Supply and Demand in Disaggregated Keynesian Economies with an Application to the Covid-19 Crisis

David Baqaee Emmanuel Farhi

UCLA Harvard

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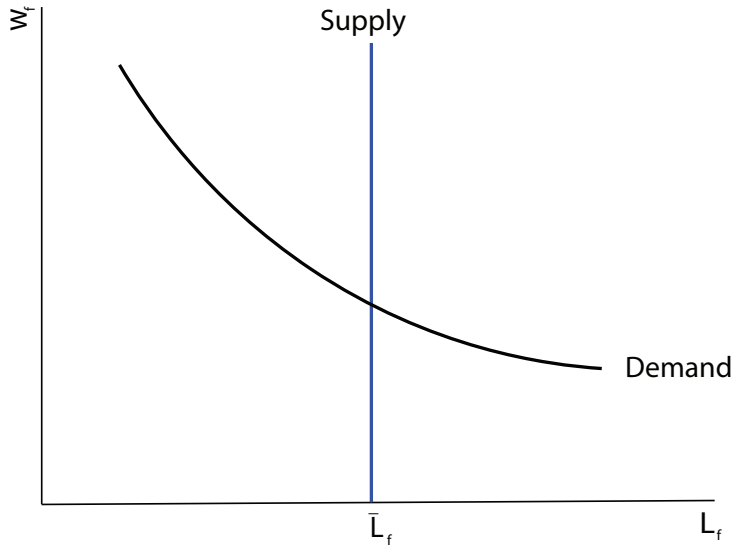
Approach

- Covid 19 mix of disaggregated supply and demand shocks.
- Divergent situation with coexistence of tight and slack markets.
- Macroeconomic implications? Policy implications?
- Use general disaggregated model and aggregate up.

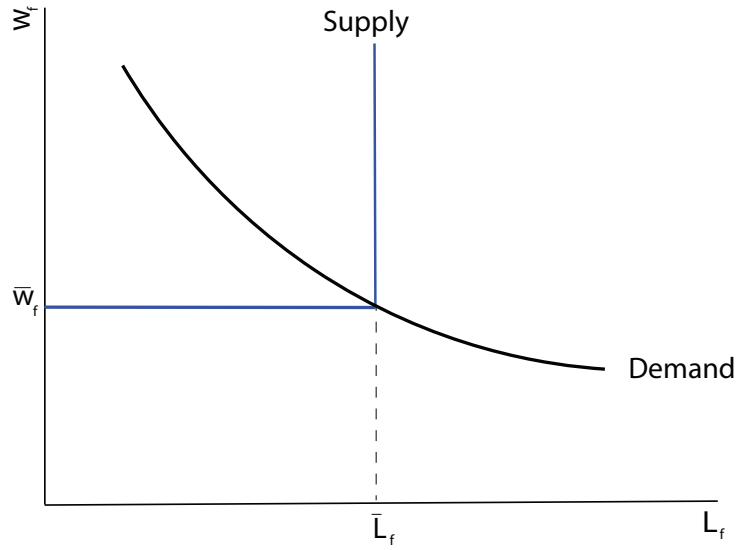
Model

- Two period: crisis present and post-crisis future.
- Multiple sectors and factors, input-output linkages, elasticities.
- Heterogeneous agents, credit constraints.
- Downward nominal wage rigidities, ZLB.

Equilibrium in Factor Markets



(a) Factors in $\mathscr{K}$



(b) Factors in $\mathscr{L}$

- "Capitals" $f \in \mathscr{K}$: always flexible.
- "Labors" $f \in \mathscr{L}$: flexible ($f \in \mathscr{F}$) or rigid ($f \in \mathscr{R}$) in equilibrium.

Supply and Demand Shocks

- **Supply shocks**: factor endowments and productivities (social distancing, shut-downs, health-related capacity constraints...).

- **Demand shocks**: changes in behavior *given prices/income* (fear of infection, less utility from consumption, anhedonia,...).

Network and Elasticities

- Network, elasticities, credit-constraints alter flow of spending.
- For today's application:
  - unit consumption elasticities across time and sectors;
  - complementarities in production network with elasticity $\theta \leq 1$.
- Tarski's theorem to handle general networks:
  - equilibria are ranked (lattice);
  - global comparative statics for best equilibrium.

Negative Supply Shocks

Proposition

For any network structure, negative supply shocks:

- *sectoral employments* $\downarrow$*;*
- *real GDP* $\downarrow$*;*
- *price level* $\uparrow$*.*

- Complementarities *amplify* supply shocks.
- Similar intuition to Guerrieri et al. (2020)

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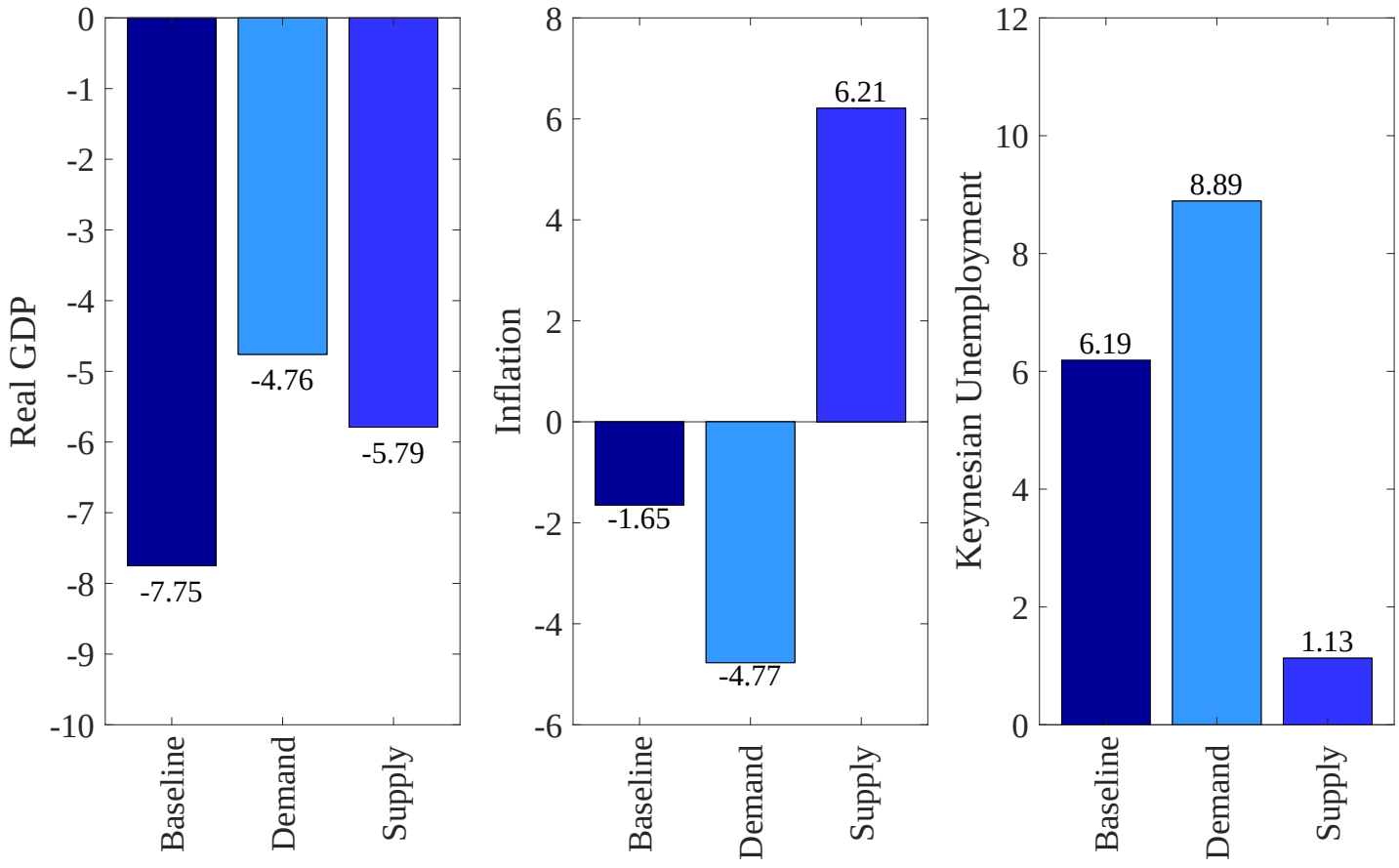
Quantitative Illustration

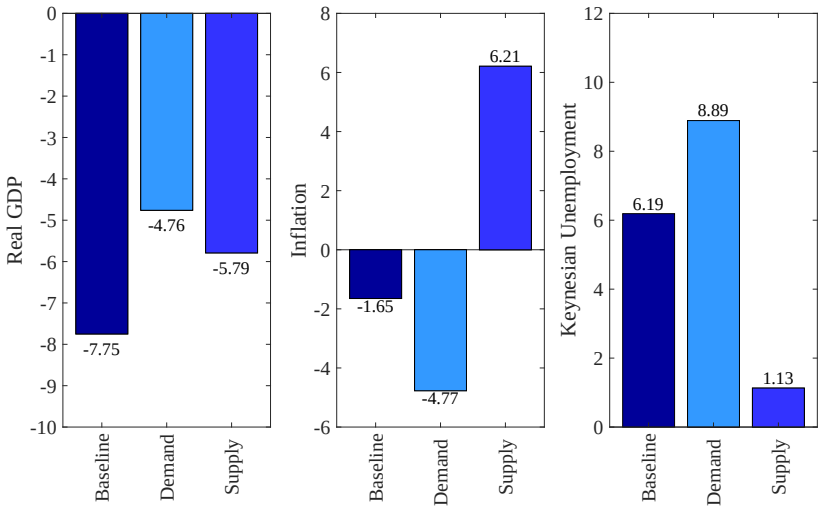
- Stylized version of U.S. economy: 66 sectors, sectoral production using capital, labor, and intermediates.
- Factors cannot be reallocated across sectors (short run).
- No credit constraints to start, introduce later.
- Shocks to match data in May compared to February:
  - (labor supply) hours worked by sector ($\sim -13\%$ on average);
  - (demand) final demand by sector ($\sim -10\%$ reduction on average);
  - use no information about prices (external check later).

Aggregate Outcomes



Realistic Complementarities

Aggregate Outcomes: Comparison to Cobb Douglas



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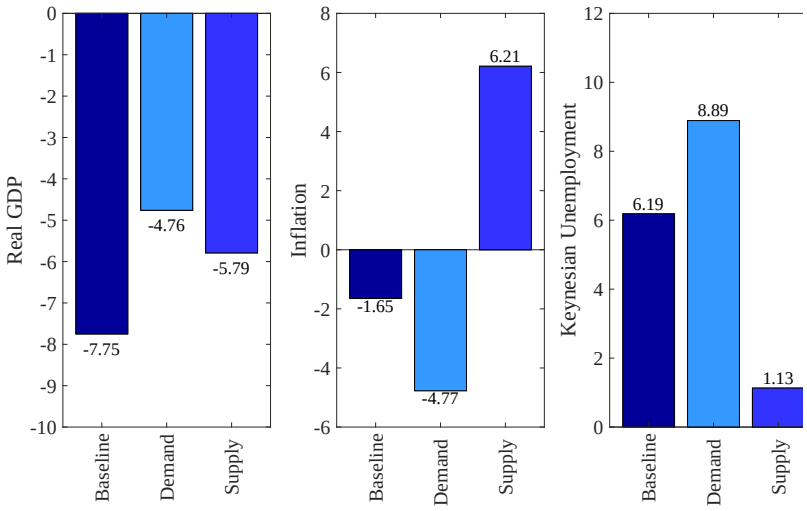

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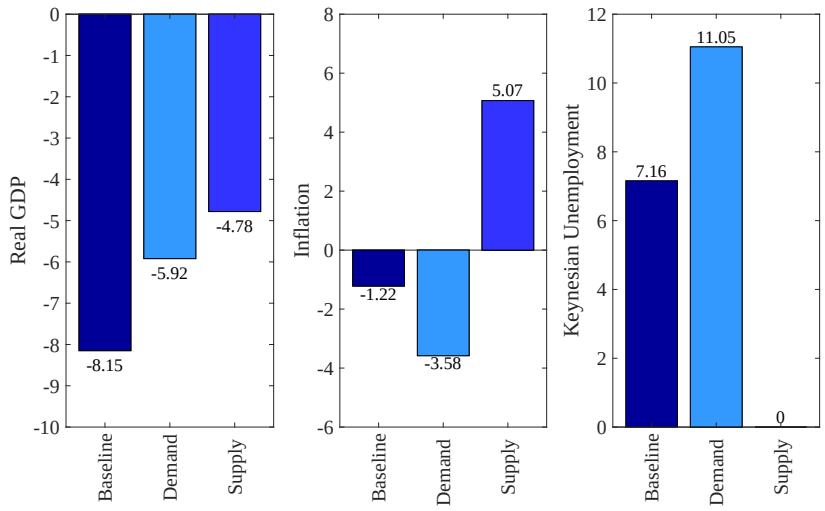
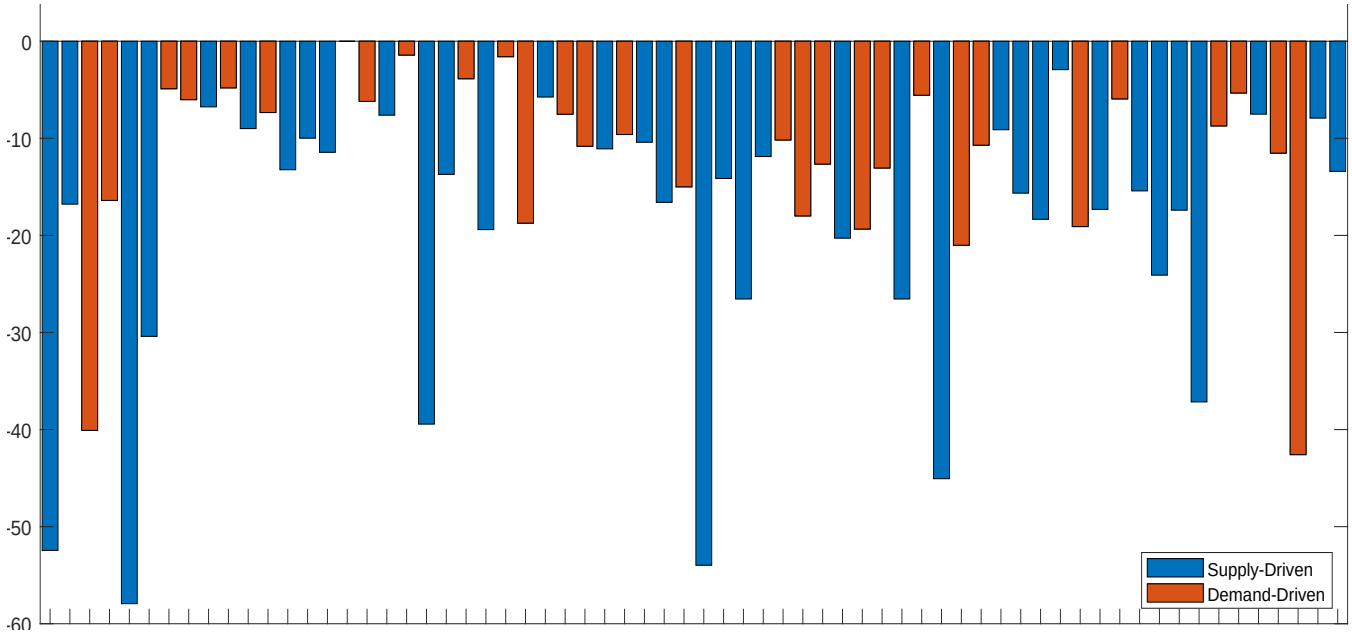


Cobb Douglas

- Complementarities amplify supply shocks.
- Complementarities mitigate demand shocks.

Hours Worked Across Sectors

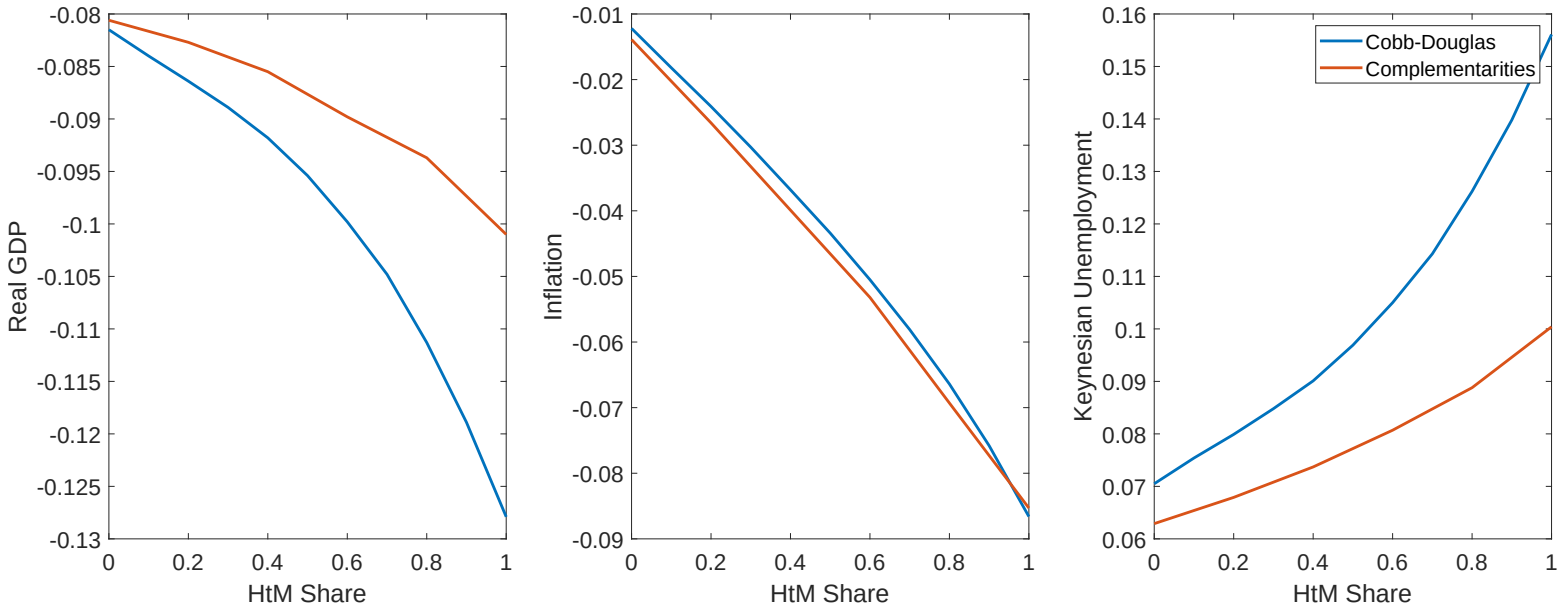


- Supply-constrained: food products and beverages (-8%), food services and accommodations (-39%), construction (-9%), and motion pictures (-54%)...
- Demand-constrained: air transportation (-40%), water transportation (-43%), rail transportation (-19%), and petroleum and coal (-21%) and oil and gas extraction (-18%)....

External Validity

- Calibration uses no information on sectoral prices.
- External validity check on prices comparing (model vs. data):
  - inflation in supply-constrained sectors ($\sim 1\%$ vs. $\sim 1\%$);
  - inflation in demand-constrained sectors ($\sim -4\%$ vs. $\sim -2.5\%$).

Implications for Social Insurance



- Lack of social insurance amplifies shocks.
- Less so with complementarities.

Implications for Monetary Policy

- Negative supply shocks reduce monetary stimulus power by 1/2.
- Complementarities reduce monetary stimulus power by extra 1/2.
- Monetary stimulus 1/4 as effective as in typical recession.

Conclusion

- Separating supply & demand important for positive implications.
- Not enough for normative implications:
  - may not want to remove the supply-constraints;
  - may not want to stimulate the demand-constrained sectors.