

# Merchants of death: The effect of credit supply shocks on hospital outcomes

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October 8, 2021

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- ▶ We study how credit market shocks transmit to hospitals and affect real health outcomes.
  - U.S. healthcare spending:  $\sim 18\%$  of GDP (1/3 by hospitals)
- ▶ Dual goals of hospitals:
  1. Community benefit: provide critical care to the public
  2. Maintain good financial conditions for operation

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By **Dr. Nancy A. Anoruo**

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COVID-19

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- ▶ We focus on a negative credit supply shock (before Covid-19).
  - Hospital external financing: 70% debt, almost no equity (Wilson et al., 1982)
- ▶ Utilize the staggered pattern of stress tests on U.S. banks:
  - DID specification: hospitals with stress-tested relationship lenders v.s. others
  - Hospital-level data: financial and operation, various measures of care quality

- ▶ Main results: with endangered credit supply, hospitals become financially more efficient at the cost of worse care for patients.
- ▶ In particular, following the negative shock
  1. Cost of borrowing: loan spread  $\uparrow$ , loan amount  $\downarrow$ , new lenders  $\uparrow$
  2. Revenue and profitability  $\uparrow$ , by accommodating more patients and particularly less severe and privately-insured ones
  3. Negative externality: healthcare quality  $\downarrow$ , across both objective and subjective measures

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- ▶ Stress tests introduced through Dodd-Frank Act of 2010 (DFAST).
  - Large banks required to undergo annual evaluation of capital adequacy through different scenarios
  - Deadline for banks with assets  $\geq$  \$50 billion: September 30, 2012
  - Deadline for banks with assets  $\geq$  \$10 billion: over next two years
- ▶ Incentives for risk management:
  - Stress-tested banks increased loan spreads and reduced loan supply for *risky borrowers* (Acharya et al., 2018; Cortés et al., 2020)
  - Borrowers may directly face higher rates, or have to look for new lenders that they do not have a relationship with (Boot, 2000)

- ▶ Hospitals are risky borrowers.
  - Average profit margin is 3.2%, one-third have negative margins
  - Waves of bankruptcies even before Covid
  - Healthcare bonds accounted for 20% of all municipal bond defaults from 1999 to 2010 (Gao et al., 2019)
- ▶ Loans are important for hospitals.
  - Average facility size is \$78 million/hospital. Yearly aggregated at \$144.3 million
  - Average loan size over borrower's total assets is 33.7%

- ▶ Hospital loans from Dealscan.
  - Term loan and revolver lending facilities started from 2007 and onwards
  - Focus on lead banks
- ▶ Hospital financial and operation: CMS Healthcare Provider Cost Reporting Information System (HCRIS).
  - Like 10K but more detailed operational information (bed utilization, patient discharge, employment etc)
  - Data over 2010-2016, includes 3,658 (short-term acute care) hospitals

- ▶ Quality of care: CMS Hospital Compare program.
  - Timely and effective care: examines if patients receive the standard procedure in time/properly after admittance/discharge
  - 30-day readmission and mortality
- ▶ Quality of care: Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) data.
  - Patient satisfaction survey by CMS about experience at hospital

- ▶ Staggered difference-in-differences (DID):

$$Y_{i,t} = \alpha + \beta STExposed_{i,t-1} + \gamma' Controls_{i,t-1} + \eta_t + \mu_i + \varepsilon_{i,t}.$$

- ▶  $STExposed_{i,t-1}$ : one if hospital  $i$ 's relationship banks experienced a stress test by year  $t - 1$  or earlier
- ▶  $\beta$  measures the relationship bank stress test effect
- ▶ Variation comes from (1) whether having a stress-tested relationship lender and (2) staggered implementation of stress tests

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- ▶ Conditional on borrowing, loan characteristics before and after stress-test exposure:

	(1)	(2)	(3)	(4)	(5)
	<i>Spread&amp;Fee</i>	<i>Spread&amp;Fee</i>	<i>LogAmt</i>	<i>LogMaturity</i>	<i>NewLender</i>
$STExposed_{i,t-1}$	74.764*** (2.968)	63.166** (2.020)	-0.362*** (-2.842)	-0.084* (-1.718)	0.132* (1.834)
Controls	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y	Y
Loan Type FE	N	Y	Y	Y	Y
Loan Purpose FE	N	Y	Y	Y	Y
<i>N</i>	1,052	717	810	801	810
Adj <i>R</i> <sup>2</sup>	0.21	0.39	0.60	0.43	0.34

- ▶ Column 1 implies \$1.08 million higher interest costs every year.

- ▶ Increase internal operational efficiency in response:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	<i>Margin</i>	<i>Liab/TA</i>	<i>Cash/TA</i>	<i>LogPatRev</i>	<i>LogInPatRev</i>	<i>LogOutPatRev</i>	<i>AvgPay</i>
<i>STExposed<sub>i,t-1</sub></i>	0.012** (2.077)	-0.052*** (-4.275)	-0.006*** (-2.583)	0.057* (1.903)	0.086*** (2.845)	0.068* (1.851)	1701.316*** (3.172)
Controls	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Hospital FE	Y	Y	Y	Y	Y	Y	Y
<i>N</i>	23,780	23,223	23,119	23,793	23,793	23,793	23,248
Adj <i>R</i> <sup>2</sup>	0.22	0.81	0.76	0.93	0.95	0.81	0.87

- ▶ Columns 1 and 4 imply \$1.39 million increased profits.

- ▶ Hospitals appear to increase services:

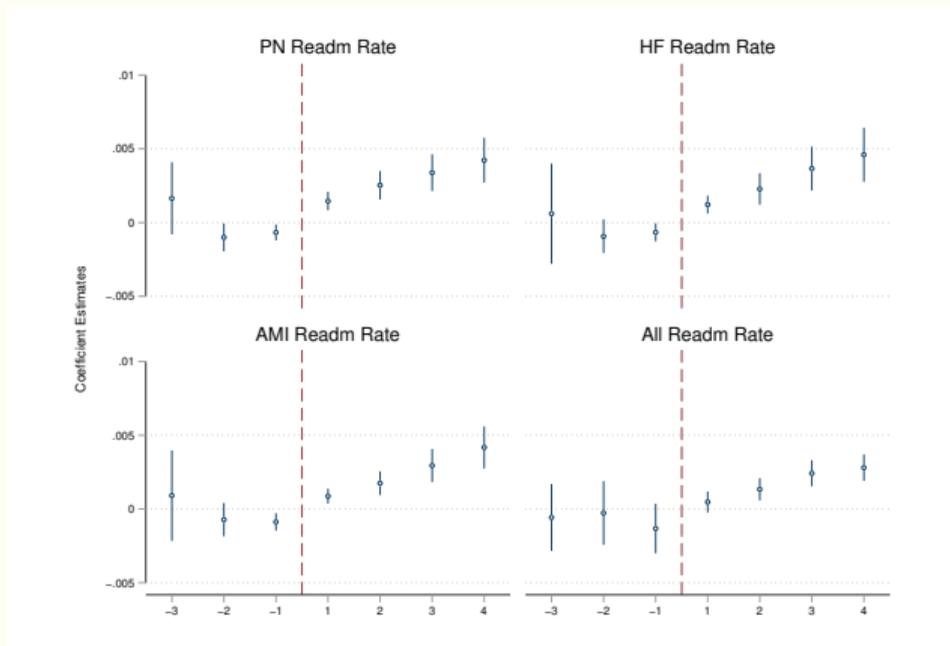
	(1) <i>Occupancy</i>	(2) <i>Discharge Rate</i>	(3) <i>Salary</i>	(4) <i>AvgHour</i>
$STExposed_{i,t-1}$	0.022*** (5.973)	2.350*** (5.752)	1750.260*** (5.017)	22.607** (2.222)
Controls	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Hospital FE	Y	Y	Y	Y
<i>N</i>	23,245	23,243	23,148	18,350
Adj $R^2$	0.94	0.80	0.93	0.65

- ▶ Additional results: admit healthier, more privately-insured, and younger patients.

- ▶ More crowded hospitals delay timely standard procedures:

	(1) <i>Aspirin</i>	(2) <i>PCI</i>	(3) <i>Statin Rx</i>	(4) <i>LVS</i>	(5) <i>ACE/ARB</i>	(6) <i>Antibiotic</i>
$STExposed_{i,t-1}$	-0.001 (-1.155)	-0.014*** (-3.112)	-0.005** (-2.390)	-0.008*** (-5.712)	-0.008*** (-3.512)	-0.008*** (-3.388)
Controls	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Hospital FE	Y	Y	Y	Y	Y	Y
<i>N</i>	9,199	6,325	6,933	14,372	11,189	14,644
Adj $R^2$	0.43	0.51	0.60	0.78	0.49	0.58

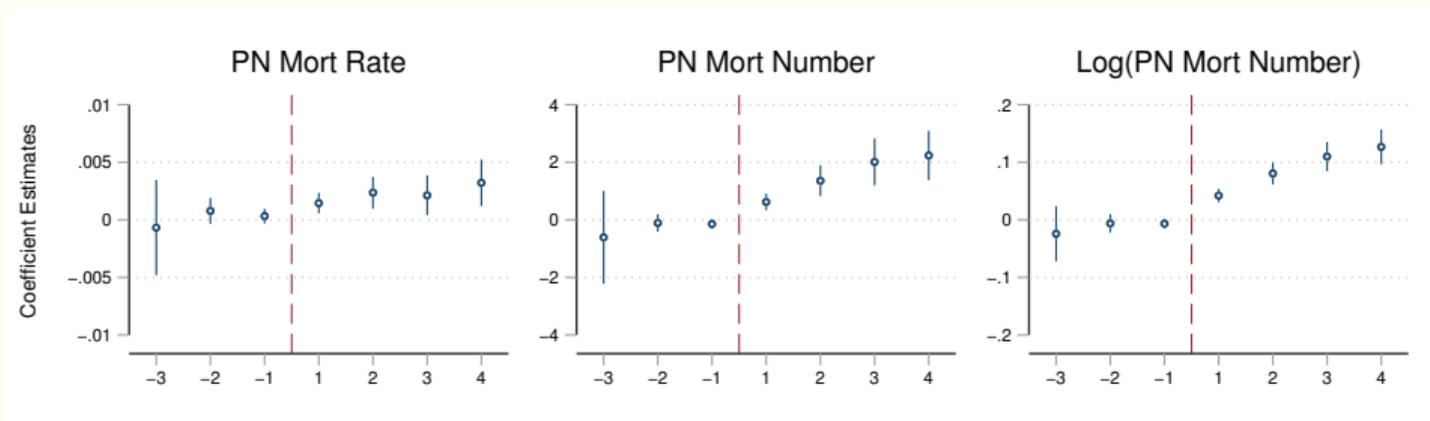
- ▶ Objective measure: higher probability of readmission.



	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<i>LogPNReadm</i>	<i>LogHFReadm</i>	<i>LogAMIReadm</i>	<i>PNReadmRate</i>	<i>HFReadmRate</i>	<i>AMIReadmRate</i>	<i>AllReadmRate</i>	<i>AllReadmWorst</i>
<i>STExposed<sub>i,t-1</sub></i>	0.101*** (8.678)	0.027** (2.475)	0.026** (1.972)	0.003*** (5.763)	0.003*** (4.898)	0.003*** (5.070)	0.002*** (5.103)	0.046*** (3.500)
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Hospital FE	Y	Y	Y	Y	Y	Y	Y	Y
<i>N</i>	21,588	20,062	12,668	23,408	22,165	14,341	17,678	19,336
Adj <i>R</i> <sup>2</sup>	0.96	0.98	0.97	0.72	0.77	0.82	0.67	0.48

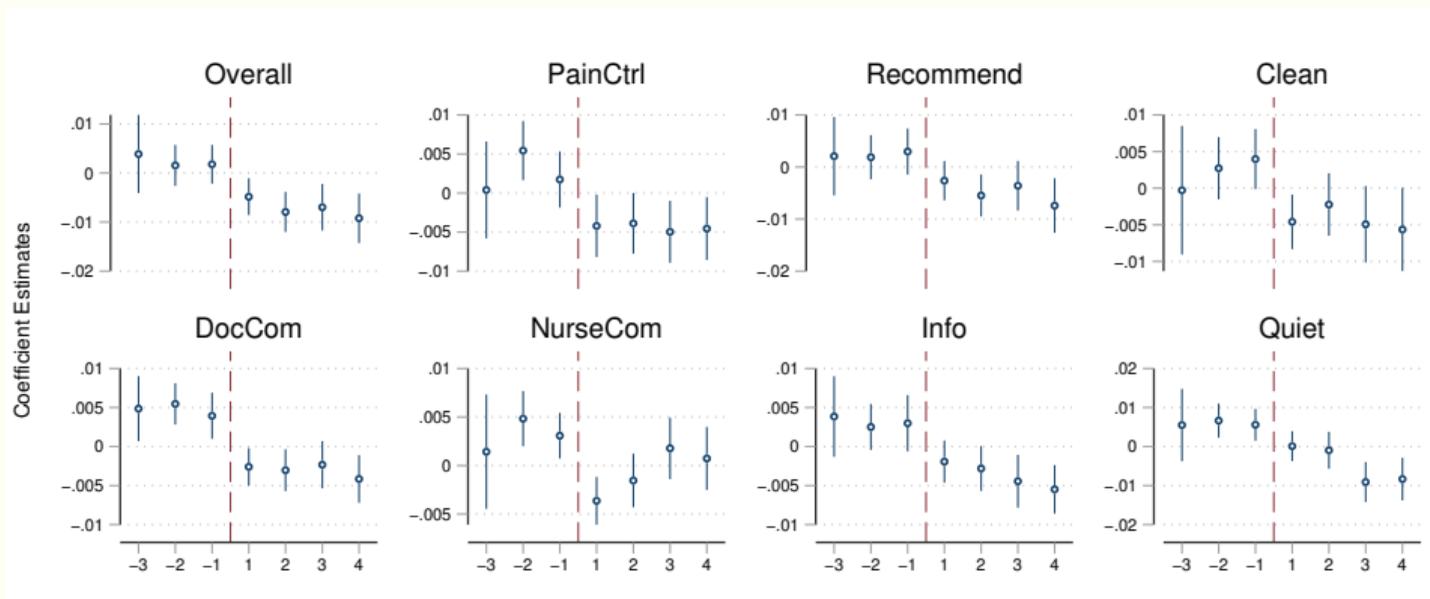
- Columns (1) - (3): 1,589 more patients readmitted per year across affected hospitals.

- ▶ Objective measure: higher mortality rate for pneumonia patients.



- ▶ Number of pneumonia death is 9.6% higher.

- ▶ Subjective measure: perceived quality of care.



- ▶ Results are stronger if
  - lender's capital adequacy is close to the regulatory minimum (Cortés et al., 2020)
  - borrower is more reliant on loan financing
  - borrower has more affected lenders
- ▶ Results are robust to
  - propensity score matching
  - controlling for regional differences
  - controlling for hospital system differences

- ▶ This paper explores the effect of credit supply shocks on hospitals.
- ▶ In response to a negative credit shock, we find evidence that hospitals trade off profitability and care: increase revenues, but deliver worse care to patients.
- ▶ Results provide novel evidence of an important connection between credit markets and public health.