

# Putting the Paycheck Protection Program into Perspective: An Analysis Using Administrative and Survey Data

Michael Dalton

Bureau of Labor Statistics

10/25/22

First Draft November 2021

New Draft Very Soon!

Views expressed do not reflect those of the Bureau of Labor  
Statistics



# Paycheck Protection Program

Created in March 2020 with \$669 billion in funding and administered by the Small Business Admin (SBA)

This amount is 85% of the estimated size of the \*entire\* American Recovery and Reinvestment Act of 2009

There was a second round in 2021 - Not using that for this analysis



# Paycheck Protection Program

Created in March 2020 with \$669 billion in funding and administered by the Small Business Admin (SBA)

This amount is 85% of the estimated size of the \*entire\* American Recovery and Reinvestment Act of 2009

There was a second round in 2021 - Not using that for this analysis

Vast majority of employers in U.S. were eligible

Loan can be converted to grant if specific payroll criteria met  
Otherwise, loan had 1% interest rate with 2 (or 5) year maturity

# Paycheck Protection Program

Created in March 2020 with \$669 billion in funding and administered by the Small Business Admin (SBA)

This amount is 85% of the estimated size of the \*entire\* American Recovery and Reinvestment Act of 2009

There was a second round in 2021 - Not using that for this analysis

Vast majority of employers in U.S. were eligible

Loan can be converted to grant if specific payroll criteria met

Otherwise, loan had 1% interest rate with 2 (or 5) year maturity

Purpose of program was for small business employers to maintain payroll by supplying direct payments of up to 10 weeks of payroll costs (max \$10 million)

Given the size and scope, **what impacts can we actually attribute to the program?**

# Assessing PPP Impact

Regression discontinuity around eligibility - rather small effects on employment

Autor et al (2020), Chetty et al (2020), Hubbard and Strain (2020)

Focuses on largest loans and largest eligible employers (and smallest ineligible employers)



# Assessing PPP Impact

Regression discontinuity around eligibility - rather small effects on employment

Autor et al (2020), Chetty et al (2020), Hubbard and Strain (2020)

Focuses on largest loans and largest eligible employers (and smallest ineligible employers)

Geographic differences in loan access as instrument

Small-ish employment effects - Granja et al (2022)

Larger employment effects - Bartik et al (2021), Doniger and Kaye (2021), Bartlett and Morse (2020), Faulkender et al (2020) Kurmann et al (2021) and Bartik et al (2021) find evidence of reduced closures



# Assessing PPP Impact

Regression discontinuity around eligibility - rather small effects on employment

Autor et al (2020), Chetty et al (2020), Hubbard and Strain (2020)

Focuses on largest loans and largest eligible employers (and smallest ineligible employers)

Geographic differences in loan access as instrument

Small-ish employment effects - Granja et al (2022)

Larger employment effects - Bartik et al (2021), Doniger and Kaye (2021), Bartlett and Morse (2020), Faulkender et al (2020)  
Kurmann et al (2021) and Bartik et al (2021) find evidence of reduced closures

Difference-in-Difference

Positive employment effects - Autor et al (2022)

Most similar to what you'll see here today

## Where does this paper fit in?

Using the full wage record database of employers

- Full employment and wage history and rich information about establishments

- Not subject to sample churn

- Can easily match it to other survey data at the BLS

Longer-term effects, in particular on closures

Use wage data to assess pass-through of PPP to wages paid

Dynamic diff-in-diff strategy using microdata

More detailed heterogeneity analysis





# Key Results

One month after PPP approval, PPP has the effect of...

8.1% increase in employment

5.6% decline in probability of closure

12.2% increase in wages



# Key Results

One month after PPP approval, PPP has the effect of...

- 8.1% increase in employment

- 5.6% decline in probability of closure

- 12.2% increase in wages

Effects fall after first month but are persistently positive up to 12 months after PPP approval



# Key Results

One month after PPP approval, PPP has the effect of...

- 8.1% increase in employment

- 5.6% decline in probability of closure

- 12.2% increase in wages

Effects fall after first month but are persistently positive up to 12 months after PPP approval

Estimate of \$27,690 of PPP loans per employee-month retained after 6 months

- Estimate goes to \$16,199 after 12 months - long term results because of reduced closures

\$3.12 of PPP spent per dollar of wages retained after 12 months

# Paycheck Protection Program

Using published PPP microdata with employer name, address, date of approval, and amount of loan

Focusing only on first round of PPP from April 2020 through August 2020

Remove some loans that are out of scope for the wage records

- Self-employed

- Independent Contractors

- Sole proprietorship

- Non-profit Religious Organizations

**Remaining:** 3.8 million loans worth \$483 billion



# Quarterly Census of Employment and Wages

Covers all establishments that pay into the Unemployment Insurance (UI) system nationwide

**Covers more than 95% of all jobs**

Gives monthly employment and quarterly wages

Employer names and addresses

Can track establishment over time

Before pandemic and after receipt of PPP loan

Using data through September 2021

Can also partially map establishments by firm

Relies on **Employment Identification Number (EIN)**

Though, this is an imperfect measure of firms

Important for thinking about who the PPP loan recipient actually is

# Record Linking

Fuzzy text match on employer name and address between PPP and QCEW

Finds closest name and geography match

This linkage allows analysis of those that did - and did not - get approved for PPP loan and when that approval happened



# Record Linking

Fuzzy text match on employer name and address between PPP and QCEW

Finds closest name and geography match

This linkage allows analysis of those that did - and did not - get approved for PPP loan and when that approval happened  
Employment, wages, and closure status before and after PPP approval



# Match Rate of PPP to QCEW

Descriptor	Total Number of Loans (millions)	Total Dollar Amount (\$billions)	% of Loans Matched	% of Loan \$ Amount Matched
All Loans	3.84	483.5	76.3	87.9
Removing Loans Reporting Only 1 Job	3.3	476.7	80.5	88.5
Removing Loans Reporting 0 or 1 Job	2.7	412.2	82.5	88.8

Match Rate Verification



# The True Effect of PPP

We want to estimate the **true treatment effect** of receiving PPP

A particularly thorny econometric question

PPP approval is **not random** - based on choice on behalf of establishment - "**selection effects**"



# The True Effect of PPP

We want to estimate the **true treatment effect** of receiving PPP

A particularly thorny econometric question

PPP approval is **not random** - based on choice on behalf of establishment - "**selection effects**"

Beyond selection effects, standard difference-in-difference has problems in this context



# The True Effect of PPP

We want to estimate the **true treatment effect** of receiving PPP

A particularly thorny econometric question

PPP approval is **not random** - based on choice on behalf of establishment - "**selection effects**"

Beyond selection effects, standard difference-in-difference has problems in this context

PPP approved over the course of 4 months - multi-period treatment means two-way fixed effects do not give true causal parameters without additional strong assumptions

Those who got PPP earlier look different than those who got it later - **treatment heterogeneity**

# The True Effect of PPP

We want to estimate the **true treatment effect** of receiving PPP

A particularly thorny econometric question

PPP approval is **not random** - based on choice on behalf of establishment - "**selection effects**"

Beyond selection effects, standard difference-in-difference has problems in this context

PPP approved over the course of 4 months - multi-period treatment means two-way fixed effects do not give true causal parameters without additional strong assumptions

Those who got PPP earlier look different than those who got it later - **treatment heterogeneity**

Want to look at effect for full sample - not just establishments in a particular size range

## Callaway and Sant'anna (2021)

Related to Goodman-Bacon (2021) and Sun and Abraham (2020)

Dynamic diff-in-diff

Allows for estimating **average treatment on the treated (ATT)** effect of policy change

Handles treatment heterogeneity

Handles differential treatment timing

Controls for time invariant characteristics to better deal with selection effects - makes use of rich QCEW data!

Allows for event study parameters

**Estimation strategy relying on \*full\* sample, not restricted to subpopulation**

**Bottom line:** This gives a credible estimation strategy for assessing PPP

Detailed Equations



# Defining the Dependent Variable

Employment of Establishment  $i$

$$E_{imyc}^* = \frac{\overbrace{e_{imyc}}}{\frac{\sum_{t=2017}^{2019} e_{imtj}}{3}} \frac{\sum_{k \in I2j,c} e_{kmyjc}}{\sum_{k \in I2j,z} e_{km2019jc}}$$

$E_{imyc}^*$  is the dependent variable of interest

$e_{imyc}$  is employment  
for establishment  $i$

Month  $m$  and year  $y$  [post-pandemic]

establishment  $i$ 's 4-digit industry  $j$

establishment  $i$ 's physical location county  $c$

## Defining the Dependent Variable

$$E_{imjyc}^* = \frac{e_{imjyc}}{\underbrace{\frac{\sum_{t=2017}^{2019} e_{imtjc}}{3}}_{\text{Avg. Employment Prior to Pandemic}}} \frac{\sum_{k \neq i, 2j, c} e_{kmyjc}}{\sum_{k \neq i, 2j, c} e_{km2019jc}}$$

Employment relative to average employment in 3 years prior to pandemic

- Same calendar month for the baseline deals with seasonality
- Uses information prior to any pandemic effects

# Defining the Dependent Variable

$$E_{imjtc}^* = \frac{e_{imjtc}}{\frac{\sum_{t=2017}^{2019} e_{imtjc}}{3}} \frac{\overbrace{\sum_{k \neq i, j, c} e_{kmyjc}}}{\sum_{k \neq i, j, c} e_{km2019jc}}$$

Employment Change in County - Industry

Subtract employment change in establishment  $i$ 's county - industry

Geography specific effects

Bank access

Local COVID policies

Local COVID incidence

Industry specific effects

COVID-specific impacts



## Defining the Dependent Variable

$$E_{imjyc}^* = \frac{e_{imjyc}}{\frac{\sum_{t=2017}^{2019} e_{imtjc}}{3}} \cdot \frac{\sum_{k \in i2j,c} e_{kmyjc}}{\sum_{k \in i2j,c} e_{km2019jc}}$$

### Example:

Establishment reports employment of 11 in June 2020

Average June employment for establishment from 2017-2019:  
10

County-4-digit industry of establishment has lost 5% of 2019  
employment as of June 2020

$$E_{imjyc}^* = 100 \left[ \frac{11}{10} \cdot .95 \right] = 15$$

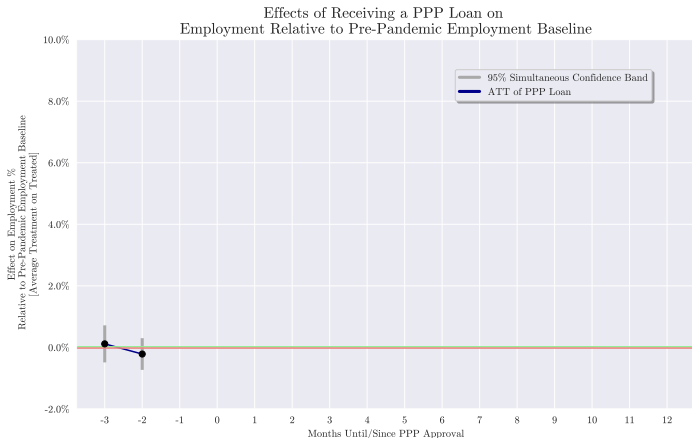
Control Variables

# ATT on Employment

Pre-treatment months

Statistically null or economically close to zero

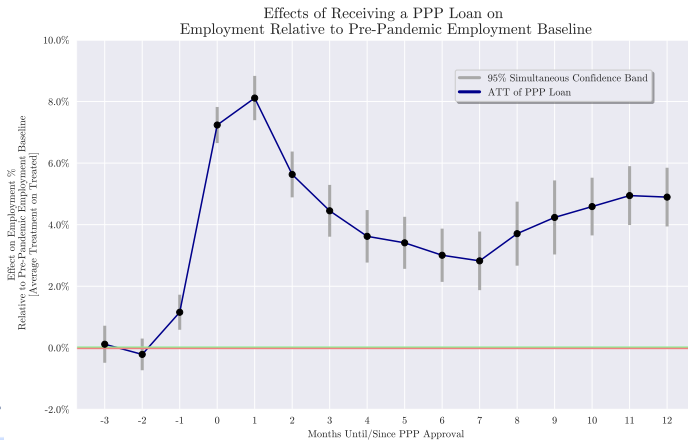
**Evidence of satisfying key assumption: parallel trends**



# ATT on Employment

**8.1% increase in employment due to approval in month 1**  
**Effect falls but still significant 12 months after PPP approval**

4.9% higher employment 12 months after approval  
Effect increases after second COVID wave  
Extended effects due to avoiding closure?



## Placebo Test

Think back to happier times, when the word "pandemic" instead elicited thoughts of the "Antonine Plague" and "The Black Death"

2018-2019 employment change relative to pre-2018 employment

Do the same establishments that receive PPP in 2020 have any different trajectory pre-pandemic compared to non-receiving establishments?

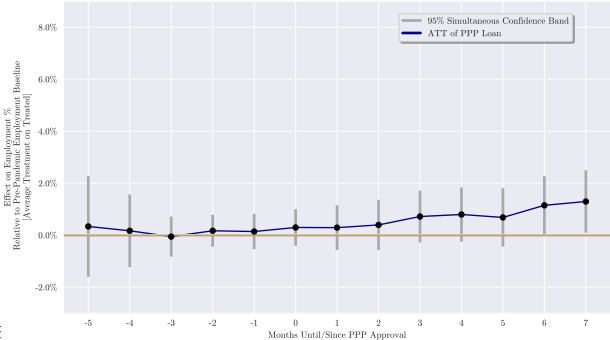


# Placebo Test

Think back to happier times, when the word "pandemic" instead elicited thoughts of the "Antonine Plague" and "The Black Death"

2018-2019 employment change relative to pre-2018 employment  
Do the same establishments that receive PPP in 2020 have any different trajectory pre-pandemic compared to non-receiving establishments?

Effects of Receiving a PPP Loan on Employment Relative to Pre-2018 Employment Baseline  
Pre-Pandemic Placebo Test



# Imputing Audience Comments



## Imputing Audience Comments

"Mike, you rube! Establishments struggling the most because of COVID are going to apply for PPP, and that will dampen the effects you find compared to the true ATT!"

Bartik et al (2021) find those with less cash-on-hand and more impacted by COVID were more likely to apply, but...

Also report that less cash on hand was less likely to get approval

# Imputing Audience Comments

"Mike, you rube! Establishments struggling the most because of COVID are going to apply for PPP, and that will dampen the effects you find compared to the true ATT!"

Bartik et al (2021) find those with less cash-on-hand and more impacted by COVID were more likely to apply, but...

Also report that less cash on hand was less likely to get approval

**Another point** - treatment misclassification

$$ATT = \frac{A\hat{T}T}{P(PPP=0|PPP=0)+P(PPP=1|PPP=1)} - 1$$

This gives an  $A\hat{T}T$  that **undershoots the true ATT** by about **22%**

Almost entirely driven by false negatives - **can I improve the match?**



## Imputing Audience Comments, pt. 2



## Imputing Audience Comments, pt. 2

"Mike, you knucklehead! Businesses that were going to fail weren't going to apply for PPP, so you are \*overestimating\* the true ATT!"

Loans were forgivable if the establishment met certain payroll criteria, but...

Even if the criteria couldn't be met, loans had a 1% interest rate with a maturity of 2 years (changed to 5 years for later-stage loans)

Most loans are under \$25k with no collateral requirement - these would be forgivable in the event of business closure

## Imputing Audience Comments, pt. 2

"Mike, you knucklehead! Businesses that were going to fail weren't going to apply for PPP, so you are \*overestimating\* the true ATT!"

Loans were forgivable if the establishment met certain payroll criteria, but...

Even if the criteria couldn't be met, loans had a 1% interest rate with a maturity of 2 years (changed to 5 years for later-stage loans)

Most loans are under \$25k with no collateral requirement - these would be forgivable in the event of business closure

**Can try to bound potential violations of parallel trends**

## Interpreting Medium-Term Effects

The immediate effect of PPP ( $t=0$ ,  $t=1$ ,  $t=2$ ) make sense, but...

**What to make of  $t > 2$  effects?**



## Interpreting Medium-Term Effects

The immediate effect of PPP ( $t=0$ ,  $t=1$ ,  $t=2$ ) make sense, but...

### **What to make of $t > 2$ effects?**

Are establishments who get PPP more likely to participate in other programs?

If so, some of the medium-term effects may be due to participating in more programs

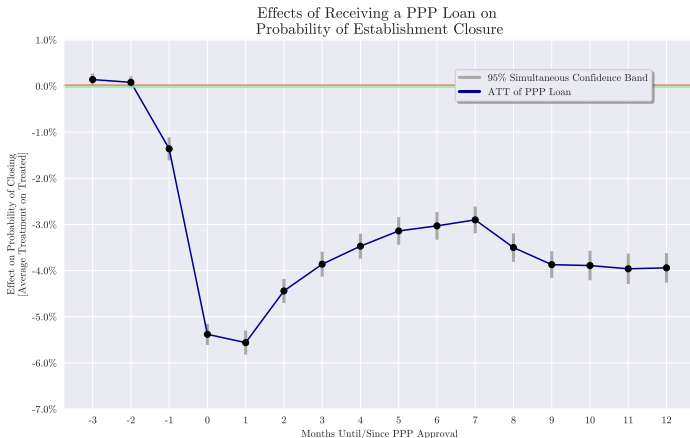
I am controlling for EIDL participation or PPP 2021, plus this was a smaller set of programs

Is this picking up longer-term avoidance of closures?

# ATT on Probability of Closures

**5.6% decrease in probability of closure in first month**  
**Effect falls initially but still statistically significant 12 months**  
**after PPP approval**

3.9% decline in closure probability 12 months out

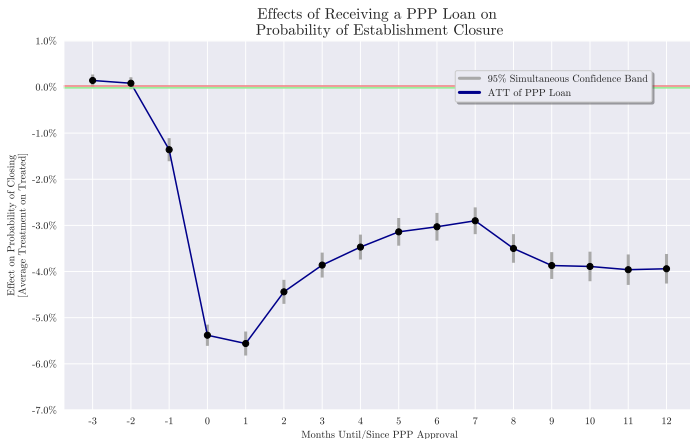


# Effect on Closures

For those businesses open in 2019, about 15% reported being closed in September 2021.

Estimates suggest without PPP **16.7% of businesses would have closed**

**11% increase in permanent business closures without PPP**



# Comparison to Previous Results

Full sample estimates in line with Autor et al (2022)

Why were previous results relying on size cutoffs so much smaller?

Chetty et al (2020); Autor et al (2020); Hubbard and Strain (2020)

CES Hours





## Alternative Results - By Size

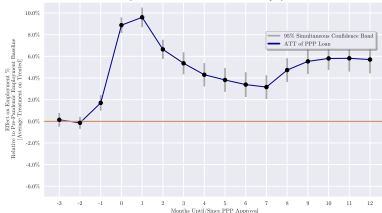
Biggest employment effects are for smallest size class  
Establishments of size 100+ have an imprecisely estimated null effect



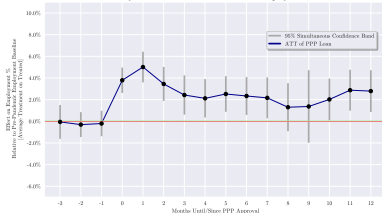
# Alternative Results - By Size

Biggest employment effects are for smallest size class  
Establishments of size 100+ have an imprecisely estimated null effect

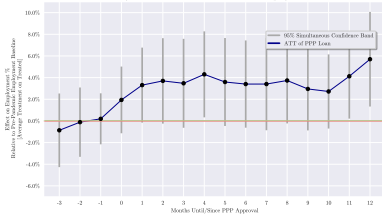
Effects of Receiving a PPP Loan on Employment Relative to Pre-Pandemic Employment Baseline by Establishment Size Class : 1-10 Employment



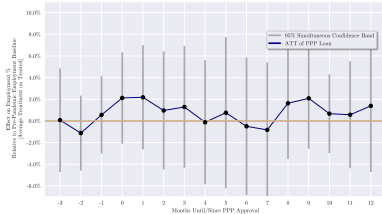
Effects of Receiving a PPP Loan on Employment Relative to Pre-Pandemic Employment Baseline by Establishment Size Class : 10-50 Employment



Effects of Receiving a PPP Loan on Employment Relative to Pre-Pandemic Employment Baseline by Establishment Size Class : 50-100 Employment



Effects of Receiving a PPP Loan on Employment Relative to Pre-Pandemic Employment Baseline by Establishment Size Class : 100+ Employment

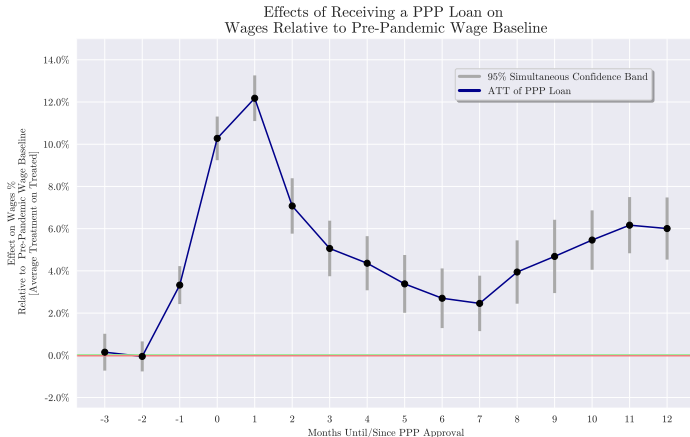


# ATT on Wages

**9.9% increase in wages in first month**

**Effect falls but still statistically significant 12 months after PPP approval**

**6% increase in wages 12 months out**



# Interpreting Money Spent Relative to Outcomes

Month $t$	$ATT_t$		Retained due to PPP	
	Employment % (1)	Wages % (2)	Employee Months (3)	Monthly Wages (\$) (4)
$ATT_0$	7.24	10.28	3,234,634	19,641,710,192
$ATT_1$	8.11	12.18	3,626,237	23,276,331,554
$ATT_2$	5.63	7.08	2,517,038	13,522,847,969
$ATT_3$	4.45	5.06	1,989,255	9,673,784,520
$ATT_4$	3.62	4.36	1,618,702	8,337,439,536
$ATT_5$	3.41	3.38	1,524,265	6,466,518,334
$ATT_6$	3.01	2.7	1,343,794	5,165,913,697
$ATT_7$	2.82	2.46	1,262,541	4,700,333,551
$ATT_8$	3.71	3.95	1,657,407	7,540,448,892
$ATT_9$	4.23	4.68	1,892,717	8,953,817,193
$ATT_{10}$	4.59	5.46	2,050,797	10,435,225,941
$ATT_{11}$	4.94	6.17	2,210,040	11,783,229,541
$ATT_{12}$	4.9	6.01	2,188,050	11,478,576,523

Columns (1) and (2) are estimates previously shown in figures

# Interpreting Money Spent Relative to Outcomes

Month $t$	$ATT_t$		Retained due to PPP	
	Employment % (1)	Wages % (2)	Employee Months (3)	Monthly Wages (\$) (4)
$ATT_0$	7.24	10.28	3,234,634	19,641,710,192
$ATT_1$	8.11	12.18	3,626,237	23,276,331,554
$ATT_2$	5.63	7.08	2,517,038	13,522,847,969
$ATT_3$	4.45	5.06	1,989,255	9,673,784,520
$ATT_4$	3.62	4.36	1,618,702	8,337,439,536
$ATT_5$	3.41	3.38	1,524,265	6,466,518,334
$ATT_6$	3.01	2.7	1,343,794	5,165,913,697
$ATT_7$	2.82	2.46	1,262,541	4,700,333,551
$ATT_8$	3.71	3.95	1,657,407	7,540,448,892
$ATT_9$	4.23	4.68	1,892,717	8,953,817,193
$ATT_{10}$	4.59	5.46	2,050,797	10,435,225,941
$ATT_{11}$	4.94	6.17	2,210,040	11,783,229,541
$ATT_{12}$	4.9	6.01	2,188,050	11,478,576,523

Columns (1) and (2) are estimates previously shown in figures

Columns (3) and (4) are solved from

$$(3) = (1) \times 45\text{million} / 100$$

$$(4) = (2) \times 191\text{billion} / 100$$

where 45 million is the 2019 monthly employment at establishments receiving PPP

and \$191 billion is the 2019 monthly wages at establishments receiving PPP



# \$ of PPP Relative to Jobs Saved After 12 Months

Total Retained due to PPP		\$ of PPP Loans per...	
Employee Months	Monthly Wages (\$)	Employee-Month Retained	Dollar-Wage Retained
(3)	(4)	(5)	(6)
27,115,477	140,976,177,444	\$16,199	\$3.12

Columns (5) and (6) are

(5) = 439billion / (3)

(6) = 439billion / (4)

where \$439 billion is the total matched \$ of approved PPP loans

# \$ of PPP Relative to Jobs Saved After 12 Months

Total Retained due to PPP		\$ of PPP Loans per...	
Employee Months	Monthly Wages (\$)	Employee-Month Retained	Dollar-Wage Retained
(3)	(4)	(5)	(6)
27,115,477	140,976,177,444	\$16,199	\$3.12

Columns (5) and (6) are

(5) = 439billion / (3)

(6) = 439billion / (4)

where \$439 billion is the total matched \$ of approved PPP loans

Can invert (6) to get percent of PPP dollars going to wage retention: 32.1%

# \$ of PPP Relative to Jobs Saved After 12 Months

Total Retained due to PPP		\$ of PPP Loans per...	
Employee Months	Monthly Wages (\$)	Employee-Month Retained	Dollar-Wage Retained
(3)	(4)	(5)	(6)
27,115,477	140,976,177,444	\$16,199	\$3.12

Columns (5) and (6) are

(5) = 439billion / (3)

(6) = 439billion / (4)

where \$439 billion is the total matched \$ of approved PPP loans

Can invert (6) to get percent of PPP dollars going to wage retention: 32.1%

Boushey and Glenn (2012) estimate that the cost to an employer of turnover is about 20% of lost employee salary

Difficult to put \$ value on keeping businesses from closing

Long-term costs to an employee of becoming unemployed

Employee would move to unemployment insurance if they had lost their job - that cost is saved by being retained

Ignores general equilibrium effects - what happens to new businesses?



## Conclusion

Presented credible estimation strategy that reconciles prior research results

PPP loans lead to improvement in employment, ability to stay open, and wages for up to 12 months post-PPP approval  
12 months post-PPP, establishments are 3.9% less likely to have closed

PPP loans measure to \$16,199 per employee-month retained after 12 months

PPP loans measure to \$3.12 per dollar of wage retained after 12 months

Lowest wage establishments, high poverty areas, smallest establishments, and youngest establishments show the lowest cost of retaining employment and wages per PPP \$

These are average effects, not marginal effects, so some caution should be given to interpreting the estimates

Noise in matching - dampens effects

What has happened to new businesses?



**Michael Dalton**  
**Research Economist**  
**ERPDS**  
**[www.bls.gov](http://www.bls.gov)**  
**202-691-7403**  
**[dalton.michael@bls.gov](mailto:dalton.michael@bls.gov)**



# Controls Included

Employment Growth from 2018 to 2019

Sector

Size x multiunit status

Monthly closure status for each calendar month in 2019 Bins  
for age

Bins for wage class

Franchise dummy

Urban classification

Receipt of EIDL Grant or Loan

PPP eligibility status

[Return](#)



# Pay per Hour in CES

Make estimate of "pay per hour"



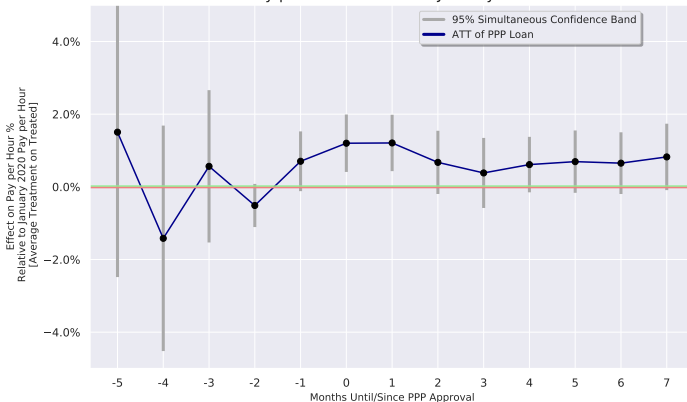
# Pay per Hour in CES

Make estimate of "pay per hour"

**1.2% increase in pay per hour in first month**

**Overall ATT of .73%**

Effects of Receiving a PPP Loan on  
Pay per Hour Relative to January 2020



Return



# Estimation Methodology

Semi-parametric estimation of an ATT for each month  $t$  and

for each group, defined by month of PPP receipt,  $p$

$PPP_p = 1$  for every month  $t$  for establishments receiving PPP in month  $p$ , zero otherwise

$D_t = 1$  for every month where  $t = p$  and  $PPP_p = 1$

$Y_t$  is the outcome variable at month  $t$

$\delta$  is the 1 month anticipation term

$X$  are the time invariant control variables

# Estimation Methodology

$$ATT_{p,t} = E \left[ \overbrace{\left( \frac{PPP_p}{E(PPP_p)} \quad \frac{Prob_{p,t+\delta}(X)(1 - D_{t+\delta})}{1 - Prob_{p,t+\delta}(X)} \right)}^{\text{Inverse Probability Weight}} \overbrace{\left( Y_t \quad Y_p \quad \delta \quad 1 \quad C_{p,t,\delta}(X) \right)}^{\text{Outcome Regression}} \right],$$

# Estimation Methodology

$$ATT_{p,t} = E \left[ \underbrace{\left( \frac{PPP_p}{E(PPP_p)} \cdot \frac{Prob_{p,t+\delta}(X)(1 - D_{t+\delta})}{1 - Prob_{p,t+\delta}(X)} \right)}_{\text{Inverse Probability Weight}} \underbrace{\left( Y_t - Y_p - \delta + 1 - C_{p,t,\delta}(X) \right)}_{\text{Outcome Regression}} \right],$$

where  $Prob_{p,t+\delta}(X) = E(PPP_p | X, PPP_p + (1 - D_{t+\delta}) = 1)$

Inverse Probability Weight is basically a matching score estimator (Abadie (2005))

Higher weight goes to control group observations that have  $X$  similar to employers receiving PPP in month  $p$



# Estimation Methodology

$$ATT_{p,t} = E \left[ \left( \overbrace{\begin{pmatrix} \frac{PPP_p}{E(PPP_p)} & \frac{Prob_{p,t+\delta}(X)(1 - D_{t+\delta})}{1 - Prob_{p,t+\delta}(X)} \\ \frac{Prob_{p,t+\delta}(X)(1 - D_{t+\delta})}{1 - Prob_{p,t+\delta}(X)} & 1 \end{pmatrix}}^{\text{Inverse Probability Weight}} \right) \overbrace{\left( Y_t - Y_p - \delta - 1 + c_{p,t,\delta}(X) \right)}^{\text{Outcome Regression}} \right],$$

where  $c_{p,t,\delta}(X) = E[Y_t - Y_p - \delta - 1 | X, D_{t+\delta} + PPP_p = 0]$

Outcome Regressions predict are similar to diff-in-diff (Heckman et al (1998))

[Return](#)

## Verifying Record Linking Using BRS

BRS is online survey of 160,000 employers conducted July 2020  
- September 2020

Asked about receiving \*any\* loan/grant from government



# Verifying Record Linking Using BRS

BRS is online survey of 160,000 employers conducted July 2020  
- September 2020

Asked about receiving \*any\* loan/grant from government

**Takeaway: High correlation between PPP match and reporting received loan or grant. Good news.**

Match Type	Geography	Fuzzy Match Score	Number of BRS Respondents	Percent Reporting in BRS Received Loan/Grant of Any Type
Exact Address Match	City	Exact	45714	97.7%
Address Match	City	-	11024	94.6%
Exact Match	City	Exact	6485	97.0%
Fuzzy Match	City	High	341	92.8%
Fuzzy Match	City	Medium	471	91.4%
Fuzzy Match	City	Low	531	86.4%
Fuzzy Match	City	Lowest	235	80.0%
Exact Match	County	Exact	1126	96.4%
Fuzzy Match	County	High	64	95.3%
Fuzzy Match	County	Medium	58	91.4%
Exact Match	State	Exact	997	92.3%
BRS Respondents with no PPP Match			95338	39.0%

## Ratio of Loan Amount to 2019 Wages

Less noisy measure: Take ratio of PPP Loan Amount to Total Wages in 2019 in QCEW



## Ratio of Loan Amount to 2019 Wages

Less noisy measure: Take ratio of PPP Loan Amount to Total Wages in 2019 in QCEW

Ratio of .19 = 10 weeks of salary

Some variation, but **interquartile range stays close to .19**

Plot for Employment

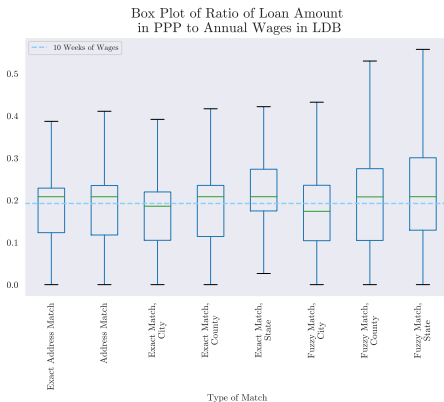
# Ratio of Loan Amount to 2019 Wages

Less noisy measure: Take ratio of PPP Loan Amount to Total Wages in 2019 in QCEW

Ratio of .19 = 10 weeks of salary

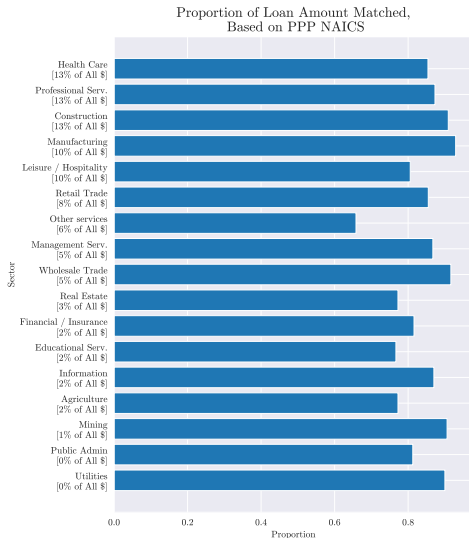
Some variation, but **interquartile range stays close to .19**

Plot for Employment



# Match Rate by Reported Sector on PPP Application

**Worst match rate  
for Educational  
Services - but not  
that much  
variation**



# Box plot of Reported Retained Jobs to Employment

Take ratio of Retained Jobs to Average Employment in 2019 in QCEW





# Box plot of Reported Retained Jobs to Employment

Take ratio of Retained Jobs to Average Employment in 2019 in QCEW

Ratio of 1 = Expected

Some variation, but **interquartile range stays close to 1**

Return



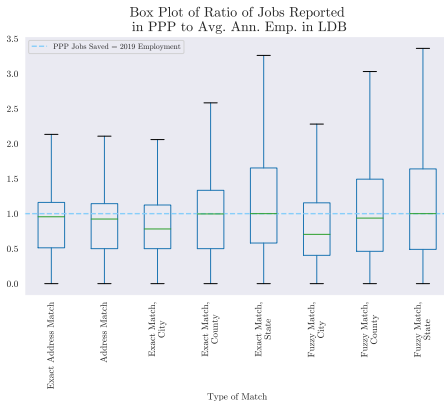
# Box plot of Reported Retained Jobs to Employment

Take ratio of Retained Jobs to Average Employment in 2019 in QCEW

Ratio of 1 = Expected

Some variation, but **interquartile range stays close to 1**

Return



**Match looks good!  
Let's carry on with the real results.**

[Return](#)

