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Has the Paycheck Protection Program Succeeded?

ABSTRACT Enacted March 27, 2020, the Paycheck Protection Program (PPP) was the most ambitious and creative fiscal policy response to the pandemic recession in the United States. PPP offers forgivable loans—essentially grants—to businesses with 500 or fewer employees that meet certain requirements. In this paper, we present evidence that PPP has substantially increased the employment, financial health, and survival of small businesses, using data from Dun & Bradstreet, Inc. We use event studies and standard difference-in-differences models to estimate the effect of a small business applying for larger PPP loans and of a small business being eligible for PPP based on size. While our findings are informative, we believe it is too early to issue conclusive judgment on PPP's success. We offer lessons for the future from the PPP experience thus far.

The Paycheck Protection Program (PPP) was the most ambitious and creative—and, potentially, the most important—fiscal policy response to the pandemic recession in the United States. With a $670 billion budget from April through August 2020, the program was the largest single component of the nation's fiscal policy response to the crisis during that period, and by itself it approaches the total amount spent by Congress on the American Recovery and Reinvestment Act of 2009 in response to the Great Recession.

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PPP was enacted on March 27, 2020, as part of the Coronavirus Aid, Relief, and Economic Security (CARES) Act, the $1.8 trillion "phase 3" response to the pandemic crisis. An entirely new program, PPP began issuing loans seven days later, on April 3. Lending under PPP continued until August. PPP offers forgivable loans—essentially, grants—to businesses with 500 or fewer employees that meet certain requirements, including maintaining employment at prepandemic levels.

Has it succeeded? In this paper, we present evidence that PPP has substantially increased the employment, financial health, and survival of small businesses. In addition, we find that the effect of PPP on small business outcomes is increasing over time, with larger effects in August than in April or May. We also find some evidence to suggest that PPP was most effective for relatively smaller firms. We use data from Dun & Bradstreet for our analysis, employing standard difference-in-differences models to estimate the effects of a small business applying for a PPP loan of greater than $150,000 (we only observe PPP applications for loans of that size) and of a small business being eligible for PPP based on size and using event studies to trace the dynamic effects of PPP.

Despite this finding, our ultimate conclusion is that it is too early to issue any definitive judgment on PPP's success. The program had important short-run goals, to be sure. These include supporting employment and replacing worker wages, maintaining worker-firm attachments, boosting consumer spending, and ensuring small business continuity during the shutdown. But the program had important medium-run goals, as well, including preventing a wave of bankruptcies once the economy partially reopened; increasing productivity by preserving firm-specific human capital, worker-firm matches, and networks; and helping the economy recover faster by keeping workers off the unemployment rolls. Our data run through August, and we cannot adequately investigate any of these outcomes. The effects of PPP are unfolding, and it will be particularly important to see what happens to businesses that received PPP and the workers they employ once they have exhausted their forgivable loan.

PPP is a novel program, and many standard intuitions about fiscal policy do not apply to it. It was not a stimulus program in the sense that its purpose was not to stimulate the economy; that is, it is not a program calling for a measure of the multiplier. Instead, its purpose was to preserve the productive capacity of the small business sector and to shorten the transition to a new, post-pandemic equilibrium by supporting labor demand over the medium term, allowing for a more rapid economic recovery. It was

not a jobs program in the sense that its goal was not exclusively to preserve employment. Instead, its goals were to maintain worker-firm attachments, particularly during the shutdown, and to ensure small business continuity. It intentionally did not attempt to exclude inframarginal recipients because the unique circumstances under which it was enacted made this impractical. In the early days of the shutdown, how could the government have known which firms were inframarginal? And given the numerous goals of the program, it's not clear how *marginal* would be defined in this context. These design features affect intuitive measures of the cost per job saved, as we describe later.

In this paper, we discuss the need for, goals of, and key design features in a small business revenue replacement program (section II). We then describe PPP and contrast select features of the program to what we view as the best design (section III). We discuss the program's implementation challenges—extensively covered in the press—and offer qualitative analysis of PPP (section IV). In section V, we present our empirical analysis of PPP. In section VI, we offer a retrospective and discuss lessons for the future.

I. The Pandemic Recession and Potential Policy Responses

The pandemic recession is remarkable in both its suddenness and depth. In the week ending March 14, 2020, there were 282,000 initial claims for unemployment insurance benefits, about one-third higher than the average number of new claims over the preceding three months. The next week, there were 3.3 million initial claims, shattering the previous record of 695,000 new claims set in October 1982. The week after that, ending March 28, there were 6.9 million initial claims.

The unemployment rate in February 2020 was 3.5 percent. In March, the first month of the pandemic recession, it stood at 4.4 percent. In April, it hit its peak of 14.7 percent, the highest rate since the Great Depression.[1] In two months, the official unemployment rate increased by a factor of four.

1. The official unemployment rate reported by the Bureau of Labor Statistics for April 2020 was 14.7 percent. The household survey on which the unemployment rate is calculated showed a large increase in the number of respondents who were classified as employed but absent from work. Most of these responses should have been classified as unemployed on temporary layoff. Incorporating this change, the actual unemployment rate for April was likely 19.5 percent.

For comparison, during the Great Recession it took nearly two years for the unemployment rate to double, from 5 percent when the recession began in December 2007 to its peak of 10 percent in October 2009.[2]

The pandemic's economic devastation extended beyond the labor market. Real GDP contracted at a 31.4 percent annual rate in the second quarter of 2020. Using the same measure, the worst quarter in the Great Recession saw an 8.4 percent decline, and the only quarter since the Great Depression to register a double-digit contraction was 1958:Q1, at 10 percent. Relative to the same quarter one year prior, 2020:Q2 real GDP contracted by 9 percent. The peak contraction using this metric in the Great Recession was 2009:Q2 at 3.9 percent.

Some of the ways policy needed to respond to this unprecedented economic crisis were relatively straightforward. The Federal Reserve needed to support the economy and to ensure liquidity and smooth functioning in financial markets. Social insurance and safety net programs needed to be strengthened, and their gaps needed to be plugged. Large businesses, with diversified revenue streams and access to capital markets, could be supported with lending programs.

But policy to support small and midsize businesses was harder to formulate. The need for a prolonged shutdown made interruption loans for such businesses inadequate, and even with a more conventional loan many businesses would likely not be able to survive. Firms needed more equity to shore up weakening balance sheets and replace lost cash flows and many businesses would not be interested in adding to debt burdens in any case. Equity injections were not implementable for many firms of this size, and operationalizing a program based on them would be extremely difficult to do in the time needed. The best available option was a revenue replacement program for small business.

II. A Small Business Revenue Replacement Program

The pandemic recession created the need for a revenue replacement program for small businesses. In this section, we discuss that need.[3] We argue that the goals of such a program should be twofold: to ensure small business continuity and prevent a cascade of small business failures, and to

2. For research on the labor market effects of the pandemic, see Bartik, Bertrand, and others (2020), Coibion, Gorodnichenko, and Weber (2020), Goolsbee and Syverson (2020), and Forsythe and others (2020).

3. This section draws on Hubbard and Strain (2020) and Strain (2020).

preserve existing employment relationships while shelter-in-place orders are in effect. We offer our view on some key program design features to achieve these goals. We also address moral hazard concerns and briefly review programs enacted by other major economies.

II.A. The Need to Replace Small Business Revenue

The pandemic itself can be thought of as a large shock to aggregate supply: businesses could no longer produce goods and services because workers could not safely go to work. The inability of workers to work caused downstream supply chain disruptions, as well.

Shelter-in-place orders ameliorated the supply shock by reducing the spread of the coronavirus. The catch is that these policies led to a precipitous drop in aggregate demand, including labor demand (Forsythe and others 2020) as businesses were temporarily closed and workers lost jobs, faced reductions in hours, and experienced nominal wage cuts (Cajner and others 2020). In the private economy, workers faced a large reduction in earned income and businesses lost revenue.

The sharp and sudden nature of the pandemic recession left smaller firms in the service sector particularly at risk. Unlike larger businesses, these firms could not readily access capital markets to shore up their balance sheets. Capital market imperfections link equity contractions to business fluctuations, and these firms were particularly vulnerable to a lack of collateralizable net worth (Gertler and Hubbard 1988). Small and midsize businesses generally do not have diversified revenue streams, as well. And they have limited cash holdings. Only half of small businesses hold cash reserves sufficient to cover fifteen days, and only four in ten have a three-week cash buffer (Farrell, Wheat, and Grandet 2019).

And unlike manufacturing firms, businesses in the service sector would not return to partial operations with a backlog of orders following the lockdowns. Nearly all of the revenue they lost during the lockdowns was lost forever—for example, diners did not eat twice as many meals out in May and June because restaurants were shut in March and April.

To summarize, the economy was at risk of a cascade of small business bankruptcies. Small businesses play a critical role in the economy. In 2019, firms with fewer than 500 employees accounted for 47 percent of private sector employees and 41 percent of private sector payroll. There were 30.7 million such businesses, 19 percent of which had paid employees (US Small Business Administration 2019). A wave of small business failures could have created an aggregate demand doom loop, in which declining incomes and employment opportunities reinforced each other.

One way to address this concern would have been to lift lockdown orders. But the public health effects of the virus and concern workers had about getting sick would have made this strategy ineffective. The best option for the federal government in a short, temporary shutdown was to make up a large fraction of revenue businesses would have generated in normal times. We return later to the challenges posed by longer-term partial shutdowns.

II.B. Goals, Cost, and Key Design Features

The specific goals of such a program are to ensure small business continuity and prevent a wave of bankruptcies and, during the period of the shutdown, to preserve employment relationships. The overarching objective is to preserve as much of the productive capacity of the economy as possible while short-term shelter-in-place orders are in effect and to help the economy transition quickly to a new, post-shutdown equilibrium by supporting labor demand over the medium term.

For firms, preventing wasteful liquidations allows the black box of productive technologies and business relationships to remain intact. Professional networks are preserved, relationships with suppliers and customers are maintained, and knowledge of local conditions and preferences can continue to be put to productive use. For workers, the value of firm-specific human capital is maintained, and maintaining employment relationships means they continue to be paid by their employer, and they are in a position to return to work immediately once shelter-in-place orders are lifted. No separation takes place, not even a temporary furlough of workers. For both workers and firms, productivity enhancing worker-firm matches are maintained. And the economy is in a position to snap back quickly because labor demand has been supported.[4]

This observation is especially true in a lockdown because the risk of mass closures is so real. Without a program to support small business continuity, a wave of closures would be followed by a period in which new businesses started. Eventually, the economy would reach a new equilibrium.

4. Papers that discuss the role of worker-firm matches include Mortensen and Pissarides (1999) and Davis and von Wachter (2011). Jackson (2013) measures match quality directly in the context of schools, estimating teacher, school, and match productivity on student outcomes. He finds that teacher-school (worker-firm) match effects are important, estimating that a one standard deviation increase in match quality increases math scores by an amount roughly equal to two-thirds of the effect of a one standard deviation increase in teacher quality. Using linked worker-firm data, Farooq, Kugler, and Muratori (2020) document an important role for match quality and find that more generous unemployment insurance benefits lead to higher quality matches. In our context, match quality likely matters the most for larger PPP-eligible firms.

But during the transition, labor demand would be depressed because there would be fewer businesses looking for workers, which would lead to lengthy spells of unemployment for millions of workers and a slower and more sluggish recovery.

Because the (aggregate, present discounted value of) social benefits of these businesses exceed their (aggregate, present discounted value of) costs, a subsidy is justified under standard economic logic. Particularly given the possibility of an aggregate demand doom loop and the lengthy period of high unemployment it would cause, we argue that in the context of the pandemic, the appropriate revenue replacement rate is large.

Once lockdown orders are lifted, partial revenue replacement may still be needed. But it is no longer necessary or economically desirable to compel firms to maintain pre-lockdown employment relationships or employment levels. After the economy has partially reopened, policy should not introduce frictions into the process of reallocating labor (and capital) to its post-lockdown most productive use, and policy should allow firms the flexibility to reorganize their post-lockdown production functions to further the key overall goal of a revenue replacement program: ensuring small business continuity.

There is an inherent tension between a revenue replacement program's goal of maintaining employment relationships and keeping firms in business and the goal of efficiently reallocating factor inputs and swiftly transitioning to a new, post-lockdown equilibrium. But for the reason we discussed earlier, there is less to this tension than meets the eye in this case. A revenue replacement program allows that transition to happen faster by preserving many otherwise viable firms during the shutdown. Once the economy has partially reopened, severing the link between program participation and maintaining prepandemic employment levels is critical to minimizing this tension. And a revenue replacement program should be of limited duration following the reopening of the economy. A revenue replacement program may also keep some businesses afloat that would have shut down in the absence of the pandemic. Presumably most businesses that were not viable prior to the pandemic will remain unviable once the revenue replacement program has ended.

These considerations emphasize the need for the revenue replacement program to focus on revenue, not simply on payroll costs. A separate reason to focus on revenue rather than narrowly focusing on payroll costs is that nonpayroll expenses, like rent in many cities, are significant. A program replacing payroll costs but not overall revenue may not be sufficient to keep many businesses in high-rent cities from closing.

Replacing small business revenue is an expensive proposition. Hubbard and Strain (2020) estimate that replacing 80 percent of revenue for twelve weeks for service sector businesses—that is, for businesses in industries other than manufacturing, finance and insurance, health care, and educational services—with fewer than 500 employees would cost $1.2 trillion.

Expensive as such an intervention is, the counterfactual would be even costlier, with cascading business failures, wasteful liquidations, plunging incomes, soaring unemployment, and little prospect for a rapid recovery because of the devastating effects on the small business ecosystem. Another budgetary consideration is the offsetting effects of less use of social insurance programs, like unemployment insurance, and safety net programs, like food stamps.

So far, our discussion of a small business revenue replacement program has been general and could be applied to any situation in which small, service sector businesses needed to shut down for a period of several weeks. A key feature of the pandemic recession is that such a program did not exist, and Congress needed to create one quickly. Given this context, it was best for Congress to rely on the existing relationships many small businesses have (via checking accounts or loans) with commercial banks rather than to have had the government attempt to set up an entirely new direct transfer program.

The government should have treated the banks essentially as conduits to get money into business accounts as quickly as possible. Of course, such an approach requires convincing banks that they will be held harmless in the event of borrower misrepresentation, both by the current administration and by future administrations. Strong assurances are necessary.[5]

To align better with an equity infusion, the revenue replacement grants should be structured as loans that are forgivable if certain conditions are met and should be fully backed by the government; that way banks assume no risk. Banks should be allowed to charge fees, paid for by the government, as an incentive to participate and for administrative costs.

5. Prior to the 2008 financial crisis, large US banks routinely made Federal Housing Administration (FHA) loans designed to help first-time home buyers and buyers with relatively poor credit purchase houses. To reach these borrowers, the government encouraged lax lending standards. This policy shift contributed to the housing bubble, and FHA's solvency was in question following the crash. The government imposed fines on banks, arguing they did not adhere to FHA underwriting standards. The revenues from the fines helped to shore up FHA. This episode has left many large banks skittish about using anything but strict underwriting standards as part of government lending programs.

Forgivable loans (i.e., grants) are necessary for the program to succeed. The pandemic shutdown's adverse consequences for firms' collateralizable net worth and cash flows require equity contributions. Loans, even with low interest rates and long maturities, would likely be insufficient given the need for equity financing. Service sector businesses permanently lose revenue in a shutdown, and many would likely rather lay off workers than take on additional debt. Even if debt service could be deferred for a period of one or two years, many would be reluctant to take out a loan.[6] These businesses often have low profit margins, and a loan program would likely have had an insufficient take-up rate to meet policymakers' objectives.[7] If the only concerns were cash flow challenges and a lack of access to equity capital, then a lending program might be all that is justified. But as we argued above, the divergence between the private and social value of small business continuity suggests that subsidies are justified using standard economic logic, particularly during the shutdown period. (In section VI, we discuss how a lending program might complement grants once the economy has partially reopened.)

A revenue replacement program should be broad-based and should avoid too much targeting. In the fog-of-war atmosphere of the pandemic, policymakers have limited knowledge of the virus's spread, and crafting an effective triggering mechanism based on public health metrics is difficult. The government should avoid picking winners and losers by targeting the program to select industries.

Revenue tests or demonstrations of hardship should also be avoided. At the beginning of a sudden and unexpected lockdown, demonstrations significantly slow down the process of getting funds to businesses, putting the effectiveness of the program in jeopardy. Once the economy partially reopens, it can be argued that revenue tests target assistance to firms that need it most, as measured by revenue loss relative to normal circumstances. But forward-looking revenue tests serve as a disincentive to earn revenue by imposing implicit marginal tax rates on revenue. Backward-looking revenue tests avoid this disincentive but are less generous to otherwise

6. For a proposal that argues in favor of lending programs, see Ozimek and Lettieri (2020). Hanson and others (2020a) argue for equity-like arrangements and grants to support small business. Hanson and others (2020b) argue for payment assistance to impacted businesses to meet recurring fixed obligations (e.g., interest, rent, and utilities) during the health emergency.

7. At the time of this writing, the Federal Reserve's Main Street Lending Facility has very few loans, suggesting that even among midsize businesses taking on debt under terms that are not borrower-friendly is not an attractive prospect.

identical firms that are doing better adjusting to the post-lockdown economic circumstances.

The main appeal of revenue tests and hardship demonstrations are lower program costs and targeting aid based on "need." The problem is that need is an amorphous concept in a partially reopened economy, and revenue tests bring their own problems. The best targeting strategy is broad-based, focusing on a large class of firms defined by size and industry type.

II.C. Addressing Moral Hazard Concerns

A program that replaces revenue for small businesses for a period of time is an extraordinary government intervention in the private economy. It is reasonable to be concerned that such a program would lead to excessive risk taking or other imprudent behavior on the part of firms by potentially creating the perception of a government "business revenue safety net."

In normal public programs under normal circumstances, this concern is certainly real. But in this instance, we are much less concerned about moral hazard. The need to shut down large segments of the economy will occur infrequently, and without advance notice. Businesses cannot purchase shutdown insurance from private firms in the way they can insure against risks from fires and floods. Government should communicate the extraordinary nature of the assistance is driven by the extraordinary nature of the threat. This step should mitigate moral hazard concerns.

II.D. Policy Response in Other OECD Nations

Before turning to the Paycheck Protection Program, we briefly discuss programs enacted by member countries in the Organisation for Economic Cooperation and Development (OECD) during the pandemic recession. See table A1 in the online appendix for specific program descriptions and parameters for OECD countries.

Many European nations relied on a version of a wage subsidy scheme in which workers saw their hours and pay reduced and their government picked up a large part of the cost of employing them.[8] This type of program

8. Hamilton and Veuger (2020) argue that large expenditures to address the pandemic will heighten concern about the public finances of some European Union member states, implying that a broader European approach to fiscal policy is necessary. They suggest that the eurozone issue Eurobonds to placate markets and to avoid issues associated with sovereign debt overhang.

was used by Germany (*Kurzarbeit*, or short-term work) during the Great Recession and is widely credited with keeping the German unemployment rate down during that period. The way it often worked was that firms paid the benefit to their workers, which was typically somewhat lower than wages, and the government reimbursed the firm (Blanchard, Philippon, and Pisani-Ferry 2020). Austria implemented a similar program during the pandemic, replacing up to 90 percent of covered wages.

A few examples: In the United Kingdom, the government reimbursed firms for 80 percent of the wages of furloughed workers. Germany covered 60 percent of wages for childless workers on furlough and 67 percent for furloughed workers with children. Depending on the month, the government of France covered 84 percent or 72 percent (as of June) of wages for workers on temporary layoff. Notably, these countries did not condition eligibility based on firm size, in contrast to the United States' emphasis on small and midsize firms. Some European economies conditioned subsidies on a demonstration of a significant decline in revenue (e.g., the Netherlands, Estonia, and the Slovak Republic). Slovenia emphasized state-funded bonuses for hazard pay in certain sectors.

These programs are similar to what we describe above. They maintain the worker-firm relationship during the shutdown period, making it easier for workers, firms, and the economy to recovery quickly once economic activity partially resumes. Keeping workers paid by the firms also allows government assistance to reach workers quickly. Such programs are similar to standard unemployment insurance in that the government is helping support the incomes of workers who are underemployed, but unlike standard unemployment insurance, they allow for part-time work.

At the same time, European programs have been more focused on supporting workers in their current employment matches, rather than smoothing a transition toward different employment matches. Programs generally permitted workers receiving nonwork or part-time work benefits to remain attached to the firm. As with the US Paycheck Protection Program, the state effectively assumed a portion of payroll costs for covered workers, albeit through payments made to firms.[9] The US program formally worked as a combination of loans and outright grants to firms and wage subsidies.

9. Norway relied on layoffs, making it easier for firms to use temporary layoffs and increasing the generosity of unemployment benefits for workers. Norway also instituted a new compensation scheme for businesses that subsidized fixed costs. Alstadsæter and others (2020) find that this program reduced firms' economic distress by a similar magnitude to PPP by reducing the negative effects of the crisis on profitability, liquidity, debt, and solvency.

As we describe later, a number of administrative challenges were "unforced errors" in its implementation.

While some European pandemic unemployment or wage subsidy schemes have faced fewer administrative challenges than in the United States, they still raise concerns (to which we return later). Importantly, they were and are designed to maintain employment relationships in a temporary cyclical downturn (e.g., a moderate and short recession or a short pandemic shutdown). In a reopening of the economy, policy shifts would be needed to focus on rehiring workers and worker transitions by gradually reducing wage subsidies and the generosity of unemployment benefits.

Employment policy responses in OECD countries outside Europe during the pandemic have been varied. Canada, for example, focused on rehiring workers previously laid off due to the COVID-19 pandemic, with subsidies of up to 75 percent of all covered wages. Israel relied on relaxing requirements for unemployment benefits, direct and government-guaranteed loans to businesses of all sizes, special support for high-risk businesses, grants for small businesses, and a variety of measures to reduce the short-term burden of business taxes. Australia, like large European economies, implemented a wage subsidy for firms' retention of employees. Japan financed wage subsidies for retained workers, but only for small and midsize firms. South Korea increased worker retention subsidies to up to 90 percent of covered wages for three months for all employers. A less generous subsidy to wages was provided in South Africa for firms whose operations were at least partially curtailed as a consequence of the COVID-19 pandemic.[10] In Latin America, Chile provided partial support for wage declines, and Colombia assisted workers in firms with significant revenue declines with support of 40 percent of the minimum wage.

III. The Paycheck Protection Program

The Paycheck Protection Program (PPP) was created by the CARES Act, the $1.8 trillion "phase 3" economic recovery package passed by Congress and signed into law on March 27, 2020. In this section, we outline the statutory design of PPP, the program's implementation by the Department of the Treasury and Small Business Administration, and the differences between PPP and the features of a small business revenue replacement program we discussed in the previous section.

10. South African Government, "Support to Business," https://www.gov.za/covid-19/companies-and-employees/support-business#; accessed August 21, 2020.

III.A. PPP's Design

PPP is a forgivable loan program. Businesses or nonprofits with 500 or fewer employees; sole proprietors, independent contractors, or self-employed individuals; and small businesses, 501(c)(19) veterans organizations, or tribal business concerns that otherwise meet the Small Business Administration's (SBA) size standards are eligible. Businesses in the accommodation and food services sector (North American Industry Classification System, or NAICS, code 72) may apply the 500 employee rule to each physical location, not to the corporation as a whole. Congress appropriated $349 billion for PPP in the CARES Act.

Under the program, businesses can borrow up to two and a half times their average monthly payroll costs, capped at $10 million. Loans are issued by banks and are guaranteed by the government.[11] The amount of the loan spent on payroll costs (including benefits), rent, utilities, and mortgage interest during the twenty-four-week period (originally eight-week period) after the loan is originated is forgiven—that is, it is converted to a grant—provided that 60 percent (originally 75 percent) of the amount forgiven is spent on payroll (a Treasury/SBA regulation not found in the CARES Act) and that the business does not reduce headcount relative to precrisis levels and does not reduce any employee's compensation by more than 25 percent of his or her precrisis level. If headcount or compensation is reduced beyond those parameters, the amount of the loan forgiven may be reduced proportionately under some (but not all) circumstances. PPP encouraged businesses that had already laid off workers due to the pandemic to rehire them quickly without penalty.[12]

11. Financial technology (fintech) played an important role, as well. Erel and Liebersohn (2020) study the response of fintech to demand for financial services created by PPP. They find that fintech was disproportionately used in zip codes with fewer bank branches, lower incomes, and larger minority share of the population, in industries with less ex ante small business lending, and in counties where the economic effect of the pandemic was more severe.

12. Rules for loan forgiveness and for loan forgiveness reduction have been evolving. At the time of this writing, loans can be fully forgiven if loan proceeds are spent and qualifying costs are incurred during the covered period of the loan, which begins when the loan is disbursed (or during an alternative covered period, depending on how the borrower manages payroll); at least 60 percent of the loan amount (originally 75 percent) was used on payroll costs; and staffing and compensation levels are maintained in the covered period relative to the reference period. The covered period is twenty-four weeks for loans made after June 5, 2020. For loans made before June 5, 2020, borrowers can choose between a twenty-four-week or eight-week covered period. Borrowers can choose one of two reference periods: February 15, 2019, to June 30, 2019, or January 1, 2020, to February 29, 2020. (Seasonal employers have different rules.) PPP also includes a safe harbor provision that allows borrowers to avoid loan forgiveness reductions due to decreases in headcount or compensation that occurred

Borrowers do not need to demonstrate hardship in order to qualify for a forgivable loan, which streamlines the process and allows banks to get money to businesses quickly. Instead, they need to offer a series of good-faith certifications, including: "Current economic uncertainty makes this loan request necessary to support the ongoing operations of the Applicant."[13] Borrowers must also certify that the business intends to use the funds received for payroll and other operating expenses and that they are not applying for a duplicative loan. For a loan to be forgiven, in some cases, businesses may need to present documentation to lenders demonstrating that they complied with the terms of the loan. In other cases, businesses simply need to attest to this.

To get funds to businesses quickly, PPP delegates authority to lenders to determine borrower eligibility. Given the PPP's structure, lenders do not need to assess the ability of the borrower to repay the loan. No collateral or personal guarantees from borrowers are required, and no credit elsewhere tests are applied. Lenders simply need to establish that a business was operational on February 15, 2020, and verify its payroll.

To entice banks to participate, the program allowed them to charge generous fees—5 percent of principal on loans up to $350,000, 3 percent on loans between $350,000 and $2 million, and 1 percent on loans above $2 million up to $10 million. Lenders can charge an interest rate of 1 percent on the portion of the loan that is not eligible for forgiveness, and loans have zero weight in banks' capital requirements. In the statute, lenders are "held harmless" in the event of borrower misrepresentation, but the Treasury/SBA did not waive requirements under the Bank Secrecy Act and required anti–money laundering compliance programs.

The Paycheck Protection Program and Health Care Enhancement Act was signed into law on April 24, 2020, and increased PPP funding by

between February 15, 2020, and April 26, 2020, provided that headcount and compensation are restored by December 31, 2020 (originally June 30, 2020). Loan forgiveness will also not be reduced if borrowers issue written offers to rehire workers who were employed on February 15, 2020, and those offers are not accepted, or if borrowers document an inability to rehire similarly qualified workers for vacancies as of December 31, 2020. Loan forgiveness will not be reduced if borrowers cannot maintain employment levels due to an inability to return to the same level of business as of February 15, 2020, because they are complying with coronavirus-related guidance for social distancing, sanitation, or worker or customer safety requirements from various federal agencies and departments between March 1, 2020, and December 31, 2020. On October 8, the Treasury/SBA issued additional guidance that exempted borrowers with loans under $50,001 from any loan forgiveness reductions based on failing to maintain headcount or wages.

13. Paycheck Protection Program Borrower Application Form, revised June 24, 2020.

$320 billion. The Paycheck Protection Program Flexibility Act (PPPFA) was signed into law on June 5, 2020. The covered period of the forgivable loan was extended from eight weeks to twenty-four weeks (or until December 31, 2020). PPPFA also allowed businesses to spend 40 percent of forgivable funds on nonpayroll expenses, rather than the 25 percent previously established by Treasury/SBA regulation. The maturity of the loans was increased from two years to five years for loans issued after June 5.

III.B. Design Concerns

On the whole, PPP is well designed relative to objectives for financing during a short-term shutdown we described earlier. It was able to get an astonishing amount of money to millions of small businesses very quickly. It relied on what are essentially grants and not loans. It took measures to encourage banks to participate. It avoided revenue tests, and it did not target select industries. Its goals—ensuring small business continuity and preserving employment relationships—were the right ones.

But we have four concerns about some design elements. First, PPP is too focused on payroll expenses. The goal should have been to replace revenue, not simply to assist businesses with meeting payroll obligations. Even the payroll share for forgiveness of 60 percent after PPPFA was enacted is too high from this perspective.

Second, the program was designed with a short lockdown period in mind. This approach was reasonable given widely held expectations about the course of the pandemic in early March, and to some extent this was addressed by PPPFA modifications to the program. Even so, the program should be more flexible post-lockdown in allowing labor to be reallocated across firms and industries, a problem given a longer period of partial shutdown. PPP contains incentives that work against this needed reallocation.

Third, a major flaw in PPP's design was the original CARES Act appropriation of $349 billion, and a major flaw in its execution was the Treasury's inability to convince banks that they would be held harmless in the event of borrower misrepresentation. Both of these flaws led to the reality and public perception that PPP funds were flowing to relatively better resourced and less vulnerable small and midsize businesses.

Finally, Hubbard and Strain (2020) estimated that the PPP's original goals would require around $1 trillion. With only $349 billion originally appropriated for PPP—and the intense demand for PPP loans in the early days of the program—a perception developed that only businesses with preexisting relationships with participating lenders would be able to access

Table 1. Summary of PPP Lending, April 3–August 8

Cumulative lending	*Loan count*	*Net loans ($)*	*Number of lenders*	
	5,212,128	525,012,201,124	5,460	
Distribution by loan size			*% of count*	*% of amount*
$150,000 and under	4,552,452	147,477,537,518	87.3	28.1
$150,000 to $2 million	630,694	272,228,531,130	12.1	51.9
Over $2 million	28,982	105,306,132,476	0.6	20.1

Source: SBA Paycheck Protection Program.

the program. Lenders, in a rush to process applications and out of concern that they would not be held harmless in all circumstances, focused lending on existing bank customers.

IV. Evaluating the PPP: Program Statistics, Implementation Challenges, and Existing Evidence

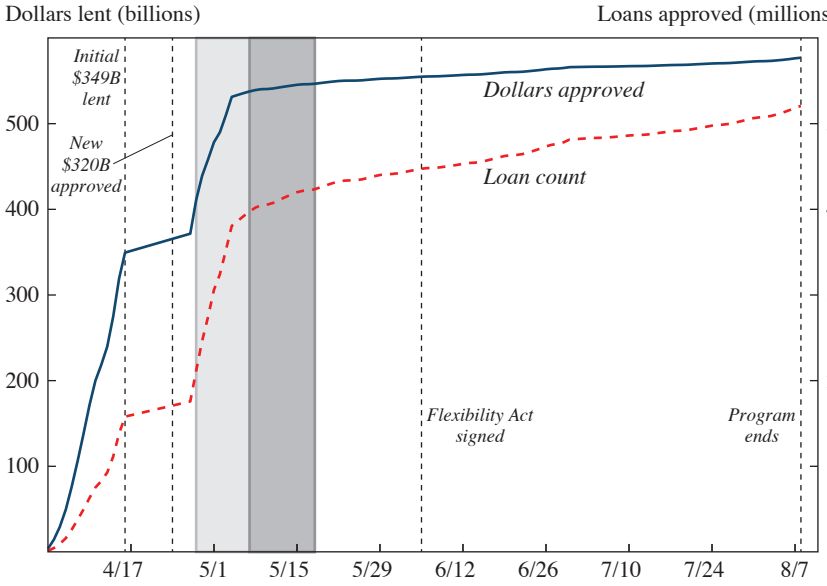
In this section, we present basic statistics about PPP loans and discuss implementation challenges. We also review current empirical evidence on the effectiveness of PPP.

IV.A. PPP Program Statistics

Table 1 presents PPP program statistics. As of August 8, PPP had approved 5,212,128 loans representing a total of $525 billion provided by 5,460 lenders. The average loan size is $101,000. The solid majority of program dollars were included in loans of less than $2 million, and the overwhelming majority of loans were for less than that amount. Loans of over $2 million represent 0.6 percent of all loans and 20 percent of all dollars loaned. In contrast, around 87 percent of all PPP loans were made for less than $150,000, and 28 percent of all funds loaned were part of loans of less than that amount. Figure 1 shows loan counts and loan amounts over time.

Granja and others (2020) study the targeting of these loans across geography and do not find evidence that the first round of PPP funds went to parts of the country that saw the largest declines in hours worked or business shutdowns. Further research is needed to study the targeting of the full program. We also note that the entire country was affected by shutdowns, and the degree to which different states were affected by the

Figure 1. Cumulative Number of PPP Loans and Dollars Approved, April 3–August 8



Source: SBA and Treasury Department micro data.

Notes: This figure displays cumulative loans and dollars lent during the operation of the PPP program calculated as of August 20, 2020. Cumulative dollars lent are overstated in the micro data due to using the midpoints of loan ranges provided for loans greater than $150,000. The shaded areas represent a period of uncertainty over audits and the safe harbor deadline. The lightly shaded area covers the total period of uncertainty over audits from April 28 (audits announced) to May 18 (final deadline to return funds under safe harbor provision). The darker area covers the period of uncertainty over the safe harbor deadline from May 7 (the original deadline) to May 18 (the final deadline).

pandemic varied at different times, particularly as the nation entered the summer months.[14]

IV.B. Implementation Challenges

Table 2 presents a timeline of selected PPP events and includes some implementation challenges. Before the program officially launched on April 3, banks and other industry associations were warning of a chaotic beginning to the program, arguing that borrower verification would be onerous and would hamper the government's objective of getting money

14. Figures A1 and A2 in the online appendix show loan counts and loan amounts by state and PPP loans and employment losses by industry, respectively.

Table 2. Timeline of Major Events in the PPP Program

Date	*Description*
March 27, 2020	CARES Act signed, appropriating $349 billion for PPP.
April 2	Treasury/SBA releases first interim final rule; 75 percent payroll requirement; two-year repayment period; 0.5 percent interest rate; eight weeks of covered expenses; application period to June 30.
	Faced with complaints from small banks, the Treasury raises the interest rate on PPP loans from 0.5 to 1 percent hours before the program launch.
	Bank associations, JPMorgan Chase Bank, and industry associations warn of chaotic PPP launch; borrower verification requirements and payroll cost calculations are unclear.
April 3	First round of PPP officially launches; only eight of twenty-five largest SBA 7(a) lenders are taking applications. Bank of America and JPMorgan Chase begin accepting applications but only for existing customers.
April 16	First round of PPP ends; original $349 billion appropriation exhausted. Thousands of submitted applications remain unapproved.
April 20	Small businesses sue large banks over allocation of loans. They claim that banks violated first-come, first-served rules and gave priority to larger applications that would generate more fees.
April 23	Treasury/SBA warns publicly traded companies and their subsidiaries against seeking loans; sets May 7 deadline to return funds.
	Treasury/SBA requires applicants to certify that the funds are necessary due to the current economic uncertainty, as well as a lack of other sources of funds to support their operations.
April 24	Paycheck Protection Program and Health Care Enhancement Act signed into law authorizing an additional $320 billion for PPP.
April 27	Second round of PPP begins with $320 billion in new funding.
	Treasury/SBA caps the dollar amount of loans that individual banks can originate at $60 billion.
April 28	Secretary Steven Mnuchin announces full audits for loans > $2 million and warns of criminal penalties for noncompliers.
April 29	SBA temporarily blocks large banks from submitting loans.
April 30	Justice Department launches probe of PPP.
	IRS confirms that PPP loans are excluded from gross income, but expenses paid for using PPP loans are not tax deductible.
May 5	Senate introduces Small Business Expense Protection Act to treat expenses paid using PPP loans as ordinary deductible business expenses.
	Deadline for companies to return funds without penalty under safe harbor provisions extended from May 7 to May 14.
May 8	SBA inspector general warns that the requirement of 75 percent payroll costs and two-year repayment burdens borrowers and may not reflect statutory intent.
May 13	SBA announces that loans below $2 million would be assumed to have satisfied good-faith certification requirements; creates opportunity for larger loans to be returned without penalty.
	Deadline for companies to return funds without penalty under safe harbor provisions extended from May 14 to May 18.

Table 2. Timeline of Major Events in the PPP Program (*Continued*)

Date	*Description*
May 14	Treasury says companies must use the total number of employees to determine eligibility for PPP loans rather than full-time equivalent as indicated previously.
May 22	Treasury/SBA warn that it may review PPP loans "of any size at any time at SBA's discretion"; borrowers required to retain documentation for six years.
June 5	PPP Flexibility Act passed; covered period extended from eight weeks to twenty-four weeks; repayment extended from two years to five years; payroll costs allowed to be 60 percent of total loan forgiveness amount, down from 75 percent.
June 12	For determining PPP eligibility, the look-back period for criminal histories for nonfinancial felonies reduced from five years to one year.
June 30	Hours before program expiration and with $130 billion left, Congress extends the PPP application period to August 8.
July 6	Under pressure from Congress, SBA releases the names of borrowers and lenders and date of approval for loans of more than $150,000, representing 15 percent of all approved loans and 75 percent of dollars lent. Exact loan amounts are not disclosed.
July 7	Using data released by the SBA, researchers estimate that banks will earn $24 billion in fees from PPP loans.
July 12	New York City comptroller report alleges that the city did not receive its fair share of PPP loans.
July 17	Secretary Mnuchin asks Congress to consider automatically forgiving all loans for less than $150,000, extending PPP, and suggesting terms for PPP in a phase 4 economic recovery package.
August 4	Businesses, lobbyists, and professional organizations ask Congress to exempt PPP income from tax reporting.
August 6	SBA releases guidelines on PPP loan forgiveness ahead of August 10 launch of forgiveness application platform. Many financial institutions delay submitting applications until regulatory and legislative uncertainty is resolved.
August 8	PPP application period closes with nearly $140 billion in reserve as Congress debates "phase 4" economic recovery package.

Source: Authors' compilation.

into the economy quickly, and due to confusion about basic program requirements like how lenders should calculate payroll costs. Due to confusion about the program, on the day it launched only eight of the twenty-five largest SBA 7(a) lenders were taking applications.

The early stage of PPP was also characterized by intense demand. By the end of its second week, all $349 billion of CARES Act PPP appropriations had been exhausted. Thousands of submitted applications remained unapproved. There were accusations that large banks violated the first-come, first-served structure of the program to favor large borrowers.

Articles in the press reported that some publicly traded companies or their subsidiaries had received PPP loans. On April 23, the SBA released guidance that publicly traded companies would likely find it difficult to certify in good faith that they needed PPP loans.[15] The Treasury/SBA gave businesses until May 7 (later extended to May 14 and then May 18) to return PPP funds without facing a penalty.[16] On April 28, Treasury Secretary Steven Mnuchin announced that a review of PPP loans in excess of $2 million would take place. The secretary warned of potential criminal penalties for borrowers found to have misrepresented themselves or not to have complied with the terms of the loan.[17] On May 13, the SBA attempted to reassure borrowers and indicated that loans of less than $2 million would be assumed to have made certifications of need in good faith.[18]

In our view, publicly traded firms or their subsidiaries should not have been eligible for PPP loans. But confusion over eligibility for PPP loans, which borrowers would be audited, and under what terms those audits would take place had a profound effect on the program.

During the period of uncertainty discussed above, shown in the light and dark gray bars in figure 1, the slope of both lines flattened. Dollars loaned have increased more slowly since this period of Treasury-sown confusion

15. See question 31, "Paycheck Protection Program Loans: Frequently Asked Questions," https://home.treasury.gov/system/files/136/Paycheck-Protection-Program-Frequently-Asked-Questions.pdf (accessed August 21, 2020): "It is unlikely that a public company with substantial market value and access to capital markets will be able to make the required certification [of economic need] in good faith, and such a company should be prepared to demonstrate to SBA, upon request, the basis for its certification."

16. See questions 43 and 47, "Paycheck Protection Program Loans: Frequently Asked Questions," https://home.treasury.gov/system/files/136/Paycheck-Protection-Program-Frequently-Asked-Questions.pdf.

17. For example, Secretary Mnuchin made this statement on April 28 on CNBC: "I really fault the borrowers who made these certifications. Now, there were some banks early on who put things up on their website and prioritized their customers. We immediately told them that was wrong. They took it down. So, you know, I want to be very clear: it's the borrowers who have criminal liability if they made this certification and it's not true. And as I said, we're going to do a full audit of every loan over $2 million. This was a program designed for small businesses, it was not a program that was designed for public companies that had liquidity. Again, the certification was very clear in saying that if people had other sources of liquidity, they could not take this loan"; https://www.cnbc.com/2020/04/28/cnbc-transcript-treasury-secretary-steven-mnuchin-speaks-to-cnbcs-squawk-box-today.html.

18. See question 46, "Paycheck Protection Program Loans: Frequently Asked Questions," accessed August 21, 2020. https://home.treasury.gov/system/files/136/Paycheck-Protection-Program-Frequently-Asked-Questions.pdf: "Any borrower that, together with its affiliates, received PPP loans with an original principal amount of less than $2 million will be deemed to have made the required certification concerning the necessity of the loan request in good faith."

ended on May 18. New PPP loans continued to be made in the second half of May and into June and July, but at a much slower rate than in April.

Of course, implementation shortcomings were inevitable to some degree in setting up a program as ambitious as PPP in a short period of time in the midst of a pandemic. But the Treasury's muddled management of PPP's implementation is noteworthy because of its failure to take seriously the advice it was given by a range of private sector participants and policy experts, leading it to make mistakes that were both forecastable and forecasted.

IV.C. Brief Review of Existing Economic Research on the PPP

Study of the PPP by academic researchers is still in the working paper stage, but some notable findings exist that shed light on the early effects of the program. Bartik, Cullen, and others (2020) study the original $349 billion of PPP funds. Using a survey of small businesses, they find that PPP approval increased self-reported firm survival probability by 14 to 30 percentage points. They also find that banks allocated PPP funds to firms with higher PPP treatment effects. But these firms were also more likely to have stronger connections to banks, while firms with less cash on hand were less likely to have their applications approved. They find that PPP had a positive but statistically insignificant impact on employment.

Quite modest employment effects are also found by Chetty and others (2020), who analyzed data from Earnin, a financial management application.[19] Granja and others (2020) also do not find evidence that the first round of PPP had a substantial effect on employment or on other local economic outcomes. Bartik, Bertrand, and others (2020) find that states that received more PPP loans and those with more generous unemployment benefits had labor markets whose declines were relatively less deep and whose recoveries were relatively more rapid. Chodorow-Reich and others (2020) find that PPP relaxed liquidity constraints facing firms, allowing some firms to pay down existing credit line balances.

Autor and others (2020) use weekly data from ADP, Inc., payroll records to study PPP's effect on employment. Using a difference-in-differences event study framework, they compare employment at firms above and below the 500 employee PPP eligibility threshold. Through the first week

19. Autor and others (2020) discuss limitations in the study by Chetty and others (2020), including that Earnin data are focused on very low-wage workers, with median wages equal to roughly the 10th percentile of wages in their industry, and that the absence of reported standard errors makes the study results hard to interpret.

of June, they find that PPP increased employment by between 2 percent and 4.5 percent. After scaling by the take-up rate, they estimate PPP increased aggregate payroll employment by 2.3 million workers, again through the first week of June.

Autor and others (2020) divide total program expenditures by their estimate of PPP's effect on aggregate employment and report a cost per job supported estimate of around $224,000. The paper notes that "while this is a substantial cost per job supported, it would be premature to offer a cost-benefit analysis of the PPP at this time" and points to the need to take a longer-term view of PPP's effects. We agree and would add that a short-term cost-benefit analysis should include other factors. For example, many workers who were kept on employer payrolls this spring would likely have been receiving unemployment insurance benefits in the absence of PPP. A short-term cost-benefit analysis should include cost savings from reducing the demand for social insurance and safety net benefits.

More fundamentally, we disagree with Autor and others (2020) in that we do not find cost per job supported to be a sufficient statistic to assess PPP's success. PPP is not exclusively a jobs program, and any evaluation of its effectiveness per dollar of program expense—even a short-run estimate—must include the benefit of preserving small businesses and employment relationships holistically, including social benefits in excess of private benefits and the benefits from hastening the economic recovery by supporting labor demand over the medium term.

V. Evaluating PPP: Empirical Analysis

We evaluate the effects of PPP on the employment, financial health, and continuity of small businesses. To do this, we use data from the Dun & Bradstreet Corporation (D&B), a company that provides commercial data and analytics to businesses. We are able to identify businesses in the Dun & Bradstreet data that applied for PPP loans of $150,000 or more. We do not observe if those companies received a loan or the exact amount (above $150,000 or more) of any loan received. We are not able to observe if a business applied for a PPP loan of less than $150,000. Information on loan applications comes from the SBA and is merged into the D&B data.

We estimate standard difference-in-differences models of the effect of PPP application and of PPP eligibility based on size. We use several treatment control groups in our analysis. We also estimate the dynamic effect of PPP application and eligibility using event studies. We find evidence that PPP increased employment, financial health, and continuity. We also

find that the effect of PPP is unfolding, with effects on employment and financial health growing over time and reaching their peak in August, the last month for which we have data. In this section, we discuss the data, our methods, and these results in further detail.

V.A. Dun & Bradstreet

D&B is a global data and analytics company whose clients are businesses. The company was founded in 1841 as the Mercantile Agency and became Dun & Bradstreet in 1933. It has extensive coverage, with over 355 million business records and data curated from tens of thousands of sources, including public registries, newspapers, and websites, its own investigations and telephone interviews, courts and legal filings, financial statements, insolvency records, and its own network, making use of proprietary and publicly available information. It is the world's largest commercial database and counts 90 percent of the Fortune 500 companies as clients, along with every cabinet agency in the US government.

D&B is able to track whether businesses pay their bills on time through its relationships with landlords, mortgage companies, credit card companies, office suppliers, and the like. Its clients make use of D&B's ability to predict whether a particular establishment might be delinquent in order to help clients manage financial risk. D&B has significant reach. For example, the US government has historically required companies that want to receive federal contracts to register with D&B, as does Apple for companies that want to distribute applications through its App Store. The Food and Drug Administration uses a company's D&B registration number as a way to verify that importers of pharmaceutical products are legitimate businesses and to confirm that applicant contact information is accurate and complete.

V.B. Sample, Variables, and Descriptive Statistics

Our sample includes all establishments in the D&B database active as of October 2019 with one to 1,000 employees. We do not include sole proprietorships, establishments with zero reported employees, establishments with missing state and industry codes, and establishments with modeled employee counts. We assign each establishment to a business size category (one to 500 employees, 501 to 1,000 employees) based on employment in February 2020. We also stratify establishments based on whether they applied for a PPP loan worth $150,000 or more. (We are only able to observe whether businesses applied for PPP loans of at least $150,000.)

Table 3 presents summary means and standard deviations for key variables and the distribution of establishments over industry. Businesses that applied for a PPP loan of $150,000 or more are nearly three times as large as those that did not. This difference is likely due to the relatively large size of the loan we are able to observe. Each group of businesses has comparable PAYDEX scores (discussed below), and over the entire sample period establishments with 501 to 1,000 employees are more likely to go out of business. The group least likely to go out of business during the sample period are establishments that we observe have applied for large PPP loans, and by a wide margin.

Key variables for our analysis include PPP application (for loans of at least $150,000), establishment employment, state, and industry. We use Dun & Bradstreet's PAYDEX variable as our measure of a business's financial health. PAYDEX is an indicator based on whether and how a business is paying its bills. PAYDEX scores range from zero to 100. A PAYDEX score of 80 denotes that payments made to D&B have generally been made within the terms of the covered agreement. A PAYDEX score over 80 indicates that payments reported to D&B have been made earlier than their terms required. PAYDEX scores of 70, 60, 50, 40, 30, 20, or below 20 indicate that businesses are 15, 22, 30, 60, 90, 120, or over 120 days late, respectively, in paying their financial obligations. PAYDEX scores evolve slowly, and for each business a given month's PAYDEX score reflects transactions that have taken place over the previous several months.

Examples of recent papers that have used D&B data to examine changes in the financial health of small businesses include Barrot and Nanda (2020), who study the impact of the 2011 federal QuickPay reform using establishment-level employment data and PAYDEX scores from D&B. Chava, Oettl, and Singh (2019) examine the effects of state minimum wage increases on the financial health of small businesses. The authors use the D&B PAYDEX score as their primary measure of financial health for 15.2 million establishments from 1989 to 2013.

D&B's out-of-business indicator is our measure of business continuity. It is a zero-one variable. D&B determines a business is out of business if it is no longer engaging in transactions, through direct investigations, and in other ways. Two separate authorities—for example, management or owners of the company itself, the landlord at its address, its licensing body, and so on—must confirm a business has closed for it to be recorded as out of business.

Panels A and B of figure 2 plot average establishment employment per month for establishments with one to 500 employees in our analysis sample and establishments with 501 to 1,000 employees. These plots indicate that

Table 3. Summary Statistics, November 2019–March 2020

Group	*1–500 employees and applied for a PPP loan ≥ $150,000*	*1–500 employees and did not apply for a PPP loan ≥ $150,000*	*All establishments 1–500 employees*	*All establishments 501–1,000 employees*
Mean number of employees per establishment	33.8 (47.6)	11.5 (35.2)	12.5 (36.1)	722.0 (167.0)
Mean PAYDEX score	73.9 (9.57)	72.6 (14.1)	72.7 (13.1)	70.0 (10.7)
Out of business (%)	0.010 (0.985)	0.157 (3.96)	0.150 (3.86)	0.325 (5.69)
Annual sales in 2019 ($)	5,603,688 (24,365,380)	2,168,570 (70,166,425)	2,338,007 (68,691,245)	66,242,380 (313,247,030)
Sectors (% share of employment)				
Agriculture	2.7	3.4	3.4	0.5
Construction	14.2	8.0	8.2	1.7
Finance, insurance, real estate	3.9	10.3	10.0	5.8
Manufacturing	12.4	4.8	5.2	20.9
Mining	0.5	0.3	0.3	0.7
Public administration	0.1	3.1	2.9	16.5
Retail trade	11.5	13.6	13.5	5.7
Services	41.6	46.6	46.4	40.3
Transportation, communications	4.6	4.9	4.9	5.1
Wholesale trade	8.4	5.0	5.2	2.8

Source: Authors' compilation using Dun & Bradstreet data.

Notes: This table displays means and standard deviations (in parentheses) in our pretreatment period, November–March, for the main establishment employee size groups used in our analyses. We also calculate the distribution of employment across industries at the two-digit standard industrial classification level. The sample consists of all establishments operating as of October 2019 that meet our sample selection criteria.

employment within the D&B sample is very stable. Among businesses with one to 500 employees, employment decreased by 1.42 percent in August relative to November. Panel B shows employment declines of 1.83 percent among establishments with 501 to 1,000 employees. In contrast, employment reported in official statistics shows much larger losses. The summary statistics we present suggest that employment evolves slowly among firms of all sizes, and our analysis does not indicate any relationship between the pace of evolution and PPP application. The relative stability of employment in the D&B data biases against finding a PPP employment effect, in both our treatment-on-the-treated and intent-to-treat models. We interpret all our estimates of PPP's effects relative to trends in the D&B data.

We present the average PAYDEX score per month in panels C and D of figure 2. These figures indicate that businesses' financial health in our sample is relatively stable, as well, falling in both panels by less than one point. This apparent stability is most likely due to the relatively lengthy look-back period for PAYDEX. As with the stability of employment, this biases against finding an effect of PPP on financial health.

The share of establishments that went out of business is shown in panels E and F of figure 2. The share of businesses with fewer than 500 employees that went out of business increased by a factor of 16 between November and August. Businesses with 501 to 1,000 employees saw closure rates increase by a factor of 14.

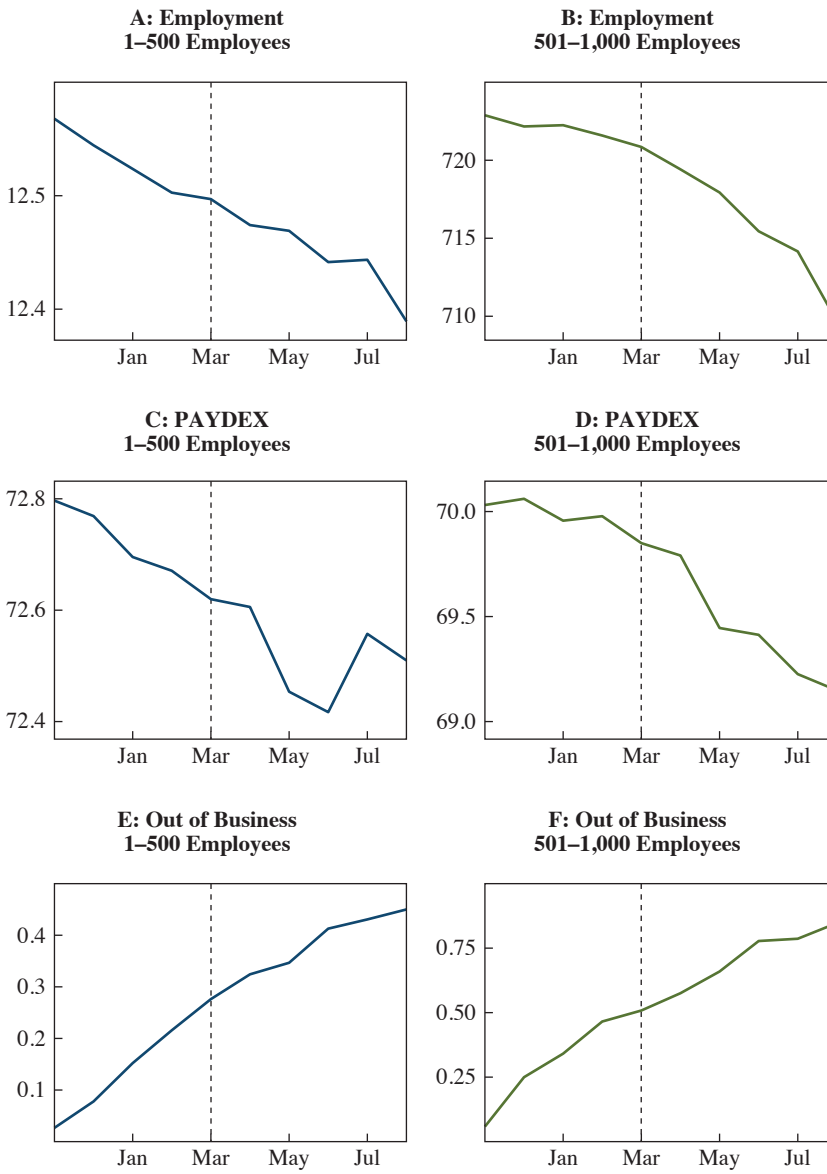
V.C. Estimation Strategy

To identify the effect of PPP on business outcomes, we estimate the following equation:

$$(1) \qquad y_{im} = \alpha + \beta(PPP_{ia} \times Post_m) + \gamma PPP_{ia} + \delta_{sm} + \delta_{jm} + \varepsilon_{im},$$

where y_{im} is an outcome experienced by business i in month m. Our analysis sample covers ten months, November 2019 through August 2020, with five months of pre-PPP period (the CARES Act was signed on March 27) and five months of post-PPP period (PPP launched on April 3). PPP_{ia} is an indicator as to whether business i applied for a PPP loan of at least $150,000. This variable is our measure of PPP—we do not observe whether businesses actually received PPP loans or, if they did receive loans, the size of the loan. The variable δ_{sm} is a state-by-month effect, and δ_{jm} is an industry-by-month effect. The result of $PPP_{ia} \times Post_m$ equals 1 if business i applied for a PPP loan and the month is April, May, June, July, or August. Standard errors are clustered by state.

Figure 2. Average Establishment Employment, PAYDEX Scores, and Out-of-Business Rates by Month



Source: Dun & Bradstreet; authors' calculations.

Note: These graphs show average employment, PAYDEX score, and out-of-business rates from November 2019 to August 2020 for establishments with 1–500 employees and 501–1,000 employees. Establishments are assigned to an employment size group using February 2020 employment. Panels A, C, and E include establishments with 1–500 employees. Panels B, D, and F include all establishments with 501–1,000 employees.

The coefficient of interest is β, which captures the effect of applying for a PPP loan of $150,000 or greater on the outcome variable. The industry-month effects capture time varying shocks to businesses in a given industry, and the state-month effects capture time varying shocks to businesses in a given state. The effects of the pandemic and the lockdowns varied substantially across industries and states. Using within-state-by-month and within-industry-by-month variation to estimate the effect of PPP application helps ensure that our results are not driven by time varying public health or social distancing policy differences between states and industries.

To trace the dynamics of PPP over the months since the CARES Act, we estimate a difference-in-differences event study of the following form:

$$y_{im} = \alpha + \sum_{t=-4}^{5} \beta_t (PPP_{ia} \times \varphi_t) + \gamma PPP_{ia} + \delta_{sm} + \delta_{jm} + \varepsilon_{im}, \quad (2)$$

where β_t is a vector of nine parameters estimating the dynamic effect of PPP, φ_t is a month dummy, and everything else is the same as in equation (1). The dynamics of the effect are interesting because of lags in receipt time, the time it may take employers to bring workers back onto payroll, and treatment control differences driven by the economic outcomes of control businesses worsening over time because they do not have access to PPP funds. The trend in the pre-PPP period coefficient vector is a partial check against differential employment trends among businesses that applied for a PPP loan and those that did not.

We observe whether a business applied for a PPP loan of $150,000 or more. If some businesses that applied were turned down, then our estimates of PPP's effect are biased downward, because the treatment group would be contaminated by control observations. Another important source of downward bias in our estimates of PPP's effect is that many businesses in our control group applied for and received PPP loans of less than $150,000. As presented in table 1, around 87 percent of all PPP loans were made for $150,000 or less, and these loans accounted for 28 percent of all funds disbursed. These are treatment-on-the-treated estimates and do not control for selection into applying for PPP. Firms that did not apply could be very different from those that did, perhaps thinking that they did not need the funds to continue operating or, alternatively, perhaps thinking that the situation was hopeless. They might have also been less financially savvy, which could be correlated with other outcomes and characteristics.

Knowing how PPP affected firms that selected into participating is interesting and important, but it confounds demand for PPP with PPP itself. To

address this distinction, we estimate intent-to-treat models. In these models, we do not use information on whether a business actually applied for a PPP loan. Instead, we compare outcomes for establishments that were eligible for PPP based on their size to establishments that were ineligible in a difference-in-differences framework. Specifically, we estimate the following equation:

$$y_{im} = \alpha + \beta(PPP_{ie} \times Post_{m}) + \gamma PPP_{ie} + \delta_{sm} + \delta_{jm} + \varepsilon_{im}. \quad (3)$$

All variables in equation (3) are the same as in equation (1) except PPP_{ie}, which equals 1 if a business is eligible for PPP based on its size, and equals 0 otherwise. We also estimate intent-to-treat event studies analogous to equation (2).

V.D. Results

RESULTS FOR EMPLOYMENT Table 4 presents estimates of equations (1) and (3) for (the log of) employment. The specification in the first column compares establishments with one to 500 employees that applied for a PPP loan of $150,000 or more to establishments in the same size class but that did not apply. PPP application is associated with a 0.90 percent increase in employment. Columns 2 and 3 present the same specification, but on smaller samples of establishments. Column 2 looks at establishments with one to 250 employees and similarly finds a 0.94 percent increase in employment from PPP. Column 3 analyzes a sample of establishments with 251 to 500 employees. Here, the effect on employment is negative, –3.2 percent. This result might be driven by greater demand for larger PPP loans within that size class among the treatment group, confounded by many control firms taking out PPP loans that we do not observe. But in evaluating the program as a whole, it is worth noting that there are approximately 81 million establishment-months with one to 500 employees in our sample, and around 360,000 of those are establishment-months with 251 to 500 employees.

These estimates are valuable in part because they implicitly control for establishment size category. But they are likely biased downward because the treatment effect is defined as a business applying for a PPP loan of $150,000 or greater, while most PPP loans were for less than this amount, so PPP-treated establishments are in the control group. The specification in column 4 attempts to address this by defining the treatment group as establishments with less than 500 employees who applied for a PPP loan of at least $150,000 and the control group as establishments with 501 to 1,000 employees. Here, we estimate a PPP employment effect of 1.78 percent, substantially larger in magnitude than the coefficients discussed previously.

Table 4. Estimating the Effect of PPP Loans on Establishment-Level Employment

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Treated × Post × 100	0.902***	0.936***	−3.20***	1.78***	0.0772	1.38***
	(0.0656)	(0.0655)	(0.470)	(0.234)	(0.366)	(0.258)
Treatment	1–500; loan	1–250; loan	251–500; loan	1–500; loan	400–475; all establishments	1–500; all establishments
Control	1–500; no loan	1–250; no loan	251–500; no loan	501–1,000; no loan	525–600; all establishments	501–1,000; all establishments
Observations	81,404,032	81,043,431	360,601	3,980,677	110,712	81,523,211
R^2	0.1390	0.1373	0.0432	0.2343	0.3783	0.0966

Source: Authors' compilation using Dun & Bradstreet data.

Note: This table reports difference-in-differences estimates for the impact of PPP on establishment-level employment. The sample consists of establishments operational as of October 2019 that meet our sample selection criteria. For all regressions, the pretreatment period is November–March and the posttreatment period is April–August. Each column uses a different treatment and control group, indicating the size of the establishment by employment in February; "loan" indicates that we observe that the establishment applied for a PPP loan of at least $150,000; "no loan" indicates the opposite; "all establishments" indicates that we include all establishments in the analysis sample regardless of whether they applied for a loan. All regressions include state, month, and two-digit standard industrial classification fixed effects as well as state-by-month and industry-by-month fixed effects. Standard errors are clustered at the state level. Coefficients and standard errors are multiplied by 100 for ease of interpretation.

*** $p < .01$

The estimates reported in columns 1–4 are treatment-on-the-treated estimates. In the context of evaluating PPP, this is interesting because estimating program outcomes conditional on selection is important and relevant (program participation is voluntary) and survey evidence finds that over 70 percent of small businesses participated in PPP.[20] But the estimates do confound the effect of demand for PPP with the effect of PPP, in addition to the limitation that we only observe PPP loans of at least $150,000.

To address these limitations, column 6 reports intent-to-treat estimates in which we define the treatment group purely based on size eligibility—that is, we do not use information on whether a business applied for a PPP loan—and the control group is establishments with 501 to 1,000 employees. We estimate that PPP size eligibility increased employment by 1.38 percent. This result might suggest an important role for smaller PPP loans in supporting employment.

Column 5 also reports intent-to-treat effects but for firms close to the 500 employee cutoff (eliminating firms near the cutoff). The advantage of this specification is that it directly controls for firm size. Comparing firms in the 400–600 employee window, we do not find a PPP employment effect. This result, along with the estimates reported in column 6, might suggest that PPP was most effective in supporting employment among smaller firms, at least through August.

The specification that estimates the effect of PPP within the 400–600 employee window arguably offers the strongest basis for causal inference assuming that the effect of PPP loans on employment is similar for firms of different sizes. But this assumption is very strong, and it is quite likely that PPP loans have effects that vary by firm size. The estimates reported in table 4 suggest this is the case, and the $10 million maximum for PPP loans also suggests that PPP would offer relatively more assistance to smaller firms. In the D&B data, 2019 average annual sales for firms with one to 500 employees were $2.4 million, while those for firms with 400–475 employees were $46.4 million. This consideration suggests that a holistic evaluation of PPP should include estimating its effects on firms of all eligible sizes. Therefore, our preferred specifications are presented in columns 4 and 6.

Our results contrast with Autor and others (2020), who find employment effects for larger firms using ADP data. It is interesting to note that their

20. The Small Business Pulse Survey of the US Census Bureau finds that 72.7 percent of small businesses received financial assistance from PPP since March 13, 2020, as of August 22, 2020.

estimates become less precise as the window around the 500 employee eligibility cutoff shrinks. This finding may be due to sample size, or it could indicate that PPP is relatively less effective at supporting employment for larger firms in the ADP data.

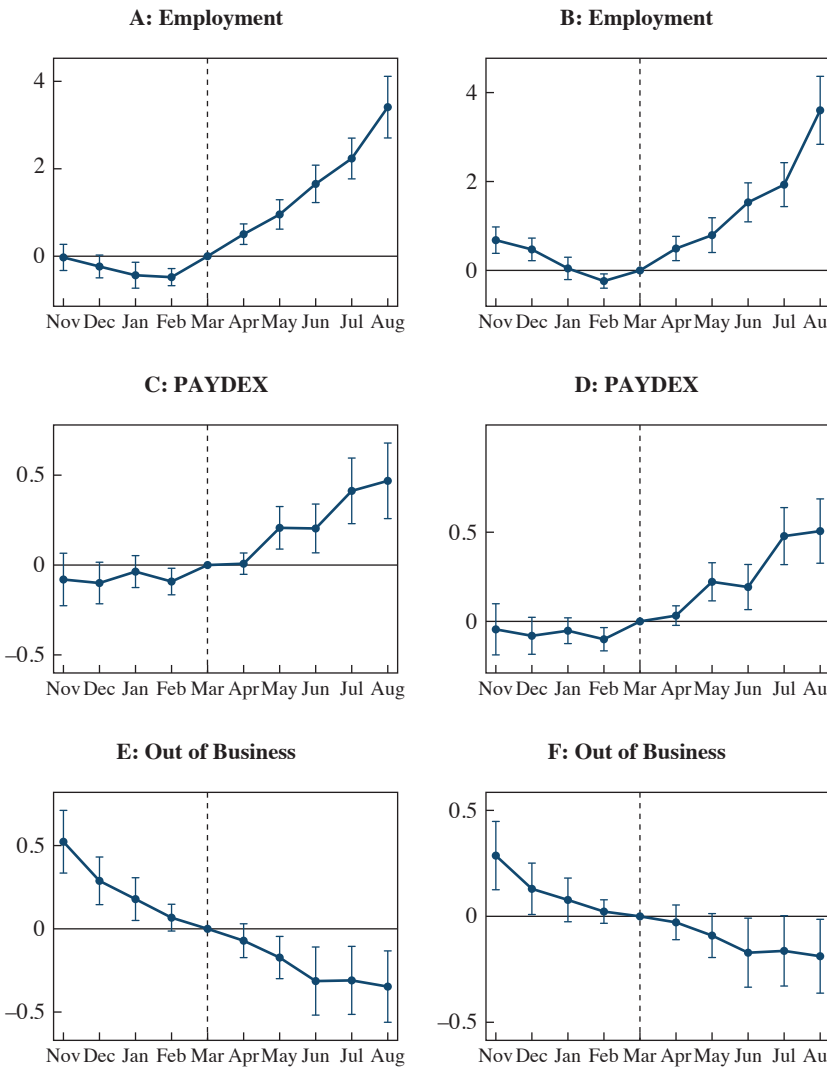
We present event study graphs using our two preferred treatment and control groups. Figure 3 presents results from equation (2). Panel A shows the dynamic effect of PPP on employment when the treatment group is establishments with one to 500 employees who applied for a PPP loan of at least $150,000 and the control group is establishments with 501 to 1,000 employees. There is no trend in the pre-PPP period coefficients, although the confidence interval on the negative coefficient in February does not include zero. The absence of a pre-PPP period trend supports a causal interpretation of the estimates. In the post-PPP period coefficients, the effect of PPP increases over time, rising to 3.13 percent in August.

Panel B shows a similar effect of PPP on employment. Here, the dynamic effect captures intent to treat, comparing establishments with 500 or fewer employees to those with between 501 and 1,000 employees, regardless of whether the firms applied for a PPP loan. Like panel A, there is no noticeable trend in the pre-PPP period, and the strength of the effect increases in the post-PPP period with each month. In August PPP eligibility is found to increase employment by 3.83 percent.

To interpret the magnitude of these effects, consider that average establishment employment fell by 1.6 percent in the D&B data for establishments with one to 1,000 employees over the sample period, between November and August. In light of this change, the 1.78 percent increase in employment reported in column 4 of table 4 and the 1.38 percent increase reported in column 6 of table 4 are both substantial increases. The effects for the month of August specifically—3.13 and 3.83 percent, respectively—are even more substantial.

RESULTS FOR FINANCIAL HEALTH Table 5 reports results for which the outcome variable is financial health, as captured by Dun & Bradstreet's PAYDEX score. Table 5 is the same as table 4, except for the outcome variable. The first three columns of table 5 report results from specifications where the treatment and control groups are the same firm employee size class. Taken together, they suggest that financial health worsened for firms with one to 250 employees that applied for PPP loans of at least $150,000. We think this puzzling finding is most likely the result of PPP-treated observations (that is, establishments with less than 250 employees that applied for loans of less than $150,000) contaminating the control group.

Figure 3. Event Study Regressions



Source: Dun & Bradstreet; authors' calculations.

Note: These graphs show the results from event study regressions in equation (2) examining the impact of the Paycheck Protection Program on establishment employment, financial health, and survival. Panels A, C, and E examine PPP's effect on employment, credit scores, and survival rates for establishments with 1–500 employees that applied for a PPP loan of $150,000 or more compared to establishments with 501–1,000 employees. Panels B, D, and F examine the effect of PPP eligibility on the same outcomes, comparing all establishments with 1–500 employees to all establishments with 501–1,000 employees (i.e., dynamic intent-to-treat effects). Establishments are assigned to an employment size group using February employment. Coefficients and standard errors for panels A, B, E, and F are multiplied by 100 to ease interpretation. Error bars represent 95 percent confidence intervals.

Table 5. Estimating the Effect of PPP Loans on Establishment-Level Credit Scores

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Treated × Post	–0.0392*	–0.0379*	–0.0349	0.305***	0.01	0.349***
	(0.0220)	(0.0219)	(0.0969)	(0.0686)	(0.154)	(0.0616)
Treatment	1–500; loan	1–250; loan	251–500; loan	1–500; loan	400–475; all establishments	1–500; all establishments
Control	1–500; no loan	1–250; no loan	251–500; no loan	501–1,000; no loan	525–600; all establishments	501–1,000; all establishments
Observations	32,139,590	31,889,423	250,167	3,731,639	81,644	32,225,515
R^2	0.013	0.013	0.021	0.024	0.027	0.012

Source: Authors' compilation using Dun & Bradstreet data.

Note: This table reports difference-in-differences estimates for the impact of PPP on establishment-level employment. The sample consists of establishments operational as of October 2019 that meet our sample selection criteria. For all regressions, the pretreatment period is November–March and the posttreatment period is April–August. Each column uses a different treatment and control group, indicating the size of the establishment by employment in February; "loan" indicates that we observe that the establishment applied for a PPP loan of at least $150,000; "no loan" indicates the opposite; "all establishments" indicates that we include all establishments in the analysis sample regardless of whether they applied for a loan. All regressions include state, month, and two-digit standard industrial classification fixed effects as well as state-by-month and industry-by-month fixed effects. Standard errors are clustered at the state level. Coefficients and standard errors are multiplied by 100 for ease of interpretation.

* $p < .1$, *** $p < .01$

For reasons discussed previously, our preferred specifications are reported in columns 4 and 6. The specification in column 4 compares firms with 500 or fewer employees that applied for PPP loans of at least $150,000 to firms with 501 to 1,000 employees that were not eligible for PPP. PPP predicts a PAYDEX increase of about 0.31 points. Column 6 presents results from an intent-to-treat specification. Here, PPP eligibility boosts PAYDEX by about 0.35 points. Similar to our results for employment, PPP seems to have had a larger impact on firms with fewer than 400 employees, as suggested by comparing the results in column 5 with column 4.

Figure 3, panels C and D, present event study graphs that trace out the dynamic effect of PPP for our two preferred specifications. As with employment, the effect of PPP on financial health (as measured by PAYDEX) grows over time. Both figures show a flat trend centered on zero for the pre-PPP period coefficients estimating the effect of PPP in November through February relative to March. As with employment, this supports a causal interpretation of our estimates. The effect of PPP application on financial health was estimated imprecisely in April and precisely every month after. The magnitude of the effect increased considerably over time, more than doubling between June and August.

The dynamic intent-to-treat estimate is shown in panel D. As with the results in panel C, PPP's effect on financial health is estimated imprecisely in April but precisely for the following four months. The magnitude of the effect in August is more than double the effect in May. PPP eligibility is estimated to have increased PAYDEX in August by 0.51 points.

The magnitude of the effect is substantial. For all firms with one to 1,000 employees, average monthly PAYDEX fell by 0.28 points from November to August. A PPP PAYDEX effect of 0.31 (column 4) and 0.35 (column 5) represents a significant increase relative to the change in financial health of all firms during our sample period. As with employment, the effect of PPP on PAYDEX in June is substantially larger than the post-PPP period average, suggesting that the effects of PPP on financial health may be increasing over time.

RESULTS FOR BUSINESS CONTINUITY Table 6 reports results for D&B's out-of-business variable. Everything in table 6 is the same as in tables 4 and 5, except the outcome variable. PPP eligibility or application is estimated to have reduced business closure in every specification at conventional levels of statistical significance, except for column 5. Column 4 presents results from the specification that compares firms that applied for a PPP loan of at least $150,000 to firms with 501 to 1,000 employees, which were ineligible for PPP. PPP application is estimated to have reduced

Table 6. Estimating the Effect of PPP Loans on the Probability an Establishment Goes Out of Business

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Treated × Post × 100	–0.237***	–0.236***	–0.616***	–0.471***	0.0562	–0.219**
	(0.0222)	(0.0224)	(0.0836)	(0.0853)	(0.124)	(0.0683)
Treatment	1–500; loan	1–250; loan	251–500; loan	1–500; loan	400–475; all establishments	1–500; all establishments
Control	1–500; no loan	1–250; no loan	251–500; no loan	501–1,000; no loan	525–600; all establishments	501–1,000; all establishments
Observations	81,625,920	81,262,585	363,335	3,982,131	111,512	81,745,730
R^2	0.00805	0.00804	0.02154	0.00344	0.0166	0.00789

Source: Authors' compilation using Dun & Bradstreet data.

Notes: This table reports difference-in-differences estimates for the impact of PPP on establishment-level employment. The sample consists of establishments operational as of October 2019 that meet our sample selection criteria. For all regressions, the pretreatment period is November–March and the posttreatment period is April–August. Each column uses a different treatment and control group, indicating the size of the establishment by employment in February 2020; "loan" indicates that we observe that the establishment applied for a PPP loan of at least $150,000; "no loan" indicates the opposite; "all establishments" indicates that we include all establishments in the analysis sample regardless of whether they applied for a loan. All regressions include state, month, and two-digit standard industrial classification fixed effects as well as state-by-month and industry-by-month fixed effects. Standard errors are clustered at the state level. Coefficients and standard errors are multiplied by 100 for ease of interpretation.

** $p < .05$, *** $p < .01$

the odds of business closure by 0.47 percentage points. Column 6 presents results from our intent-to-treat model. Here, PPP eligibility is estimated to reduce business closure odds by 0.22 percentage points. Column 5 reports intent-to-treat results for a smaller window around the 500 employee cutoff. As with employment and financial health, we do not find a significant effect of PPP on business closure among firms with 400–475 employees.

Panels E and F of figure 3 present event studies for those two models. The pre-PPP period coefficients show a trend, and these results should be interpreted cautiously. The confidence interval on pre-PPP period coefficients includes zero in several cases. In the post-PPP period, the magnitude of the effect is larger in June than in April or May. This pattern is similar to our employment and PAYDEX results. The magnitude of these effects is large.

To place the difference-in-differences estimates and June event study coefficient estimates in context, the average establishment out-of-business indicator in August was 0.42 percentage points higher than in November for firms with one to 1,000 employees.

V.E. Discussion and Conclusions

Our results point to PPP playing a significant role in the health and viability of small businesses. Both applying for a PPP loan of $150,000 or more and PPP eligibility as determined by firm size increase employment, financial health, and business continuity. In addition, we find that it may have taken a month or two for PPP to kick in. An alternative interpretation is that PPP was more effective in a partially reopened economy (that is, June–August) than during the lockdowns.

Several caveats are in order. We avoid making strong statements about the success or failure of PPP because the program is so young, and we are only analyzing the first five months of the program. PPP did have important short-run goals, which included maintaining employment relationships during the lockdowns and supporting consumer spending by allowing workers to continue to be paid. But PPP has important medium-run goals as well, and it is too early to say anything definitive about its success or failure. Those goals include mitigating business closures after the economy had partially reopened (which we observe for about one month), supporting employment and reducing unemployment, and increasing productivity by preserving firm-specific human capital, worker-firm matches, and networks. Crucially, by preserving the productivity capacity of the small business sector, PPP stands to quicken the recovery by supporting labor demand over the medium run. In addition, the firms in the D&B data are not nationally

representative, and they exhibit employment and financial health indicators that are likely more stable than typical firms. We also want to stress the tentative nature of our conclusions. As shown in the dynamics of the effect (in figure 3), the effect of PPP on employment, financial health, and business continuity is evolving and is much stronger in July and August than in April and May. The effects of PPP are unfolding, and it will be particularly important to see what happens to businesses that received PPP and the workers they employ once they have exhausted their forgivable loan.

VI. Retrospective and Lessons for the Future

Many of the common criticisms of the PPP as failed by design and effect were too strong. Banks were skittish about participating, particularly in the early days of the program. But program demand by lenders was sufficient to allow the government to transfer funds in an amount roughly equal to 10 percent of a typical quarter's GDP to small businesses. With the vast majority of loans and the sizeable majority of program dollars going to loans of less than $2 million, media coverage suggesting that PPP was in the main offering grants to large and well-connected firms was overblown. Many of the anecdotes in the media implying fraudulent participation in the program actually pointed to firms that were eligible for PPP loans under the statute. The criticism that the original CARES Act appropriation of $349 billion was too small, obvious from the outset, was quickly proven valid by events, but Congress rectified that swiftly.

Could policymakers have designed a more effective and cost-effective intervention than a small business revenue replacement program? In theory, one could argue that relying on the unemployment insurance (UI) system to replace workers' income and using a PPP-like program to help small businesses with nonpayroll cost has appeal to some economists and analysts. But that plan would require worker-firm separations, albeit temporary, to take place. It would change the default for small businesses from keeping workers employed (as under a revenue replacement program) to recalling workers following a separation, which is the wrong place for the default to be during the shutdown. The UI system in many states was simply and troublingly unable to handle the demands placed on it during the shutdown—increasing those demands would not likely lead to the most successful outcomes. Finally, having both UI and a small business revenue replacement program is good policy design because it allows for redundancy, with multiple programs operating to replace workers' incomes.

For the reasons we discussed previously, we do not view a loan program as an adequate substitute for a small business revenue replacement program. Many businesses would not want to add to their debt burdens, even under very favorable lending conditions. Many would resort to layoffs, which would disrupt other businesses, deepen the recession, and hurt workers' employment and earnings opportunities.

Even though a small business revenue replacement program may have been the best available option, the PPP could have been better designed and better implemented in ways we previously discussed: it is too focused on payroll expenses; banks should have been given stronger assurances that they would be held harmless; and its initial appropriation was too small. Much of the confusion about the program was driven by chaotic Treasury/SBA management which weakened the program's effectiveness, limited its reach, and ultimately led to a falloff in demand for PPP funds.

PPP was designed for a short shutdown that would be followed by a strong and rapid recovery. But the shutdown was longer than anticipated and the recovery decelerated after a burst of improvement in May and June. In addition, partial shutdowns may remain in some regions for an extended period of time. Subsequent changes to PPP addressed these concerns, but the program needed to facilitate the transition from the "freeze the economy in place" stage to the "allow labor to reallocate across firms and industries" stage. The economy overall, including workers, will benefit from a fast transition from the pre- to post-lockdown equilibrium. PPP could facilitate this transition by eliminating any link between PPP loan forgiveness and precrisis employment levels.

We have argued that many small businesses needed equity or grants, and not loans. But a lending program could—and in the future perhaps should—exist alongside a revenue replacement program, particularly for a partially reopened economy. An advantage of a lending program is that businesses that expect to be nonviable in the post-pandemic economy would be less likely to take out a loan than to accept a grant. This feature would keep the cost of the program lower, channel funds more effectively, and allow for a swifter transition to the post-pandemic equilibrium. A disadvantage—and the reason we do not support this during the shutdown period—is that some firms that might be viable in the absence of the loan could be tipped over into insolvency by taking out a loan. More practically, in the shutdown, we are concerned that few firms would participate in a lending program.

One way to structure such a lending program could be in two stages, following a venture capital model preceded by a broadly available loan. In the first stage, the Treasury Department could issue a small loan to firms

using limited underwriting standards, knowing that the loan will have a high default rate. In the second stage, surviving firms could have access to additional funding. This financing would help to give many firms a lifeline for survival, while still well-stewarding taxpayer funds.[21]

An alternative approach would be a federal business interruption insurance program for small and midsize firms (analogous to the federal terrorism risk insurance program) layered on top of private business interruption insurance. Linking a trigger to a pandemic shutdown could require a shutdown order by a public official (for example, the governor of the state).

Looking forward, there are broader lessons as well. For a situation in which the government is shutting down large sections of the economy, Congress and the White House need to be willing to tolerate stories of "undeserving" beneficiaries of economic recovery programs. The alternative is upfront targeting measures that slow down aid and worsen the downturn. Another alternative is that programs are much less effective. PPP stands a chance at succeeding because its relief was broad based. The Treasury Department was much more conservative with putting taxpayer dollars at risk when approving the terms of the PPP, limiting early take-up. The Treasury's conservative approach has extended to the Federal Reserve's Main Street Lending Facility, which received capital funds (along with other Federal Reserve facilities under the CARES Act). As a consequence of the Treasury's aversion to putting that capital at risk, potentially driven in part by concern about stories of undeserving borrowers, the facility is not supporting the economic recovery yet because it, essentially, is not making loans.

Another broader lesson is the need for government at the state and federal levels to upgrade computer systems. Banks were needed as intermediaries in part because the government's IT constraint would not have allowed for it to lend directly to banks in a timely fashion. Finally, the government's attempt to support small and midsize businesses in the pandemic recession calls into question the nature of the division between the Federal Reserve and the Treasury. Following the Dodd-Frank Act, the Treasury is required to approve the terms of 13(3) lending programs, including the Main Street programs. But these are labeled as Federal

21. The Federal Reserve's Main Street Lending Facility offers another lending vehicle for small and midsize firms. While the facility's design remains in flux, its structure could also mimic better patient equity financing. Terms could include much longer maturity and very low interest rates, for example.

Reserve programs, creating confusion about which agency is ultimately responsible for their success or failure. Furthermore, Congress appropriated $454 billion in the CARES Act to the Treasury to support Federal Reserve lending programs. At the time of this writing, little of those funds have been put to use to support the recovery, despite congressional intent. If the Treasury is unwilling to risk capital losses as part of Federal Reserve lending programs, then Congress should consider whether an alternative structure to support small and midsize businesses is advisable.

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Comment and Discussion

COMMENT BY

ERIC ZWICK Hubbard and Strain offer a clear and comprehensive assessment of the initial months of the Paycheck Protection Program (PPP). My comment has two goals. First, I want to place the PPP into a framework for evaluating the welfare effects of such programs. Second, I want to place this analysis in the context of what we know from contemporaneous work about whether the PPP succeeded. While I agree with the authors that it is too soon to provide a complete grade of the PPP, we know enough now to offer a provisional assessment that can guide ongoing policy debates and future research on the program.

GRADING THE PPP: A RUBRIC What kind of policy is the PPP? Many popular commentators have described the program as fiscal stimulus, but this view is mistaken. The goal of the PPP was not to increase economic activity immediately. In fact, if the initial crisis response was aimed at suppressing the virus by reducing public interactions, the goal may well have been the opposite: to encourage everyone to stay home to slow the virus's spread while supporting workers and firms during the lockdown.

Thus, the goal of the PPP was more to enable future economic activity—by preserving firm-worker links and preventing permanent failures—than to stimulate immediately. Hubbard and Strain are right to point out that in this case we should not use metrics like cost per job or fiscal impact multipliers to grade the program.

One might alternatively think of the program as support for capital markets in the spirit of liquidity support programs aimed at the financial system, which were pursued by the Federal Reserve and the Treasury both during this crisis and during the Great Recession. Again, this is not the right way to view the PPP. In particular, the lender-of-last-resort motivation for policy intervention is not the right model when output evaporates and

there are real losses. In this world, loans are unattractive from a private and public perspective because repayment is nonviable for many firms despite having positive long-term prospects.[1] In such a case, and in stark contrast to the Great Recession, banks may be more unwilling than unable to lend to firms that were hard hit by the crisis.

In my view, the closest policy analogy to the current situation is disaster relief and insurance. Firms face a severe noneconomic shock that entails an unusually low correlation between their short-run and long-run performance. If these firms close, society will risk losing valuable firm-worker matches, fixed startup costs already paid, and sweat equity already accumulated. At the aggregate level, there is risk that congestion externalities in bankruptcy courts and in the labor market could exacerbate economic losses.

In all of these respects, the pandemic is similar to a large storm that devastates a local area, though this time the devastation is geographically widespread, of uncertain duration, and wrought with lost revenues instead of lost capital. Still, I believe that conceptualizing the PPP as a kind of social insurance program helps to illuminate the framework we ought to use to evaluate design and implementation.

REVENUE REPLACEMENT VERSUS BUSINESS CONTINUITY INSURANCE An important part of the paper is a discussion of the key design elements of a business support program. If we think of the PPP as insurance, then we can fruitfully debate these elements in terms of their insurance value beyond being mere transfers. Let me contrast some of the authors' preferred design elements to our business continuity insurance proposal (Hanson and others 2020a), which was itself inspired by Hubbard and Strain's earlier writing on the program and by Emmanuel Saez and Gabriel Zucman's buyer of last resort proposal (Saez and Zucman 2020).

First is the question of what expenses to permit. The authors argue for including payroll in the category of eligible expenses to be covered by the PPP. Supporting payroll might help firms retain workers, thereby preserving valuable firm-worker matches. It also might keep workers from claiming unemployment insurance (UI) at a time when the risk of overwhelmed UI systems is a concern. Both arguments amplify the insurance value of the program.

1. Hanson and others (2020b) argue why it makes more sense to think of the government's role as "venture capitalist of last resort," that is, as needing to take on significant credit risk in this crisis.

Nevertheless, I have several concerns with this element. First, including payroll dramatically raises the cost of the program, thus limiting the amount of time firms might be able to benefit from additional funds. Second, many of the hardest hit firms were bars and restaurants in the service sector, for which high rates of turnover in normal times imply the value of firm-worker matches might be low. Third, it is somewhat unnatural to expect firms to pay workers to be idle, when accounting and payroll systems are based on hours worked and when many firms have some workers that can still work. Fourth, though there were plenty of hiccups in the initial rollout, the UI system actually worked pretty well in supporting more than 30 million workers! Last, as the authors note, including payroll deters reallocation of workers across firms and industries by subsidizing newly inefficient matches.

The second design question concerns how to deploy PPP funds. The authors argue in favor of using banks as conduits to access the program. Preexisting relationships between banks and firms might accelerate the transfer of funds, and the underwriting infrastructure could help detect fraud. These arguments speak to the efficiency and timeliness of the program, both key aspects of good insurance.

At the same time, because banks do not have the same incentives as the government, we have to pay them to participate. And banks might steer preferred clients in one direction and new clients in another. While true that many firms are connected to banks, there are many others without prior relationships or whose banks were themselves disrupted by the lockdown orders. My view is that the IRS could have been more involved in implementing this policy, given its track record for large-scale stimulus in other contexts (such as economic impact payments, refunds for net operating losses, or the first-time homebuyer credit).

A third question concerns targeting. The authors argue that the program should feature little or no targeting. Their logic is that, given the unknown shock severity and duration, trying to narrow eligibility for the program in a sophisticated way would fall prey to lobbying by connected industries. They also worry that conditioning loan forgiveness on revenues might discourage firms from reopening by subjecting them to high marginal tax rates.

Here, viewing the program through the lens of insurance is especially instructive. Providing little or no targeting is both expensive and by definition allocates funds to low-insurance-value types. To the extent there is a budget constraint at the federal level (which is debatable these days), we are now in a position where benefits have been exhausted though help is still needed. Moreover, it will surely strike many as unfair that firms that

were able to continue operating, or that operated in defiance of best public health practices, received the same level of support as those that temporarily closed.

I should note that we agree on many design features and general principles. For example, though the authors describe their proposal as "revenue replacement," it is better thought of as "net value added" replacement. In other words, we agree to exclude profits, intermediates, and depreciation in the list of eligible expenses. More fundamentally, we agree that the loans should be closer to grants. We also agree that placing the demands solely on the Small Business Administration (SBA) to implement this program would not have made sense, given the agency's size and the infrastructure in place prior to the crisis.[2] And we agree that the largest firms should be treated less generously.

The bottom line in this discussion is that this area deserves more formal study. Economics has a natural opportunity to contribute in this time of crisis by improving our understanding of the optimal features of business support policy.

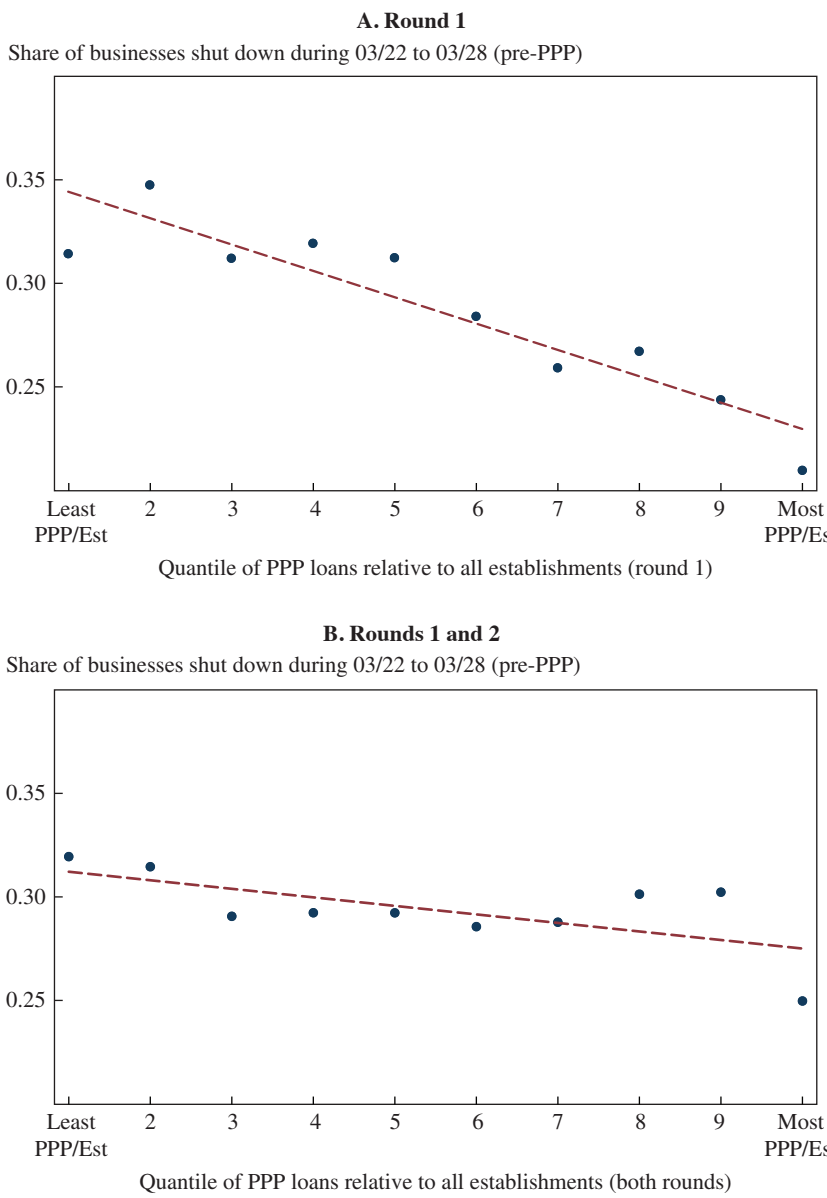
DID FUNDS GO TO HIGH-INSURANCE-VALUE TYPES? Ideally, we would grade the PPP in terms of insurance value provided relative to the program's cost, but defining the notion of insurance value for firms is beyond the scope of my discussion. As a first pass, let's consider what we know about program targeting and how firms used the funds.

Judged by its timeliness, the program receives high marks. More than $500 billion in funds were distributed in just six weeks!

One reason why funds could be deployed so quickly is that nearly all firms could apply. As a consequence, the targeting of the program was poor. In work with João Granja, Christos Makridis, and Constantine Yannelis (Granja and others 2020), I found that more of the program's initial funds actually flowed to regions that were less hard hit by the shock (figure 1, top panel). This distribution is to a large extent due to differences across lenders in their participation in the program. For example, the top four banks alone account for 36 percent of total pre-policy small business loans but disbursed less than 3 percent of all PPP loans in the first round of funding. Ultimately, we find a weak correlation between initial shock severity and funding levels, reflecting the program's broad eligibility criteria (figure 1, bottom panel).

2. Recently, the SBA inspector general released a report finding that the "unprecedented demand for COVID-19 EIDLs [relief loans] and the equally unprecedented challenges SBA had in responding to this pandemic combined with lowered controls resulted in billions of dollars in potentially fraudulent loans and loans to potentially ineligible businesses" (SBA 2020, 2).

Figure 1. Weak Geographic Targeting of the PPP



Source: Granja and others (2020).

Notes: The figure stratifies all businesses in Homebase in ten bins based on the fraction of establishments in their zip code receiving PPP during the first round and during both rounds combined. The figure plots for each bin the share of Homebase businesses that shut down in the week of March 22–March 28, that is, prior to the PPP.

Additional evidence on targeting and design elements comes from firm surveys (Alekseev and others 2020). Drawing on data from a large survey of business owners on Facebook, Alekseev and others (2020) find that 30–40 percent of small businesses did not experience sales declines in the first month of the crisis. Among the businesses that did experience declines, the severity of the decline varies widely from declines of 10–20 percent to nearly complete shutdowns. Moreover, only half of firms surveyed reported struggling to pay obligated expenses (though presumably this share increased over time). Such heterogeneity in experiences is at odds with the one-size-fits-all design of the program's forgiveness formula.

The evidence also points to other issues with the PPP's rollout. First, firms that do report struggling to make payments appear to struggle equally to pay rent, wages, and interest on loans. This fact suggests the initial weight of 75 percent on payroll expenses was likely too high. Second, half of firms report not having preexisting relationships with banks as borrowers (Alekseev and others 2020), which appears to have led to such firms initially struggling to access the program and eventually switching lenders in order to receive funds (Rudegeair 2020). Data from the SBA show that, across participating banks, larger firms received funding first, and many smaller borrowers had to wait several months to access the program (Granja and others 2020).

WHAT DID FIRMS DO WITH THE MONEY? The authors focus on a second approach to evaluating the PPP's success to date. They use data from Dun & Bradstreet and a series of research designs to evaluate the impact of the program on employment, financial performance, and business closures. Their most compelling research design exploits the eligibility threshold of 500 workers; with some exceptions, firms above this threshold could not apply for PPP loans, providing a natural control group.

The authors find modest but statistically significant effects on employment that appear to grow over the six-month period their data cover. These employment effects are largely consistent with Autor and others (2020) and Chetty and others (2020), who use the same research design and data from different payroll processors. Using a bank exposure design at the regional level, Granja and others (2020) find null effects of the program in April that grow to modest effects in May and June. Across studies, the results appear to imply very high cost-per-job estimates (about $200,000 per job), though recall this metric is probably the wrong way to evaluate this program.

The authors find modest impacts of the program in reducing financial vulnerability and business closures. These findings contrast somewhat with Granja and others (2020), who find no impact on business shutdowns and

large effects on firms' reported cash on hand and propensity to miss obligated loan and other payments. On the other hand, Bartik and others (2020) use a bank exposure design and find that the PPP had large effects on firms' own forecasts of failure probabilities. Reconciling these contrasting findings is a task for future research, as more data become available.

I do have a few concerns with the authors' approach. First, in some analyses, they report differences that compare loan applicants to nonapplicants. These differences will tend to overstate program impacts because they do not isolate loan demand effects, which are likely to be correlated with business expenditure plans. For these reasons, I prefer estimates using the worker threshold as an instrument.

Second, the aggregate time series in the Dun & Bradstreet data are extremely stable and indicate very limited aggregate impact of the pandemic and lockdowns on firms in the sample. These patterns stand in sharp contrast to pretty much every other real-time data set available, in which employment appears to fall by between 20 and 60 percent depending on the sample of interest. I worry that the patterns in the Dun & Bradstreet data are an artifact of stale or incomplete measurement and updating. Moreover, if such measurement issues are more pronounced for small firms, this problem will confound estimates that compare firms across size thresholds. My bet is the Dun & Bradstreet data will ultimately be more useful for evaluating the question of permanent closures, once data are comprehensively updated.

PENCILS DOWN The ultimate grade for the PPP will depend on the medium-term impacts that have yet to materialize. We see modest short-term employment effects but more significant improvement in firm balance sheets. The PPP's success will hinge on whether the cost of limited targeting is ultimately offset by the gains from preventing a large number of firm failures. If instead a large share of the funds prove inframarginal, the economic incidence of the program will fall largely on business owners, many of whom would have been able to weather the storm without this support.

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GENERAL DISCUSSION Caroline Hoxby began the discussion by thanking the authors for a terrific paper and Eric Zwick for his excellent discussion. She agreed with Zwick's concern that the Dun & Bradstreet data used in the paper are not very sensitive and are infrequently updated

in comparison to other monthly sources of data. Hoxby then remarked that the specification in column 5 of tables 4 through 6, which compare firms with 400 to 475 employees to firms with 525 to 600 employees, was most persuasive because the control group and treatment group are similar and therefore most comparable. Her concern, however, was that the results for this specification showed very little. Hoxby closed her comments by lamenting that the eligibility threshold was 500 employees because that doesn't allow the authors to identify the effects on very small firms, such as restaurants and small family businesses. She wondered whether any eligibility or identification strategy would allow the authors to look specifically at very small firms.

Joshua Gotbaum asked, via the teleconferencing chat function, whether shifting the program from a wage subsidy to a revenue subsidy made the distributional effects of the Paycheck Protection Program (PPP) regressive, at least in comparison to the European programs.

Gabriel Chodorow-Reich thanked the authors and the discussant and followed up on Zwick's question regarding what firms did with the PPP money. He described his ongoing research with Darmouni, Luck, and Plosser that finds midsize firms were making large repayments on credit lines in the second quarter of 2020, which may be tied to PPP receipt.[1] Chodorow-Reich wondered whether the authors' view of the program's success might be affected if it is true that the same businesses who were getting PPP loans were paying down credit lines.

Jason Furman stated that he would like to see the employment impact of the PPP in December before gauging the PPP's success. He noted that workers could have been given unemployment insurance (UI), which would have saved the firms the cost of their employment. Furthermore, assuming employment is determined by comparing the marginal cost of hiring someone to the firms' marginal revenue product, then the PPP from earlier in the year will have no effect on employment in December. Furman stated that the effects the authors found could have been achieved more cheaply and efficiently through UI. For the PPP to have a lasting effect, he argued, it would need to keep some firms from going bankrupt such that the firm is employing more people in December than they otherwise would have. He concluded that whether a firm is hiring someone in December

1. Gabriel Chodorow-Reich, Olivier Darmouni, Stephan Luck, and Matthew C. Plosser, "Bank Liquidity Provision across the Firm Size Distribution," Working Paper 27945 (Cambridge, Mass.: National Bureau of Economic Research, 2020).

is more likely to relate to the firm's demand than whether they received a lump sum transfer many months earlier.

Austan Goolsbee praised the authors' work but cautioned them on the potential confounds correlated with size. He described recent work with Syverson using phone data of consumer visits to millions of businesses which finds a strong trend of people shopping at smaller, less busy stores correlated with the rise of the pandemic.[2] Goolsbee noted that, given the paper's use of size to separate treatment and control groups, this would confound the result of the paper; it may look like PPP is benefiting smaller firms when in fact this is an unobserved effect related to increases in relative demand. Goolsbee concluded by offering to share the phone record data with the authors and suggesting they might be able to match some firms in their sample.

Steven Davis began by following up on Furman's point regarding the cost of the PPP program relative to other systems of distributing support to workers. He restated that the cost per worker of using the PPP to support workers is much larger than it would have been through the UI system. He asked whether the PPP was better than UI at preserving worker-firm matches in some way, and if so in what way. Relatedly, he pointed out that it's not clear that retaining worker-firm matches is valuable given the kinds of employees who work for PPP-targeted firms. Davis noted that the displaced worker literature largely focuses on mass layoff events affecting high-tenure workers at large firms, typically in industrial jobs. He contrasted this with the jobs lost in the pandemic, which he argued are very different, involving much less match-specific capital and match-specific rents than workers studied in the displaced worker literature.

Davis went on to note that he knows little about the value of business continuity for the population targeted by the PPP. He suggested that if there is great evidence that business continuity is of high value beyond the value to the business owner, the discussion should emphasize this. Davis also wondered if the PPP, by sustaining incumbent firms, crowds out new firms. He noted that the Census Bureau now draws on administrative records to tabulate monthly business formation statistics by state and by industry. He suggested it would be interesting to use these data to investigate whether industries and states that received more PPP support show evidence of crowding-out effects in the form of weaker business formation.

2. Austan Goolsbee and Chad Syverson, "Fear, Lockdown, and Diversion: Comparing Drivers of Pandemic Economic Decline," Working Paper 27432 (Cambridge, Mass.: National Bureau of Economic Research, 2020).

Davis concluded by noting that the PPP, the $600 federal benefit supplement, and other recent expensive fiscal programs have been motivated by the need to compensate for administrative weaknesses in the UI system. To that end, he wondered what the cost of fixing the administrative weaknesses would be and posited it might cost a few tens of billions of dollars, which is much less than the trillion dollars spent on the current programs. Davis remarked that this would likely belong in a separate paper from the authors' current one.

Katharine Abraham seconded Davis's point regarding the administrative capacity of the UI system, noting that the system infrastructure is fragile and inflexible. She lamented that many states' UI systems still use COBOL software and many more couldn't easily be modified to pay workers a higher replacement rate rather than a flat supplement to their benefit amount.

Abraham then followed up on Furman's and Davis's comments stating that it would have been cheaper to allow individuals to be laid off and get UI than to keep them attached to their jobs through the PPP. Besides the value of business continuity and increasing the likelihood of workers still being employed in December, she stated, there is also value in reducing unemployment. Even beyond the associated loss of income, unemployment imposes significant mental and physical costs on affected individuals. Abraham argued that the value of the PPP thus includes the value to workers of having a job, even if the job eventually ends. She concluded that this should affect how the authors consider the policy's effectiveness.

Glenn Hubbard thanked the discussant and the audience for their questions. In response to the comments regarding alternatives to the PPP, he reiterated that the value of worker-firm matches and business continuity is still unknown, making it difficult to decide whether it would have been better to put people on UI, irrespective of the UI system's administrative deficiencies.

Hubbard then agreed that the authors hoped to find an effect using the specification Hoxby noted she most preferred, found in column 5 of the results tables. Hubbard added that the authors suspect this specification did not show any significant results because this specification focuses on relatively larger firms and the effects are mostly found in much smaller firms.

Hubbard concluded by addressing a question in the teleconferencing chat function regarding targeting. Hubbard noted that it would have been preferable to know exactly who could have been helped because that would have been more efficient, but there is no way to know. Given that the value of worker-firm matches and business continuity are also unknown, Hubbard stated that it isn't obvious what the alternatives to the PPP were.

Michael Strain also thanked the discussant and audience for their comments. He then noted that the authors attempted to evaluate the program empirically, using specifications with different treatment and control groups, using treatment-on-the-treated effects and intent-to-treat effects. One such specification, he notes, is comparing only firms with one to 250 employees, using loan application as the treatment. Strain argued that this specification addresses some of the concerns about comparing firms with one to 500 employees to firms with 501 to 1,000 employees. However, he also acknowledged that their data only show firms that applied for a loan greater than $150,000, which muddles the control group. Strain added that there could also be issues with comparing groups based on eligibility because the PPP likely affected firms with 450 employees very differently from firms with 15 employees. The authors attempted to navigate these empirical challenges accordingly, he said.

Strain then turned to Furman and others' point regarding alternatives to the PPP. He stated that part of the program's goal was to preserve the productive capacity of the economy over the medium term until the pandemic had subsided. Moreover, the program was promoted as an employment program which would make comparisons to UI natural, but he argued it was more along the lines of a continuity program for businesses. For example, a restaurant might survive the economic downturn due to the PPP, Strain said. He added that it's reasonable to believe that the PPP loan doesn't affect how many workers the restaurant hires in nine months; however, the conclusion shouldn't be that the PPP failed, he argued, because the business survived. Perhaps without the revenue replacement the restaurant received from the grant the business otherwise wouldn't be there at all, he said.

Strain concluded that when comparing the costs of the PPP to UI, it is crucial to consider whether the period of economic weakness was shorter because the PPP supported labor demand over the medium term during the transition by averting millions of business closures that otherwise would have happened. He noted that while this is difficult to quantify, comparing UI costs to the PPP would need to account for these concerns holistically.