029)		(0.044)		(0.045)
N	4949	2662	3357	1493	916	660	676	509

Note: *** Significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level. "PPP" is an indicator for if the business received a PPP loan while "PPP (cond)" is the same regression, but restricted to those who applied to the PPP program. The first two columns show results for the full sample, while the remaining columns show results conditional on firm size bins. All regressions control for a third order polynomial in the number of full-time employees in January, a third order polynomial in the number of part-time employees in January, the day of the week the survey was completed, state dummies, years of education dummies, gender, age group dummies, firm type, firm sector, and the date the survey was completed. See Appendix E for additional robustness results. These include a table replicating this analysis controlling for additional state and ZIP code level characteristics and a table replicating this analysis controlling for baseline beliefs.

3.4. The impact of receiving the PPP on expectations and employment

We find that receiving a PPP loan was associated with substantially better expectations about the future and having moderately more employees. Table 2 regresses outcomes on an indicator for receiving a PPP loan and a rich set of controls. For each outcome, the first row includes the whole sample of individuals who were asked about PPP loans, while the second row restricts to those who applied for PPP loans. Columns show results for the full sample, as well as regressions conditional on firm size. Overall, receiving a PPP loan is associated with notable improvements in expectations: the probability of recovery within two years increases by 0.08, and the probability of closure or bankruptcy in the next six months decreases by 0.08. When conditioning only on those who applied for a PPP loan, the results are larger, with a 0.12 increase in the probability of recovering within two years and a 0.11 reduction in the probability of closure or bankruptcy in the next six months. These effects are largely similar across firm size bins, though they are larger and have smaller standard errors for firms with fewer than five employees.

The last two panels report the same regressions with current employment and an indicator for if the firm has any reduction in employment since January as the outcome variables. Those who received a PPP loan reported slightly more employees. In addition, they are nine percentage points less likely to have fewer employees than in January.

Establishing causality is difficult in this setting, as we cannot fully control for self-selection (though our main specification includes many business-specific controls). Firms may have been more likely to apply for and receive a PPP loan if they were better-off to begin with, or if they were in locations less affected by COVID-19. In Appendix E, we show that our results are largely unchanged when controlling for additional local controls. These include the number of COVID-19 cases and deaths per capita in the state at the time the respondent took the survey, the minimum distance from the centroid of the respondent's ZIP code to the closest SBA approved lender, the number of SBA approved lenders within 10 km, and ZIP code level demographic controls. The appendix also repeats the above analysis, but controls for baseline expectations about the future in the sub-sample of respondents who completed both the baseline and follow-up surveys. This is a smaller sample and estimates are less precise, but the table finds similar results, though with smaller coefficients.

4. Discussion and conclusion

Our results suggest that information frictions played an important role in determining differential access to PPP resources between smaller and larger businesses. These frictions might be associated with uncertainty about the eligibility criteria or the forgivable aspect of the loan. We argue that these frictions are more binding for small businesses for at least three reasons. First, firm sophistication (measured by years of education of the owner and firm type) is positively correlated with firm size, and lower sophistication could imply greater difficulties in accessing and processing information. Second, larger firms typically

have more and better human resources (e.g. accountants or human resources departments), which also contribute to reducing the cost of acquiring information, and applying to the program. Third, there are fixed costs implied by the application process (e.g. finding a bank that will accept the application and acquiring appropriate documentation of payroll), which are more likely to be binding for smaller business. The "first-come, first-served" nature of the program magnifies the potential impacts of these frictions since a timely application was integral to quickly receiving a PPP loan.

The results also show that lower application rates, longer processing times, and ultimately less access to the programs may have had negative consequences for small firms. To the extent that small businesses struggle to re-hire laid-off workers (potentially due to increased unemployment benefits introduced by the CARES Act), the layoffs that have already occurred might be costly to reverse in the short- to mid-run.[20] This by itself also potentially reduces the attractiveness of loans from the later stages of PPP (which are not covered in our survey), as payroll determines the size of the loan and how much of the loan can be forgiven. Moreover, uncertainty about what can be forgiven, and how firms will apply for forgiveness may have caused firms to not apply. When the PPP was initially launched, there were few details on how forgiveness worked, and the detailed rules were not posted until May 22nd, almost two months after the CARES Act was signed into law (the rules were then further amended in early June). The initial uncertainty, combined with changing guidance, may have distorted small business owners' beliefs about their eligibility and what the program actually provides.

Overall, our results show unequal access to program resources across firm size. Even though we cannot rule out all competing explanations, the results strongly indicate that information frictions, combined with the "first-come, first-served" nature of the PPP, played a central role in this inequality of access. Moreover, our results indicate that lack of access to PPP is associated with substantially worse outcomes for small businesses, such as greater layoffs and perceived probability of bankruptcy, and overall worse expectations about their businesses' recovery.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpubeco.2020.104244.

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[20] While many layoffs may have been intended to be temporary (Alstadsæter et al., 2020), the increased UI benefits introduced as part of the CARES Act, may create additional challenges in re-hiring workers (Barrero et al., 2020).