COVID-19 and Small Business Failures

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COVID-19 Crisis

- COVID-19 is unprecedented in its complexity and severity.
- Crisis will trigger many business failures.
- Small businesses are especially at risk for failure.
- Lack of real-time data on failures complicates policy enactment and evaluation.

These Papers:

1. What is the impact of COVID-19 on SME failures in a wide range of countries?
2. What is the cost/effectiveness of government interventions aimed at saving firms?

Outline of Approach

- **Challenge**: To identify a liquidity shortage, need firm cashflow under COVID-19.

$$\text{cash} + CF_{\text{COVID}} < \text{financial expenses}$$

- **Approach**: Combine data with model to estimate CF_{COVID}
  - Representative firm-level financial data (ORBIS) from 17 countries.

$$CF_{\text{COVID}} = PY_{2018}\widehat{PY}_{\text{COVID}} - \text{COGS}_{2018}\widehat{COGS}_{\text{COVID}} - \text{Fixed Costs} - \text{Taxes}$$

  - Firm cost-minimizes over labor and materials given supply and demand shocks calibrated at sectoral level (4-digit).

Results Summary

Results

1. Absent interventions, failure rates rise by 9.2 pct pts (upper bound estimate).
2. Resulting NPLs lower the CET-1 ratio by 2.16 pct pts to 12.0%.
3. Targeted interventions: save 9.2% of SMEs and 4.75% of employment at a cost of 0.8% of GDP.
4. Blanket subsidies: save up to 8.7% of SMEs, preserve 4.7% of employment, but cost 5.8% of GDP.
5. Firms saved in 2020 are unlikely to fail in 2021. Biggest risk is credit tightening in 2021.

Limitations

1. **Liquidity, not insolvency, criterion**:
   - Distinction matters for firms with access to credit markets (SME access limited).
   - Insolvency defined as negative equity; difficult to establish for private firms.
2. **Assume perfectly rigid prices**: output is demand driven.
3. **Static, partial equilibrium exercise**: no state variable; estimate first-round effect.
4. **No amplification via input-output matrix**: important and left for future work.
5. **Calibration of shocks**: may not be independent of each other/policy interventions.

Literature: Rapidly Growing in 2020

- Labor market, demand, supply, and reallocation (Barrero, Bloom and Davis; Coibion, Gorodnichenko and Weber; Dingel and Neimann; Mongey, Pilossoph and Weinberg; Guerrieri, Lorenzoni, Straub and Werning; Krueger, Uhlig and Xie)
- Business solvency and policy response: (Acharya and Steffen; Brunnermeier and Krishnamurthy; Carletti, Oliviero, Pagano, Pelizzon and Subrahmanyan; Core and De Marco; Elenev, Landvoight and van Nieuwerburgh; Granja, Makridis, Yannelis and Zwick; Greenwald, Hanson, Stein, Sunderam, and Zwick; Joaquim and Netto; Krainer and Paul; Greenwood, Iverson and Thesmar; Jones, Philippon and Venkateswaran; Schivardi and Romano)

Contribution

1. Infer COVID-19 impact from structural model combined with firm-level data.
2. Assess sources of heterogeneity in failure rates and the effects of gov't support.

Methodology

Model Details I: Supply & Demand

- **Supply**: firms produce output (y_{is}) using idiosyncratic productivity (z_{is}), fixed factors (k_{is}), materials (m_{is}), and effective labor ($A_s n_{is}$):

$$y_{is} = z_{is} k_{is}^{\alpha_s} (A_s n_{is})^{\beta_s} m_{is}^{\gamma_s}.$$

- **Demand**: firms within sectors sell differentiated varieties (nested CES demand structure)

$$d_{is} = \xi_s^{\eta} \left(\frac{p_{is}}{P_s} \right)^{-\rho_s} \left(\frac{P_s}{P} \right)^{-\eta} D$$

  - **Hat algebra**: change in demand from normal (d_{is}) to COVID-19 (d'_{is}) times:

$$\hat{d}_{is} \equiv \frac{d'_{is}}{d_{is}} = \frac{\hat{\xi}_s^{\eta}}{\sum_{\sigma} \hat{\xi}_{\sigma}^{\eta} / \mathcal{S}} \widehat{PD} = \tilde{\xi}_s^{\eta} \widehat{PD}, \text{ where } \sum_s \tilde{\xi}_s^{\eta} / \mathcal{S} = 1$$

additional details

Model Details II: Firm Decisions

$$\min_{m',n'} \quad wn' + p_m m'$$

$$zk^{\alpha_s}(\hat{A}_s n')^{\beta_s} m'^{\gamma_s} \geq d' \qquad \text{: produce to meet demand}$$

$$n' \leq \hat{x}_s n \qquad \text{: labor constraint}$$

- When labor is not constrained:

$$\frac{n'}{n} = \hat{n} = \hat{m} = \left(\tilde{\xi}_s^{\eta} \widehat{PD}\right)^{1/(\beta_s+\gamma_s)} \hat{A}_s^{-\beta_s/(\beta_s+\gamma_s)} \equiv \hat{x}_s^*$$

- When labor is constrained:

$$\hat{n} = \hat{x}_s < \hat{x}_s^* \quad ; \quad \hat{m} = \hat{x}_s \left(\frac{\hat{x}_s^*}{\hat{x}_s}\right)^{(\beta_s+\gamma_s)/\gamma_s} > \hat{x}_s^*$$

Model Details III: Failures

- Define operating cashflow:

$$CF_{is} = p_{is}y_{is} - wn_{is} - p_m m_{is} - F_{is} - T_{is}$$

- Construct change in cashflows (predicted minus observed):
  - When labor is not constrained, change in cashflow (COVID/non-COVID):

$$CF_{is}^{\text{covid}} - CF_{is} = p_{is}y_{is}(\tilde{\xi}_s^{\eta}\widehat{PD} - 1) - (wn_{is} + p_m m_{is})(\hat{x}_s^* - 1)$$

  - When labor is constrained,

$$CF_{is}^{\text{covid}} - CF_{is} = p_{is}y_{is}(\tilde{\xi}_s^{\eta}\widehat{PD} - 1) - wn_{is}(\hat{x}_s - 1) - p_m m_{is}\left(\hat{x}_s{}^{*(\beta_s+\gamma_s)/\gamma_s}\hat{x}_s{}^{-\beta_s/\gamma_s} - 1\right)$$

- Businesses failures defined by liquidity criterion:

$$\text{cash}_{is} + CF_{is}^{\text{covid}} < \text{financial expenses}_{is}$$

Taking the Model to the Data

Methodology – Shocks

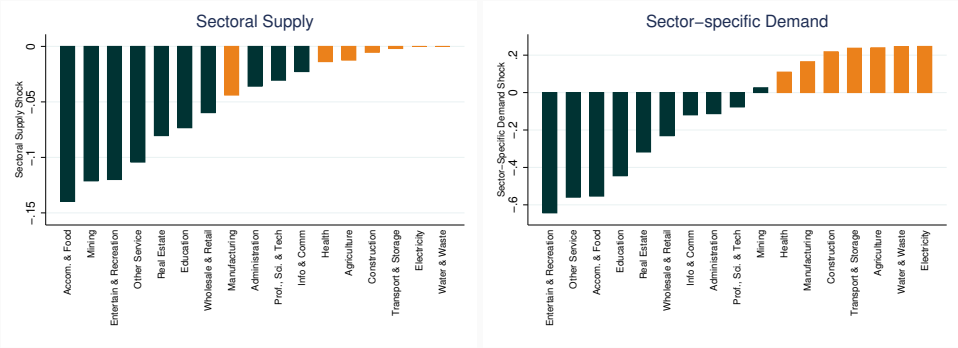
- Labor Utilization Constraint: $n'_{is}/n_{is} \leq \hat{x}_s$
  - Essential sectors: $\hat{x}_s = \infty$.
  - All non-essential workers assumed to be remote workers
  - **Data**: Evaluate feasibility of remote work (Dingel and Neiman 2020, O*NET).

- Productivity shock: Shifting to remote work ($\hat{A}_s \leq 1$)
  - Adjust productivity of remote workers down by 20%
  - **Data**: Use ACS for existing shares of remote workers

- Demand: $d'_{is}/d_{is} = \tilde{\xi}_s^{\eta} \widehat{PD}$
  - Sectoral demand shock: $\tilde{\xi}_s^{\eta}$ (restaurants $\tilde{\xi}_s^{\eta} < 1$ vs. online grocery $\tilde{\xi}_s^{\eta} \geq 1$.
    Data: Evaluate reliance on face-to-face interaction (O*NET)
  - Aggregate demand shock: $\widehat{PD}$
    Data: Use quarterly GDP growth forecasts (IMF, WEO).

- All sectoral shocks defined at the 4-digit NACE sector level.

Sectoral Supply & Demand Shocks



- Labor restrictions (left) are most severe in service sectors and mining.
- Demand (right) in customer-oriented sectors falls relative to essential sectors (orange).

Firm-level Data

- **ORBIS from BvD-Moody's for 17 countries**: Belgium, Czech Republic, Finland, France, Germany, Greece, Hungary, Italy, Japan, Korea, Poland, Romania, Slovak Republic, Slovenia, Spain, and the United Kingdom.
- **Coverage** averages 50% of aggregate revenue and 48% of SME revenue; exceeds 40% of aggregate SME revenue for 13 countries (high quality). table
- **Focus on small businesses (SMEs)**: account for 53% of employment, 50% of wages, 50% of revenue, and 46% of total assets. figure
- **Balance sheet and income statement variables (2018)**: Sales, wages, intermediate input costs, cash, cashflow, financial expenses employment.

Baseline Failure Rates

Aggregate SME Failure Rate (%)

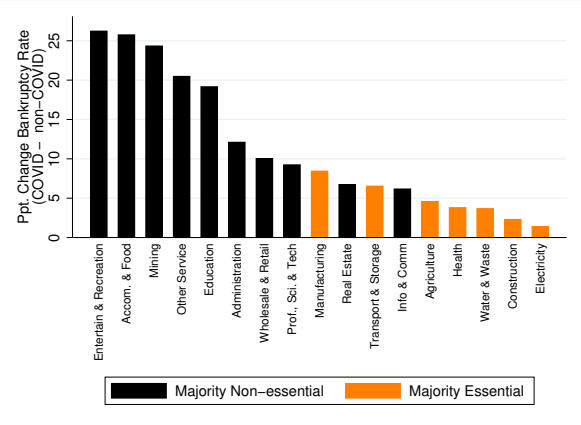
	(1) Non-COVID	(2) COVID	(3) Δ
High coverage	9.60	18.81	9.21
All	9.43	18.58	9.15

Baseline scenario: Single 8 week lockdown

- No government fiscal support.
- Run our cash flow equation and assess failure weekly
- The table reports the cumulative failure rate at the end of 2020.
- Aggregate failure rates mask heterogeneity across sectors and countries.
- Electricity has a "Δ" of 2 pp. vs Accomodation and Food Services of 25 pp.!

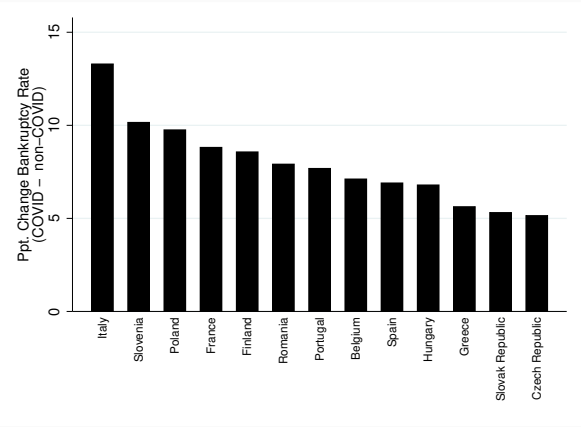
Benchmarking of Non-COVID

Sectoral Heterogeneity in Failure Rates (COVID - non-COVID)



- COVID impact ranges from 2 pct. pt. (Electricity) to 25 pct. pt. (Accommodation & Food Service) difference in failure rates. full table weekly evolution shocks decomposition

Country Heterogeneity in Failure Rates (COVID - non-COVID)



- COVID impact ranges from 5.4 pct. pt. (Czech Republic) to 12.8 pct pt. (Italy) difference in failure rates. full table weekly evolution

Country-level COVID Risk to the Banking Sector

	CET1 ratio (risk-weighted)	Δ CET1R
Average	14.14%	-2.16 pct. pts.

- Data availability limits analysis to Belgium, Finland, France, Germany, Greece, Spain.
- **Little systemic risk from SME failures under COVID**:
  - CET1 ratio declines 2.16 pct. pts. from initial level of 14.1%
  - Initial level in 2018 more than double what it was in 2009.
  - EBA's 2018 adverse scenario stress test generated a 4 pct. pt. decline in CET1 ratio.

Extensions

Government Interventions

Government Interventions

- **Variety of interventions implemented**: subsidies (JobKeeper (AUS), Solidarity Fund (FRA)); guaranteed loans (EBA (CAN), PPP (USA))
- **Benchmark Policies:**
  - All firm bail-out: Can give all SMEs that fail just enough cash to avoid failure.
  - Targeted bail-out: Focus on SMEs that only fail due to COVID (ie: survive non-COVID).
- **Untargeted Policies:**
  - Waive Financial Expenses: SMEs Don't have to pay interest during 2020 (from after lockdown begins).
  - Labor Subsidy: During the 8 week lockdown, SMEs receive lump sum 100% of weekly 2018 wages.
  - Euro Area Loan Guarantee: In 2020 SMEs receive loan equal to $\frac{8}{52}\max\{\frac{1}{4}\text{Revenue}_{2018}, 2\text{Labor Costs}_{2018}\}$ (repayment discussed later).
- See paper for more policy related results. More

The Effects and Costs of Various Policy Options

	Firms Saved (% Firms)	Jobs Saved (% Employed)	Wages Saved (% GDP)	Loans Saved (% Loans)	Policy Cost (% GDP)
All Firms Bailed Out	-18.81	8.28	2.09	20.95	2.11
Targeted Bailouts	-9.21	4.75	1.15	8.42	0.78
Financial Expenses Waived	-1.31	0.54	0.14	4.59	1.29
Labor Subsidy	-5.76	3.39	0.78	3.37	2.38
Euro Area Loan Guarantee	-8.72	4.71	1.10	5.87	5.84

- Targeted Bailouts generates large "Fiscal-Bankruptcy Multiplier": 1.15/0.78 = 1.47

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- Multiplier smaller for blanket policies:
- Waiving Financial Expenses fairly ineffective (0.14/1.29=0.11)
- Labor Subsidy effective but costly (1.78/2.38 = 0.34). Same for Loan Guarantee (0.19)

Which SMEs get Relief: “Survivors”, “Ghosts” and “Viable” SMEs

	Firms that Survive COVID (Strong)		Firms Fail Regardless of COVID (Ghost)		Firms Fail Only in COVID Scenario (Viable)	
	Jobs Saved (% Emp)	Policy Costs (% GDP)	Jobs Saved (% Emp)	Policy Costs (% GDP)	Jobs Saved (% Emp)	Policy Costs (% GDP)
Labor Subsidy	0.00	**1.94**	0.88	**0.19**	2.51	**0.24**
Euro Area Loan Guarantee	0.00	**4.71**	1.29	**0.44**	3.42	**0.65**

- Transfers to “strong firms” (1.9-4.7% of GDP) and “ghosts” (0.19-0.44%) cause of low multiplier.
- Claw-back of relief via additional policies (ex: future excess profit tax) could help reclaim misallocated resources.

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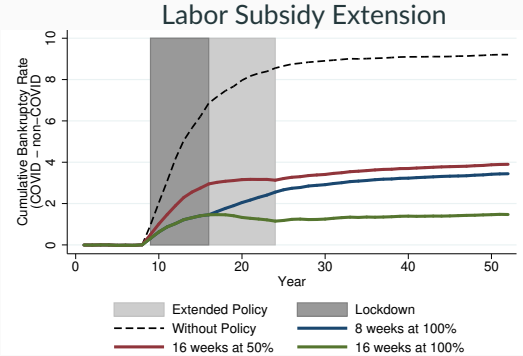
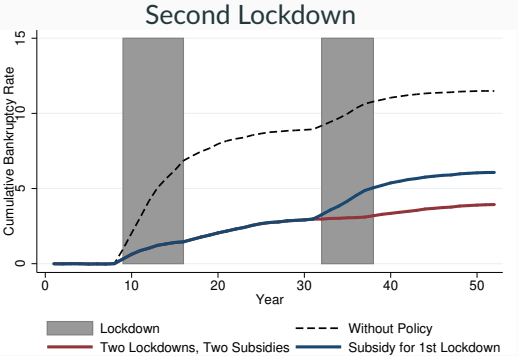
- Claw-back of relief via additional policies (ex: future excess profit tax) could help reclaim misallocated resources.
- 1/4 of jobs saved are at “ghost firms” – unlikely to be sustainable.

Continued Relief Critical





- **One lockdown**: 8-week support lowers failure rates by 65% (5.61 pct. pts).
  - Additional 8 weeks of support lowers failure rates by additional 60%.
  - **Timing:** Makes small difference – better to get the magnitude right.
- **Two lockdowns**: Absent policy support, 2nd lockdown raises failure rates by 3 pct. pts.
  - Providing additional labor subsidy almost eliminates the effect of 2nd lockdown.

More Realistic Scenario

- In many countries there were 2 lockdowns and very generous policy support.
- We introduce a second 6 week lockdown and the loan guarantee policy based on:

$$Payment_i = \frac{14}{52} \max \left\{ \frac{1}{4} \text{Revenue}_{i,2018}, 2 \cdot \text{Wage Costs}_{i,2018} \right\}$$

- Bankruptcy Rates in 2020 become:

	(1) Non-COVID	(2) COVID-19	(3) COVID + Policy
High coverage	9.60	19.44	9.57

- Natural Question: Given how many firms saved in 2020, what happens in 2021?

What About 2021?

Questions:

- Was policy too generous and only delaying failures (is there a “time bomb”)?
- Does requiring repayment of policy support matter?
- How does financial market functioning matter?

Scenarios:

- What to do regarding repayment of policy-supported loans?
  1. **Policy Repaid:** 20% of policy repaid in 2021 (5 year loan)
- Financial Market Freezes
  2. **Financial Market Freeze:** 1) + No rollover of short term debt.

2021 Results

Scenario	COVID–non-COVID Failure Rates			% of Firms	Policy-Related	Non-performing
	Overall	Strong 2020	Saved 2020	Saved in 2021	Costs	Loans
	(pp.)	(pp.)	(pp.)	(pp.)	(% 2018 GDP)	(% SME Loans)
(1) Policy Principal Repaid	1.88	-0.77	2.65	10.61	0.26	3.71
(2) No Rollover	**8.44**	4.14	4.30	12.62	1.00	29.97

Outstanding loans at end of 2020: 9.32% of GDP.

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- **Any "time bomb" of failures depends on financial market panic.**
- Failing firms in financial stress look strong from the perspective of 2020.
- In 2020 no systemic risk for banks (CET1 ratio falls 2 pp). In 2021, there is a tail risk.

Main Lessons

- COVID-19 poses significant risk for SMEs: raises failure rates by 9.2%
- Targeted bailouts, if feasible, would save SMEs at a modest fiscal cost (0.8% of GDP).
- Blanket policies are less efficient; warrants claw back of funds disbursed to “Strong Firms”.
- In 2021, key risk to manage: financial market panic.

Thank You

Appendix

Model Details: Demand

- Nested CES demand structure:

$$D = \left[\sum_s \xi_s \mathcal{N}_s D_s^{(\eta-1)/\eta}\right]^{\eta/(\eta-1)} \quad ; \quad D_s = \left(\frac{1}{\mathcal{N}_s}\int_0^{\mathcal{N}_s} d_{is}^{(\rho_s-1)/\rho_s}\mathrm{d}i\right)^{\rho_s/(\rho_s-1)}$$

  with η cross sector elasticity and ρ_s cross variety elasticity. $\mathcal{N}_s$: mass of firms in s. ξ_s: sectoral demand shock.

- P_s sectoral (per unit of expenditure) and P overall price index:

$$P_s = \left(\frac{1}{\mathcal{N}_s}\int_0^{\mathcal{N}_s} p_{is}^{1-\rho_s}\mathrm{d}i\right)^{1/(1-\rho_s)} \quad ; \quad P = \left(\sum_s \xi_s^{\eta}\mathcal{N}_s P_s^{1-\eta}\right)^{1/(1-\eta)}$$

- Assume price stickiness: p_{is} and P_s are constant.

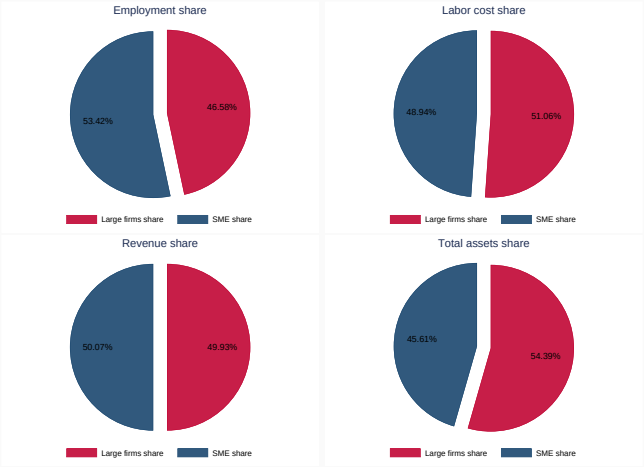
return

Firm-level Data: Coverage (% of OECD Revenue)

	All	SMEs
Belgium	60.4	52.1
Czech Republic	63.4	62.8
Finland	66.0	68.3
France	46.3	46.3
Germany	27.2	17.7
Greece	48.0	48.1
Hungary	63.9	48.7
Italy	63.5	75.8
Japan	42.5	.
Korea	61.9	34.0
Poland	47.5	44.5
Portugal	63.2	72.9
Romania	60.6	40.0
Slovak Republic	52.0	73.2
Slovenia	49.3	61.0
Spain	58.4	69.9
United Kingdom	49.2	41.4

- Countries in grey have SME coverage below 40% (Germany) or lack data for aggregation (UK). return

Firm-level Data: Economic Contribution of SMEs (Orbis)



- SMEs account for 50% of emp., wages, and rev. and 46% of total assets. return

Benchmarking our Exercise

	(1) OECD	(2) Orbis (All)
Belgium	3.0	8.8
Czech Republic	7.9	8.3
Finland	5.4	9.5
France	4.7	8.7
Germany	6.7	11.5
Greece	4.1	8.4
Hungary	8.8	9.4
Italy	6.7	9.2
Portugal	11.5	12.5
Romania	8.6	13.1
Slovak Republic	10.0	10.3
Slovenia	3.9	7.5
Spain	7.4	8.7
United Kingdom	13.8	11.2

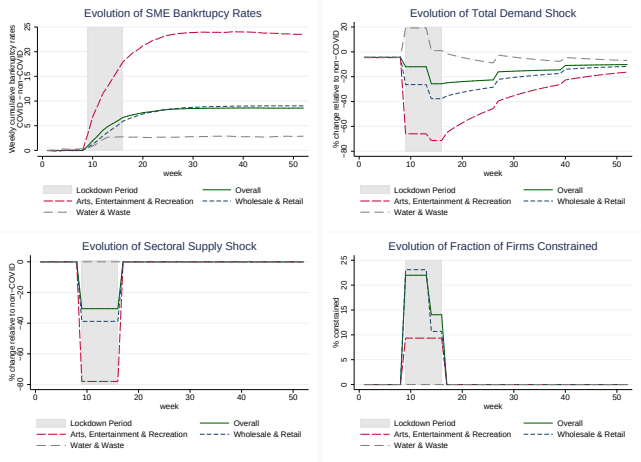
Return

Sectoral Heterogeneity in Failure Rates (COVID - non-COVID)

	(1) Non-COVID	(2) COVID-19	(3) Δ
Agriculture	9.44	13.52	4.08
Mining	12.50	36.03	23.54
Manufacturing	8.48	16.73	8.25
Electric, Gas & Air Con	9.35	11.31	1.96
Water & Waste	6.72	9.65	2.93
Construction	7.97	10.19	2.21
Wholesale & Retail	9.12	18.21	9.10
Transport & Storage	7.64	13.28	5.63
Accom. & Food Service	13.15	38.59	25.44
Info. & Comms	10.00	15.92	5.92
Real Estate	11.61	17.38	5.76
Prof., Sci., & Technical	10.24	18.85	8.60
Administration	8.32	19.39	11.06
Education	10.86	30.04	19.18
Health & Social Work	7.74	11.22	3.48
Arts, Ent., & Recreation	12.95	36.55	23.60
Other Services	12.80	31.42	18.62

- Table reports sector-level failure rates (COVID and non-COVID) and difference (COVID - non-COVID). return

Weekly Evolution of Baseline Failure Rates (Sectors)



- Total demand and sectoral supply shocks drive sectoral heterogeneity. return

Impact of Shocks on Sector Failure Rates

	(1) $\widehat{PC}$	(2) $\widehat{PC}, \hat{x}_s$	(3) $\widehat{PC}\tilde{\xi}_s^{\eta}$	(4) $\widehat{PC}\tilde{\xi}_s^{\eta}, \hat{x}_s$	(5) Baseline
Accom. & Food Service	0.07	75.04	9.20	20.04	25.44
Arts, Ent., & Recreation	1.92	51.04	18.92	21.27	23.60
Wholesale & Retail	1.65	4.83	8.84	8.73	9.10
Manufacturing	1.00	6.11	0.95	6.56	8.25
Info. & Comms	2.12	3.56	4.99	4.99	5.92
Health & Social Work	1.85	12.16	3.14	3.14	3.48
Average	2.02	11.78	6.19	7.75	8.63

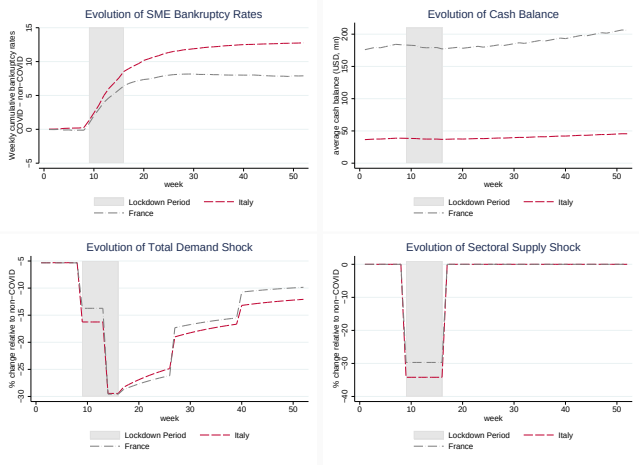
- Sectoral supply and demand matter most for failure rates.
- Supply shocks increase labor constrained firms, raising failure rates.
- Sectoral demand shocks raise failure rates, and mitigate impact of sectoral supply shocks. return

Country Heterogeneity in Failure Rates (COVID - non-COVID)

	Non-COVID	COVID	Δ
Belgium	7.75	14.18	6.42
Czech Republic	8.24	13.59	5.35
Finland	8.35	16.91	8.56
France	9.03	16.94	7.91
Greece	10.43	16.37	5.94
Hungary	8.22	14.01	5.79
Italy	9.91	22.68	12.77
Japan	3.78	9.94	6.16
Korea	12.89	27.20	14.31
Poland	11.68	20.45	8.77
Portugal	12.21	19.65	7.44
Romania	15.77	23.18	7.41
Slovak Republic	10.41	16.05	5.64
Slovenia	7.25	15.95	8.71
Spain	8.98	15.50	6.52

- Table reports country-level failure rates (COVID and non-COVID) and difference (COVID - non-COVID). return

Weekly Evolution of Baseline Failure Rates (Countries)



- Differences in the financial vulnerability of firms contribute to cross-country differences in failure rates. return

Alternative Scenarios

	(1) Baseline	(2) Mothballing	(3) End of 2020 Bankruptcy Criterion	(4) Quadratic Labor Adjustment Costs
High Quality	8.75	7.03	5.90	6.21
All	8.63	7.65	6.21	6.64

- Mothballing lowers failure rates by about 1 pct. pt.
- Evaluating bankruptcy criterion at end of 2020 lowers failure rates by 2-3 pct. pts.
- Allowing convex costs of labor inputs above $\hat{x}_s$ lowers failure rates by 2-2.5 pct. pts.

return

Extensions

- **Model Extensions:** Details
  - Mothballing: Allow firms to shut down if too costly to operate.
    - Can re-open at any time during 2020.
    - Avoids failures in cases with small demand shocks but strict workplace restrictions.
  - Labor Adjustment Costs: Firms allowed to increase labor utilization above constraint: $\hat{x}_s$.
    - Must pay a quadratic cost to do so.
    - i.e. $\text{cost}(\hat{n}) \propto \hat{n}^2 \mathbb{1}_{\hat{n} > \hat{x}_s}$ and $\text{cost}(\hat{x}_s) = 0$.
    - Alternative way to meet demand than increased materials usage.
  - Annual Failure Assessment: Assess failure condition at the end of 2020.
    - Effectively allows firms to borrow within 2020 to smooth cashflow.
  - Each extension lower bankruptcy rates by between 1-3 pct. pts.

Return