

Macro Policy Trade-offs during Covid-19

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POLICY DISCUSSIONS

Health Policy + Self Protection \implies **Suppression of Sectors**

- ★ Sectoral impact of policy responses
 - (i) Supply restrictions on social prone production
 - (ii) Demand restrictions on social prone production
- ★ Through demand, effects can spill-over to other sectors

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Policy Tradeoffs \implies Widely Used Policy Mix

- ★ Aggregate Demand Externalities:
 - clear goals but, issue is implementation
- ★ **Lump-sum transfers**
- ★ **Credit Stimulus**
- ★ **Unemployment Insurance**

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Framing of Analysis \implies Same Gov Budget

- ★ **Where more bang for buck?**
- ★ **Speed?**

THINGS OUTSIDE OF TALK

Focus on Household Side Policies

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Missing Sectoral Aspects \implies

- ★ **Firm Side:** credit to firms to keep intangible capital alive
 - (i) jobs but also R&D, relations, etc.
- ★ **Bank System:** credit policy channeled through banks
 - (i) Capital support?
 - (ii) Regulatory forbearance?
 - (iii) Liquidity provision

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Focus on Household Side Policies

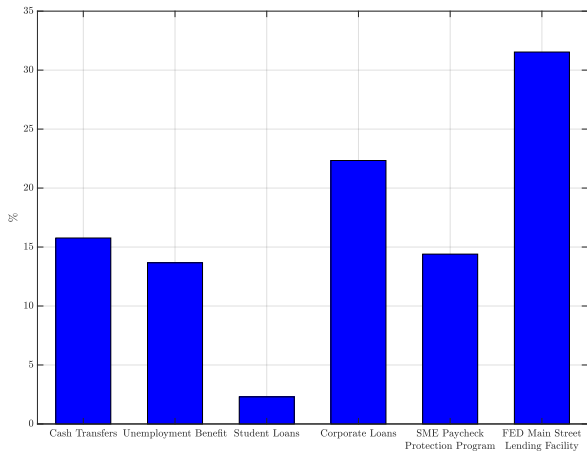
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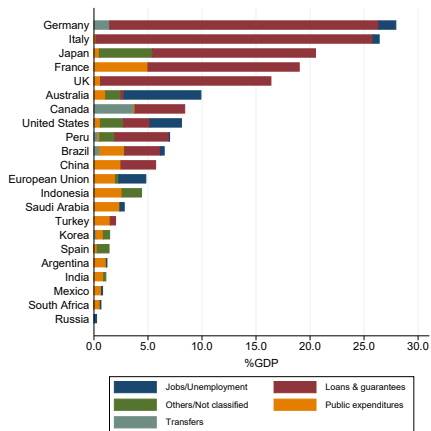
Key Economic Aspects \implies

- ★ **Moral Hazard**
 - absent but we should think of cost
- ★ **Source of Rigidity**
 - Wage rigidity: shortcut for deeper contractual rigidity/payments etc.

CARES ACT IN THE US



CROSS-COUNTRY RESPONSES



MAIN TAKEAWAY

Answer depends on extent of financial depth

- (i) Credit policy: greater kick, the wider credit limits
- (ii) Transfer policy: greater kick, the narrower credit limits

| | Natural Borrowing Limit | Zero Borrowing Limit |
|-----------------|-------------------------|----------------------|
| Credit Policy | ✓ | ✗ |
| Transfer Policy | ✗ | ✓ |
| UI | ✗ | ✓ |

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| Transfer Policy | ✗ | ✓ |
| UI | ✗ | ✓ |

- Intuition: goal is to target policy to highest MPC
 - transfers: not targeted
 - UI: targets unemployed, but not necessarily the poor
 - Credit policy limited by financial depth

OUTLINE FOR SECTION 2

- 1 Environment
 - Underlying Environment
 - The Household Sector
- 2 Analysis
 - Two Results
- 3 Policy Responses
 - Flexible Price Benchmark
 - Laissez-Faire
 - Policies and Debt Limits

ENVIRONMENT

Continuous Time, Two Sectors

One-time shock (unexpected but anticipated)

- Covid-19
- policy instruments

Aggregate Demand Externality

- Nominal Rigidity + Unemployment

Demographics

- banks, households, and consolidated government

HOUSEHOLDS

Two goods:

- akin to Guerrieri et al. (2020)
- c_t^r remotely consumed/produced
- c_t^s socially consumed/produced

Preferences ($1/\gamma$ is IES)

$$\mathbb{E} \left[\int_0^\infty e^{-\rho t} \left(x_t^{1-\gamma} - 1 \right) / (1 - \gamma) dt \right],$$

w/ bundle

$$x_t = \left(\alpha^{1/\epsilon} c_t^r^{1-1/\epsilon} + ((1 - \alpha) \beta_t)^{1/\epsilon} c_t^s^{1-1/\epsilon} \right)^{\epsilon/(\epsilon-1)}.$$

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Covid-19 shock

- β_t lockdown policy
- produces endogenous discount shock

$$\mathbb{E} \left[\int_0^\infty e^{-\rho t} \xi_t U(c_t) dt \right],$$

Condition $(1 - \gamma) / (\epsilon - 1) < 0$ grants $\frac{\partial \xi_t}{\partial \beta_t} < 0$

EMPLOYMENT DYNAMICS

Employed e_t and unemployed u_t

- uninsurable idiosyncratic risk $z \in \{u, e\}$

Transition probabilities

$$\Gamma_t^{eu} = \nu^{eu} + \phi_t^+ \text{ and } \Gamma_t^{ue} = \nu^{ue} - \phi_t^-,$$

- Natural flows $\{\nu^{ue}, \nu^{eu}\}$, endogenous flows ϕ

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Real income :

$$dw_t = y(z) \zeta_t dt + T_t dt,$$

- labor income $y(z)\zeta_t$
- ζ_t is wage
- $y(e) = (1 - \tau^l)$ and $y(u) = b_t$, is time varying unemployment insurance

SAVINGS AND CREDIT POLICY

The law of motion for real wealth follows

$$ds_t = \left(r_t a - r_t^l l - c_t \right) dt + dw_t,$$

Borrowing limit: $s_t \geq \bar{s} \geq 0$.

Spread $\sigma_t > 0$ is a choice variable:

$$\sigma_t = r_t^l - r_t.$$

- In work w/ Bianchi/Sannikov: open-market operations controls spread
 - take implementation as given

HOUSEHOLD PROBLEM

H-HJB

Household Problem is:

$$\begin{aligned} \rho V(z, s, t) = & \max_{\{c\}} \xi_t U(c) + \underbrace{V'(z, s, t)}_{\text{prec. demand}} [r_t(s)s - c + y(z) + T_t] \\ & + \Gamma_t^{zz'} \underbrace{[V(z', s, t) - V(z, s, t)]}_{\text{employment risk}} + \dot{V}(z, s, t). \end{aligned}$$

subject to $s \geq \bar{s}$.

EVOLUTION OF WEALTH

Real Wealth KFE

$$\partial_t f_t(e, s) = -\partial_s [\mu_t(e, s) f_t(s)] - [\nu^{eu} + (\phi_t)^+] f_t(e, s) + [\nu^{ue} - (\phi_t)^-] f_t(u, s),$$

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FINANCIAL MARKETS

Assets and liabilities:

$$A_t^b = \int_0^\infty \left[a_t^h(e, s) f(e, s, t) + a_t^h(u, s) f(u, s, t) \right] ds,$$

$$L_t^b + L_t^f = \int_{\bar{s}}^0 \left[l_t^h(e, s) f(e, s, t) + l_t^h(u, s) f(u, s, t) \right] ds,$$

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Goods and labor

$$\zeta_t (1 - U_t) \equiv Y_t = C_t \equiv \int_{\bar{s}}^\infty \left[\sum_{z \in \{u, e\}} c_t^r(z, s) f(z, s, t) + c_t^s(e, s) f(e, s, t) \right] ds,$$

AGGREGATE DEMAND BLOCK

Phillips curve

$$\dot{\pi}_t = \rho (\pi_t - \pi_{ss}) - \kappa (U_{ss} - U_t),$$

“modified Keynesian” block of Bigio-Sannikov (ϕ_t ensures clearing):

$$\dot{U}_t = \left[\nu^{eu} + \phi_t^+ \right] (1 - U_t) - \left[\nu^{ue} - \phi_t^- \right] U_t.$$

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Taylor rule

$$i_t^m = i_\infty^m + \eta \cdot (\pi_t - \pi_{ss})$$

BANKS + CONSOLIDATED GOVERNMENT

Banks: issue deposits A_t^b and hold loans L_t^b + reserves

- role: passthrough entity

Government:

- balance sheet: holds loans + reserves
- policies: UI, transfers, credit policy, Taylor rule (background)

Consolidated Gov Budget:

$$E_t \equiv L_t^f - M_t.$$

E_t net asset position

- L_t^f purchases of loans - government debt
- M_t monetary base $\rightarrow 0$, controls i^m

Consolidated Surplus:

$$\Pi_t^f = i_t^m L_t^f - i_t^m M_t - P_t T_t - \sigma_t L_t^b + w_t \tau^l (1 - U_t) - w_t b_t U_t,$$

- in paper we also discuss timing assumptions

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SUMMARY CONDITIONS

One clearing condition:

$$-\int_{\bar{s}}^0 s [f_t(e, s) + f_t(u, s)] ds = \mathcal{E}_t + \int_0^{\infty} s [f_t(e, s) + f_t(u, s)] ds$$

and

$$\underbrace{\dot{\mathcal{E}}_t}_{\text{gov real NAP}} = r_t \mathcal{E}_t + \underbrace{\mathcal{W}_t (\tau^l (1 - U_t) - bU_t)}_{\text{UI}} - \underbrace{(\sigma_t - \pi_t)}_{\text{credit}} \int_0^{\bar{s}} s [f_t(u, s) + f_t(e, s)] ds - \underbrace{T_t}_{\text{transfer}}$$

CONJECTURED: RICARDIAN PROPOSITION

Conditions for “Ricardian Equivalence”

Given $f_0 = f_{ss}$, $\sigma = 0$, let transfer/taxes serve as collateral:

$$\bar{s}^{(a)}(t) = \bar{s} + h(t)$$

and

$$h(t) \equiv \int_t^\infty \exp\left(-\int_t^\tau r^a(z) dz\right) T_\tau d\tau = \mathcal{E}_t.$$

Then, $\{T_t, \mathcal{E}_t\}$ satisfies Ricardian Equivalence.

No Impact of Credit Policy

Let $\bar{s} = 0$ then credit policy has no impact.

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Flexible Prices

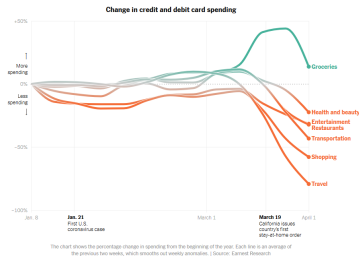
(Neutral Benchmark)

SECTORAL REALLOCATION

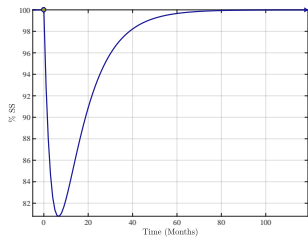
Reuters (midst of shutdowns): Amazon to add jobs as online orders surge during lockdowns

APRIL 13, 2020

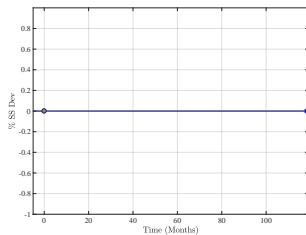
- Filled 100,000 positions and adding new jobs



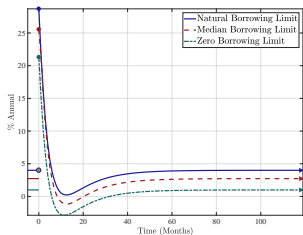
FLEXIBLE PRICES - SECTORAL REALLOCATION



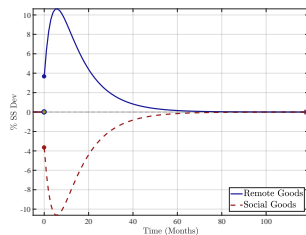
(1) Shock $\beta(t)$



(2) Output Y_t



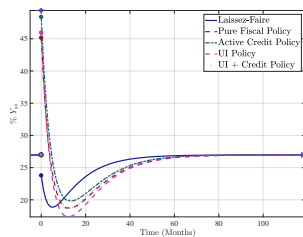
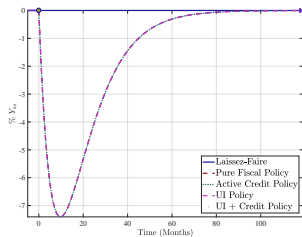
(3) Real Rates



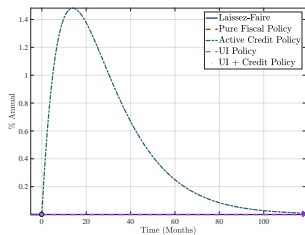
(4) Consumption C_t^r and C_t^s

Wage Rigidity (Policy Effects)

FOUR POLICIES

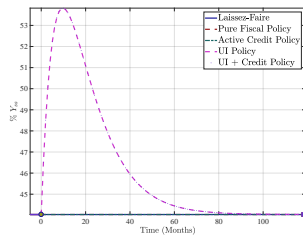


(1) Gov Net Asset Position \mathcal{E}_t



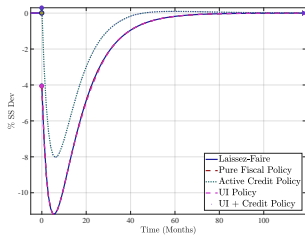
(3) Credit Subsidy $\sigma_t - \pi_t$

(2) Transfer T_t

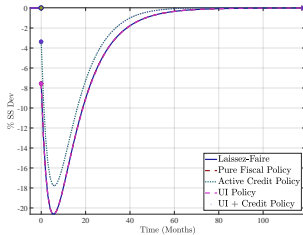


(4) Unemployment Insurance b_t

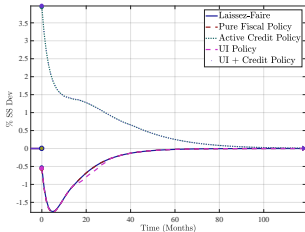
NATURAL DEBT LIMIT



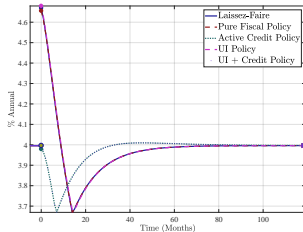
(1) Output Y_t



(2) Social Goods C_t^S

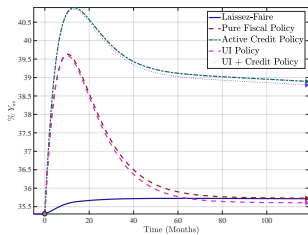


(3) Remote Goods C_t^r

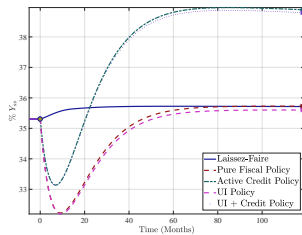


(4) Real Deposit Rate

NATURAL DEBT LIMIT



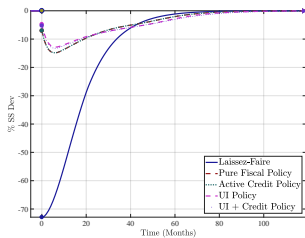
(1) Bank Deposits A_t



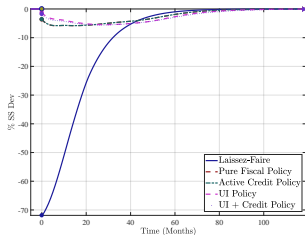
(2) Bank Loans L_t

Figure: Nominal Rigidity and Policies: Credit

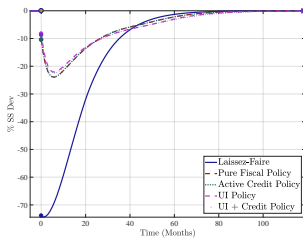
ZERO DEBT LIMIT



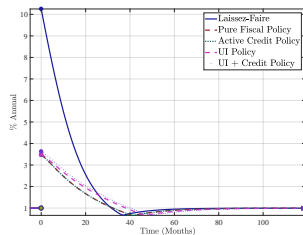
(1) Output Y_t



(3) Remote Goods C_t^r

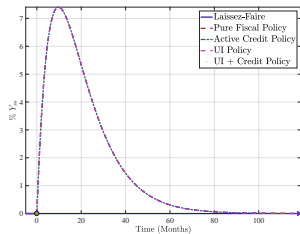


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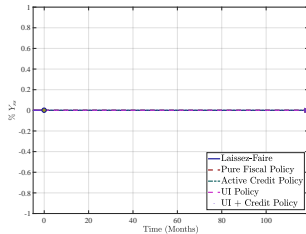


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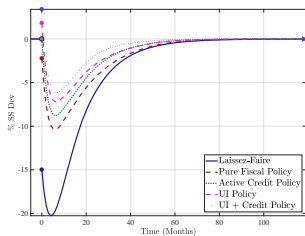


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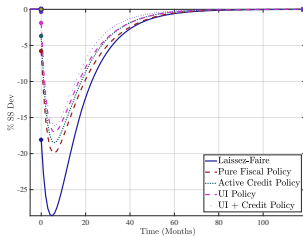


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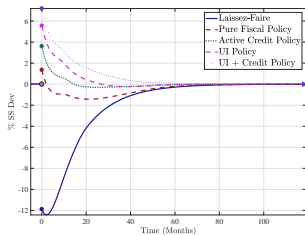
MODERATE CREDIT LIMIT



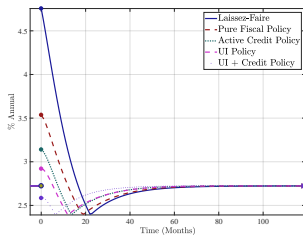
(1) Output Y_t



(2) Social Goods C_t^S



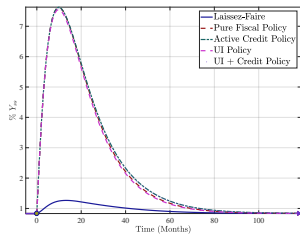
(3) Remote Goods C_t^R



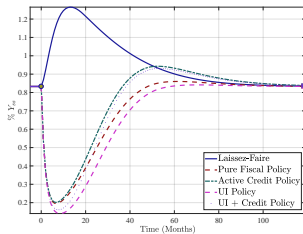
(4) Real Deposit Rate

Figure: Nominal Rigidity and Policies: Real Variables

MODERATE CREDIT LIMIT



(1) Bank Deposits A_t



(2) Bank Loans L_t