Rescue Policies for Small Businesses in the COVID-19 Recession

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Motivation

- The Covid-19 pandemic caused a deep but short-lived economic recession. Go
- The impact is highly asymmetric on firms:
  - Small firms experienced greater drop in sales, employment, and higher failure rates. (Bloom et al, 2021; Cajner et al, 2020) Go

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- Policy response: governments enacted massive business rescue programs targeting small firms.
  - The U.S. allocated more than $600 billion for the Payroll Protection Program (PPP) in 2020 to support small businesses.
  - Forgivable loans up to 2.5 $\times$ average monthly payroll.
  - Max 500 employees.
  - Take-up rate by end of 2020 is 76% (Borawski and Schweitzer 2021)
  - As of November 2021, 92% of all PPP loans issues in 2020 have been forgiven (Source: SBA).

- Little is known about *macroeconomic* impacts of such policies on heterogeneous firms.

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Research Question

- What are the effects of small-firm rescue policies on
  - Business entry and exits,
  - Factor reallocation,
  - Macroeconomic outcomes and welfare?
- Main tradeoff:
  - Giving credit to small firms can prevent inefficient capital liquidation and allow productive firms to continue operating.
  - However, this can create “zombie” firms, which hampers efficient reallocation of capital and labor.

What We Do

- We build a general equilibrium model with heterogeneous firms that face financial constraints and capital irreversibility.
- We calibrate the stationary model and the pandemic shock to the U.S. economy, taking into account the PPP.
- Policy analysis:
  - We compare the PPP to a counterfactual scenario without any rescue policy (*laissez-faire*).
  - Rescue policies with different generosity (small vs. large grant).
  - We decompose the cumulative effects into short- and long-run effects.
- We simulate the effects of the PPP assuming a “typical” recession (less severe but more persistent).

What We Find

- Based on our model, the PPP prevents 60% of small business exits at the onset of the pandemic.
- The PPP leads to a modest increase in welfare and is mostly ineffective in improving aggregate output and employment.
  - The PPP triggers a reallocation of capital and labor towards larger, less impacted firms.
  - Relatively low productive firms are prevented from exiting.
  - These low productive firms account for only a small fraction of total employment.
- Our results echo previous findings (Crouzet and Mehrotra, 2020) showing that
  - Small firms experience more volatility, but: only modest impact on aggregate fluctuations.
  - Small firms credit policies likely to have more limited benefit than commonly assumed.

▸ Literature review

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Model

- Discrete-time general equilibrium model. Each period is a quarter.
- Two sectors: small-firms sector and corporate sector
- Small firms
  - Heterogeneous in productivity and capital
  - Face idiosyncratic risks and collateral constraints
  - Endogenous entry and exit
- Representative household owns and invests in firms, chooses consumption and labor supply.
- Steady state model with one-time unexpected pandemic shock to productivity and preferences.

Small Firms: Technology

- Fixed amount of capital κ
  - Fraction ξ of capital is rented
  - $1 - \xi$ is bought upon entry
- Firm produces output $xf(\kappa, \ell)$ using capital κ and labor ℓ.
  - Productivity x is stochastic and follows Markov chain $g(x'|x)$.
  - Capital κ is *partially irreversible*: upon exit only fraction $\theta < 1 - \xi$ of owned capital can be liquidated.
  - f is a decreasing returns to scale production function.
- Fixed operating costs:
  - Rental cost of capital $R_t \xi \kappa$
  - Additional fixed cost: $c^f(\kappa)$

Small Firms: Financial Frictions

- Small firm chooses ℓ to maximize operating profits $\pi_t(x, \kappa)$
- Financial constraints
  - Positive-dividend: $\underbrace{\pi_t(x, \kappa)}_{\text{profit}} - \underbrace{b}_{\text{current debt}} + q_t \underbrace{b'}_{\text{new debt}} \geqslant 0$
  - Collateral: $b' \leqslant \theta\kappa$

Small Firms: Decisions

Firm Exit

- A firm would exit if
  - the firm cannot pay a positive dividend (Forced exit), or
  - value of the firm is lower than its liquidation value $\theta\kappa - b$ (Voluntary exit)

Firm Entry

- Potential entrants are drawn from exogenous distribution $\Phi(x, b, \kappa)$.
- A firm would enter if
  - value of the firm is greater than the entry cost $(1-\xi)\kappa - b$.

$\theta < 1 - \xi$: Capital irreversibility!

Dividend and Debt Decision:

- Unconstrained firms (with low debt) pay positive dividend and remain unconstrained until exit.
- Constrained firms (with high debt) save to become unconstrained.
  $\Rightarrow$ They pay zero dividend: $b' = \frac{1}{q}(b - \pi(x, \kappa))$.

Aggregate Shock and Rescue Policy

- The economy is at a stationary equilibrium when the pandemic shock strikes at $t = 0$.
- The shock has four components:
  - TFP shock on the corporate sector ν_t^c
  - TFP shock on the small-firm sector ν_t^n
  - Demand shock affecting marginal utility of consumption ν_t^d
  - Labor supply shock affecting marginal utility of leisure ν_t^ℓ
- The shock has a persistence parameter ρ.
- Small firm rescue grant:
  - Grant is only given in $t = 0$. Only continuing firms are eligible.
  - An exogenous η fraction of eligible firms receive it.
  - Grant amount equals 2.5 times the firm's monthly payroll in normal times.
- Grants do not need to be repaid. (In the data, over 90% of PPP loans issued in 2020 have been forgiven.)

Steady State Calibration: Data and Sample

- Small firms = firms fewer than 500 employees.
- Data sources
  - Statistics of U.S. Businesses (SUSB) and Business Dynamics Statistics (BDS): annual semi-aggregate statistics of U.S. businesses by firm size.
  - Kauffman Firm Survey (KFS): longitudinal survey of a cohort of start-ups from 2004-2011 with information on firms' balance sheet.

Steady State Calibration: Model Fit

Moment	Data	Model
Average employment in small firms	9.251	11.067
Small firm share of employment	0.489	0.526
Small firm exit rate	0.019	0.030
Average employment in entrants	5.293	6.821
Fixed expense to revenue ratio	0.244	0.180
Autocorr. employment	0.966	0.959
Debt to asset ratio	0.082	0.107
Time spent in market work	0.330	0.242
Share of firms with debt	0.328	0.290
Capital to payroll ratio	4.598	5.879

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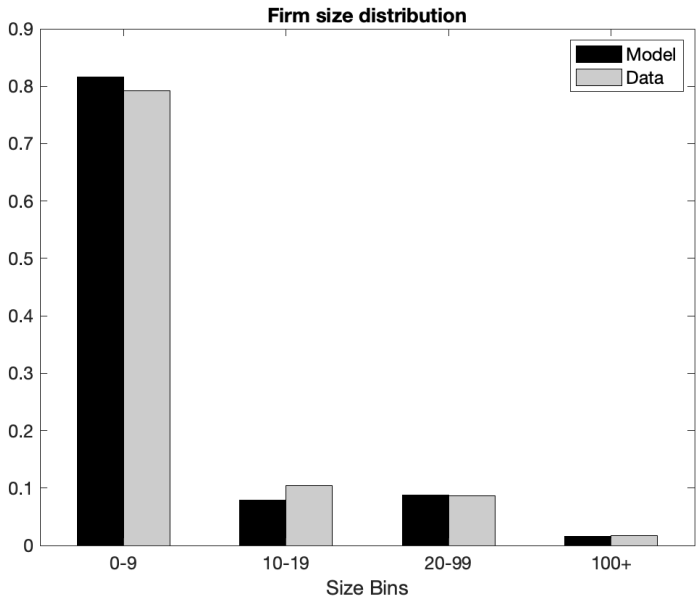
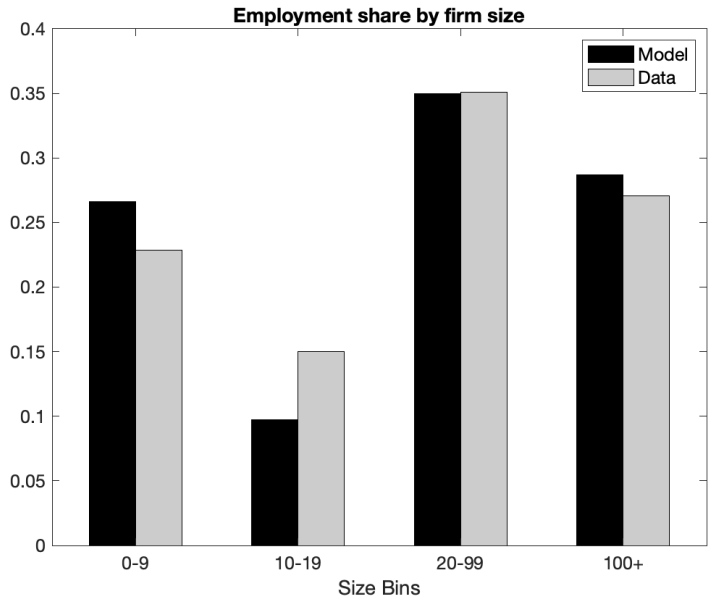
▸ Calibration

Steady State Calibration: Model Fit





Liquidation Policy

Pandemic Shock Calibration

- Impact period ($t = 0$) is 2020Q1.
- For each shock $s \in \{c, n, d, \ell\}$,

$$\nu_t^s = \rho^t \nu^s \text{ for all } t = 0, 1, ...$$

- The economy converges back to the pre-pandemic steady state.
- Calibrated shock parameters:

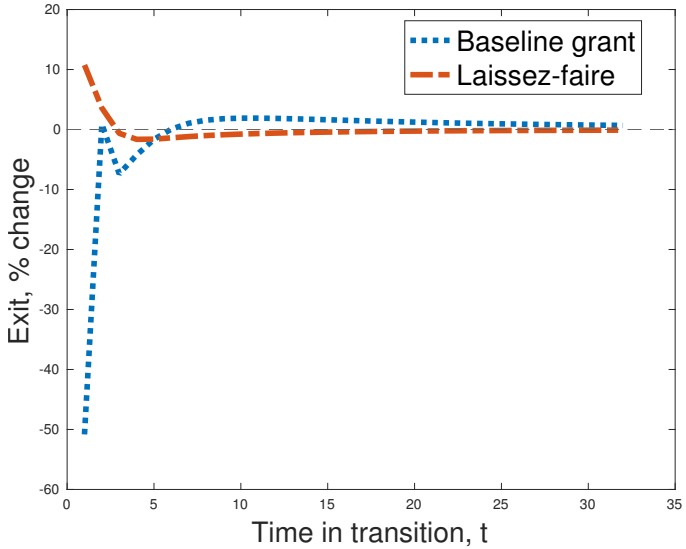
Parameter	Description	Value
ν^c	TFP shock on the corporate sector	-0.012
ν^n	Productivity shock on small firms	-0.027
ν^d	Preference shock	-0.082
ν^ℓ	Labor supply shock	0.136
ρ	Autocorrelation	0.161

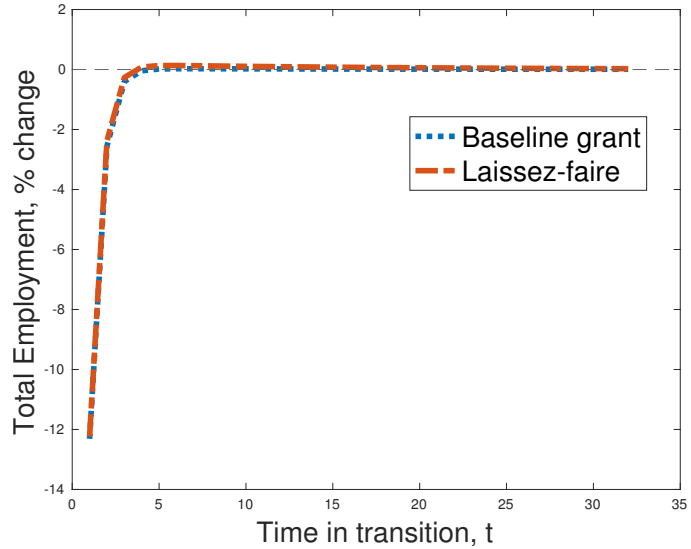
Pandemic Shock Calibration

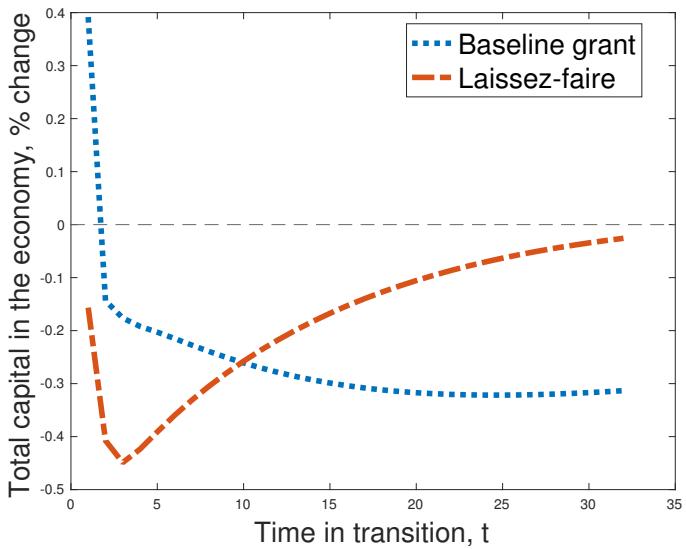
Description	Data	Grant (Baseline)
Targeted		
Drop in total output, 2020Q2:	-10.857%	-10.856%
Drop in total output, 2020Q3:	-2.246	-2.245
Drop in consumption, 2020Q2:	-9.667	-9.667
Drop in employment small, 2020Q2:	-12.539	-12.532
Drop in employment corp, 2020Q2:	-12.068	-12.066
Untargeted		
Drop in private investment, 2020Q2:	-15.398	-17.788
Drop in employment, 2020Q2:	-12.850	-12.312

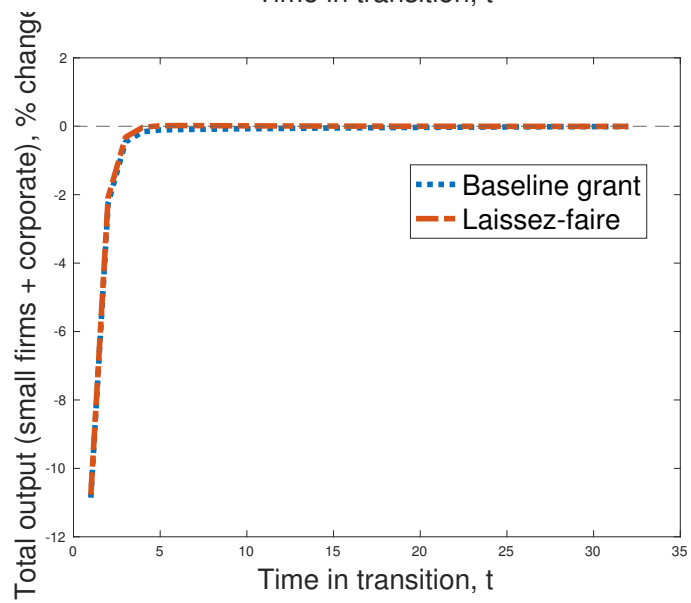
Data sources: Total output, consumption, investment and aggregate employment are from FRED. Employment by firm size is from Automatic Data Processing, Inc. (ADP).

Impulse Response 1

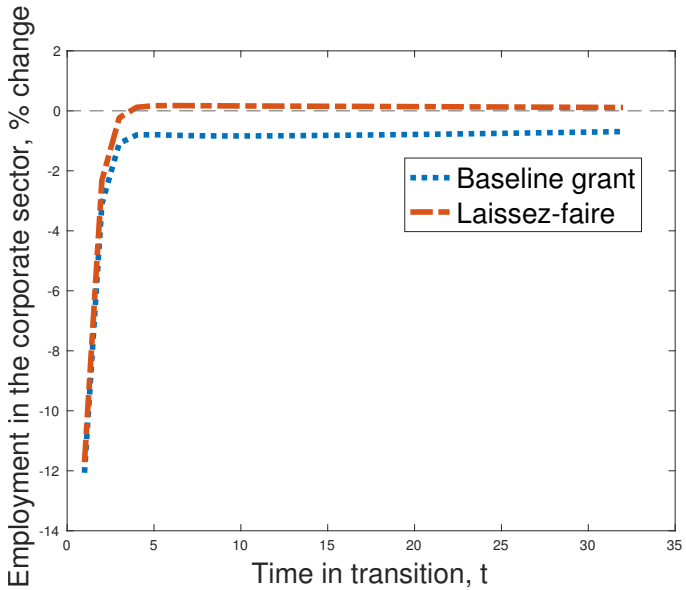


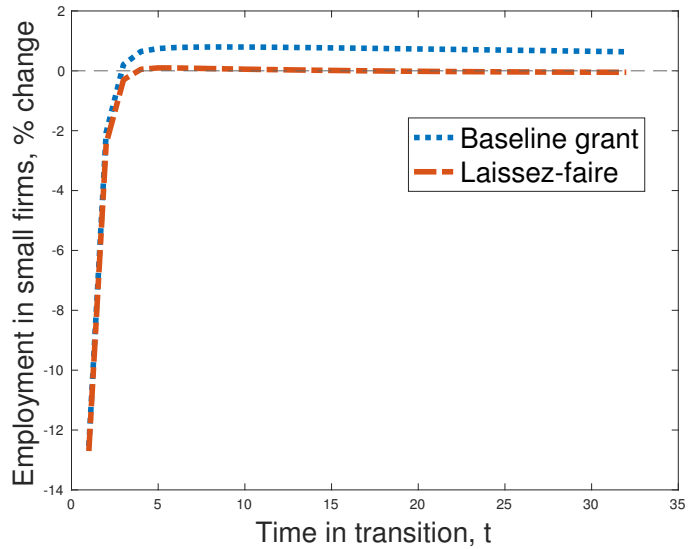


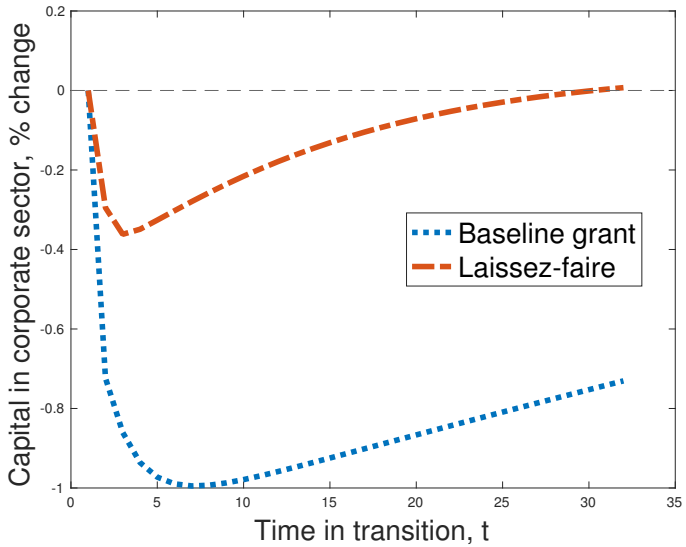


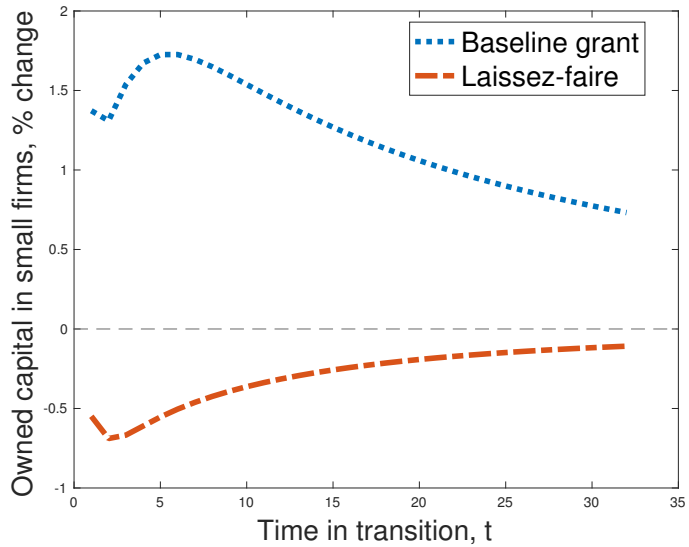


Impulse Response 2





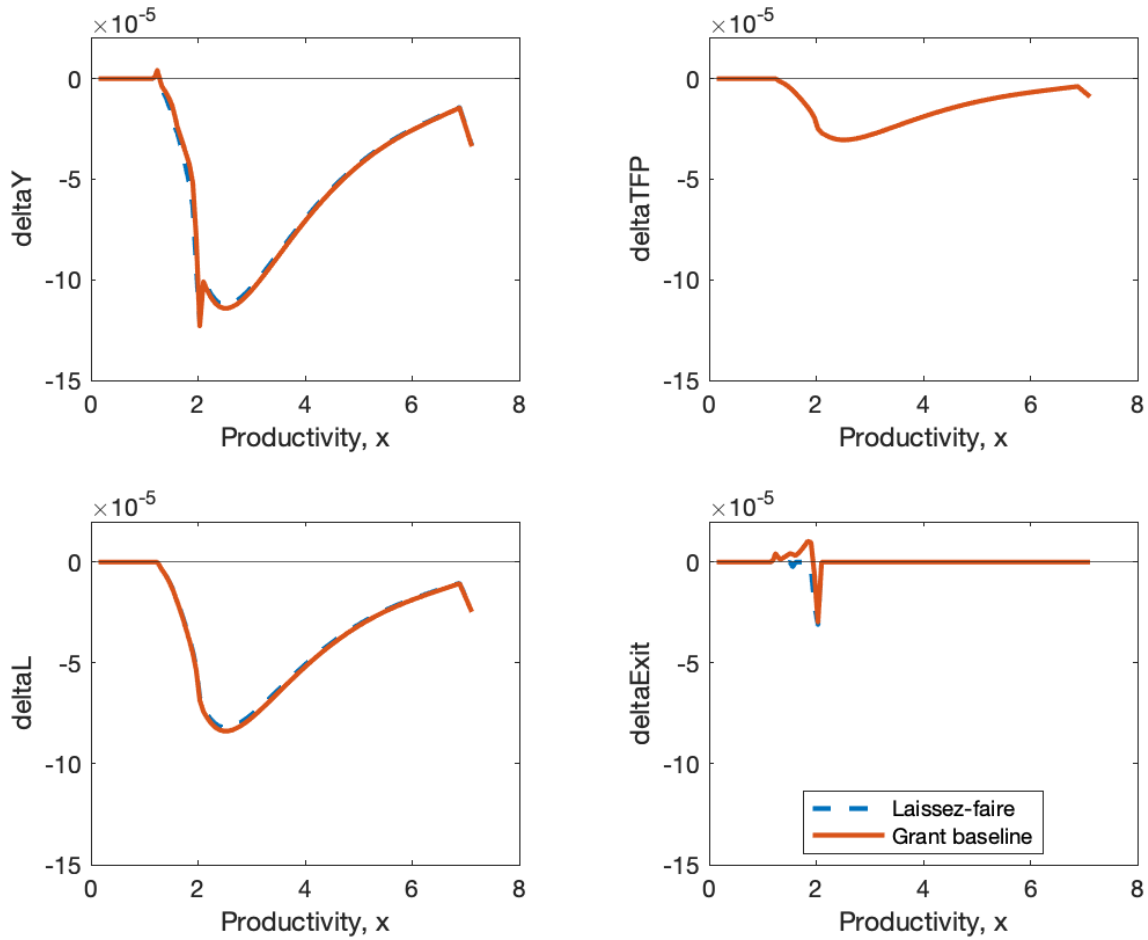




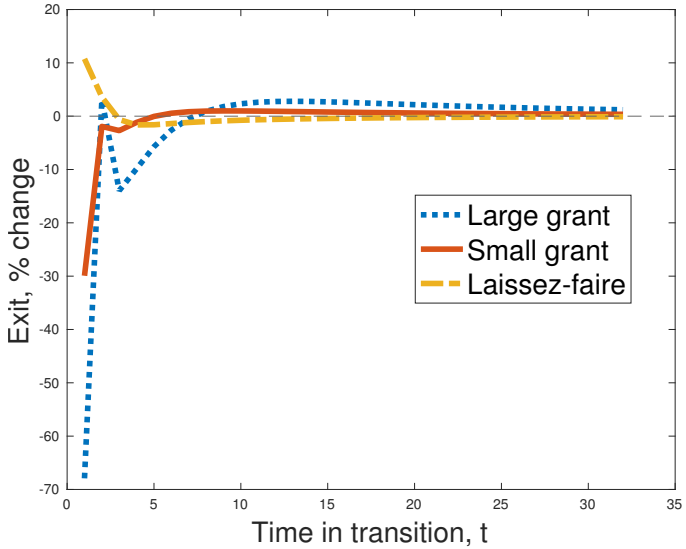
Decomposing the Effect of Rescue Grant

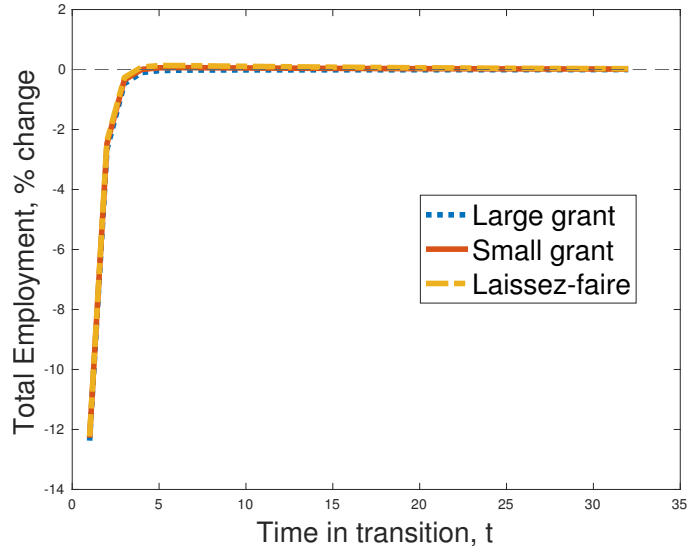
Total output loss in $t = 0$: $\Delta_Y = \Delta_{TFP} + \Delta_L + \Delta_{Exit}$,

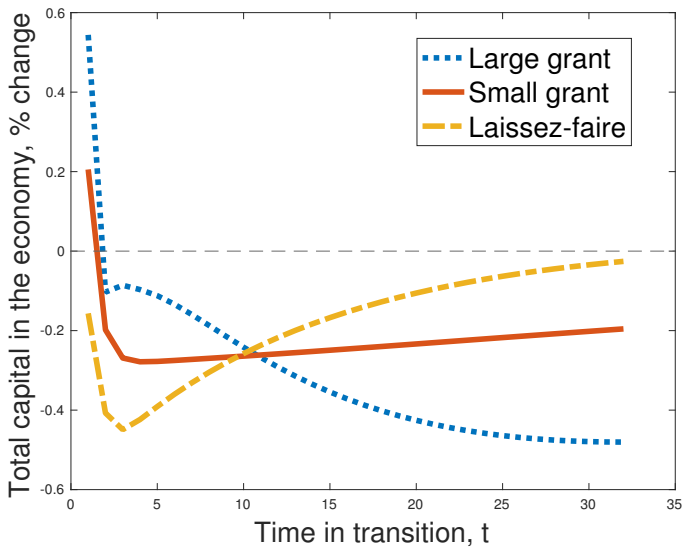
- Δ_{TFP} output loss due to TFP shock.
- Δ_L output loss due to drop in employment.
- Δ_{Exit} output loss due to firm exit.

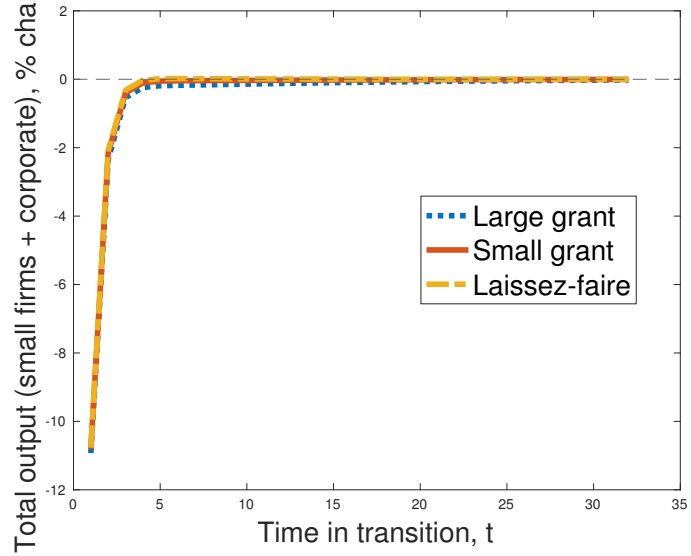


Impulse response by grant generosity

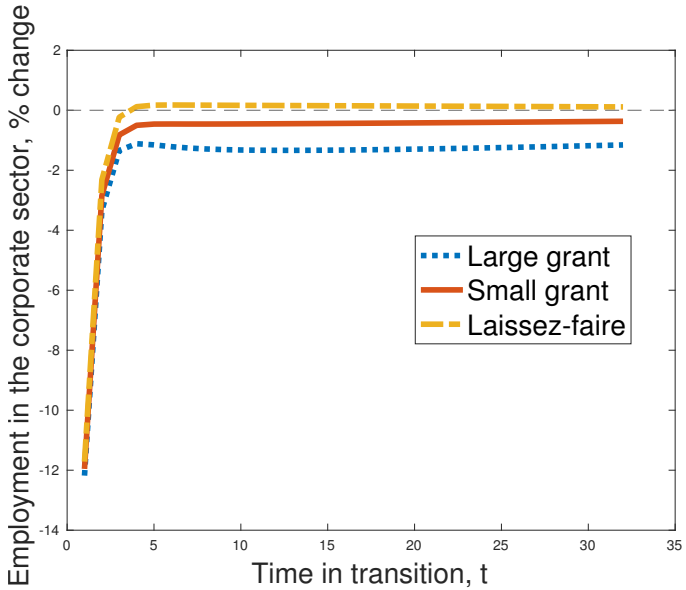


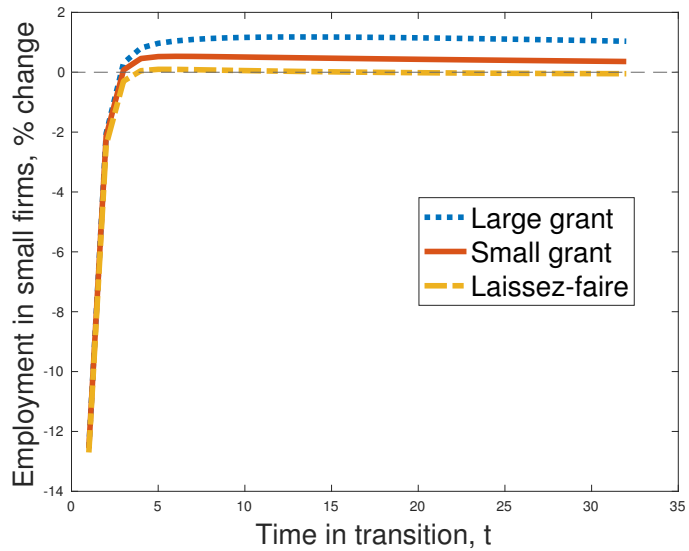


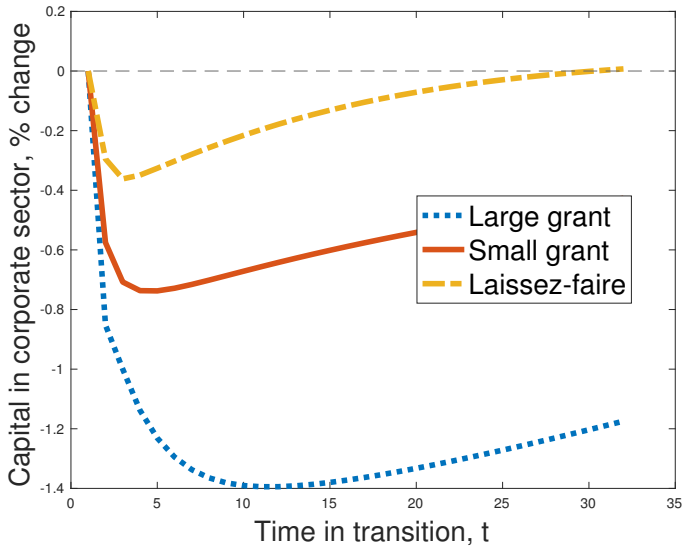


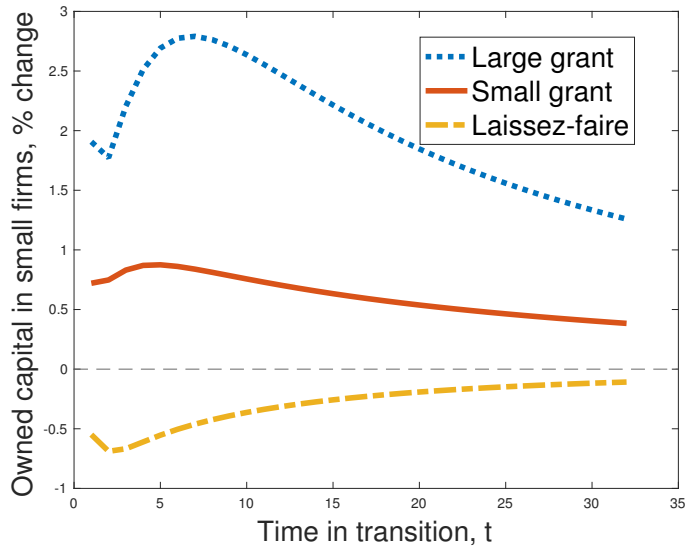


Impulse response by grant generosity relative to laissez-faire

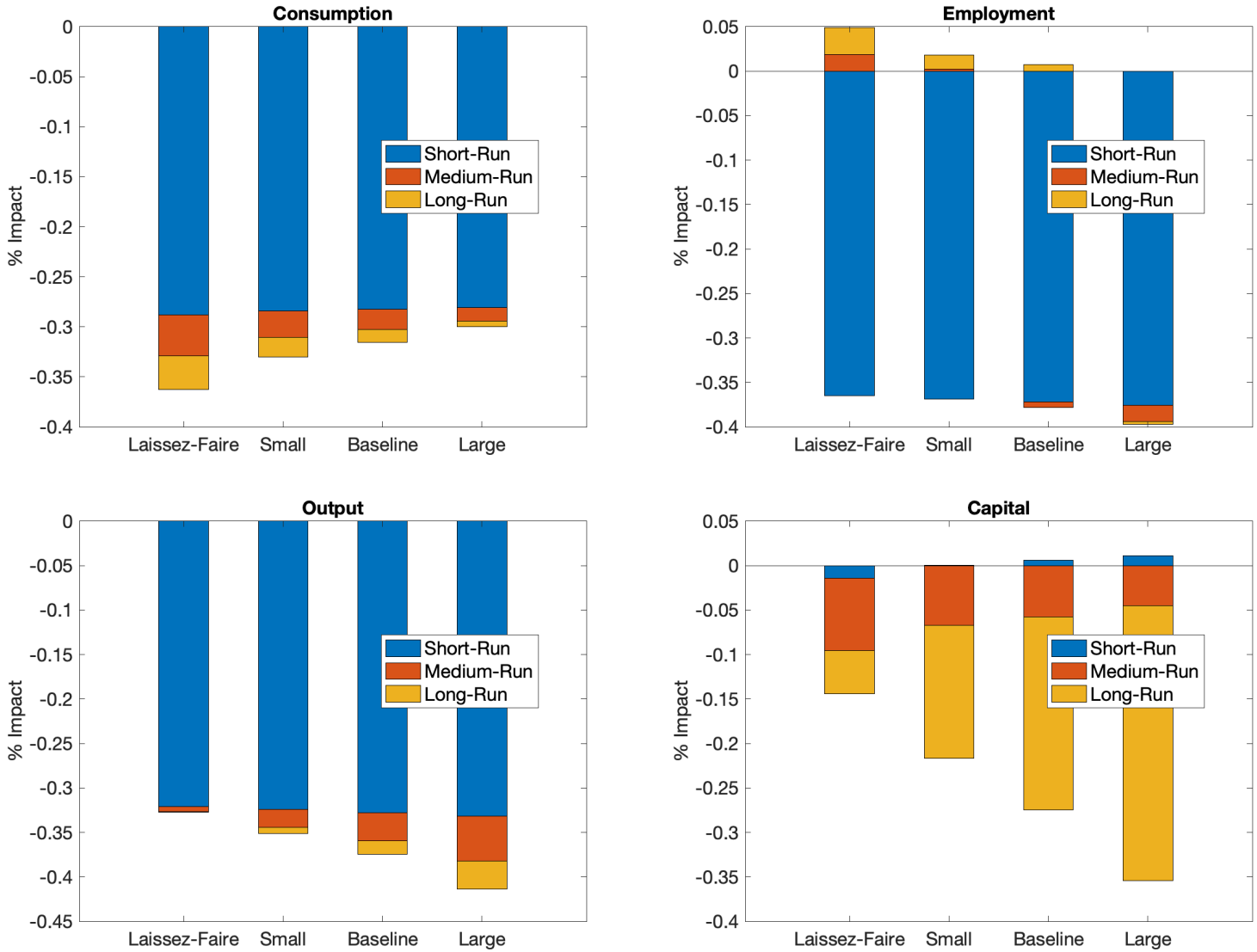








Short- and Long-Run Effects



Short-run = first two quarters; medium-run = Q3-Q12; long-run = Q13-Q40.

Conclusion

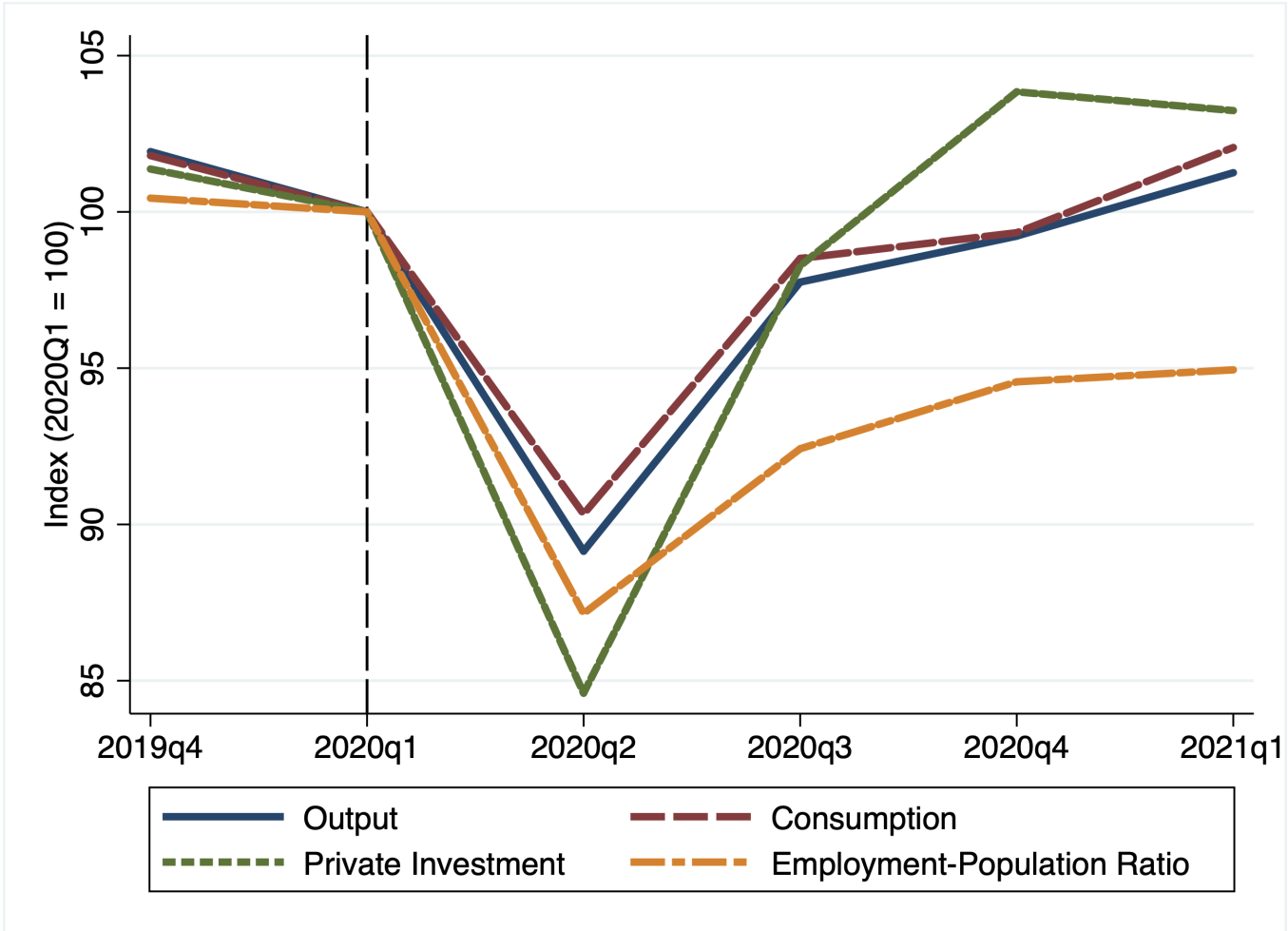
- We analyze the macroeconomic impact of small firms rescue policies in the Covid-19 recession using an equilibrium model with heterogeneous firms
- Rescue policies greatly reduced small-firm exits but had a negligible impact on aggregate output and employment
- The grant reduces reallocation towards the corporate sector and saves relatively low productive firms

Future work

- How the effect of small firms rescue policies differ in different types of recessions (Covid-19 recession vs “typical” recessions) ▸ More

Appendix

Covid-19 Recession



Data source: FRED.

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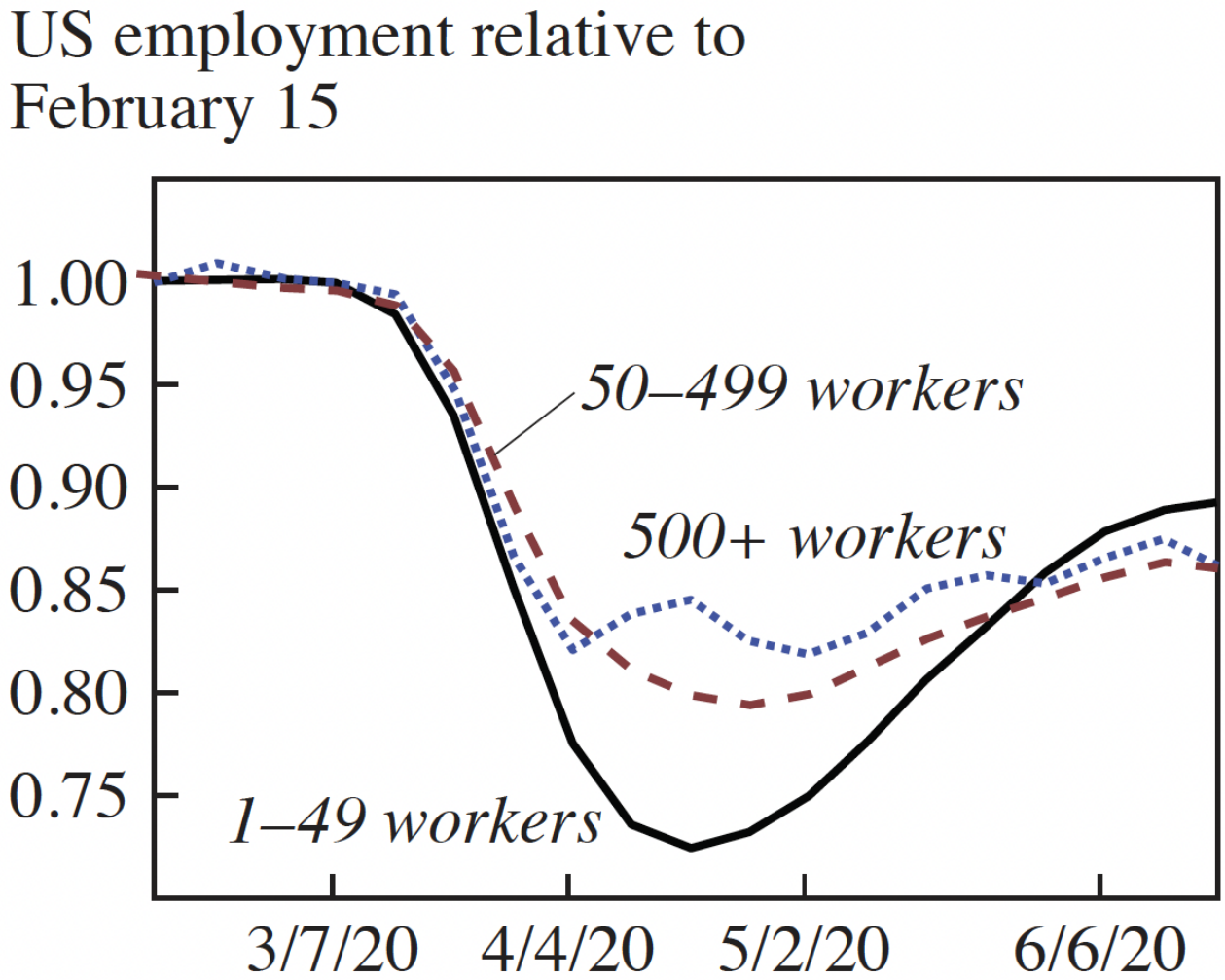
Covid-19 Recession - Small vs Large firms



Source: Cajner, Crane, Decker, Grigsby (2020) based on Automatic Data Processing Inc. (ADP) anonymized payroll records.

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Literature Review

- Macroeconomic analysis of public policies in the Covid-19 pandemic
  - Health policies: Eichenbaum, Rebelo and Trabandt (2020), Glover, Heathcote, Krueger and Rios-Rull (2020), Guerrieri, Lorenzoni, Straub and Werning (2020), Baqaee and Fahri (2020)
  - Fiscal policies: Bayer, Luetticke and Mueller (2020), Bigio, Zhang and Zilberman (2020), Faria-e-Castro (2021)
- Firm dynamics in the pandemic recession
  - Buera et al. (2021), Jo, Khan, Senga and Thomas (2021)
- Reduced-form studies of the pandemic recession
  - Bloom, Fletcher and Yeh (2021), Cajner, Crane, Decker et al. (2020), Autor, Cho, Crane and Goldar (2020)

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Small Firms: Value Function

Present value of a continuing firm is

$$v(x, b, \kappa) = \max_{b'} \underbrace{\pi(x, \kappa) - b + qb'}_{\text{dividend}} + q\mathbb{E}_x v^0(x', b', \kappa)$$

$$\text{s.t. } b' \leqslant \theta\kappa \quad \text{and} \quad \pi(x, \kappa) - b + qb' \geqslant 0 \ .$$

where v^0 is the value before exit decisions:

$$v^0(x, b, \kappa) = \begin{cases} \theta\kappa - b & \text{if the firm exits,} \\ v(x, b, \kappa) & \text{else} \end{cases}$$

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Resources Constraint

- The representative household maximizes lifetime utility.
- Markets for labor, financial asset, rental capital clear in each period.
- *Stationary competitive equilibrium*: Aggregate capital, financial asset, and small firm distribution are constant.

Consumption + Investment + Entry costs
= Total output + Liquation values

where

$$
\begin{aligned}
\text{Investment, small firms} &= \delta \int \kappa d\mu(x, b, \kappa) \\
\text{Investment, corp. sector} &= \delta K^c \\
\text{Entry costs} &= M \int (1 - \xi) \kappa d^e(x, b, \kappa) d\Phi(x, b, \kappa) \\
\text{Output, small firms} &= \int x f(\ell(x, \kappa)) d\mu(x, b, \kappa) \\
\text{Output, corp. sector} &= F(K^c, L^c) \\
\text{Liquation values} &= \int \kappa d^l(x, b, \kappa) d\mu^0(x, b, \kappa)
\end{aligned}
$$

Steady State Calibration: Parameter Values

Parameter	Description	Value	Source/Target
External parameters:			
β	Subjective discount factor	0.989	Annual interest rate of 4%
α	Capital Share, corporate sector	0.300	Standard
δ	Capital depreciation rate	0.015	Annual depreciation rate of 6%
γ_1	Capital Share, small firms	0.318	Jo and Senga (2019)
γ_2	Span of control, small firms	0.880	Jo and Senga (2019)
θ	Resale value of owned capital	0.500	Lanteri and Rampini (2021)
A	TFP shifter	0.250	Quarterly calibration
Internally calibrated parameters:			
M	Mass of potential entrants	107.966	Small firm share of employment
$c^f(\kappa_1)$	Fixed cost	0.395	Fixed expense to revenue ratio
$c^f(\kappa_2)$	Fixed cost	3.984	Firm exit rate by firm size
κ_1	Capital level	6.877	Capital to payroll ratio
κ_2	Capital level	164.478	Average firm size
			Employment share by firm size
$\Phi_\kappa(\kappa_1)$	Prob. of κ_1	0.363	Firm size distribution
ζ	Marginal utility of leisure	3.348	Time spent in market work
ε_x	Standard deviation of $\ln(x)$	0.107	Firm exit rate
ρ_x	Autocorrelation of $\ln(x)$	0.981	Autocorr. of employment
λ	Initial debt distribution	0.871	Debt to asset ratio
			Share of firms with debt
x_0	Productivity shifter of entrants	0.112	Average size of entrants

Rescue Grant in a "Typical" Recession

- A "typical" economic recession is less severe and more persistent.
- We set $\rho' = \rho^{1/2} > \rho$ and reduce the size of all shocks such that

$$\nu'^s = \nu^s \frac{1-\rho'}{1-\rho} \text{ for all } s \in \{c, n, d, \ell\}$$

- What is the effect of the small firm grant in a typical recession?

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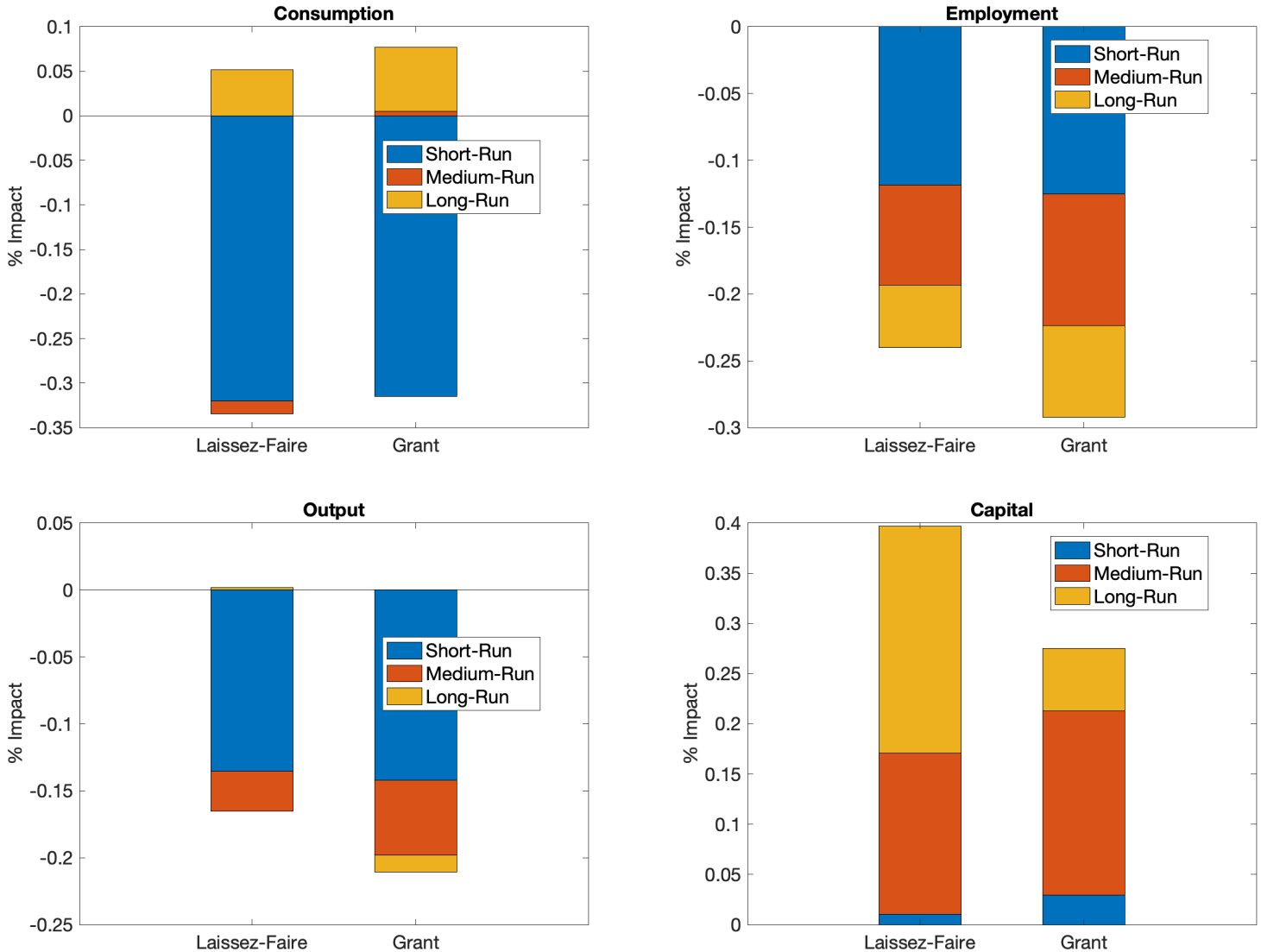
Short- and Long-Run Effects: Persistent Aggregate Shock



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