Business Dynamism, Sectoral Reallocation, and Productivity in a Pandemic

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Motivation: Reallocation During the Pandemic

- The Covid-19 is a shock with uneven effects across and within sectors;
- **Inter-sectoral reallocation**: sectors that rely more on personal interaction experienced a long lasting decline in demand e.g. Barrero at al. (2020)
- **Intra-sectoral reallocation**: Inter-sectoral reallocation may force an intra-sectoral reallocation since firms may have different ability to adapt to the shock.

Entry, Exit, Sectoral and Aggregate Productivity

- We study how
  1. reallocation of entry and exit across sectors
  2. reallocation of demand across sectors

  Affected sectoral and aggregate productivity in the early phase of the pandemic

US Business Formation Statistics

- We consider US monthly Business Formation Application (BA) data
- We assign industries to either the socially-intensive sectors, or to non-socially intensive sectors, following the partition of industries proposed by Kaplan et al. (2020).
- BA indicate that the pandemic represents a large and temporary shock to the Social Sector, that shifted entry opportunities from Social sectors to Non-social sectors.

BA in Social Sectors

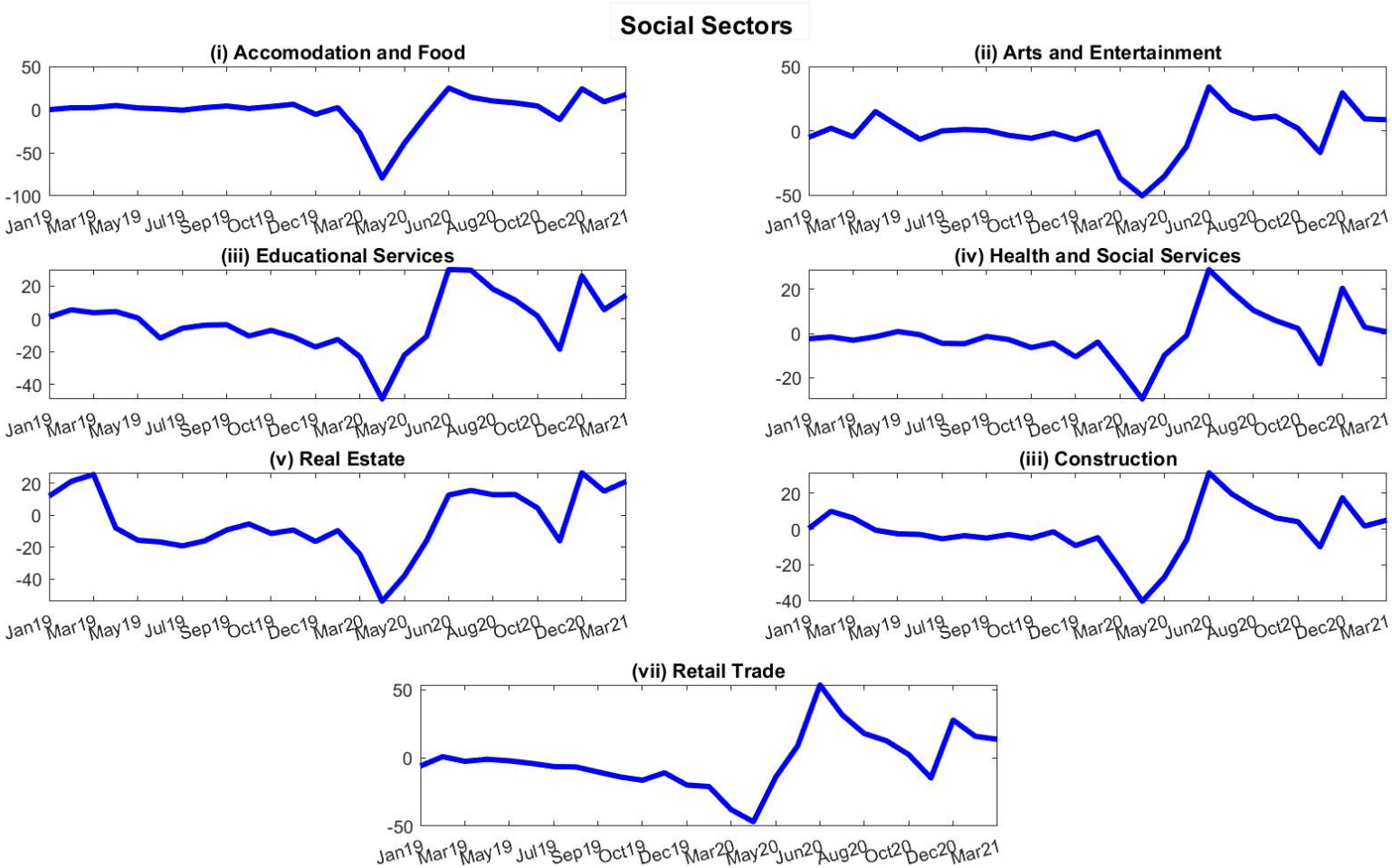


Figure 1: Business Applications (BA) in Social Sectors: perc. devs from trend

BA in Non Social Sectors

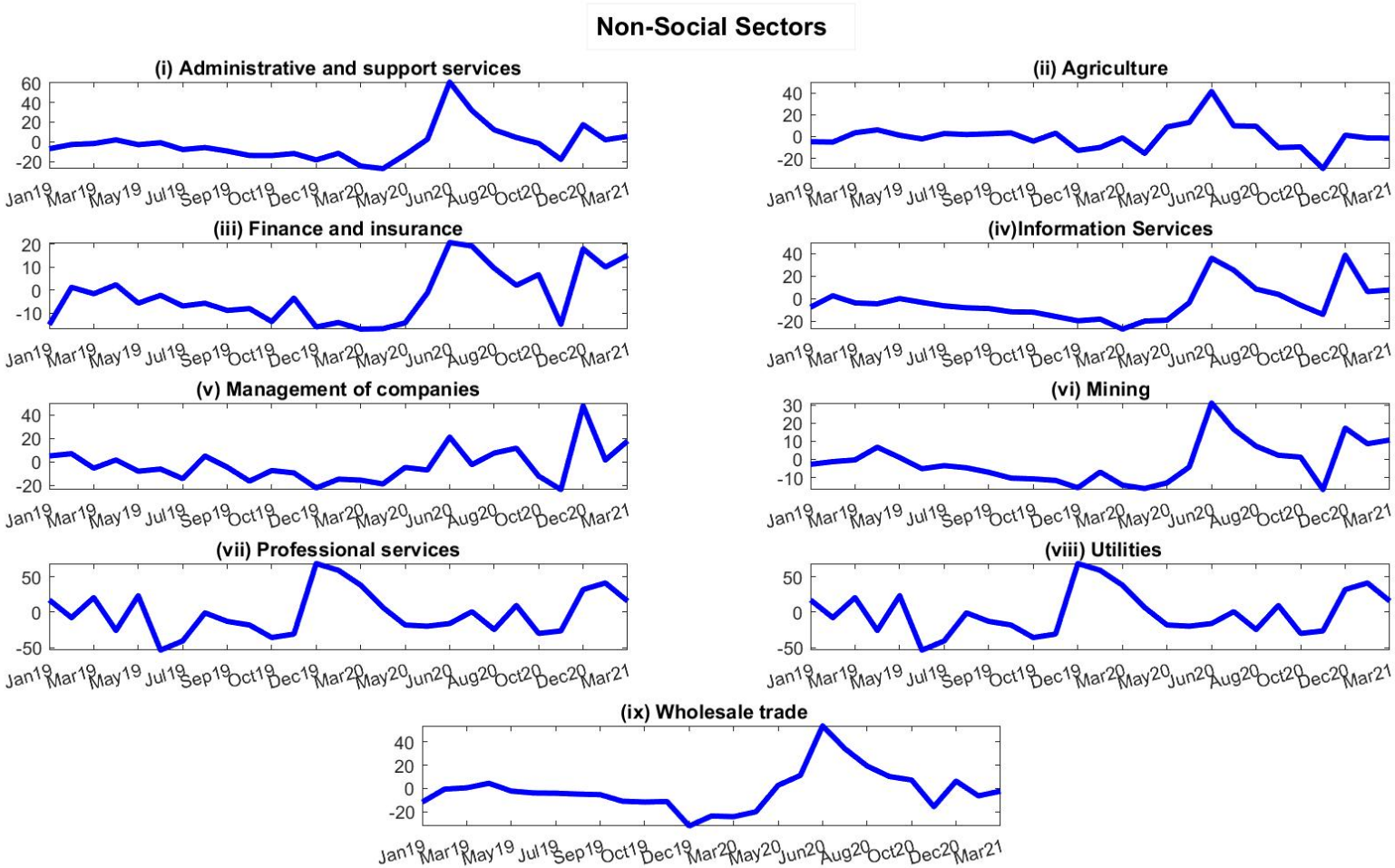


Figure 2: Business Applications (BA) in Non-Social Sectors: perc. devs from trend

Reallocation, Business Dynamism and Productivity

- Firm entry and exit are a critical component of productivity dynamics induced through reallocation: e.g. Foster et al. (2018).
- The reallocation of business opportunities from less profitable industries to more profitable ones, could also play a critical role for aggregate productivity.

Entry, Exit and Productivity

- To capture the effects of inter-sectoral and intra-sectoral reallocation on productivity, we build an **Epidemiological-Industry Dynamic model** with endogenous entry/exit, heterogeneous firms in terms of productivity, and two sectors: social and non-social.

Preview of Results

In response to the outburst of the COVID-19 pandemic:

1. The behavioral response of households leads to **reallocation of demand toward the non-social sector**. This lead to the heterogeneous entry patterns we saw in the data
2. **Cleansing** in the social sector, **Sullying** in the other.
3. **Aggregate labor productivity:** Reallocation across sectors, and opposite sectoral productivity dynamics explain the dynamics of aggregate labor productivity during the Pandemic.

Mechanism and Intuition: Reallocation

1. Contagion through consumption (just) in the social sector, and through working (in both sectors).
2. Due to fear of contagion agents cut consumption of the social good and partially substitute it with that of the non social good.

Mechanism and Intuition: Sectoral productivities

- In the Social Sector

  1. Due to the drop in revenues, break even requires higher idiosyncratic productivity:
  2. Only firms with higher productivity will find convenient to enter
  3. Cleansing of low-productivity firms which implies an increase in productivity in the social sector.

- In the Non-Social Sector:

  Opposite dynamics with respect to 1-3.

Mechanism and Intuition: Aggregate productivity

- **Cleansing in the social sector**, together with **reallocation across sectors**, are the key dimensions to consider in order to explain the empirical dynamics of aggregate labor productivity during the Pandemic.
- Neglecting one of the two dimensions leads to counterfactual dynamics in aggregate productivity.

Additional Results

1. **Accomodative Monetary Policy**: crucial to replicate the differing patterns of business creation across sectors observed during the pandemic.
2. **Economies with large Social Sectors**: consistently with IMF evidence, we obtain a positive relationship between the size of the social sector and the severity of the recession
3. **Social Distancing**: leads to a trade-off between the duration of the recession, and its depth.

Epidemiological Industry Dynamics Model

Demand Side:

1. **SIR epidemiological** model.
2. Unitary continuum of homogeneous households/families, populated by unitary continua of ex-ante homogeneous individuals.

Supply Side:

1. NK industry model with **two sectors**: Social vs. Non-Social sector.
2. Firms are endowed with **heterogeneous productivity levels**, determined once for all at birth.
3. Firms' dynamics: **sectoral endogenous entry and exit**.
4. Roundabout productivity to capture network effects.
5. Nominal rigidities: **sticky wages**.

SIR Model

Ex-post individual **heterogeneity** due to the pandemic status.

Households' (aggregate) epidemiological state is given by the shares of susceptible individuals $\mathcal{S}_t$ ($\mathbb{S}_t$), infected $\mathcal{I}_t$ ($\mathbb{I}_t$), dead $\mathcal{D}_t$ ($\mathbb{D}_t$) and recovered $\mathcal{R}_t = 1 - \mathcal{S}_t - \mathcal{I}_t - \mathcal{D}_t$ ($\mathbb{R}_t$). Types evolve according to:

$$\mathcal{S}_{t+1} = \mathcal{S}_t - \mathcal{T}_t$$

$$\mathcal{I}_{t+1} = \mathcal{I}_t + \mathcal{T}_t - (\pi_r + \pi_d)\,\mathcal{I}_t$$

$$\mathcal{D}_{t+1} = \mathcal{D}_t + \pi_d \mathcal{I}_t$$

where the fraction of **newly infected** individuals $\mathcal{T}_t$ is given by:

$$\mathcal{T}_t = \mathcal{S}_t \mathbb{I}_t \pi_1 c_t(s)\, C_t(s) + \mathcal{S}_t \mathbb{I}_t \pi_2 l_t^s L_t^d + \pi_3 \mathcal{S}_t \mathbb{I}_t$$

Theoretical Framework - Firms

- Firms compete monopolistically by maximizing real profits in sector $(\cdot)$, under a Cobb-Douglas technology with roundabout (and fixed costs).

- Setting the real profits to zero, we can solve for the cut-off productivity $z_t^c(\cdot) \rightarrow$ minimal productivity required to break even in a given sector and remain operative.

$$z_t^c(\cdot) = \underbrace{\frac{\theta^{\frac{\theta}{\theta-1}}}{\theta-1}}_{preferences} \underbrace{mc_t}_{marginal\,costs} \underbrace{\overbrace{\left(\frac{f_{x,t}}{Y_t(\cdot)}\right)^{\frac{1}{\theta-1}}}^{fixed\,costs}}_{CES+SIR}$$

Theoretical Framework - Firms (II)

The form of the demand of the social good departs from standard C.E.S. demand. It takes into account the effect of exposure

$$\frac{Y_t(s)}{Y_t} = \chi \left(\lambda_t \rho_t(s) + \lambda_{\mathcal{T},t} \frac{\mathcal{S}_t \mathcal{I}_t}{1 - \mathcal{D}_t} \pi_1 C_t(s) \right)^{-\eta} \left(\frac{C_t}{1 - \mathcal{D}_t} \right)^{-\eta}$$

There is a direct effect of the pandemic on sectoral productivity through demand
Main mechanism:

Covid shock $\rightarrow$ Behavioral response $\rightarrow$ Inter-sectoral reallocation $\rightarrow$ Asymmetric effects on the **cut-offs** through demand.

Changes in the cut-off affect entry and *exit* margins as well as the average sectoral productivity.

Theoretical Framework - Entry, Exit and Inactivity

- Entry occurs up to the point where the expected value of the potential entrant in a sector, $\tilde{v}_t(\cdot)$, is equal to the entry costs:

$$\tilde{v}_t(\cdot) = f_{e,t}(\cdot) \quad \text{where} \quad f_{e,t}(\cdot) = \psi_0 + \psi_1 \left[N_t^e(\cdot)\right]^\gamma$$

- Every incumbent or new entrant can be hit by an exit shock with probability δ at the very end of each period:

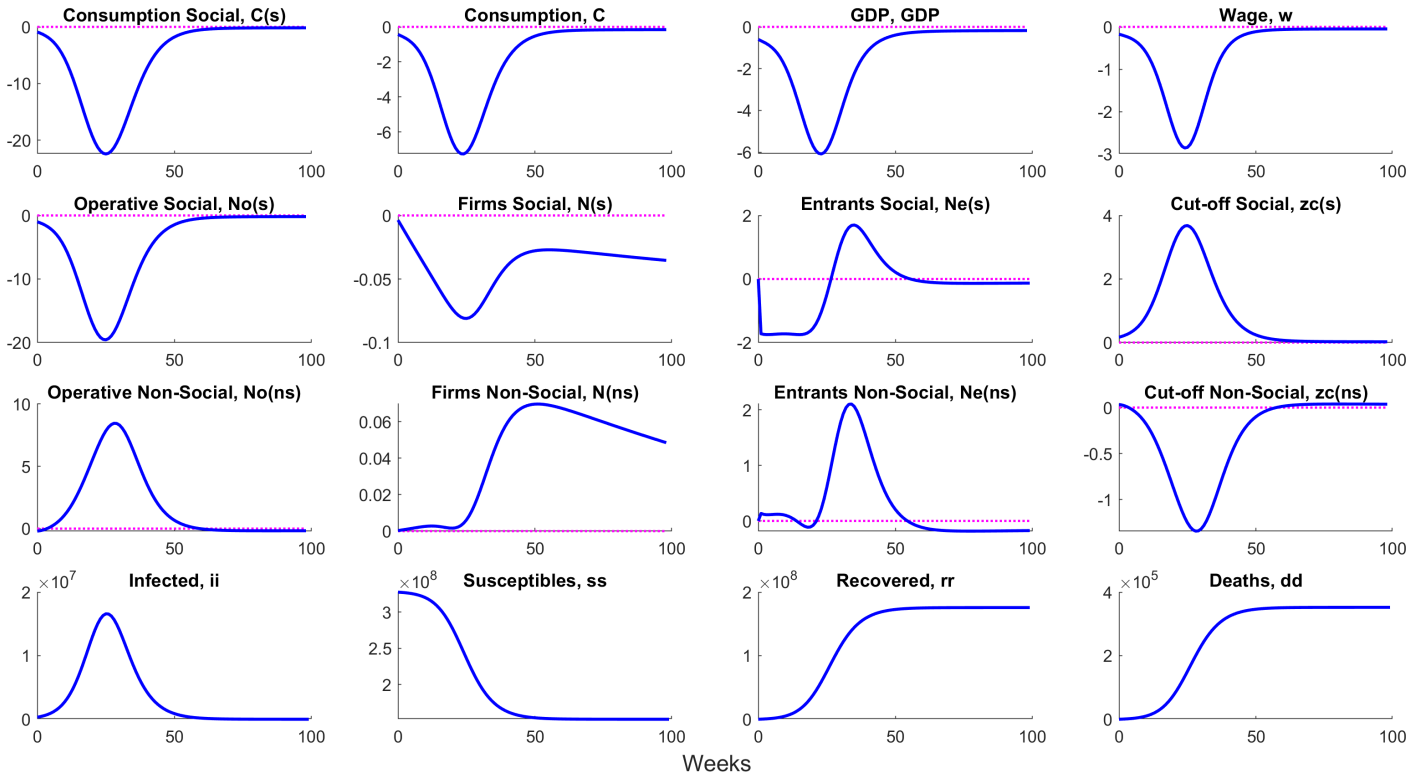
$$N_t(\cdot) = (1-\delta)(N_{t-1}(\cdot) + N_{t-1}^e(\cdot))$$

- In each sector, those firms that fall below the cut-off $z_t^c(\cdot)$ turn inactive. This is the endogenous component of exit.

Benchmark IRF to the Pandemic Shock

- The calibration of the SIR model follows Eichmbaum et al. (2020), which is based on data on the infection from South Korea.
- Initial contagion is due for 1/6 to consumption activities, for 1/6 to working activities and for 2/3 to random interactions.
- Covid Shock: 1/1000 of the popolulation is hit by the infection.
- Monetary policy rule has the standard Taylor calibration.

IRF - Benchmark



▸ Cross-Country ▸ Stickiness ▸ Social Distancing

Aggregate Productivity: Model Vs Data

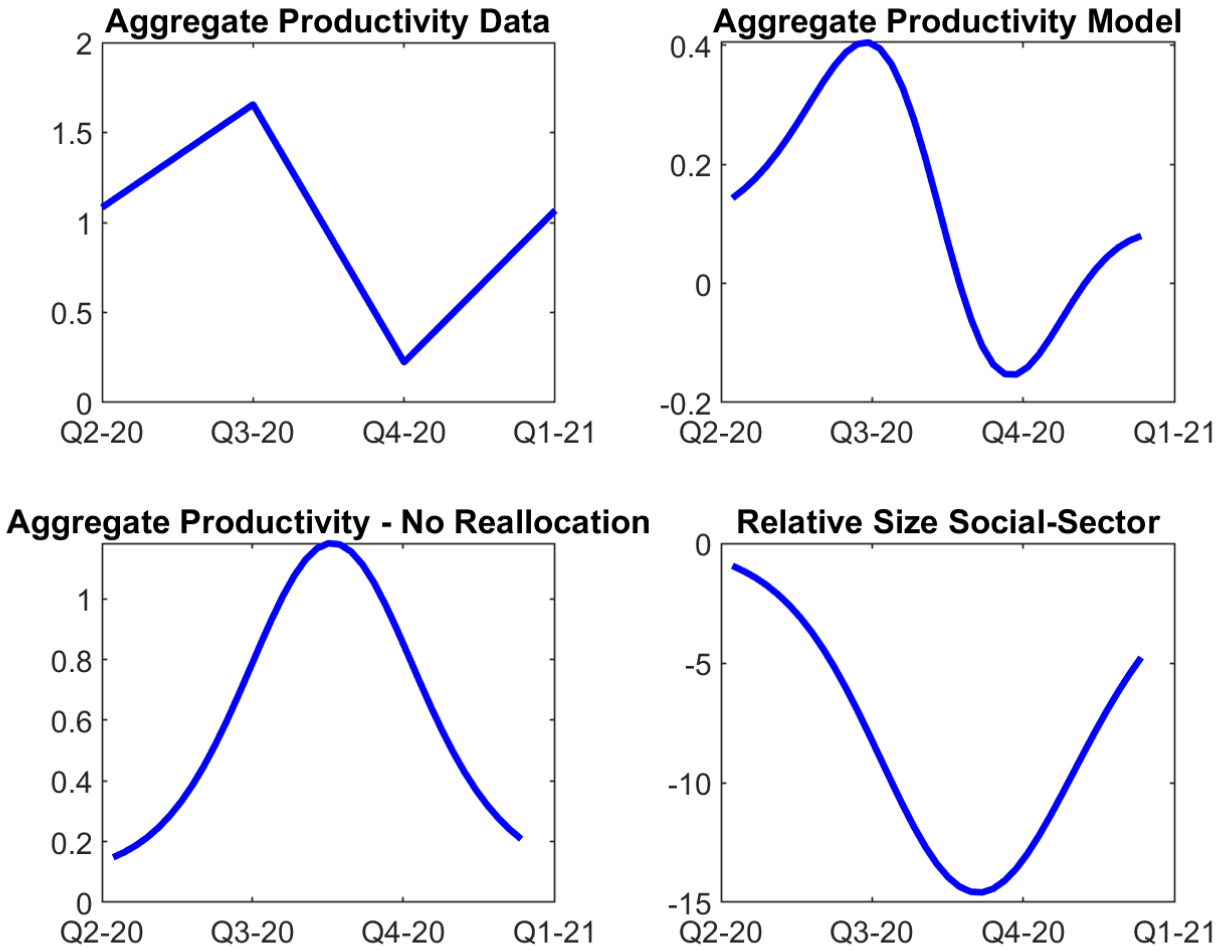
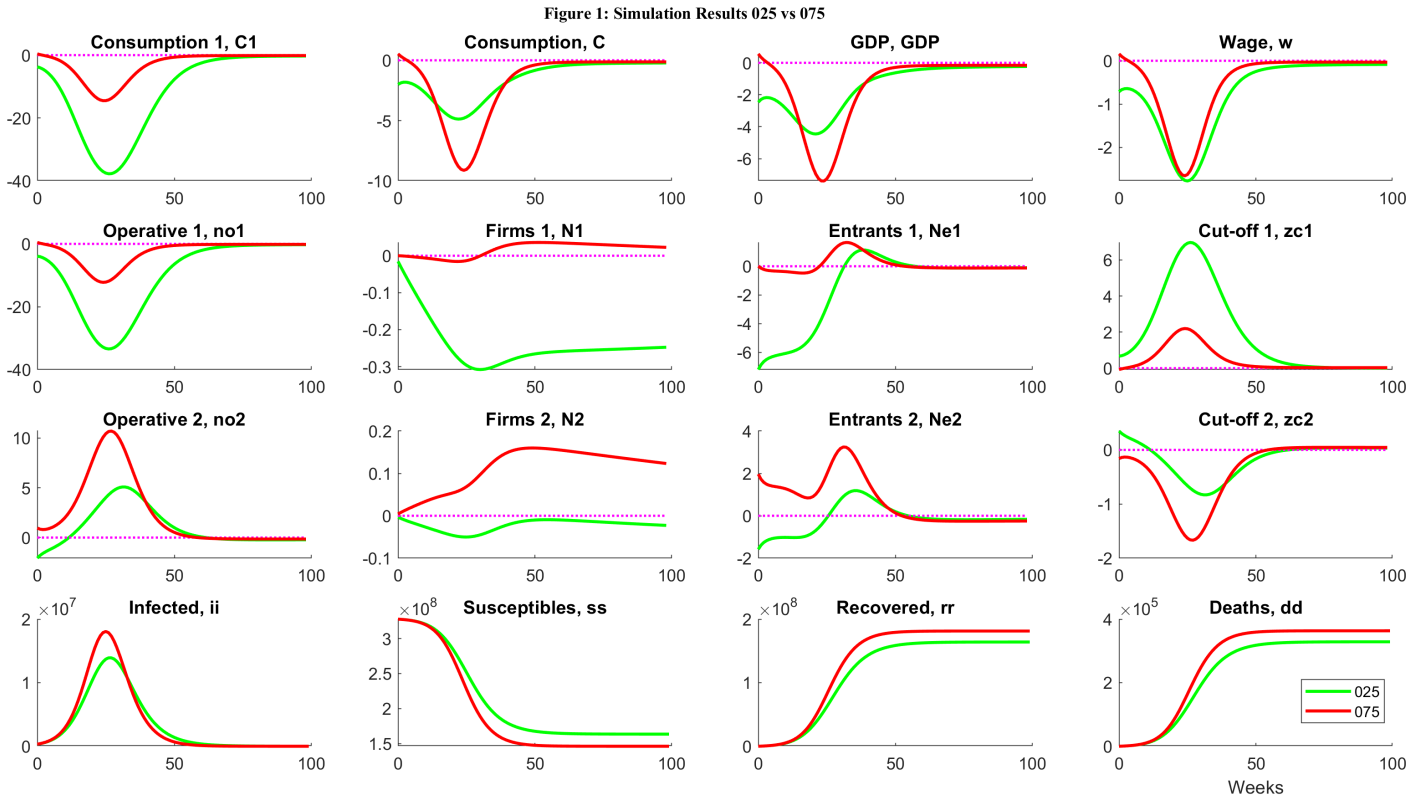


Figure 3: Top Panels: aggregate productivity in the model and in the data during the pandemic. Bottom Panels: productivity decomposition.

Conclusions

1. The Covid-19 is a shock with asymmetric effects across and within sectors;
2. We provide a framework that explains the reallocation of demand and entry opportunities across sectors observed during the Covid-19 pandemic.
3. The reallocation of demand leads to cleansing in the social sector and a decrease in productivity in non social sector $\rightarrow$ sector specific cleansing
4. The dynamics of Aggregate labor productivity in the crisis can be traced back to the behavior of the sectoral productivities and changes in sector relative sizes.
5. An Accomodative Monetary Policy is a crucial to explain business dynamism during the pandemic.

Cross-Country Comparison



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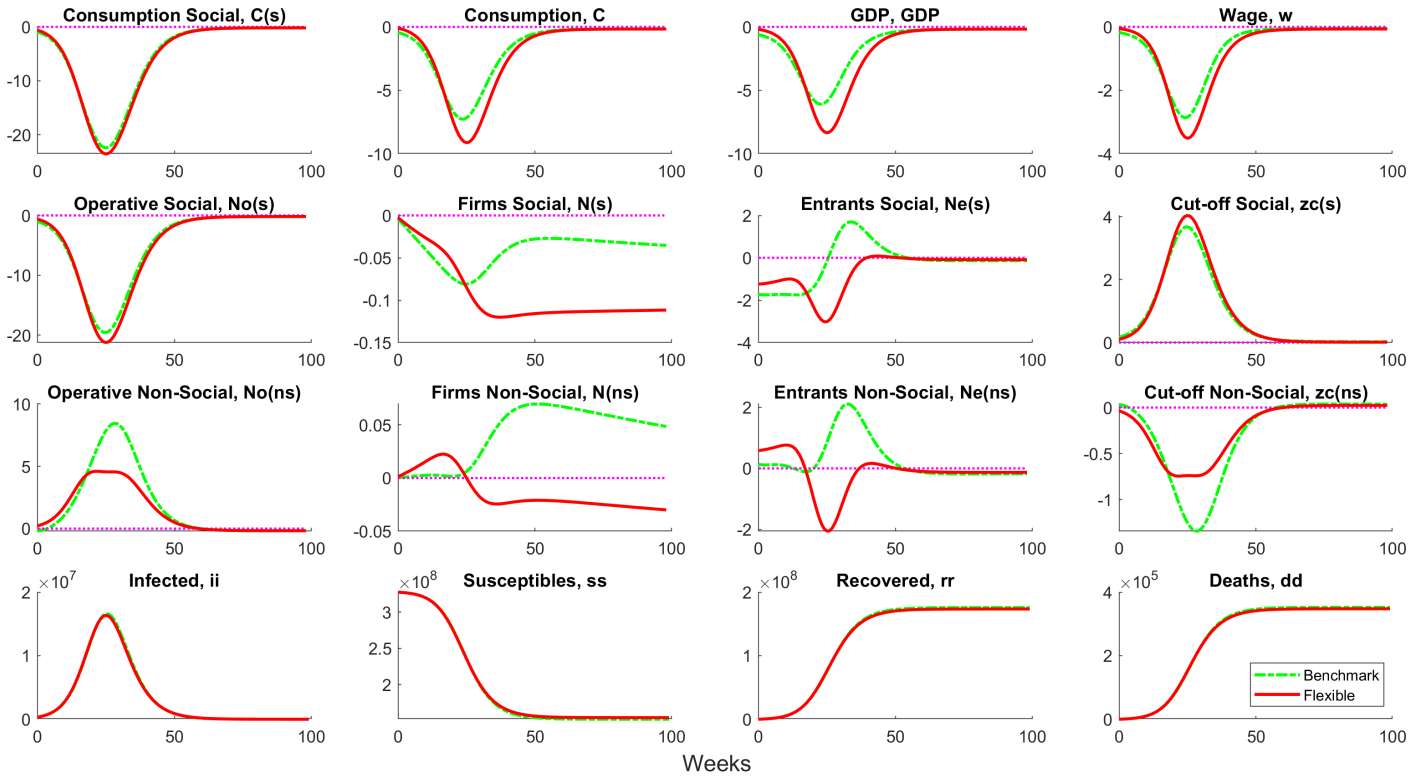
The Role of Monetary Policy



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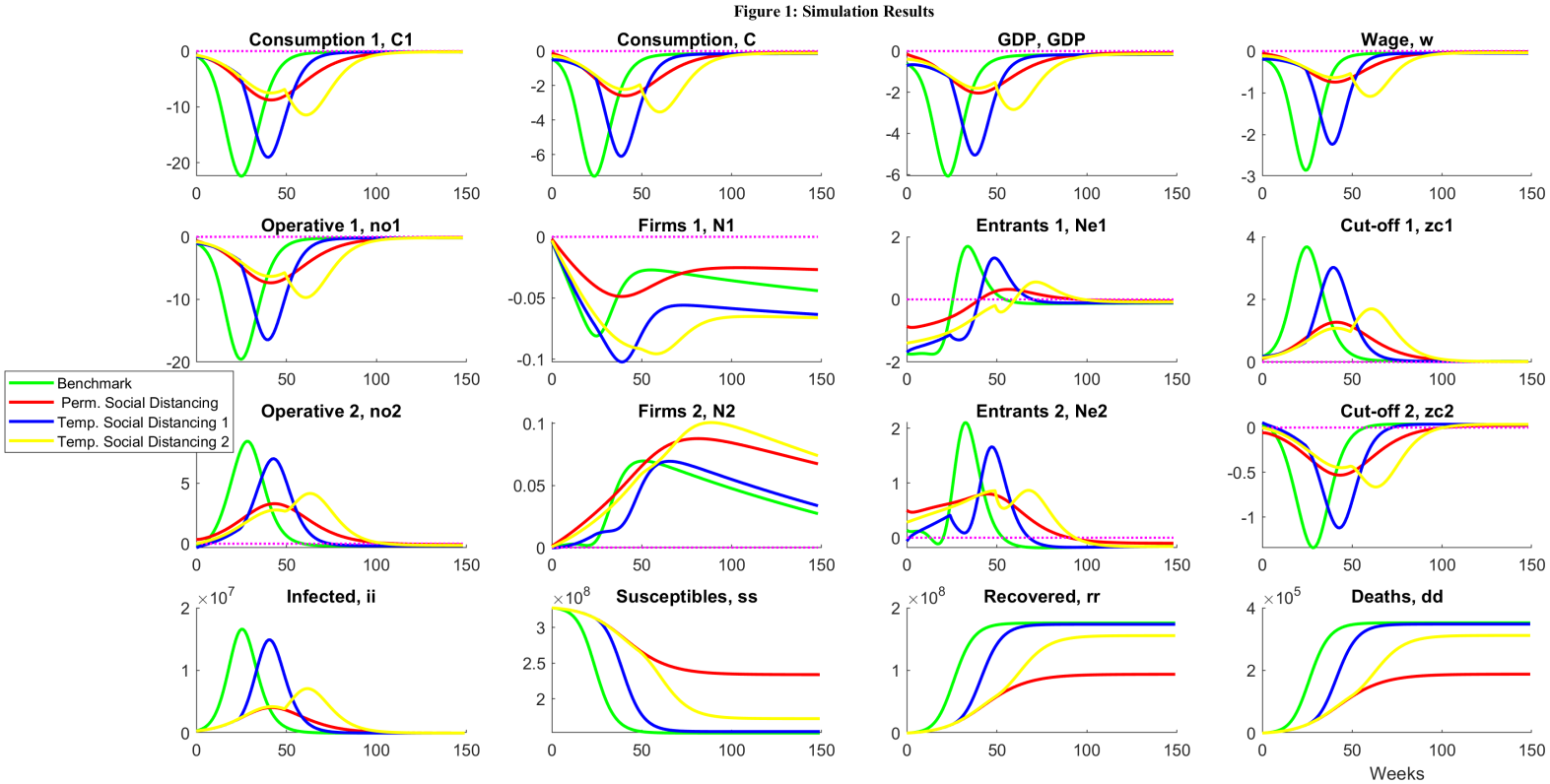
Social Distancing



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