Fiscal Policy during a Pandemic

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Introduction

Fiscal Policy during a Pandemic

- Policies that have been proposed/implemented:
  1. Unconditional transfers
  2. Income tax cuts
  3. UI extensions/expansions
  4. Liquidity support to firms
  5. Other types of govt spending
- Shock different than most shocks FP is designed to stabilize
- Stimulus vs. stabilization policy

This paper:

1. Pandemic shock in a macro model
2. Quantitative effects of different types of fiscal policies

Approach and Results I

Epidemic shock in a standard macro model

- Incomplete markets + two sectors
- Epidemic: contact-intensive services sector shuts down
- GE forces $\Rightarrow$ shock spills over to rest of the economy
- Persistent recession due to endogenous entry/exit
- Fiscal policy cannot fight the underlying shock, but can fight those spillovers

Approach and Results II

Quantitative application

- Calibrate model to the US
- Study effects of different types of fiscal policies in the model
- UI/transfers effective at stabilizing worker income
- Liquidity assistance to firms effective at stabilizing employment
- CARES Act of 2020: employment multiplier of 1.3

This is not a SIR-Macro Model.

1. Pre-Covid literature: Wren-Lewis & Keogh-Brown (2009).
2. Closest in spirit: Guerrieri, Lorenzoni, Straub & Werning (2020).
   Incomplete markets + multiple sectors crucial to make sense of what is going on.
3. Fiscal policy during Covid-19: Bayer, Born, Luetticke, Muller (2020)
   This paper: analysis of a broader set of fiscal policies in a TANK framework.
4. SIR-Macro: Eichenbaum, Rebelo, & Trabandt (2020); Glover, Heathcote, Krueger, & Rios-Rull (2020); Jones, Philippon, & Venkatsweran (2020); Kaplan, Moll, & Violante (2020)
   This paper: no public health policy, framework for analysis of "classic" fiscal policy

Outline of the Talk

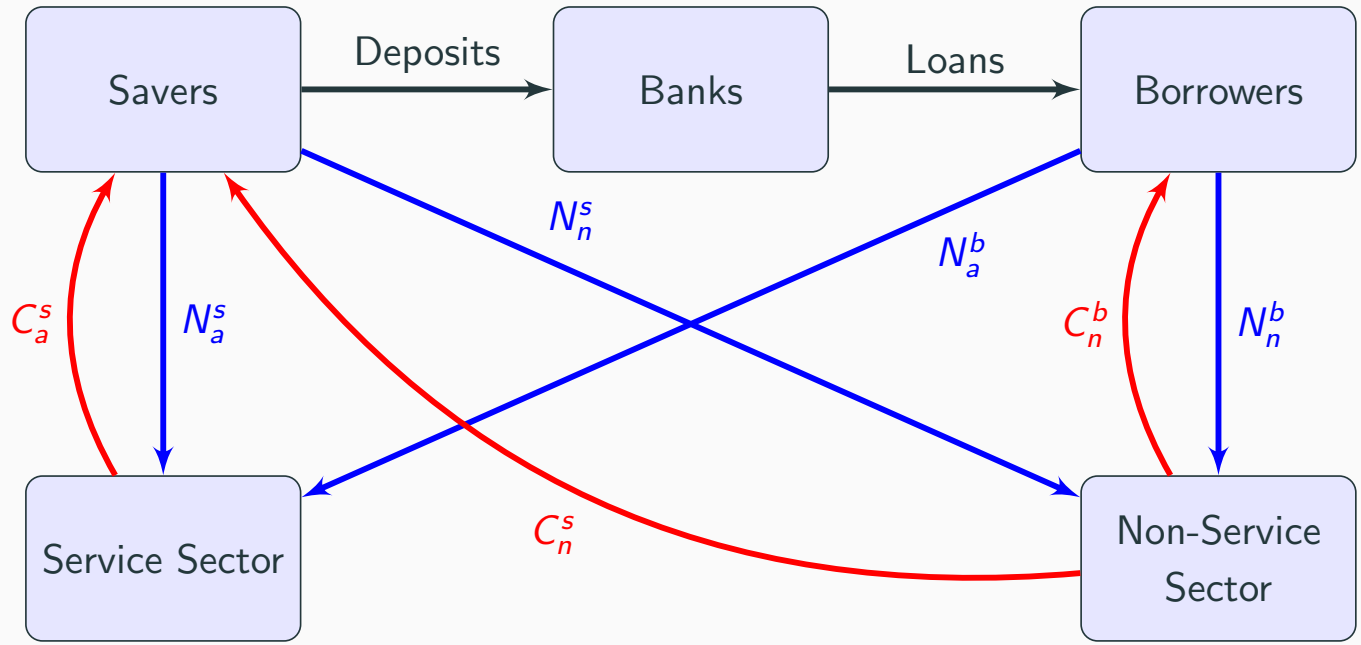
1. Model
2. Calibration
3. Pandemic Shock
4. Fiscal Policy in the Model
5. Effects of the CARES Act
6. Conclusion

Model

Model

Environment:

- Time discrete and infinite, $t = 0, 1, \ldots$
- Demographics:
  1. Households: borrowers (χ) and savers ($1 - \chi$)
  2. Producers: service (a) and non-service (n) sectors
  3. Financial intermediaries
  4. Fiscal authority, central bank
- Incomplete markets



Borrowers: Debt and Default

- Family construct: liquidity shocks + cash-in-advance constraint
- Borrower family enters period with debt B^b_{t-1}
- Continuum of members $i \in [0,1]$, have to repay B^b_{t-1} with cash in hand:

$$\mathbb{I}[i \in N^{n,b}_t \vee i \in N^{a,b}_t] w_t(1-\tau^l_t) + \mathbb{I}[i \notin N^{n,b}_t, N^{a,b}_t] \text{ui}_t + T^b_t + \varepsilon_t(i)$$

where $\varepsilon_t(i) \sim F^e, F^u$ is a **liquidity shock**

- Default thresholds

$$\varepsilon^e_t = \frac{B^b_{t-1}}{\Pi_t} - w_t(1-\tau^l_t) - T^b_t$$

$$\varepsilon^u_t = \frac{B^b_{t-1}}{\Pi_t} - \text{ui}_t - T^b_t$$

- Total default rate given by

$$F^b_t = N^{a,b}_t F^e(\varepsilon^e_t) + N^{n,b}_t F^e(\varepsilon^e_t) + (1 - N^{a,b}_t - N^{n,b}_t) F^u(\varepsilon^u_t)$$

Borrower Family Problem

$$V_t^b(B_{t-1}^b) = \max_{C_t^b, B_t^b} \left\{ u(C_t^b) + \beta^b \mathbb{E}_t V_{t+1}^b(B_t^b) \right\}$$

s.t.

$$\begin{aligned} & C_t^b + \frac{B_{t-1}^b}{\Pi_t}(1 - F_t^b) \\ =& (N_t^{a,b} + N_t^{n,b}) w_t (1 - \tau_t^l) + (1 - N_t^{a,b} - N_t^{n,b}) \mathrm{ui}_t + Q_t^b B_t^b + T_t^b \end{aligned}$$

and borrowing constraint

$$B_t^b \leq \Gamma$$

Savers

$$V_t^s(D_{t-1}, B_{t-1}^g) = \max_{C_t^s, C_t^a, B_t^g, D_t} \left\{ u(C_t^s) + \alpha_t \frac{(C_t^a)^{1-\sigma_a}}{1-\sigma_a} + \beta^s \mathbb{E}_t V_{t+1}^s(D_t, B_t^g) \right\}$$

s.t.

$$C_t^s + p_t^a C_t^a + Q_t(D_t + B_t^g) = (N_t^{a,s} + N_t^{n,s}) w_t (1 - \tau_t^l)$$
$$+ (1 - N_t^{a,s} - N_t^{n,s}) \text{ui}_t + \frac{B_{t-1}^g + D_{t-1}}{\Pi_t} + (1 - \tau^k)\mathcal{P}_t - T_t + T_t^b$$

C_t^a is consumption of services.

$$C_t^a = \left[\alpha_t \frac{1}{p_t^a u'(C_t^s)} \right]^{1/\sigma_a}$$

α_t is the key shock.

Banks

- Leverage constraint

$$\kappa Q_t^b B_t^b \leq \Phi_t E_t$$

- Law of motion for capital

$$E_t = \theta \left[(1 - F_t^b) \frac{B_{t-1}^b(j)}{\Pi_t} - \frac{D_{t-1}(j)}{\Pi_t} \right] + \varpi$$

- First-order condition/loan pricing

$$\mathbb{E}_t \frac{\Lambda_{t+1}^s}{\Pi_{t+1}} (1 - \theta + \theta \Phi_{t+1}) \left[\frac{1 - F_{t+1}^b}{Q_t^b} - \frac{1}{Q_t} \right] = \mu_t \kappa$$

- Defaults deplete bank capital and make banks raise spreads
- See Gertler & Karadi (2011), Faria-e-Castro (2018) for detailed expositions

Production

- Two sectors: services (or quarantined) sector, and non-services.
- Non-sector final good is the numeraire of this economy.
- Non-services sector: standard Rotemberg apparatus, yields NKPC

$$\eta \frac{\Pi_t}{\Pi}\left(\frac{\Pi_t}{\Pi}-1\right)+\epsilon\left(\frac{\epsilon-1}{\epsilon}-\frac{w_t^n}{A_t}\right)=\eta\mathbb{E}_t\left\{\Lambda_{t+1}^s\frac{Y_{t+1}}{Y_t}\frac{\Pi_{t+1}}{\Pi}\left(\frac{\Pi_{t+1}}{\Pi}-1\right)\right\}$$

Services/Quarantine Sector

- Continuum of firms indexed by k, total mass F_t
- Incumbents draw cost shock $c \sim H \in [0, \infty)$ at the beginning of the period
- May choose to exit
- Value of non-exiting firm:

$$V_t^a(A_t) = p_t^a A_t - w_t^a + T_t^a w_t^a + \mathbb{E}_t \Lambda_{t+1}^s \int_c \max\{0, V_{t+1}^a(A_{t+1}) - c\} \mathrm{d}H(c)$$

- $\exists \bar{c}_t(A_t)$ such that a firm decides to operate if $c \leq \bar{c}_t(A_t)$

Services/Quarantine Sector: Entry

- Endogenous mass of entrants ν_t
- Entry subject to congestion. Entry cost: $\kappa \nu_t^{\psi}$
- Free-entry condition

$$V_t^a(A_t) \leq \kappa \nu_t^{\psi} \perp \nu_t \geq 0$$

- Entrants can produce right away
- Law of motion for mass of firms in this sector

$$F_t = H[\bar{c}_t(A_t)]F_{t-1} + \nu_t$$

Labor Markets

- Very simple
- No disutility of labor $\Rightarrow$ all unemployment is involuntary
- Labor rationed according to wage rule that responds to "market tightness" and productivity

$$w_t = \xi A_t (N_t^n + N_t^a)^{\zeta}$$

- Can be microfounded in simple SAM models: McKay & Reis (2016); Christiano, Eichenbaum, & Trabandt (2016)
- Labor uniformly rationed across agents

$$N_t^{b,a} = N_t^{s,a} = N_t^a$$
$$N_t^{b,n} = N_t^{s,n} = N_t^n$$

Government

Central Bank

$$\frac{1}{Q_t} = \max\left\{1, \left(\frac{\Pi_t}{\bar{\Pi}}\right)^{\phi_\Pi} \left(\frac{p_t^a}{p_{t-1}^a}\right)^{\phi_a} \left(\frac{GDP_t}{G\bar{D}P}\right)^{\phi_{GDP}}\right\}$$

where

$$GDP_t = Y_t^n + p_t^a Y_t^a$$

Fiscal Authority Budget constraint:

$$G_t + \frac{B_{t-1}^g}{\Pi_t} + \text{ui}_t(1 - N_t^a - N_t^n) + T_t^b + T_t^a w_t F_t = \tau_t^l w_t (N_t^a + N_t^n) + \tau^k \mathcal{P}_t + B_t^g + T_t$$

Tax rule:

$$T_t = \left[\frac{B_{t-1}^g}{\bar{B}^g}\right]^{\phi_\tau} - 1$$

Analysis

Calibration

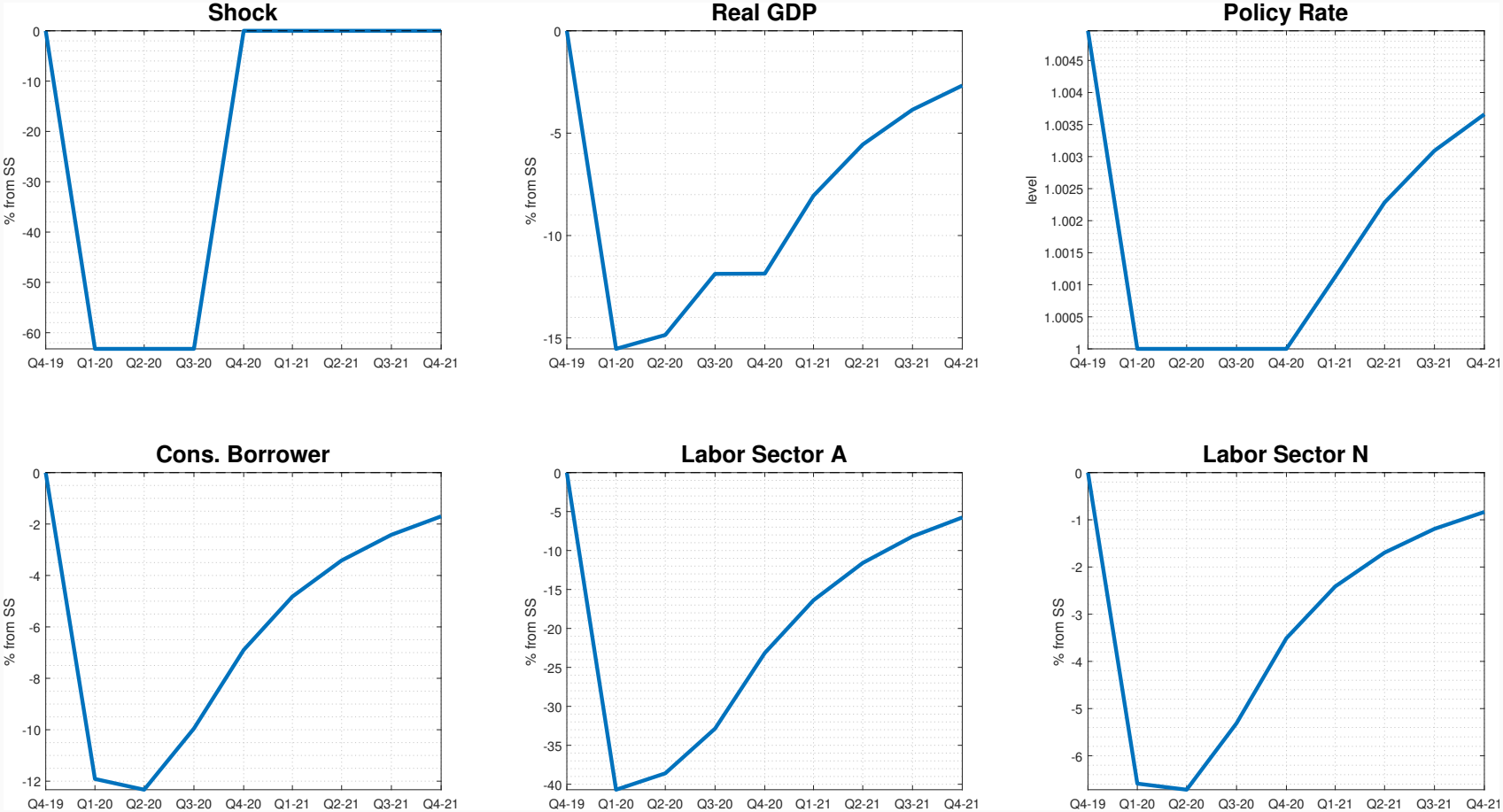
Non-standard parameters:

Parameter	Description	Value	Target
		Households	
σ_a	EIS for services	1	Same as for non-services
Γ	Borrowing constraint	0.1769	Payment to income ratio of 30%
χ	Fraction of borrowers	0.475	Faria-e-Castro (2018)
σ^e	SD of liquidity shock, employed	0.2315	Default rate of 8%, yearly
σ^u	SD of liquidity shock, unemployed	0.0742	Default rate of 40%, yearly
		Production	
ϕ	Labor in a-sector	0.40	BLS: % of employment in contact-intensive industries
N	Employment at SS	0.925	SS unemployment rate of 7.5%
ζ	Elasticity of wage to employment	0.05	Relatively sticky wages
κ	Entry cost constant	0.20	Entry rate of 8% yearly
ψ	Elasticity of entry costs to entrants	1.00	–
σ_k	Variance of a-sector shock	4.7617	Employment in the a-sector
		Government/Policy	
$\bar{\text{ui}}$	Unemployment insurance	$0.35 \times w$	25% covered by UI + home production
τ^l	Labor income tax rate	15%	Avg for the US
τ^k	Tax rate on profits	28%	Implied by other parameters

Pandemic Shock

- Fall in marginal utility of consumption for service sector, $\alpha_t \downarrow$
- Shock lasts for three quarters: 2020Q2 through 2020Q4
- Shock size: generate $\sim 20\%$ unemployment rate in 2020Q2
- Shock not persistent, everything returns to normal in 2021Q1
- All persistent effects arise from endogenous propagation

Pandemic Shock



Pandemic: Propagation

$\alpha_t \downarrow$

1. $C_t^a, p_t^a \downarrow$, jobs are destroyed $N_t^a \downarrow$
2. Incomplete markets: borrower income $\downarrow$, $C_t^b \downarrow$
3. This triggers a "recession" in the non-services sector
4. Default + financial frictions amplify recession
5. Endogenous entry/exit generate endogenous persistence

Fiscal Policy

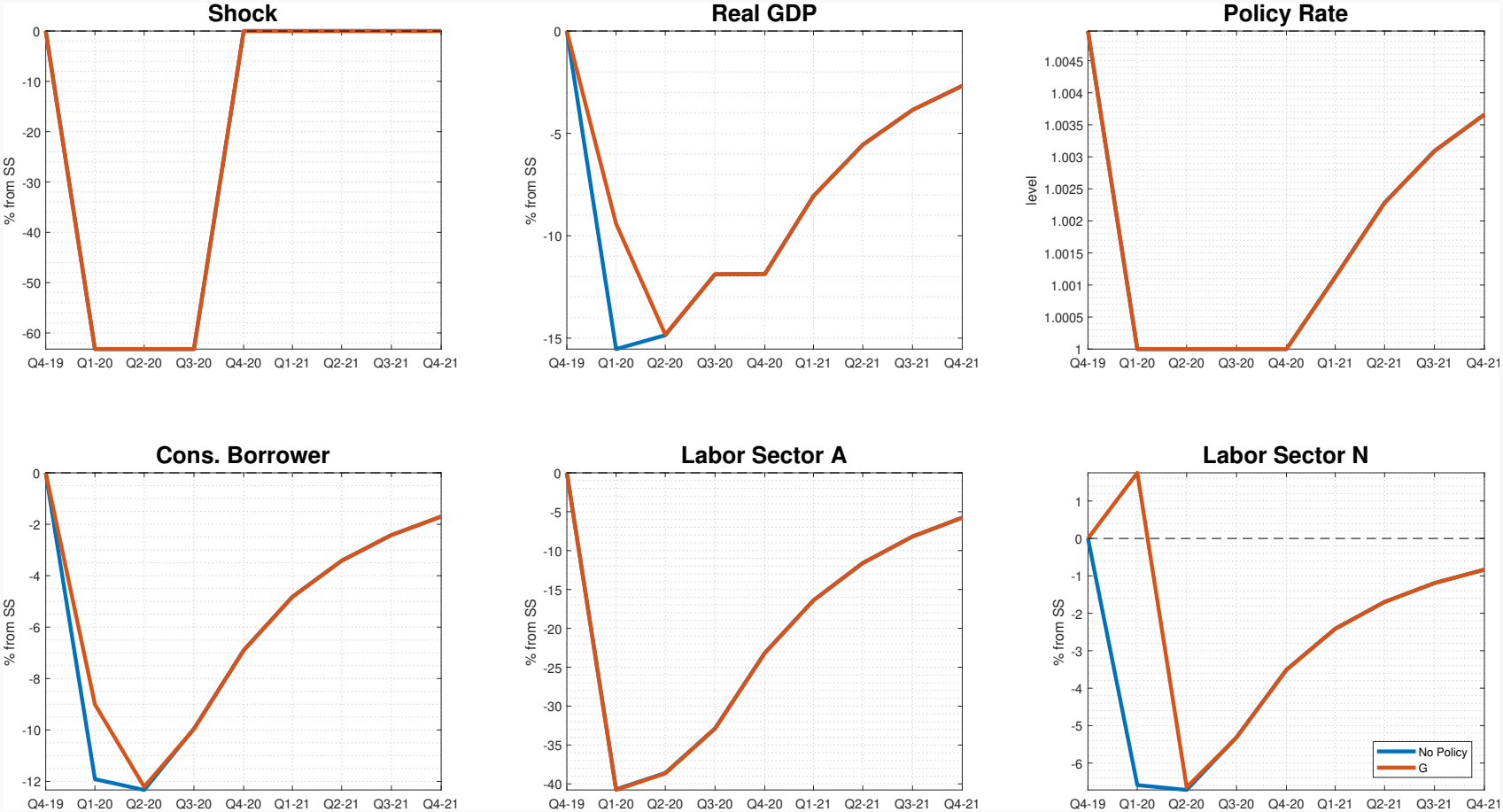
Fiscal Policy Experiment and Tools

Study the effects of the following instruments

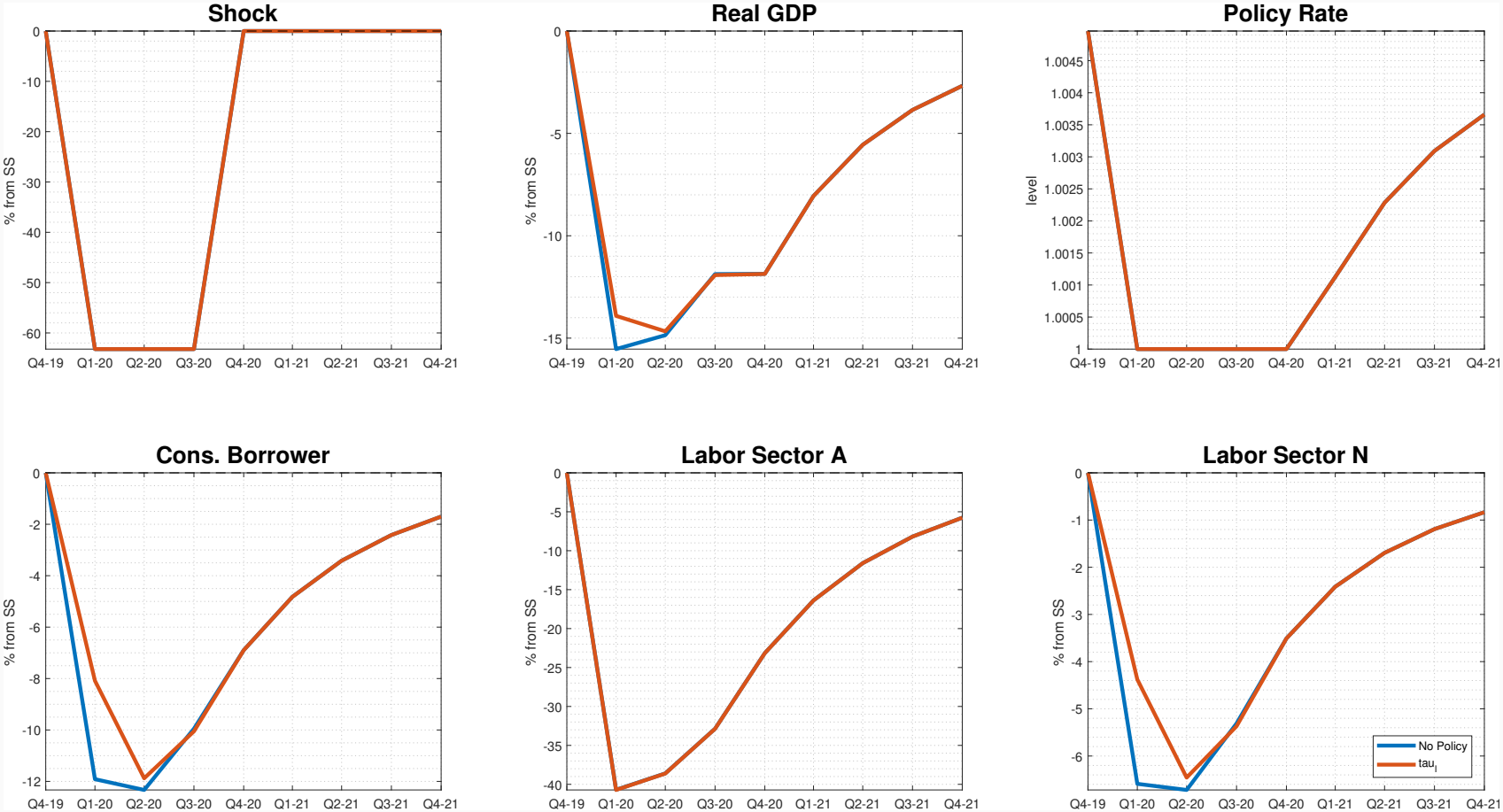
1. Government consumption of non-services, $G_t \uparrow$
2. Income tax cut, $\tau_t^{\ell} \downarrow$
3. Unemployment insurance expansion $\text{ui}_t \uparrow$
4. Unconditional transfer, $T_t^b \uparrow$
5. Liquidity assistance to service firms $T_t^a \uparrow$

Focus on one-time $\sim$ \$200 bn impulse on the quarter of the shock

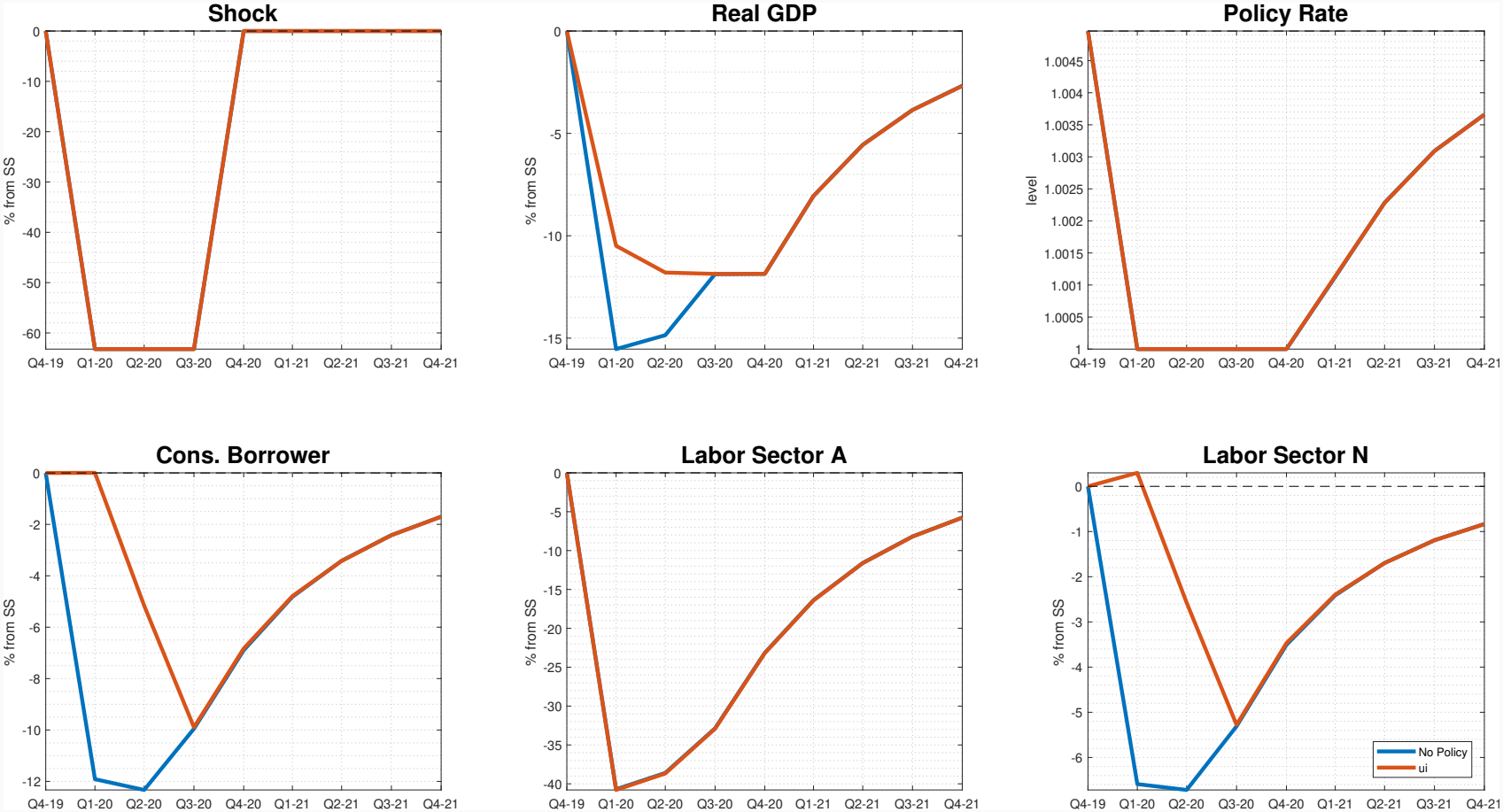
Government Consumption (in non-services)



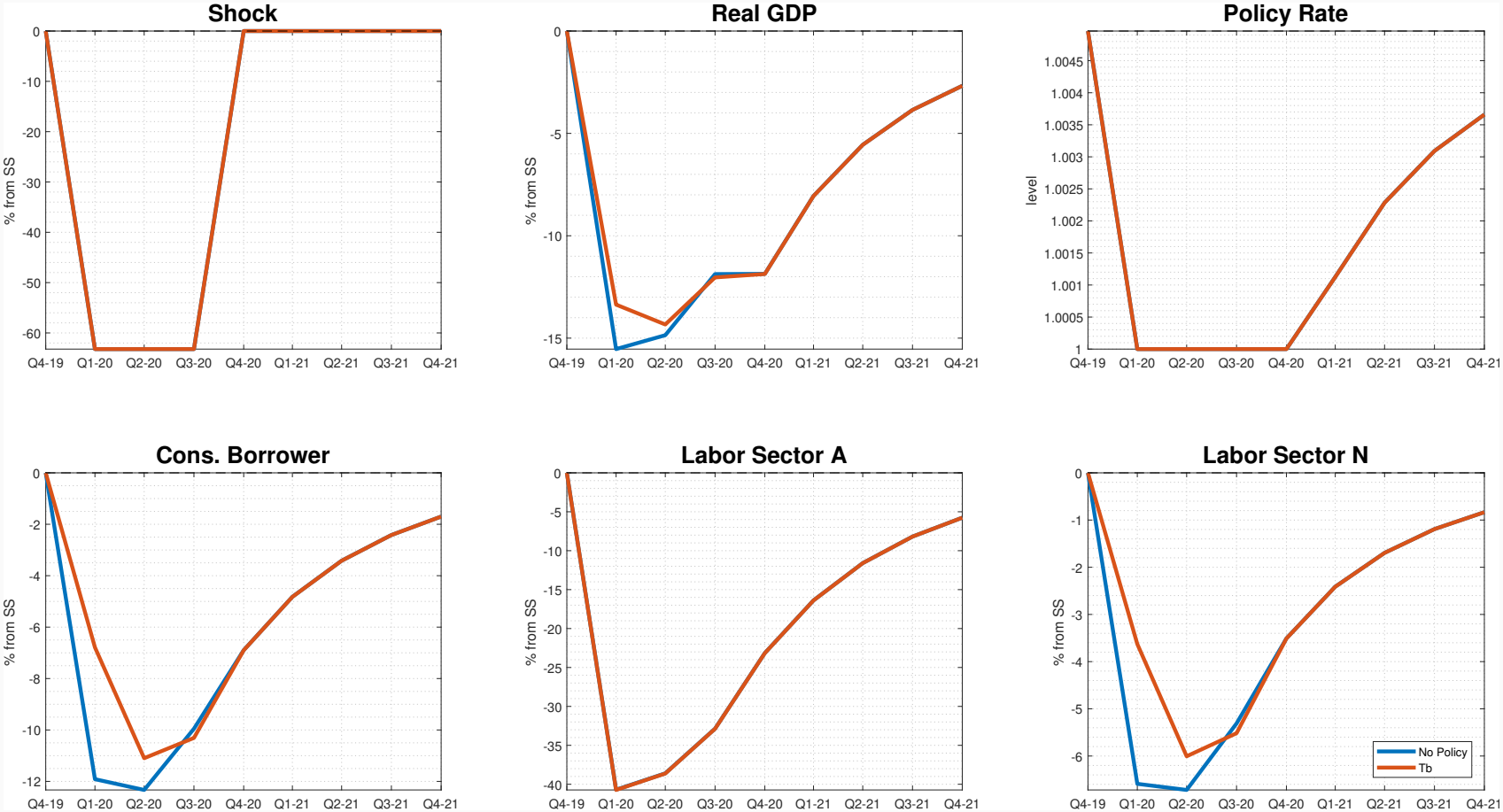
Income tax cut



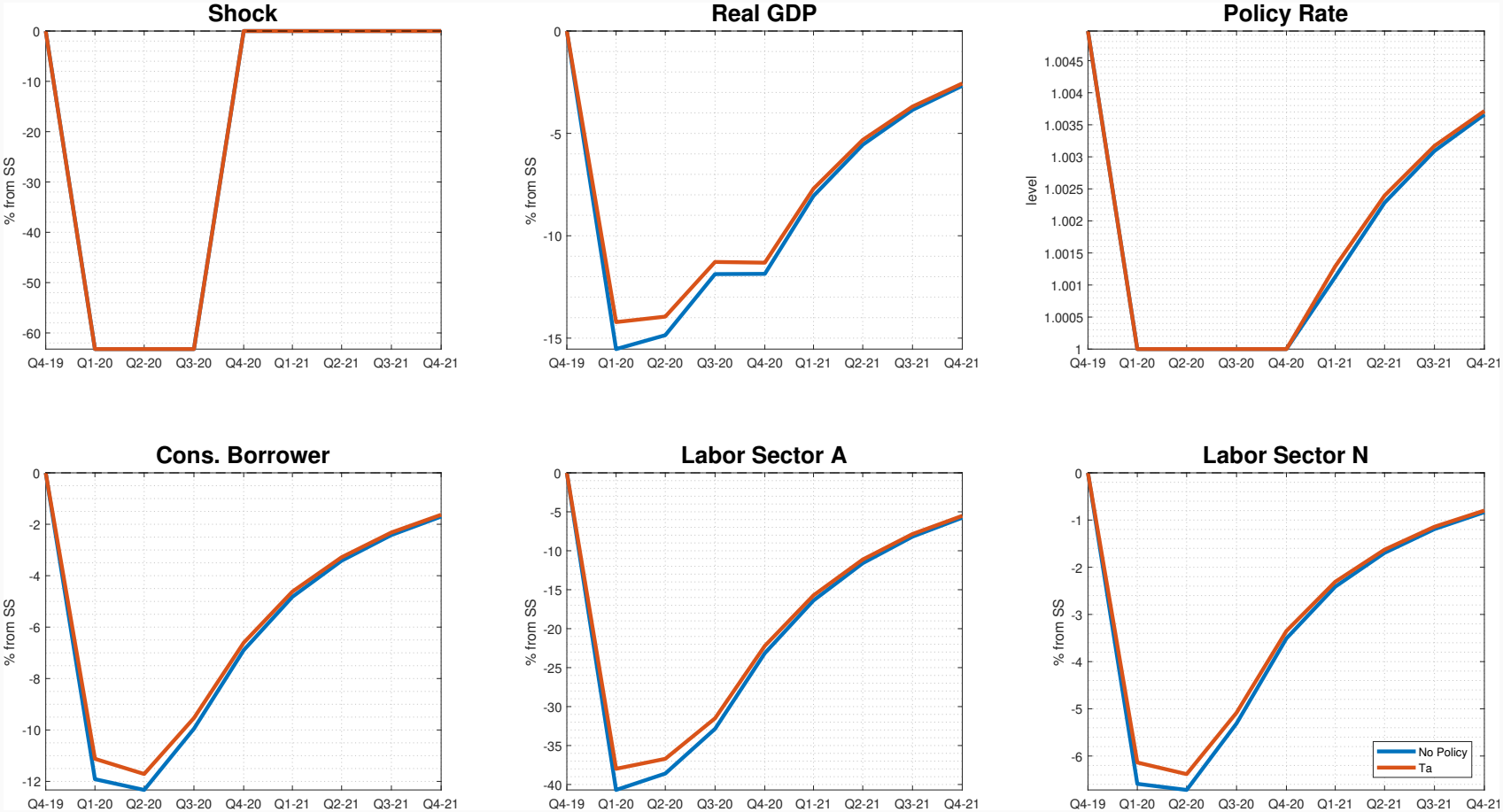
Unemployment Insurance



Unconditional Transfer



Liquidity Assistance to Firms



Multipliers

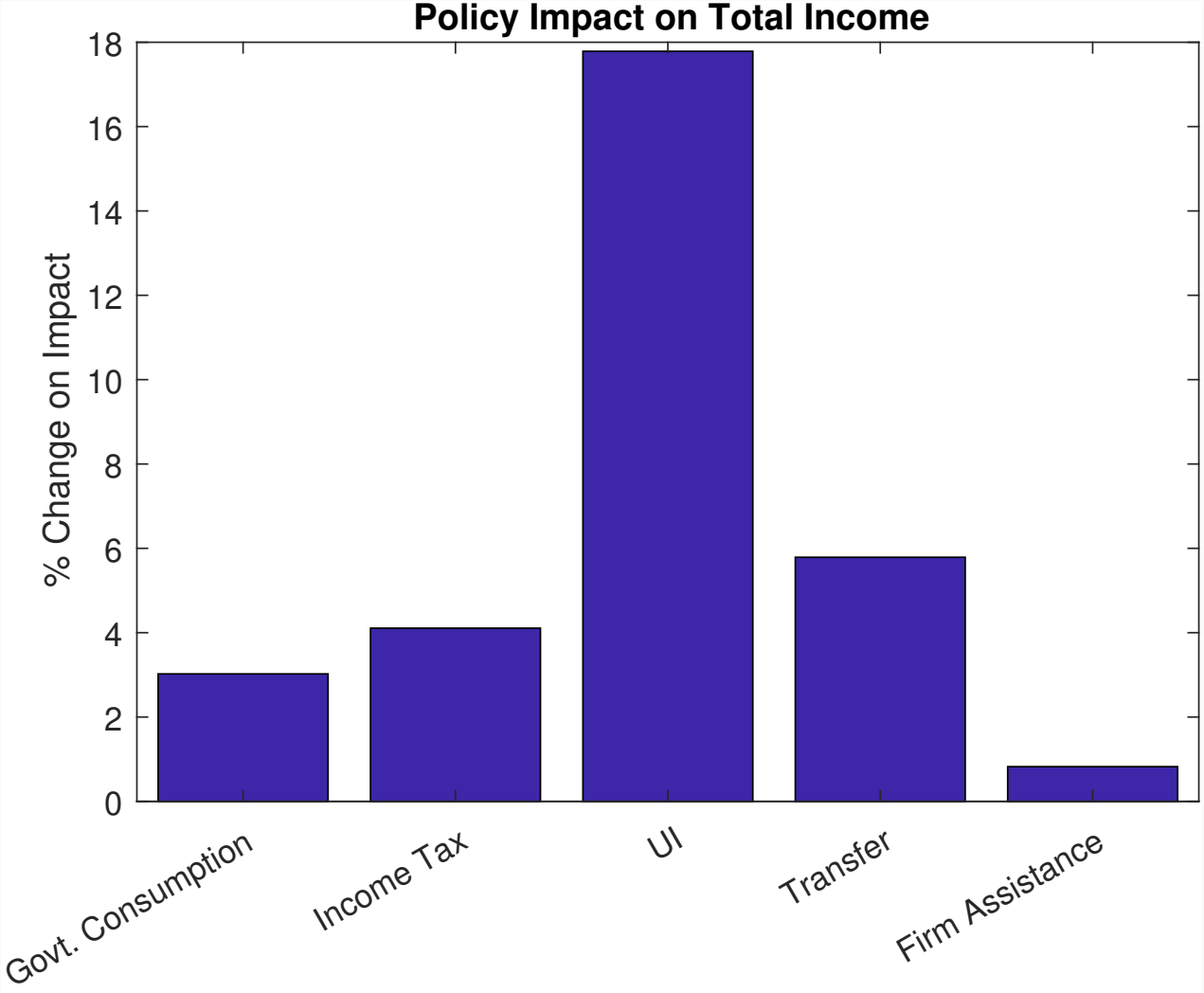
Present-value discounted fiscal multipliers as in Mountford & Uhlig (2009)

$$\mathcal{M}_T^{\omega}(x) = \frac{\sum_{t=1}^{T} \prod_{j=1}^{t} R_j^{-1} \left(x_t^{\text{Stimulus}} - x_t^{\text{No Stimulus}} \right)}{\sum_{t=1}^{T} \prod_{j=1}^{t} R_j^{-1} \left(\text{Spending}_t^{\text{Stimulus}} - \text{Spending}_t^{\text{No Stimulus}} \right)}$$

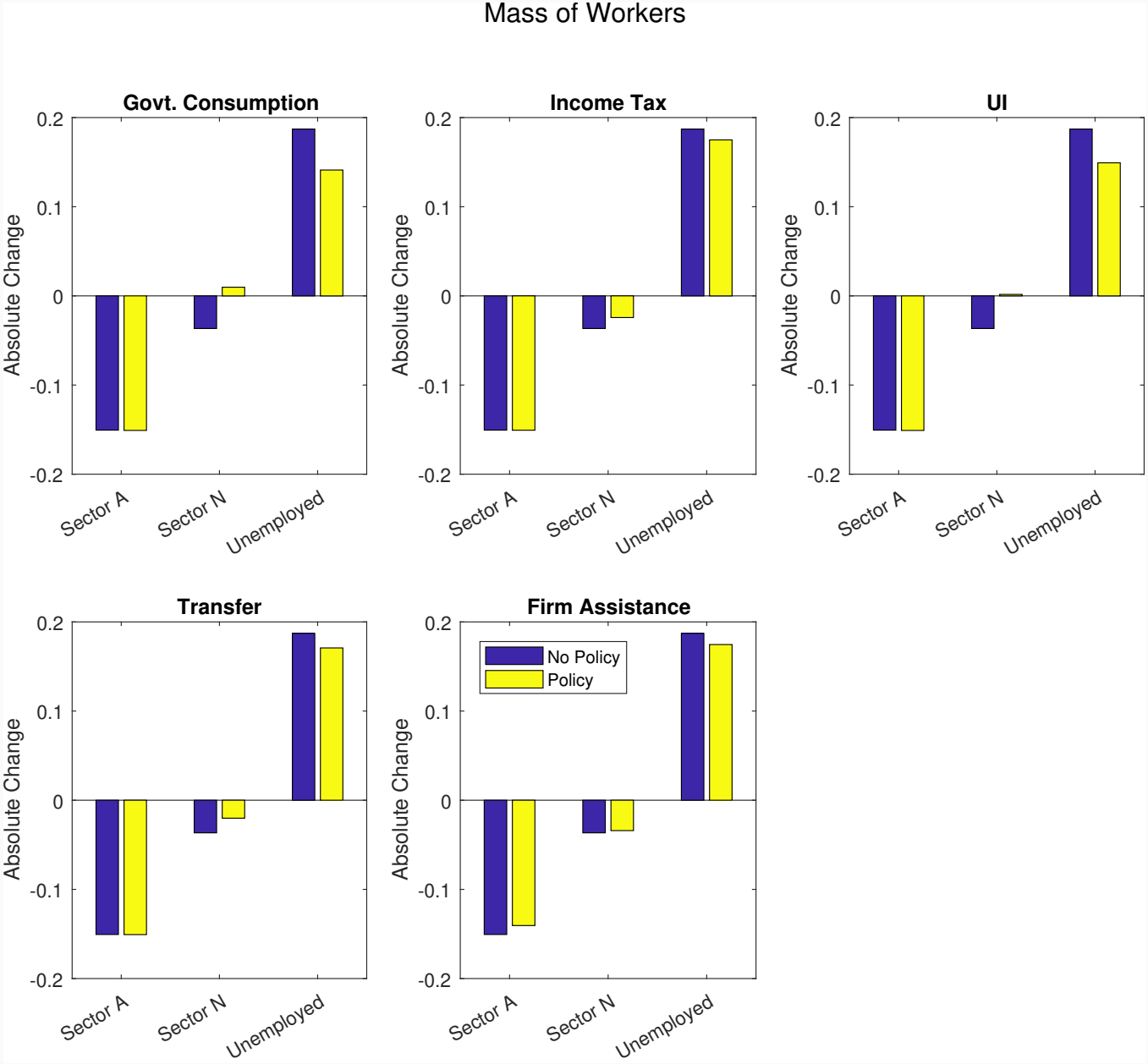
Set $T = 20$ quarters

Instrument	Description	$\mathcal{M}_{20}(N_t)$	$\mathcal{M}_{20}(y_t)$	$\mathcal{M}_{20}(C_t^b)$	$\mathcal{M}_{20}(C_t^s)$	$\mathcal{M}_{20}(GDP_t)$
G	Govt. Cons.	1.2320	0.5480	0.5459	0.0004	1.2589
τ_t^l	Income Tax	0.6329	1.3631	1.3622	0.0003	0.6469
ς	UI	0.7032	1.5178	1.5114	0.0007	0.7180
T_t^b	Transfer	0.5890	1.2615	1.2676	0.0003	0.6020
T_t^a	Liq. Assist.	2.1496	0.9592	0.9579	-0.0269	0.3956

Change in Borrower Income due to Policy



Change in Distribution of Worker Status



CARES Act of 2020

Description

$2 trillion dollar relief bill signed into law on March 27, 2020

1. $423 billion (2% of GDP) in small business loans, payroll subsidies, and relief for affected industries (T_t^a)

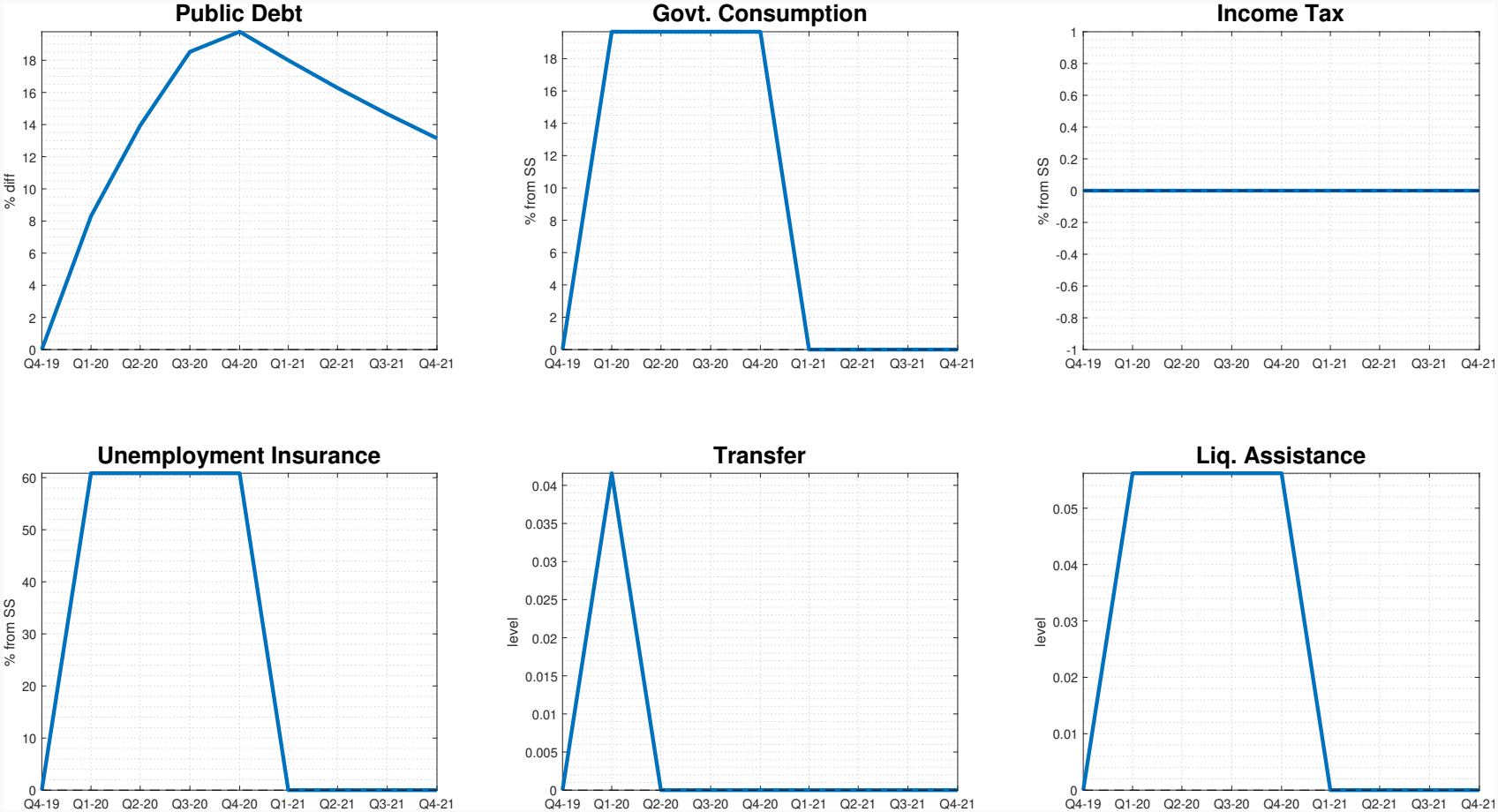
2. $250 billion (1.2% of GDP) in payments to individuals in the form of rebates to taxpayers (T_t^b)

3. $250 billion (1.2% of GDP) in expanded unemployment insurance (ui_t)

4. $490 billion (2.3% of GDP) in state fiscal aid and federal spending across departments and programs (G_t)

$\sim$\$ 454 bn transferred to the Federal Reserve to fund lending facilities (not considered)

Paths fed to the Model



Multipliers

Instrument	Description	$\mathcal{M}_{20}(N_t)$	$\mathcal{M}_{20}(y_t)$	$\mathcal{M}_{20}(C_t^b)$	$\mathcal{M}_{20}(C_t^s)$	$\mathcal{M}_{20}(GDP_t)$
All Policies		1.3026	1.3310	1.3239	-0.0292	0.9959
G	Govt. Cons.	1.1612	0.5176	0.5120	-0.0305	1.2040
ς	UI	0.6685	1.4928	1.4852	-0.0120	0.6897
T_t^b	Transfer	0.5898	1.2619	1.2690	0.0004	0.6027
T_t^a	Liq. Assist.	1.8518	0.8276	0.8262	-0.0318	0.3333

Caveats & Discussion

Caveats

Many important things that I do NOT consider:

1. Pandemic shock is completely exogenous
    - size and duration may be endogenous to policy
2. Timing and size of policies may matter for effects/multipliers
3. Complementarities/substitutabilities between policies
4. Announcement effects, implementation issues
5. No endogenous labor supply decision
    - i.e., Walmart workers quitting because UI is too generous

Conclusion

This paper:

- Pandemic shock in a standard monetary DSGE model
- Propagation hinges on two sectors + incomplete markets
- Persistence due to endogenous entry/exit

Fiscal policy:

- UI/transfers most effective tools to stabilize household income
- Liquidity assistance programs effective at preserving employment
- Aggregate employment multiplier of the CARES Act of about 1.3