Distorting Effects of PPP Loans on Business Competition

Alexei Tchistyi (Cornell) Eva Steiner (Penn State)

Motivation

- Covid-19 pandemic emerged in 2020, caused deep, global economic crisis
- U.S. government responded with emergency set of economic relief measures
- Key part of $2 trillion CARES Act was Payroll Protection Program (PPP)
  - Temporary payroll subsidies in the form of forgivable loans for small businesses to reduce layoffs
  - $525 billion worth of PPP loans approved by August 2020
- Given significant cost, important to evaluate economic consequences of PPP initiative
  - Program was beneficial for businesses that received PPP funds
  - We study an unintended consequence of the PPP—potential distortion of business competition
- How do equilibrium market outcomes change when firms benefiting from government subsidies compete against non-subsidized firms?

This Paper

1. Model of monopolistic competition with differentiated products, heterogeneous production costs
   - Benefit of PPP loans is temporary reduction in marginal production costs
   - Derive equilibrium market outcomes before, during, after PPP loans are active
   - Obtaining PPP loans is not cost-less for firms; trade-off between benefits and perceived costs
2. Test model predictions in U.S. airport hotel industry
   - Sector hit hard by the Covid-19 pandemic
   - All hotels were officially eligible for PPP loans, but perceived cost was high due to initial uncertainty
   - Can measure daily demand, daily prices, market shares, and profits
   - Assess outcomes of PPP hotels relative to local competitors before, during, after active PPP loans
3. Quantify effects of PPP loans on profits of airport hotels

Preview of Main Results

- Consistent with model predictions, we show that
  - Hotels facing higher production costs (older, less profitable hotels) and larger negative demand shocks (larger air traffic declines during Covid-19 pandemic) are more likely to apply for PPP loans
  - Compared to competitors without PPP loans, hotels with active PPP loans
    - Reduced prices, increased market shares, short-term profits
    - These competitive strategies were reversed once PPP loans expired
- We calculate that, for every $ spent on PPP initiative
  - Hotels that obtained PPP loans earned 72.3 cents in extra profits in aggregate
  - Hotels without PPP loans lost 70.5 cents in aggregate
    - Net benefits of PPP initiative to hotel industry are 1.8 cents per $ spent, remaining 98.2 cents of surplus accrued to consumers through lower prices
  - Every dollar of extra profit to a given hotel with a PPP loan cost a given non-PPP rival 18.6 cents
- PPP loans associated with significant distortion of business competition, effects unlikely to be limited to the hotel sector

Contributions

- Evidence on effectiveness of PPP is mixed (see, e.g., Hubbard and Strain, 2020; Agarwal et al., 2021; Birinci et al., 2021; Granja et al., 2022)
  - We document **distortion of business competition**
- Drivers of access to PPP funds (see, e.g., Humphries et al., 2020; Fairlie and Fossen, 2021; Bartik et al., 2020; Li and Strahan, 2021; Balyuk et al., 2020; Cororaton and Rosen, 2021)
  - We show that **poor pre-pandemic profitability was key driver** for firms to seek PPP loans
- Concerns around misallocation of credit and adverse effects on real economy (Group of Thirty, 2020; Goldstein et al., 2021; Acharya et al., 2021)
  - We show potentially **large costs to healthy firms** of providing PPP loans to poorly performing firms
- Salop (1979) circular city model often used to evaluate market entry decisions (Syverson, 2004)
  - We introduce temporary cash subsidies, propose method for computing effects on firm profits, approach can be used to **study subsidies more widely**

Outline

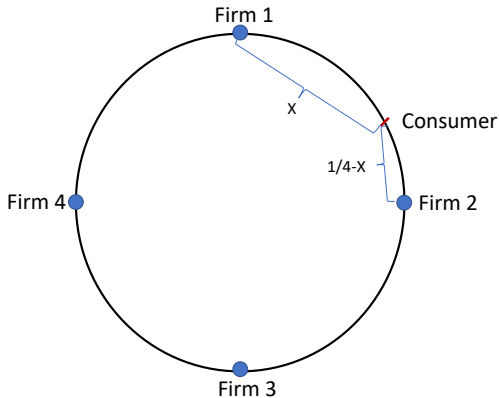
Institutional Background

- PPP loan initiative in our model
  - Benefit to receiving firms is *reduction in marginal production costs*
  - Benefits of PPP loans are *temporary*
  - PPP funds are temporary *cash subsidies*
  - Firms *anticipate cost* of obtaining PPP loans (Balyuk et al., 2020; Cororaton and Rosen, 2021)
- U.S. airport hotel industry
  - All firms in the hotel sector were eligible for PPP loans (see, e.g., Autor et al., 2022a)
    - But perceived costs likely to be particularly acute
    - Lower take-up rates of PPP loans
  - Airport hotels are simple businesses
    - Do not require complex production technologies $\rightarrow$ Simple cost structures
    - Offer relatively homogeneous products

Basic Model

- Salop circular city model with heterogeneous production costs (Syverson, 2004)
- Time 0: before the Covid-19 shock
- There are n firms, $i = 1, ...n$, each selling one product which is differentiated in the brand space from other products
- There are D_0 consumers
  - Consumers have inelastic demand for one indivisible unit, e.g., hotel room
- Consumer preferences over the products are uniformly located along a circle with circumference 1
  - $u - \theta x - p$ is net utility of buying one unit, where
  - p is the price paid to the firm
  - $x \geq 0$ is the length of the arc between the firm and consumer ideal preferences
  - θ represents a disutility rate associated with deviations from ideal preferences
- Alternative interpretation of disutility θx as a transportation cost for a customer who has to travel distance x

Firms and Consumers in Circular City Model



Market Shares

- Firms located equidistant $(1/n)$ from each other along circle
  - Maximal differentiation principle
- For any two neighboring firms i and j, indifferent consumer is located at distance x^{ij} from i s.t.

$$p_0^i + \theta x^{ij} = p_0^j + \theta(\frac{1}{n} - x^{ij}),$$

and p_0^i and p_0^j are prices set by firms i and j, respectively. Solving yields

$$x^{ij} = \frac{p_0^j - p_0^i}{2\theta} + \frac{1}{2n}.$$

- Expected market share

$$S_0^i \equiv E_0(x^{ij}) + E_0(x^{ji}) = \frac{E_0(p_0) - p_0^i}{\theta} + \frac{1}{n}$$

Optimal Pricing

- Firms have heterogeneous constant marginal production costs c_i
  - Common fixed cost f
- Expected profit

$$\pi_0^i = S_0^i(p_0^i - c_i)D_0 - f = \left[\frac{E_0(p_0) - p_0^i}{\theta} + \frac{1}{n}\right](p_0^i - c_i)D_0 - f$$

- Maximizing this expression with respect to p_0^i yields firm i's optimal price:

$$p_0^i = \frac{1}{2}c_i + \frac{1}{2}E_0(p_0) + \frac{\theta}{2n}$$

- Rivals' expected price

$$E_0(p_0) = \bar{c} + \frac{\theta}{n}$$

where $\bar{c} = E_0(c)$ is the expected marginal cost of other firms

Pre-Covid Equilibrium (Period 0)

- Equilibrium price, expected market share, and expected profit of firm i :

$$\begin{aligned} p_0^i &= \frac{1}{2}(c_i + \bar{c}) + \frac{\theta}{n} \\ S_0^i &= \frac{\bar{c} - c_i}{2\theta} + \frac{1}{n} \\ \pi_0^i &= \frac{D_0}{4\theta}\left[\bar{c} + \frac{2\theta}{n} - c_i\right]^2 - f \end{aligned}$$

- p_0^i increases in the firm's marginal cost c_i and in the expected cost $\bar{c}$ of its competitors.
- A higher marginal cost c_i results in a lower market share S_0^i and expected profit π_0^i
- Market average cost $\bar{c}$ has a positive effect on S_0^i and π_0^i

Equilibrium With and Without PPP Loans (Period 1 and 2)

- Negative shock reduces demand from D_0 to D_1

- Period 1 with active PPP loans:
  - If firm i obtains a PPP loan its marginal cost declines from c_i to $c_i - \rho$ during period 1
  - Firms obtain PPP loans with probability $\alpha < 1$
  - Expected marginal cost during this period is given by $E_1(c) = \bar{c} - \alpha\rho$

- Period 2 with expired PPP loans
  - Demand remains the same: $D_2 = D_1$
  - Costs are as in period 0 (no subsidies)

Proposition 1

Period 1: Firm i with a PPP loan charges lower price $p_1^{i,PPP}$, captures bigger expected market share $S_1^{i,PPP}$, and earns higher expected profit of $\pi_1^{i,PPP}$:

$$\begin{aligned} p_1^{i,PPP} &< p_1^i \\ S_1^{i,PPP} &> S_1^i \\ \pi_1^{i,PPP} &> \pi_1^i \end{aligned}$$

Period 2: After PPP subsidies end, all firms raise their prices. Firms with expired PPP loans lose their market shares and profits, while firms without PPP loans gain back their market shares and profits

$$\begin{aligned} p_2^i &> p_1^i > p_1^{i,PPP} \\ S_1^{i,PPP} &> S_2^i > S_1^i \\ \pi_1^{i,PPP} &> \pi_2^i > \pi_1^i \end{aligned}$$

Long Term Equilibrium (Period 3)

- When firms decide whether to apply for PPP loans at time 1, long-term demand D_3 is not known
- Firms assume that D_3 is positively correlated with D_1 and $D_3 \leq D_0$
- Highest cost c_3^* sustainable in a long-term equilibrium with n firms is lower than c_0^*

$$c_3^* = \bar{c} + \frac{2\theta}{n} - \sqrt{\frac{4\theta f}{D_3}} \leq c_0^*$$

- Some firm(s) may be forced to go out of business in the long run
- Firms exit the market sequentially
- Firm with the highest cost is the first to exit

PPP Application Decisions

- Extra profit associated with obtaining a PPP loan:

$$B^{i,PPP} \equiv \pi_1^{i,PPP} - \pi_1^i$$

- Firms anticipate a future cost Z associated with obtaining a PPP loan
  - Damages to firm reputation, future government audits, and regulations associated with accepting taxpayer-funded financial assistance (Balyuk et al., 2020; Cororaton and Rosen, 2021)
  - Firms that obtain PPP loans at time 1 are expected to pay future cost Z only if they survive in the long term
- Expected cost $K^{i,PPP}$ associated with obtaining a PPP loan is given by

$$K^{i,PPP} = (1 - P(c_i|D_1))\, Z$$

- Firm i applies for a PPP loan if and only if $B^{i,PPP} > K^{i,PPP}$

Proposition 2

(i) Firms with high marginal costs apply for PPP loans, i.e., there exists c'' such that firms with $c_i > c''$ apply for PPP loans

(ii) If Z is sufficiently large, firms with low marginal costs do not apply for PPP loans, i.e., there exists c' such that firms with $c_i < c'$ do not apply for PPP loans

(iii) If Z is sufficiently large and $P(c_i|D_1)$ is convex in c_i, then $c' = c''$

(iv) Firms are more likely to apply for PPP loans in markets that are hit harder by the shock, i.e., everything else being equal, the expected number of firms applying for PPP loans is weakly decreasing in D_1

Testable Hypotheses

- **Hypothesis 1:** Hotels are more likely to apply for PPP loans if
  - They were less profitable than their competitors in 2019
  - They are older than their competitors
  - They are located near airports that experienced large passenger traffic declines
- **Hypothesis 2:** Compared to their competitors without PPP loans, hotels with active PPP loans
  - Set lower average daily rates (ADR)
  - Achieve higher occupancy rates
  - Achieve higher revenues per available room (RevPAR)
- **Hypothesis 3:** Compared to their competitors without PPP loans, hotels with expired PPP loans
  - Set higher average daily rates (ADR)
  - Achieve lower occupancy rates
  - Achieve lower revenues per available room (RevPAR)

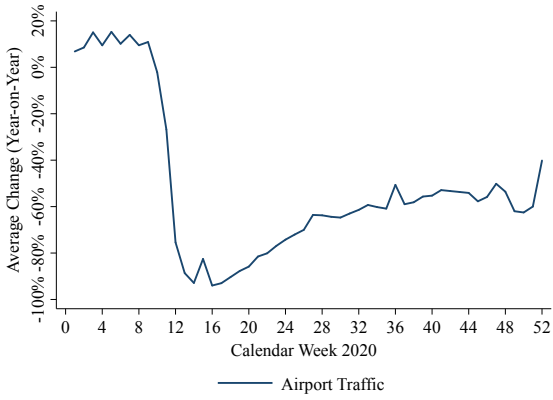
Data and Sample Selection

- Obtain sub-set of airport hotels from annual census of U.S. airport hotels (STR, 2019)
- Daily survey of hotel operating performance data by STR
  - Hotels submit ADR, occupancy, and RevPAR
  - Sample of 1,945 airport hotels that participate in daily survey
- Which sample hotels obtained PPP loans in 2020?
  - Loan-level data on SBA's PPP initiative, including name and address of the business applying
- Supplement with additional data
  - Annual hotel accounting data (STR)
  - Reported closure and (planned) reopening dates (STR); actual dates inferred from performance data
  - Airport passenger traffic from TSA (proxy for local hotel demand)

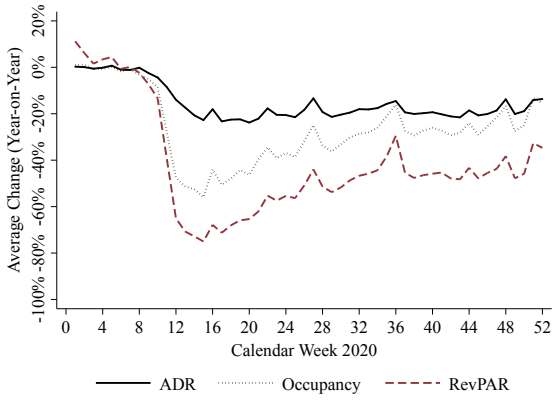
Locations Hotels Airports Breakdown

Airport Hotels During the Covid-19 Pandemic

Time Series of Weekly Airport Traffic and Top-Line Hotel Performance



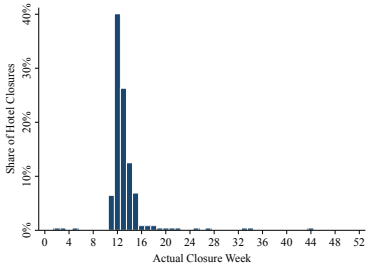
(A) Airport Traffic



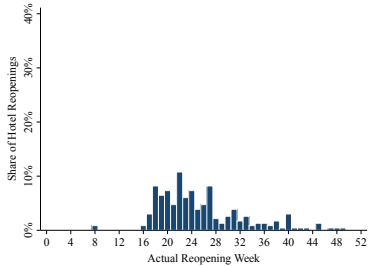
(B) Hotel Performance

Airport Hotels During the Covid-19 Pandemic

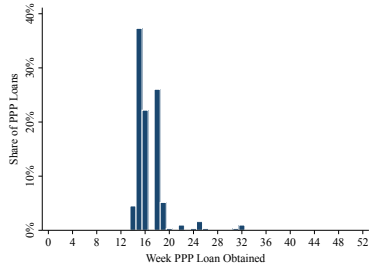
Distribution of Hotel Closures, Reopenings, and PPP Loan Approvals



(A) Hotel Closures



(B) Hotel Reopenings



(C) PPP Loan Approvals

- Note: PPP loans did little to mitigate business disruptions Results

Drivers of PPP Loan Applications

Which Airport Hotels Applied for PPP Loans?

$$PPP\ Loan_i = \beta_1 Pre\text{-}Pandemic\ Profitability_i + \beta_2 Large\ Air\ Traffic\ Decline_i + \beta_3 Market\ Size_i + \gamma_o + \delta_c + \theta_s + \epsilon_i \quad (1)$$

	PPP Loan (1)	PPP Loan (2)	PPP Loan (3)
Pre-Pandemic Profitability	-0.050***		
	(0.015)		
Large Air Traffic Decline	0.769**	0.323**	
	(0.308)	(0.136)	
Age		0.022***	
		(0.006)	
High Competition			0.294**
			(0.139)
Market Size	0.200	0.301***	
	(0.171)	(0.069)	
Hotel Operation Fixed Effects	Yes	Yes	Yes
Hotel Class Fixed Effects	Yes	Yes	No
Hotel Size Category Fixed Effects	Yes	Yes	No
Observations	534	1,938	1,945
R-squared	0.20	0.16	0.03

Drivers of PPP Loan Applications

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Market Size	0.200	0.301***	
	(0.171)	(0.069)	

Determinants of PPP Loan Application Choices (Hypothesis 1)

- Hotels with lower pre-pandemic profitability, older hotels, those which experienced larger declines in demand were more likely to apply for PPP loans; also hotels in more competitive markets

PPP Loans and Airport Hotel Performance

Identification Strategy

- PPP hotels may be different from non-PPP hotels, those differences may affect performance
  - Include hotel fixed effects
- PPP hotels may be located in different markets than non-PPP hotels, with different demand dynamics over time
  - Include market×week fixed effects
- Even in the same market/period, PPP hotels may have different clienteles from non-PPP hotels
  - Compute outcomes of interest for PPP hotels *relative to* non-PPP hotels matched by location and quality category, perform estimation over observations from PPP hotels only
- Identification comes from variation in timing of PPP loan receipt
  - Also see, e.g., Bartik et al. (2020); Granja et al. (2022); Li and Strahan (2021); Dalton (2021); Autor et al. (2022b)

PPP Loans and Airport Hotel Performance

Top-Line Performance With Active PPP Loans

$$Relative\ ADR_{i,t} = \beta PPP\ Active_{i,t} + \gamma_i + \phi_{m,t} + \epsilon_{i,t}$$

	Relative ADR (1)	Relative Occupancy (2)	Relative RevPAR (3)
PPP Loan Active	–0.030***	0.231***	0.221***
	(0.010)	(0.043)	(0.045)
Hotel Fixed Effects	Yes	Yes	Yes
Market×Week Fixed Effects	Yes	Yes	Yes
Observations	11,137	11,137	11,137
R-squared	0.80	0.64	0.68

PPP Loans and Airport Hotel Performance

Top-Line Performance After PPP Loans Expired

$$Relative\ ADR_{i,t} = \beta PPP\ Expired_{i,t} + \gamma_i + \phi_{m,t} + \epsilon_{i,t}$$

	Relative ADR (1)	Relative Occupancy (2)	Relative RevPAR (3)
PPP Loan Expired	0.023***	–0.065***	–0.051**
	(0.007)	(0.020)	(0.022)
Hotel Fixed Effects	Yes	Yes	Yes
Market×Week Fixed Effects	Yes	Yes	Yes
Observations	14,475	14,475	14,475
R-squared	0.82	0.64	0.70

PPP Loans and Airport Hotel Performance

Top-Line Performance After PPP Loans Expired

$$Relative\ ADR_{i,t} = \beta PPP\ Expired_{i,t} + \gamma_i + \phi_{m,t} + \epsilon_{i,t}$$

	Relative ADR (1)	Relative Occupancy (2)	Relative RevPAR (3)
PPP Loan Expired	0.023***	–0.065***	–0.051**
	(0.007)	(0.020)	(0.022)
Hotel Fixed Effects	Yes	Yes	Yes
Market×Week Fixed Effects	Yes	Yes	Yes
Observations	14,475	14,475	14,475

How Did PPP Loans Affect Hotel Performance? (Hypotheses 2 and 3)

- Hotels with active PPP loans reduced ADR, achieved higher market shares and short-term profits; those competitive strategies were reversed after PPP loans expired

Robustness Tests

- Differences in growth prospects of PPP and matched non-PPP hotels
  - Compute relative performance outcomes in sub-sample of PPP hotels *only* Results
- Cluster of PPP loan approvals in April 2020
  - Use daily hotel pricing data to show how PPP hotels responded to *the same* level of negative demand shock while they had active PPP loans versus after their PPP loans expired Results
- Direct comparisons between PPP and non-PPP hotels
  - Use daily hotel pricing data to show how PPP versus non-PPP hotels responded to *the same* level of negative demand shock Results
- Differences in access to PPP funding
  - Compare response of eventual-PPP hotels to negative demand shock against that of never-PPP hotels to same-magnitude demand shock *before* PPP started Results

All robustness tests consistent with main estimates, supporting central model predictions

Quantifying the Effects of PPP Loans

- Two types of firms:
  - Fraction α are high cost firms with $c_i = c_H$ that obtain PPP loans
  - The rest are low cost firms with $c_i = c_L < c_H$ that do not obtain PPP loans
- Gains $\Delta\pi^{PPP}$ and $\Delta\pi$ for firms with and without PPP loans

$$\begin{aligned} \Delta\pi^{PPP} &= \pi_1^{H,PPP} - \pi_2^H \\ \Delta\pi &= \pi_1^L - \pi_2^L \end{aligned}$$

  - $\pi_1^{H,PPP}$ and π_1^L are the actual profits of a firm with and without PPP loans in Period 1
  - π_2^H and π_2^L are the corresponding profits in the counterfactual equilibrium without PPP loans (same equilibrium as in Period 2)

Gain Yields

- Total dollar amount of PPP subsidies

$$M = \alpha n D_1 S_1^{H,PPP} \rho$$

  - αn is the number of firms (hotels) with PPP loans
  - $D_1 S_1^{H,PPP}$ is the number of units (rooms) sold by a firm with a PPP loan
  - ρ is the cost saving due to PPP subsidies on each unit sold

- Gain yields, i.e., gains in profits per dollar of PPP subsidies for firms with and without PPP loans

$$\begin{aligned} \gamma^{PPP} &\equiv \frac{\alpha n \Delta\pi^{PPP}}{M} \\ \gamma &\equiv \frac{(1-\alpha) n \Delta\pi}{M} \end{aligned}$$

Proposition 3

The gain yields can be expressed as follows:

$$\begin{aligned}
\gamma^{PPP} &= (1-\alpha)\left(1+\frac{(1-\alpha)}{2}\frac{\Delta S_1}{S_1^{H,PPP}}\left(\frac{\Delta P_2}{\Delta P_1}-1\right)\right) \\
\gamma &= -(1-\alpha)\left(\frac{S_1^L}{S_1^{H,PPP}}-\frac{\alpha}{2}\frac{\Delta S_1}{S_1^{H,PPP}}\left(\frac{\Delta P_2}{\Delta P_1}-1\right)\right)
\end{aligned}$$

where

$$\begin{aligned}
\Delta S_1 &= S_1^{H,PPP} - S_1^L \\
\Delta P_1 &= p_1^{H,PPP} - p_1^L \\
\Delta P_2 &= p_2^H - p_2^L
\end{aligned}$$

Estimating Gain Yields for Airport Hotels

- Hotels with PPP loans achieve 23.1% higher relative occupancy when PPP loans are active. Hence,

$$\frac{S_1^L}{S_1^{H,PPP}} = \frac{1}{1.231}$$
$$\frac{\Delta S_1}{S_1^{H,PPP}} = \frac{S_1^{H,PPP} - S_1^L}{S_1^{H,PPP}} = \frac{0.231}{1.231}$$

- Hotels with PPP loans charge 3.0% lower prices when PPP are active and 2.3% higher prices when PPP loans are expired:

$$\frac{\Delta P_2}{\Delta P_1} = -\frac{0.023}{0.030}$$

- $\alpha = 0.16$, since 16% of the airport hotels obtained PPP loans

Aggregate Effects

- $\gamma^{PPP} = 0.723$
  - Each dollar of PPP subsidies translated into 72.3 cents of profits for the hotels that obtained PPP loans
- $\gamma = -0.705$
  - Each dollar of PPP subsidies translated into 70.5 cents of losses for the hotels that did not obtain PPP loans
- Net benefits of PPP subsidies to the hotel industry: 1.8 cents per dollar spent
  - Consumers gained of 98.2 cents per dollar of PPP funds allocated to U.S. airport hotels
  - Benefited from lower room rates
- Biggest winners: Consumers and hotels that took PPP money
- Biggest losers: Hotels that did not take PPP money

Effects on Individual Hotels

- For every dollar of extra profit to a given hotel with a PPP loan made, a given non-PPP competitor lost 18.6 cents
  - 16% of the airport hotels obtained PPP loans

$$\frac{\Delta\pi}{\Delta\pi^{PPP}} = \frac{\alpha}{1-\alpha}\frac{\gamma}{\gamma^{PPP}} = -0.186$$

- Strong effect of PPP loans on equilibrium outcomes in the airport hotel industry is consistent with that industry being highly competitive
  - Prices are adjusted on a daily basis
- We should expect weaker economic effects in less competitive markets
- Model and empirical procedure can be used to quantify effects of PPP loans in other industries

Conclusion

- PPP loans distorted business competition among airport hotels during Covid-19 pandemic
- While beneficial for PPP hotels, loans had negative effects on hotels that did not apply for them
- Consumers benefited the most from PPP loans
- The insights from our theoretical model can apply to many other sectors of the economy
- Distortion of competition caused by the PPP program is unlikely to be limited to the hotel sector

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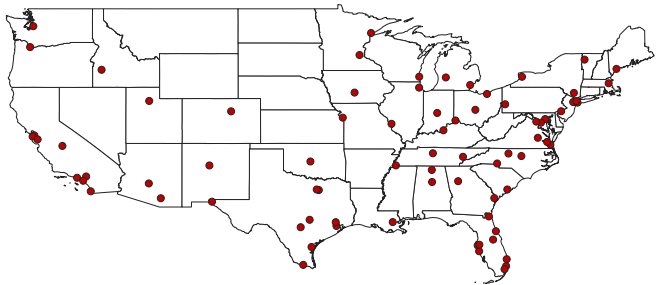
Data and Sample Selection

Airport Locations of Sample Hotels



- For each sample hotel, find nearest airport (by physical distance)
- Sample hotels clustered around 78 airports, accounted for 85% of passenger traffic in U.S. in 2019

Descriptive Statistics

Sample Hotels

	PPP Hotels			Non-PPP Hotels			Difference
	N	Mean	SD	N	Mean	SD	in Means
Closed for Pandemic	311	0.148	0.356	1,634	0.114	0.318	0.034*
Closed by End-2020	311	0.019	0.138	1,634	0.031	0.172	-0.012
Pre-Pandemic Profitability	68	0.335	0.099	467	0.412	0.111	-0.077***
Class Category	311	3.354	0.972	1,634	4.145	1.291	-0.791***
Size Category	311	2.656	0.819	1,634	2.182	0.821	0.474***
High Competition	311	0.296	0.457	1,634	0.240	0.427	0.056**
Age	311	26.945	15.820	1,628	23.770	13.119	3.175***

Back

Descriptive Statistics

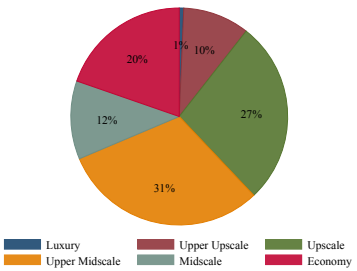
Airports

	N	Mean	Median	SD
Number of Airport Hotels	78	24.923	22	16.844
Market Size	78	8.527	5.191	8.917
Decline in Airport Traffic January-April 2020	78	-0.369	-0.381	0.058
Share of Airport Hotels with PPP Loans	78	0.168	0.129	0.155

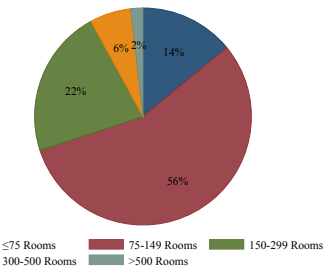
Back

Descriptive Statistics

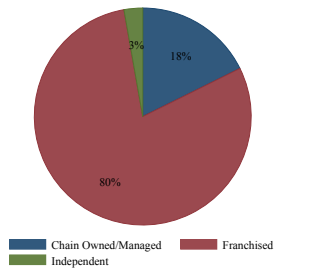
Breakdown of Sample Hotels by Class, Size, and Operation Category



(A) Hotel Class Categories



(B) Hotel Size Categories



(C) Hotel Operation Categories

Back

PPP Loans and Hotel Business Disruptions

$$\begin{aligned} \textit{Reported Closure}_i = {} & \beta_1 \textit{PPP Loan Obtained by Wk. 14}_i + \beta_2 \textit{PPP Loan Obtained by Wk. 15}_i \\ & + \beta_3 \textit{PPP Loan Obtained by Wk. 16}_i + \beta_4 \textit{PPP Loan Obtained by Wk. 18}_i \\ & + \beta_5 \textit{PPP Loan after Wk. 18}_i + \beta_6 \textit{Controls}_i + \gamma_o + \delta_c + \theta_s + \epsilon_i \end{aligned}$$

	Reported Closure	Closed by End-2020	Planned Reopen Week	Actual Reopen Week
	(1)	(2)	(3)	(4)
PPP Loan Obtained by Wk. 14	−0.119	−12.341***	−0.002	1.718
	(1.034)	(0.924)	(2.335)	(2.019)
PPP Loan Obtained by Wk. 15	−1.010*	−1.468	2.207	−3.015*
	(0.579)	(1.036)	(2.422)	(1.771)
PPP Loan Obtained by Wk. 16	1.995**	1.834	−1.071	2.746
	(0.837)	(1.318)	(3.304)	(1.868)
PPP Loan Obtained by Wk. 18	−1.578**	−1.204	−1.442	−1.753
	(0.747)	(1.191)	(2.937)	(1.491)
PPP Loan Obtained after Wk. 18	0.700	−13.612***	−4.121***	0.880
	(0.446)	(0.383)	(1.128)	(1.811)
Age	0.017**	0.009	0.001	0.033
	(0.008)	(0.011)	(0.025)	(0.033)
Market Size	0.182**	0.192*	0.945**	0.233
	(0.088)	(0.103)	(0.376)	(0.529)
Hotel Operation Fixed Effects	Yes	Yes	Yes	Yes
Hotel Class Fixed Effects	Yes	Yes	Yes	Yes
Hotel Size Category Fixed Effects	Yes	Yes	Yes	Yes
Observations	1,938	1,938	155	231
R-squared	0.13	0.15	0.35	0.22

PPP Loans and Hotel Business Disruptions

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Determinants of Hotel Closures and Reopenings (Preliminary)

- PPP loans did little to mitigate business disruptions; hotels that were going to close mostly did so before the PPP initiative began Back

Differences in Growth Prospects of PPP and Non-PPP Hotels

Top-Line Performance With Active PPP Loans among PPP Hotels Only

	Relative ADR (1)	Relative Occupancy (2)	Relative RevPAR (3)
PPP Loan Active	-0.025** (0.012)	0.545*** (0.082)	0.467*** (0.077)
Hotel Fixed Effects	Yes	Yes	Yes
Market×Week Fixed Effects	Yes	Yes	Yes
Observations	4,036	4,036	4,036
R-squared	0.79	0.59	0.61

Differences in Growth Prospects of PPP and Non-PPP Hotels

Top-Line Performance After PPP Loans Expired among PPP Hotels Only

	Relative ADR (1)	Relative Occupancy (2)	Relative RevPAR (3)
PPP Loan Expired	0.039** (0.019)	-0.271*** (0.071)	-0.135*** (0.051)
Hotel Fixed Effects	Yes	Yes	Yes
Market×Week Fixed Effects	Yes	Yes	Yes
Observations	6,106	6,106	6,106
R-squared	0.76	0.59	0.63

Differences in Growth Prospects of PPP and Non-PPP Hotels

Top-Line Performance After PPP Loans Expired among PPP Hotels Only

	Relative ADR (1)	Relative Occupancy (2)	Relative RevPAR (3)
PPP Loan Expired	0.039**	-0.271***	-0.135***
	(0.019)	(0.071)	(0.051)
Hotel Fixed Effects	Yes	Yes	Yes
Market×Week Fixed Effects	Yes	Yes	Yes
Observations	6,106	6,106	6,106
R-squared	0.76	0.59	0.63

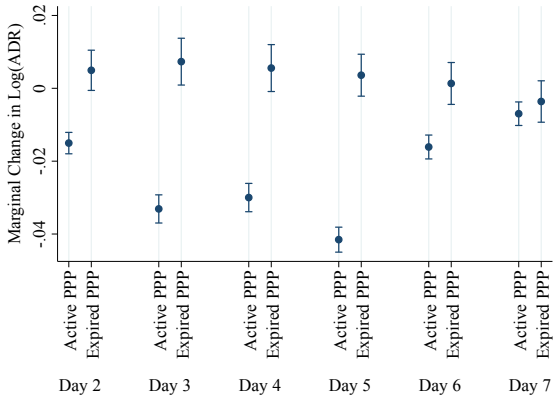
How Did PPP Loans Affect Hotel Performance? (Hypotheses 2 and 3)

- Results consistent with main findings in support of Hypotheses 2 and 3 Back

Clustering of PPP Loan Approvals in April 2020

Marginal Changes in Daily ADR Among Hotels with Active and Expired PPP Loans

$$\ln ADR_{i,t} = \beta PPP\ Expired_{i,t} \times Day\ After_t + \gamma_i + \phi_{m,t} + \epsilon_{i,t}$$



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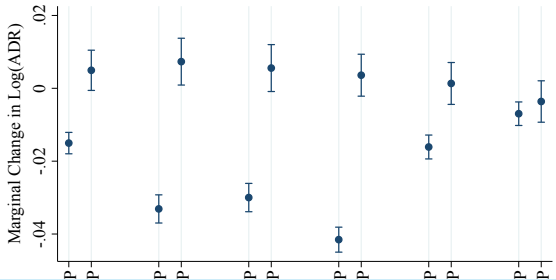


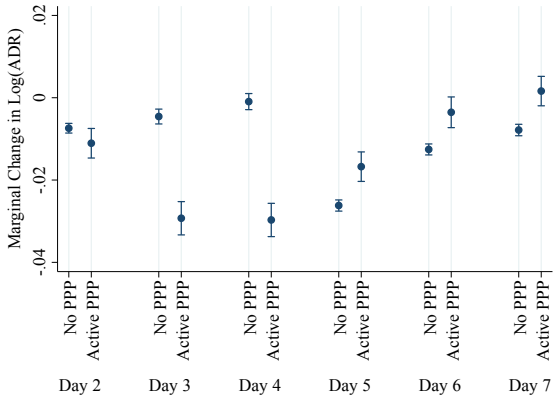
How Did PPP Loans Affect Hotels' Response to Demand Shocks?

- PPP loans allowed airport hotels to compete more aggressively on price; findings show that main inferences are unlikely to be driven by general demand fluctuations Back

Direct Comparisons Between PPP and Non-PPP Hotels

Marginal Changes in Daily ADR Among PPP- and Non-PPP Hotels

$$\ln ADR_{i,t} = \beta PPP\ Active_{i,t} \times Day\ After_t + \gamma_i + \phi_{m,t} + \epsilon_{i,t}$$



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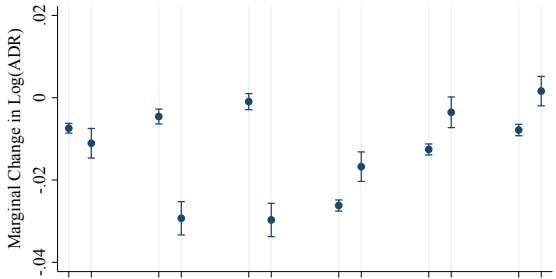


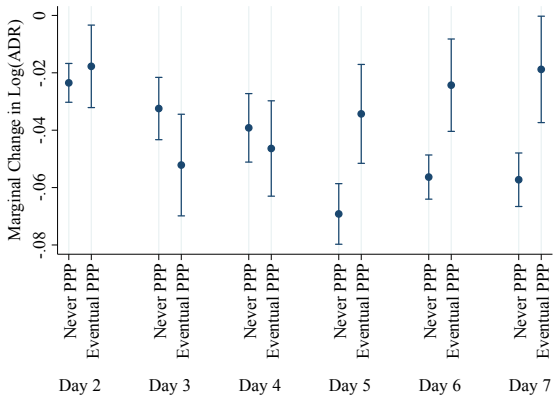
How Did PPP Loans Affect Hotels' Response to Demand Shock?

- PPP hotels competed more aggressively in response to equivalent demand shocks; main results are unlikely to be due to different demand patterns for PPP and non-PPP hotels in 2020 Back

Differences in Access to PPP Funding

Marginal Changes in Daily ADR Among Eventual PPP- and Never PPP-Hotels

$$\ln ADR_{i,t} = \beta PPP\ Eventual_{i,t} \times Day\ After_t + \gamma_i + \phi_{m,t} + \epsilon_{i,t}$$



Differences in Access to PPP Funding

Marginal Changes in Daily ADR Among Eventual PPP- and Never PPP-Hotels

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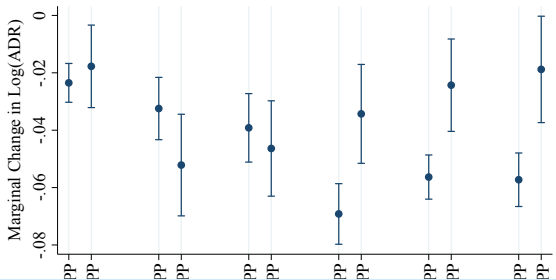

How Did Better Access to Credit Affect Hotels' Response to Demand Shock?

- Prior to start of PPP, never-PPP hotels compete more aggressively than eventual-PPP hotels; main results unlikely to be driven by superior access to credit for PPP hotels Back