COVID and Productivity in Europe: A Responsiveness Perspective

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Covid-19: A large common shock with asymmetric impact

(a) Industrial Production

(b) Employment growth (Manufacturing)

Figure: Annual Output and Employment during Covid-19
Take the firm responsiveness perspective and ask:

1. Are there differences in firm responsiveness across Europe?
2. How do these differences shape the economy-wide response to the Covid-19 economic shock and related policy support?
Firm Responsiveness

**Definition:**
- Firms face idiosyncratic profitability shocks from a variety of sources (e.g., labor force productivity or demand)
- “Responsiveness” measures how reactive firms are to these shocks in terms of their decisions (e.g., investment and labor adjustment).

**Our project:**
- Focus on labor demand
This paper

First part — only briefly today

- Estimate a structural dyn. labor choice model for four EA countries
  - Estimation separately for each country
  - Responsiveness measures estimated in data and included as moments
- Use model to understand cross-country differences in firms responsiveness to idiosyncratic shocks

Second part

- Extend model to include aggregate Covid-19 shock
- Simulate effects of aggregate shock and related policies on:
  - Aggregate employment
  - Firm exit
  - Productivity
- Disentangle effect of shock and policy support
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Agenda

1./ Motivation

2./ Related Literature

3./ Data

4./ Model & Estimation

5./ Quantitative Exercise
  5.1./ Shock and Policy Support
  5.2./ Importance of Targeted Policy Support
  5.3./ Role of Heterogeneous Beliefs

6./ Conclusion
Related Literature
1. **Firm responsiveness and macroeconomic outcomes**
   Decker et al. (2016), Foster et al. (2016), Bartelsman et al. (2019)
   → Take cross-sectional perspective; Covid-19 as laboratory to study the role of cross-country differences in responsiveness for resilience to aggregate shocks.

2. **Covid-19 and Firm Dynamics**
   Albert et al. (2020), Harasztosi et al. (2022), Kozeniauskas et al. (2022)
   → Take responsiveness perspective; study interaction of responsiveness, aggregate shocks, and labor market stabilization policies in structural labor-demand framework.
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Data
Data

- Bureau van Dijk’s **Orbis**
  - Private and public firms
  - Sample: Unbalanced panel of manufacturing firms, 2014-2018
  - 4 countries: France, Germany, Italy, Spain

- Eurostat’s **Structural Business Statistics**
  - Employment-weighted exit rate: 1-digit manufacturing sector
Model
Key ingredients

- Partial equilibrium model of firms’ dynamic labor demand with
  - Discrete time, annual frequency
  - Firms are subject to idiosyncratic profitability shocks
  - Time to build for labor
  - Convex and non-convex adjustment costs for labor
  - Endogenous entry and exit
Firm Problem: Optimization

- **Exit Decision:**
  \[ V(A, e) = \max(V^c(A, e), 0) \]
  - \( A \) = profitability shock, AR(1)
  - \( e \) = current employment level

- **Conditional dynamic labor demand:** \( \forall(A, e) \)
  \[ V^c(A, e) = \max_{e'} R(A, e) - \omega(e) - C(e', e) - \Gamma + \beta E_{A'|A} V(A', e') \]
  - \( R(\cdot) \) = revenue
  - \( \omega(\cdot) \) = compensation
  - \( C(\cdot) \) = adjustment costs
  - \( \Gamma \) = fixed operating costs

- **Entry Decision:**
  \[ E_{A|s} V(A, e) \geq 0 \]
  - \( e \) = lowest employment level
  - \( s \) = signal about prospective profitability; same process as \( A \)
Firm Problem: Optimization

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Estimation
Estimation

- **Simulated Method of Moments: [SMM Approach](#) [Moments](#)**
  - Min. distance betw. key moments from actual and simulated data
  - Include responsiveness coefficients as moments

- **Estimation Results: [Model Fit](#)**

- **Estimation Results: [Parameters](#)**

**Table: Fixed Adjustment Costs Incurred Relative to Revenue**

<table>
<thead>
<tr>
<th>Country</th>
<th>Fixed costs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fixed hiring costs ($F_m$)</td>
<td>Fixed firing costs ($F_p$)</td>
</tr>
<tr>
<td>France</td>
<td>0.9%</td>
<td>5.1%</td>
</tr>
<tr>
<td>Germany</td>
<td>1.5%</td>
<td>11.3%</td>
</tr>
<tr>
<td>Italy</td>
<td>1.8%</td>
<td>6.9%</td>
</tr>
<tr>
<td>Spain</td>
<td>1.2%</td>
<td>6.8%</td>
</tr>
</tbody>
</table>

*Notes — This table reports fixed costs (computed as $F_m$ and $F_p$ times average revenues) as fraction of average revenues of firms that actually hire or fire.*
Quantitative Exercise
Quantitative Exercise: Covid-19 Shock and Policies

Set-up

- Extend model to include aggregate state \((S)\)
  - \(S \in \{normal, disaster\} \Rightarrow R(A, e, S) = \lambda_S Ae^\alpha\)
  - \(\lambda\) captures both demand and labor supply shock
  - Parameterization
    - \(S\) follows 2-state Markov process: 
      \[ Q(S'|S) = \begin{bmatrix} \tau_{nn} & \tau_{nd} \\ \tau_{dn} & \tau_{dd} \end{bmatrix} \]
    - Transition probabilities: \(\tau_{nd} = 0.01, \tau_{dd} = \rho\)
    - \(\lambda\) set to match employment drop in 2020

- Types of policies
  - Short-time work scheme (STW)/Hours sharing
  - ‘No-firing’ clauses (Italy)
Quantitative Exercise: Covid-19 Shock and Policies

Set-up

- Extend model to include aggregate state ($S$)
  - $S \in \{\text{normal, disaster}\} \Rightarrow R(A, e, S) = \lambda_S A e^\alpha$
  - $\lambda$ captures both demand and labor supply shock
- Parameterization
  - $S$ follows 2-state Markov process: $Q(S'|S) = \begin{bmatrix} \tau_{nn} & \tau_{nd} \\ \tau_{dn} & \tau_{dd} \end{bmatrix}$
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- Types of policies
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  - ‘No-firing’ clauses (Italy)
## Quantitative Exercise: Covid-19 Shock and Policies

### Calibration

<table>
<thead>
<tr>
<th>STW (%)</th>
<th>Hours sharing (%)</th>
<th>Employment drop</th>
<th>λ</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Data</td>
<td>Model</td>
</tr>
<tr>
<td>Germany</td>
<td>15.8</td>
<td>-2.40</td>
<td>-2.41</td>
</tr>
<tr>
<td>France</td>
<td>14.0</td>
<td>-0.79</td>
<td>-0.79</td>
</tr>
<tr>
<td>Italy</td>
<td>49.0</td>
<td>-1.10</td>
<td>-1.05</td>
</tr>
<tr>
<td>Spain</td>
<td>38.0</td>
<td>-5.71</td>
<td>-5.69</td>
</tr>
</tbody>
</table>

- **STW (%)**: Fraction of firms using STW
- **Hours sharing**: Average fraction of hours cut

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Quantitative Exercise: Covid-19 Shock and Policies

Simulation

- Start economy in stationary distribution of productivity and employment in normal times

- Simulate two versions of economy for 10 time periods:
  1. No Covid-19: Economy evolves always in normal state
  2. Covid-19: Impose disaster state for one period in period 2

- Compare 1. and 2. to quantify the effect of shock and policies

- Baseline includes country-specific policy interventions
  - Policies linked to onset of shock
  - Targeted to support least productive fraction of firms

- Evaluate impact of policies by removing them
Covid-19 Shock and Policy Support

Employment Response

(a) Germany

(b) Italy

Figure: Employment Responses

- Policy support reduces employment losses by up to \(\sim 47\%\)

### Exit margin

<table>
<thead>
<tr>
<th>Table: Employment-weighted exit rates (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Normal times</td>
</tr>
<tr>
<td>Shock with full policy support</td>
</tr>
<tr>
<td>Shock with only short-time work policy</td>
</tr>
<tr>
<td>Shock with only ‘No-firing’ policy</td>
</tr>
<tr>
<td>Shock without policy support</td>
</tr>
</tbody>
</table>

*Note*—This table summarizes the effect of the policy support on employment losses due to exit.

- Policy support reduces empl.-weighted exit rates by up to $\sim 65\%$
- ‘No-firing’ policy can increase employment losses due to exit
Productivity Implications
Covid-19: Productivity Implications
Aggregate Productivity and Cleansing Effect

(a) Covid-19 shock w/o policy support
(b) Covid-19 shock w/ policy support
(c) Survivors vs. Exiters

Figure: Productivity Implications of Covid-19 and policies

- Covid-19 shock adversely affects aggregate productivity
- Effect of shock on productivity not impacted much by policies
- “Cleansing effect” present but dominated in the aggregate

Adjustment Costs
The Importance of Targeted Policy Support
The Importance of Targeted Policy Support
Employment Response

- Untargeted: STW randomly allocated to same fraction of firms
- Targeting policy support reduces employment loss by up to $\sim 45\%$

(a) Germany
(b) Italy

Other countries
The Importance of Targeted Policy Support
Aggregate Productivity and Misallocation

**Table: Productivity measures**

<table>
<thead>
<tr>
<th></th>
<th>Normal times</th>
<th>Shock</th>
<th>Shock + targeted pol. supp.</th>
<th>Shock + untargeted pol. supp</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Germany</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agg. RPL</td>
<td>0.6019</td>
<td>0.5811</td>
<td>0.5803</td>
<td>0.5809</td>
</tr>
<tr>
<td>Mstd</td>
<td>0.5421</td>
<td>0.5330</td>
<td>0.5333</td>
<td>0.5330</td>
</tr>
<tr>
<td>c(A,ls)</td>
<td>0.5348</td>
<td>0.5329</td>
<td>0.5323</td>
<td>0.5332</td>
</tr>
<tr>
<td><strong>Italy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agg. RPL</td>
<td>0.6859</td>
<td>0.6586</td>
<td>0.6563</td>
<td>0.6565</td>
</tr>
<tr>
<td>Mstd</td>
<td>0.5804</td>
<td>0.5667</td>
<td>0.5675</td>
<td>0.5673</td>
</tr>
<tr>
<td>c(A,ls)</td>
<td>0.5791</td>
<td>0.5761</td>
<td>0.5730</td>
<td>0.5733</td>
</tr>
</tbody>
</table>

- Targeting policy support has limited effect on productivity due to large adjustment costs
Role of Heterogeneous Beliefs
Role of Heterogeneous Beliefs

Set-up

- Baseline: firms have identical beliefs, persistent shock
- Reality from survey: very dispersed beliefs
- Introduce dispersion: mean-preserving spread around baseline beliefs
  - optimists: $\rho = 0.93$
  - pessimists: $\rho = 0.99$
  - 50% of each type
- Study response to one period shock
Role of heterogeneous beliefs
Employment Response

(a) Germany: Employment
(b) Germany: Optimists vs. Pessimists

Figure: Homogeneous versus dispersed beliefs

- Belief dispersion matters for aggregate employment
- Firm decisions non-linear in expect. about duration of agg. state
Role of heterogeneous beliefs
Can uncertainty fuel misallocation?

Table: Productivity measures

<table>
<thead>
<tr>
<th></th>
<th>Normal times</th>
<th>Shock</th>
<th>Shock + policy support</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Homogeneous</td>
<td>Dispersed</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>Germany RPL</td>
<td>0.602</td>
<td>0.602</td>
<td>0.580</td>
</tr>
<tr>
<td>Mstd</td>
<td>0.542</td>
<td>0.542</td>
<td>0.533</td>
</tr>
<tr>
<td>c(A,ls)</td>
<td>0.535</td>
<td>0.536</td>
<td>0.532</td>
</tr>
</tbody>
</table>

Notes — The table shows the aggregate productivity implications of dispersion in beliefs in normal times, during the period of the shock absent any policy support, and during the period of the shock when policy support is activated. Homogeneous beliefs refers to the baseline economy. Dispersed beliefs refers to the economy described in section ??.

- No apparent misallocation from heterogeneous beliefs in this model.
Conclusion
Conclusion

Motivation and Research Question

- Role of responsiveness for response to Covid-19 shock and policies
- Focus on cross-country diff. among four major EA countries

Results

- Estimated adjustment costs not that different across countries
- Policy Support mattered considerably:
  - Exit ↓ (∼66%)
  - Employment loss ↓ (∼47%)
  - Limited effects of policy on productivity (large adjustment costs)
- Targeting of support important
- Dispersion of beliefs matters:
  - More evidence
  - Policy implications


Appendix
Policy Support During Covid-19

**Figure:** Economic Policy Support Index

Source: COVID-19 Government Response Tracker, Oxford University
## Summary Moments

### Table: Data Moments

<table>
<thead>
<tr>
<th>$\mu_e$</th>
<th>inaction</th>
<th>JC10+</th>
<th>JD10+</th>
<th>JC5+</th>
<th>JD5+</th>
<th>$\tilde{\alpha}$</th>
<th>$\tilde{\rho}$</th>
<th>$\tilde{\sigma}$</th>
<th>$\beta_{1}^{int}$</th>
<th>$\beta_{2}^{int}$</th>
<th>$\beta_{1}^{ext}$</th>
<th>$\beta_{2}^{ext}$</th>
<th>Exit Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>France 17</td>
<td>0.329</td>
<td>0.132</td>
<td>0.047</td>
<td>0.255</td>
<td>0.125</td>
<td>1.040</td>
<td>0.920</td>
<td>0.301</td>
<td>0.343</td>
<td>0.255</td>
<td>-0.005</td>
<td>0.191</td>
<td>0.698</td>
</tr>
<tr>
<td>Germany 35</td>
<td>0.331</td>
<td>0.081</td>
<td>0.032</td>
<td>0.232</td>
<td>0.069</td>
<td>1.012</td>
<td>0.926</td>
<td>0.299</td>
<td>0.168</td>
<td>0.053</td>
<td>0.021</td>
<td>0.190</td>
<td>0.210</td>
</tr>
<tr>
<td>Italy 9</td>
<td>0.350</td>
<td>0.175</td>
<td>0.084</td>
<td>0.293</td>
<td>0.154</td>
<td>1.042</td>
<td>0.870</td>
<td>0.365</td>
<td>0.242</td>
<td>0.022</td>
<td>0.002</td>
<td>1.090</td>
<td>0.882</td>
</tr>
<tr>
<td>Spain 6</td>
<td>0.277</td>
<td>0.237</td>
<td>0.071</td>
<td>0.416</td>
<td>0.132</td>
<td>1.091</td>
<td>0.885</td>
<td>0.352</td>
<td>0.300</td>
<td>0.054</td>
<td>0.019</td>
<td>0.174</td>
<td>1.442</td>
</tr>
</tbody>
</table>

Notes — All moments are calculated from ORBIS data using an unbalanced panel of firms between 2014-2018. The exit rate is employment weighted and refers to the average of the “Employment share of enterprise deaths” from Eurostat’s Business Dynamism Statistics (BDS) over the period 2014-2018. The exit rate is reported as a percentage. The estimation of the parameters pertaining to the revenue function is described in section ??.
Firm Problem: Environment

- **Revenue function**: \( R(A, e) = Ae^\alpha \)
  - \( e \) = employment, \( \alpha \) = labor coefficient, \( A \) = AR(1) profitability shock

- **Compensation function**: \( \omega(e) = w_0 \times e \)
  - \( w_0 \) = wage rate

- **Adjustment costs**:
  \[
  C(e', e) = \frac{\nu}{2} \left( \frac{e' - e}{e} \right)^2 e + F_p \mathbb{I}(e' - e > 0) + F_m \mathbb{I}(e' - e < 0)
  \]
  - **quadratic costs**
  - **fixed hiring costs**
  - **fixed firing costs**

- **Fixed operating costs** \( \Gamma \) to generate firm exit
SMM Approach

- Solve optimization problem country-by-country:

\[ J = \min_{\Theta} \left( M^s(\Theta) - M^d \right)' W \left( (M^s(\Theta) - M^d) \right) \]

- Weighting matrix: \( W = I \)
- No aggregate shock; parameter values s.t. \( \exists \) stat. dist. \( \Lambda(A, e) \)
- Moments (except exit rate) from balanced panel of surviving firms
- Exit rate from one period of steady state equilibrium
Moments

Revenue Function and TFP(R) innovations

TFPR
\[ \log \text{Revenue}_{i,t} = \alpha \log \text{Employment}_{i,t} + \sum_{t=2014}^{2018} D_t + \varepsilon_{i,t} \]

AR(1)
\[ \varepsilon_{i,t} = \rho \varepsilon_{i,t-1} + \eta_{i,t}, \quad \eta_{i,t} \sim \mathcal{N}(0, \sigma^2_\eta) \]

Responsiveness

Extensive Margin
\[ Pr(\Pi_{adj} = 1) = \alpha + \beta_{1}^{\text{ext}} \varepsilon_{i,t} + \beta_{2}^{\text{ext}} \varepsilon_{i,t}^2 + \gamma \text{Employment}_{i,t-1} + \nu_{i,t} \]

Intensive Margin
\[ g_{i,t}^{\text{emp}} |_{\Pi_{adj}=1} = \delta + \beta_{1}^{\text{int}} \eta_{i,t} + \beta_{2}^{\text{int}} \eta_{i,t}^2 + \gamma \text{Employment}_{i,t-1} + \zeta_{i,t} \]

Exit

Emp-weighted exit rate
Avg. emp.-weighted exit rate in 1-digit manufacturing sector

\[ \Rightarrow M^d = [\alpha \quad \rho \quad \sigma_\eta \quad \hat{\beta}_1^{\text{int}} \quad \hat{\beta}_2^{\text{int}} \quad \hat{\beta}_1^{\text{ext}}, \xi] \]
### Table: Moments

<table>
<thead>
<tr>
<th>Country</th>
<th>Revenue Function</th>
<th>Responsiveness</th>
<th>Exit rate</th>
<th>Fit</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>$\tilde{\alpha}$</td>
<td>$\tilde{\rho}$</td>
<td>$\tilde{\sigma}_\eta$</td>
<td>$\beta_{1}^{\text{int}}$</td>
</tr>
<tr>
<td>France</td>
<td>1.040</td>
<td>0.920</td>
<td>0.301</td>
<td>0.343</td>
</tr>
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<td></td>
<td>0.917</td>
<td>0.900</td>
<td>0.159</td>
<td>0.242</td>
</tr>
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<td>Germany</td>
<td>1.012</td>
<td>0.926</td>
<td>0.299</td>
<td>0.168</td>
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<td>0.217</td>
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<tr>
<td>Italy</td>
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<td>0.870</td>
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<td>0.242</td>
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<td></td>
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<td>Spain</td>
<td>1.091</td>
<td>0.885</td>
<td>0.352</td>
<td>0.300</td>
</tr>
<tr>
<td></td>
<td>0.900</td>
<td>0.882</td>
<td>0.141</td>
<td>0.323</td>
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<td>Country</td>
<td>Parameters</td>
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</tr>
<tr>
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<td>---------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\nu$</td>
<td>$F_P$</td>
<td>$F_M$</td>
<td>$\alpha$</td>
</tr>
<tr>
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<td>4.713</td>
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<td>0.020</td>
<td>0.518</td>
</tr>
<tr>
<td>Germany</td>
<td>5.136</td>
<td>0.148</td>
<td>0.020</td>
<td>0.518</td>
</tr>
<tr>
<td>Italy</td>
<td>5.008</td>
<td>0.105</td>
<td>0.027</td>
<td>0.512</td>
</tr>
<tr>
<td>Spain</td>
<td>4.373</td>
<td>0.133</td>
<td>0.024</td>
<td>0.517</td>
</tr>
</tbody>
</table>

*Notes* — The parameters here are: $\nu =$ quadratic adjustment cost, $(F_P, F_M) =$ fixed hiring and firing costs as a fraction of average revenue, $(\alpha, \rho, \sigma) =$ curvature of revenue functions, serial correlation of profitability shocks and the standard deviation of the innovation to profitability shocks. $\Gamma$ denotes the fixed operating costs.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>(\tilde{\alpha})</th>
<th>(\tilde{\rho})</th>
<th>(\tilde{\sigma}_{\eta})</th>
<th>(\beta_1^{int})</th>
<th>(\beta_2^{int})</th>
<th>(\beta_1^{ext})</th>
<th>Exit rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\nu)</td>
<td>-0.384</td>
<td>0.058</td>
<td>0.134</td>
<td>-1.881</td>
<td>8.913</td>
<td>8.849</td>
<td>-3.434</td>
</tr>
<tr>
<td>(f_p)</td>
<td>-0.049</td>
<td>0.041</td>
<td>0.029</td>
<td>1.190</td>
<td>-28.688</td>
<td>10.817</td>
<td>-1.734</td>
</tr>
<tr>
<td>(f_m)</td>
<td>-0.039</td>
<td>0.093</td>
<td>0.014</td>
<td>-1.482</td>
<td>11.301</td>
<td>-28.159</td>
<td>-0.904</td>
</tr>
<tr>
<td>(\alpha)</td>
<td>-1.066</td>
<td>-0.061</td>
<td>0.158</td>
<td>-0.202</td>
<td>7.394</td>
<td>26.031</td>
<td>8.560</td>
</tr>
<tr>
<td>(\rho)</td>
<td>-4.956</td>
<td>0.868</td>
<td>-12.054</td>
<td>1.242</td>
<td>-72.454</td>
<td>144.541</td>
<td>27.259</td>
</tr>
<tr>
<td>(\sigma)</td>
<td>0.123</td>
<td>0.031</td>
<td>0.998</td>
<td>-1.615</td>
<td>14.794</td>
<td>1.665</td>
<td>0.019</td>
</tr>
<tr>
<td>(\xi)</td>
<td>-0.400</td>
<td>0.035</td>
<td>0.119</td>
<td>-0.614</td>
<td>18.588</td>
<td>-6.912</td>
<td>0.018</td>
</tr>
</tbody>
</table>
Covid-19: Revised Firm Optimization Problem

- Revised firm problem

\[ V(A, e, S) = \max(V^c(A, e, S), 0) \]

\[ V^c(A, e, S) = \max_{e'} R(A, (1 - \tau(S))e, S) - \omega(e)(1 - \tau(S)) \]
\[ - C(e', e) - \Gamma + \beta E_{A', S'|A, S} V(A', e', S') \]
Model validation
Responses: Employment and Output

(a) Employment

(b) Output

Figure: Employment and Output Responses
Model validation
Responses: Size-weighted exit

Figure: Exit Rates
Output Response in Data

Notes — The figure shows production output in the manufacturing sector in Germany, Italy, France, and Spain. Values are obtained from Eurostat’s “Production in Industry Monthly” table, aggregated to quarterly values.
Covid-19 Policy Support

Employment Response

(a) France

(b) Spain
### Table: Employment-weighted exit rates (Percent)

<table>
<thead>
<tr>
<th>Scenario</th>
<th>France</th>
<th>Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal times</td>
<td>0.45</td>
<td>0.83</td>
</tr>
<tr>
<td>Shock with full policy support</td>
<td>0.47</td>
<td>3.99</td>
</tr>
<tr>
<td>Shock with only short-time work policy</td>
<td>0.47</td>
<td>3.99</td>
</tr>
<tr>
<td>Shock with only 'No-firing' policy</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Shock without policy support</td>
<td>1.34</td>
<td>4.72</td>
</tr>
</tbody>
</table>

*Note—This table summarizes the effect of the policy support on employment losses due to exit.*
# Covid-19: Productivity Implications

## Aggregate Productivity and Misallocation

### Table: Productivity measures

<table>
<thead>
<tr>
<th>Country</th>
<th>Measure</th>
<th>Normal times</th>
<th>Shock</th>
<th>Shock + targeted policy support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>Agg. RPL</td>
<td>0.6019</td>
<td>0.5811</td>
<td>0.5803</td>
</tr>
<tr>
<td></td>
<td>Mstd</td>
<td>0.5421</td>
<td>0.5330</td>
<td>0.5333</td>
</tr>
<tr>
<td></td>
<td>c(A,ls)</td>
<td>0.5348</td>
<td>0.5329</td>
<td>0.5323</td>
</tr>
<tr>
<td>Italy</td>
<td>Agg. RPL</td>
<td>0.6859</td>
<td>0.6586</td>
<td>0.6563</td>
</tr>
<tr>
<td></td>
<td>Mstd</td>
<td>0.5804</td>
<td>0.5667</td>
<td>0.5675</td>
</tr>
<tr>
<td></td>
<td>c(A,ls)</td>
<td>0.5791</td>
<td>0.5761</td>
<td>0.5730</td>
</tr>
</tbody>
</table>

- Adj. costs create misallocation (also in normal times)
- Adj. costs mute effect of shock and policies on (mis-)allocation
Covid-19: Productivity Implications - Italy

Aggregate Productivity and Cleansing Effect

(a) Covid-19 shock w/o policy support
(b) Covid-19 shock w/ policy support
(c) Survivors vs. Exiters

Figure: Productivity Implications of Covid-19 and policies
Covid-19: Productivity Implications - France
Aggregate Productivity and Cleansing Effect

(a) Covid-19 shock w/o policy support
(b) Covid-19 shock w/ policy support
(c) Survivors vs. Exiters

Figure: Productivity Implications of Covid-19 and policies
Covid-19: Productivity Implications - Spain
Aggregate Productivity and Cleansing Effect

(a) Covid-19 shock w/o policy support
(b) Covid-19 shock w/ policy support
(c) Survivors vs. Exiters

Figure: Productivity Implications of Covid-19 and policies
Productivity Thresholds

(a) Germany  
(b) Italy  
(c) France  
(d) Spain
Adjustment Costs & Productivity Implications of Covid-19

(a) Germany

(b) Italy

Figure: Surviving firms normal vs shock period with no adjustment costs

- ACs prevent firm from adjusting optimally $\Rightarrow$ revenue per worker $\downarrow$
- Absent ACs, no effect on aggregate productivity
## Role of Adjustment Costs

**Table: Productivity measures**

<table>
<thead>
<tr>
<th></th>
<th>Shock with adjustment costs</th>
<th>Shock without adjustment costs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Germany</strong></td>
<td>Aggregate RPL</td>
<td>0.5811</td>
</tr>
<tr>
<td></td>
<td>Mstd</td>
<td>0.5330</td>
</tr>
<tr>
<td></td>
<td>c(A,ls)</td>
<td>0.4960</td>
</tr>
<tr>
<td><strong>Italy</strong></td>
<td>Aggregate RPL</td>
<td>0.6586</td>
</tr>
<tr>
<td></td>
<td>Mstd</td>
<td>0.5667</td>
</tr>
<tr>
<td></td>
<td>c(A,ls)</td>
<td>0.4970</td>
</tr>
</tbody>
</table>
Table: Productivity measures

<table>
<thead>
<tr>
<th></th>
<th>Normal times</th>
<th>Shock</th>
<th>Shock + targeted policy support</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agg. RPL</td>
<td>0.6405</td>
<td>0.6291</td>
<td>0.6283</td>
</tr>
<tr>
<td>Mstd</td>
<td>0.5684</td>
<td>0.5628</td>
<td>0.5633</td>
</tr>
<tr>
<td>c(A,ls)</td>
<td>0.5909</td>
<td>0.5889</td>
<td>0.5884</td>
</tr>
<tr>
<td>Spain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agg. RPL</td>
<td>0.7329</td>
<td>0.6843</td>
<td>0.6825</td>
</tr>
<tr>
<td>Mstd</td>
<td>0.6065</td>
<td>0.5796</td>
<td>0.5800</td>
</tr>
<tr>
<td>c(A,ls)</td>
<td>0.5595</td>
<td>0.5536</td>
<td>0.5522</td>
</tr>
</tbody>
</table>
The Importance of Targeting Policy Support

Employment Response

(a) France

(b) Spain
## The Importance of Targeted Policies

Aggregate Productivity and Misallocation

### Table: Productivity measures

<table>
<thead>
<tr>
<th></th>
<th>Normal times</th>
<th>Shock</th>
<th>Shock + targeted pol. supp.</th>
<th>Shock + untargeted pol. supp</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>France</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agg. RPL</td>
<td>0.6405</td>
<td>0.6291</td>
<td>0.6283</td>
<td>0.6289</td>
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<tr>
<td>Mstd</td>
<td>0.5684</td>
<td>0.5628</td>
<td>0.5633</td>
<td>0.5627</td>
</tr>
<tr>
<td>c(A,ls)</td>
<td>0.5909</td>
<td>0.5889</td>
<td>0.5884</td>
<td>0.5897</td>
</tr>
<tr>
<td><strong>Spain</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Agg. RPL</td>
<td>0.7329</td>
<td>0.6843</td>
<td>0.6825</td>
<td>0.6831</td>
</tr>
<tr>
<td>Mstd</td>
<td>0.6065</td>
<td>0.5796</td>
<td>0.5800</td>
<td>0.5797</td>
</tr>
<tr>
<td>c(A,ls)</td>
<td>0.5595</td>
<td>0.5536</td>
<td>0.5522</td>
<td>0.5536</td>
</tr>
</tbody>
</table>
(a) Germany: Employment

(b) Germany: Size-weighted Exit Rate

Figure: Optimists versus Pessimists

- Optimists adjust employment less than pessimists
- Pessimists dominate exit margin