Redistribution and the Monetary–Fiscal Policy Mix

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Motivation

- Two worst post-war US contractions—the Great Recession and the COVID recession
- Fiscal policy responses included significant *transfer* components
    - The American Recovery and Reinvestment (ARRA) Act of 2009
    - The Coronavirus Aid, Relief, and Economic Security (CARES) Act of 2020
- Renewed interest in *the effectiveness of transfer policies* for rebooting the economy
- Ongoing debates on the rapid increase in *public debt* and *inflationary pressures*
- The large-scale transfer programs eventually require *fiscal and/or monetary adjustments* to finance them

Questions

- What are the macroeconomic effects of redistribution policies that transfer resources from the *unconstrained* to the *constrained*?
- What are the determinants of the transfer multiplier?
- What are the welfare implications of such redistribution policies?

This Paper

- Focus on *the source of financing* and its role in effectiveness of redistribution
- A transfer policy redistributes resources toward "hand-to-mouth" households and away from "Ricardian" households that own government bonds

- Two distinct ways to finance transfers

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  - **Conventional tax financed transfers**: Under the *monetary regime*, the government raises taxes and inflation is then stabilized in the usual way by the central bank

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- A transfer policy redistributes resources toward "hand-to-mouth" households and away from "Ricardian" households that own government bonds

- Two distinct ways to finance transfers
  - **Conventional tax financed transfers**: Under the *monetary regime*, the government raises taxes and inflation is then stabilized in the usual way by the central bank
  - **Inflation tax financed transfers**: Under the *fiscal regime*, the government commits itself to no adjustments in taxes, and the central bank allows inflation to rise to stabilize the real value of debt

Preview of Results

- In an analytical two-agent model show:
  - A transfer policy generates *greater and more persistent* inflation under the fiscal regime than under the monetary regime
  - *Direct channel*
  - *Interest rate channel*: valuation effect on government debt due to changes in the real rate

Preview of Results

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  - A transfer policy generates *greater and more persistent* inflation under the fiscal regime than under the monetary regime
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- In a quantitative two-sector TANK model applied to the COVID recession and the CARES Act show:
  - Inflation-financed transfers lead to high output and consumption multipliers
  - The welfare of both household types is higher under the fiscal regime
  - Inflation-financed transfers can lead a Pareto improvement relative to no-transfer case

Related Literature

- The fiscal-monetary interactions literature (no TANK model)
  - Leeper (1991), Sims (1994), Woodford (1994), Cochrane (2001)
  - Analytical characterization in a linearized model: Bhattarai, Lee and Park (2014)
- Two-agent models (no fiscal regime)
  - Galí, López-Salido and Vallés (2007), Bilbiie (2018)
  - Transfer multipliers in a TANK model : Bilbiie et al. (2013)
- Macroeconomic effects of the COVID crisis (no fiscal regime)
  - Two-sector, two-agent model: Guerrieri, Lorenzoni, Straub and Werning (2020)
  - Effects of fiscal policy during the pandemic using a model with household heterogeneity: Faria-e-Castro (2021), Bayer, Born, Luetticke and Müller (2020)
- Monetary-fiscal policy interactions in TANK models (no transfer policy analysis)
  - Bhattarai, Lee, Park and Yang (2020), Bianchi, Faccini and Melosi (2020)

Outline

1. **Simple Model**
2. Quantitative Model
3. Data and Calibration
4. Quantitative Results
5. Conclusion

Simple Model

- Two types of households: Ricardian and Hand-To-Mouth.
  - Ricardian household makes optimal labor supply and consumption/savings decisions
  - HTM household simply consumes government transfers every period

- Ricardian households, of measure $1-\lambda$, choose $\{C_t^R, L_t^R, B_t^R\}$ to maximize

$$\sum_{t=0}^{\infty} \beta^t \left[\log C_t^R - \chi \frac{\left(L_t^R\right)^{1+\varphi}}{1+\varphi} \right]$$

subject to a sequence of flow budget constraints

$$C_t^R + b_t^R = R_{t-1} \frac{1}{\Pi_t} b_{t-1}^R + w_t L_t^R + \Psi_t^R - \tau_t^R,$$

where $b_t^R = \frac{B_t^R}{P_t}$ is the real value of nominal debt and $\Pi_t = \frac{P_t}{P_{t-1}}$ is inflation

Ricardian Households

- Optimality conditions:

$$\frac{C_{t+1}^R}{C_t^R} = \beta \frac{R_t}{\Pi_{t+1}}, \qquad \text{(Euler equation)}$$

$$\chi \left(L_t^R\right)^{\varphi} C_t^R = w_t, \qquad \text{(Intra-temporal labor supply)}$$

$$\lim_{t\to\infty} \left[\beta^t \frac{1}{C_t^R} \left(\frac{B_t^R}{P_t}\right)\right] = 0. \qquad \text{(Transversality condition)}$$

- The labor supply condition captures transmission of transfer policy
- The Euler equation captures the new interest rate channel
- How the TVC is satisfied will be key to distinguishing the monetary vs. fiscal regimes
- Lump-sum taxes in this simple model and so no distortions in the optimality conditions

Hand-to-Mouth (HTM) Households and Firms

- HTM households, of measure λ, consume government transfers, s_t^H, every period

$$C_t^H = s_t^H$$

- A representative firm in the competitive market chooses hours, L_t, to maximize profits:

$$\Psi_t = Y_t - w_t L_t,$$

subject to the production function

$$Y_t = L_t.$$

Government

- Government budget constraint (GBC) is

$$b_t = \frac{R_{t-1}}{\Pi_t} b_{t-1} - \tau_t + s_t, \tag{GBC}$$

  where $b_t = \frac{B_t}{P_t}$ is the real value of nominal debt, s_t is transfers, and τ_t is taxes
- Transfer, s_t, is exogenous and deterministic

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- Transfer, s_t, is exogenous and deterministic
- Monetary and tax policy rules are

$$\frac{R_t}{\bar{R}} = \left(\frac{\Pi_t}{\bar{\Pi}}\right)^{\phi}, \tag{Monetary policy rule}$$

$$(\tau_t - \bar{\tau}) = \psi(b_{t-1} - \bar{b}), \tag{Tax policy rule}$$

where ϕ and ψ are the feedback policy parameters that will govern the regimes

Aggregation and the Resource Constraint

- Combining household and government budget constraints gives:

$$(1-\lambda)C_t^R + \lambda C_t^H = Y_t$$

- Output is simply divided between the two types of households as:

$$C_t^H = \frac{1}{\lambda} s_t,$$
$$C_t^R = \frac{1}{1-\lambda} Y_t - \frac{1}{1-\lambda} s_t.$$

- Output is endogenous

Effects of Redistribution Policy—Output and Consumption

- We derive output as a function of transfers: $Y_t = Y(s_t)$

$$Y_t = \chi^{-1}(1-\lambda)^{1+\varphi} Y_t^{-\varphi} + s_t$$

- The "transfer multiplier" is

$$\frac{dY(s_t)}{ds_t} = \frac{1}{1+(1-\lambda)^{1+\varphi}\frac{\varphi}{\chi}Y_t^{-(1+\varphi)}} \in [0,1] \qquad \text{(Classical labor supply channel)}$$

- The Ricardian consumption response:

$$\frac{dC^R(s_t)}{ds_t} = \frac{1}{1-\lambda}\left[\frac{dY(s_t)}{ds_t} - 1\right] \leq 0 \qquad \text{(Key for interest rate channel)}$$

- The alternative policy regimes have no differential effect on output and consumption

Effects of Redistribution Policy—Inflation

- Equilibrium path $\{\Pi_t, R_t, b_t, \tau_t\}$ satisfies TVC and the following:

$$\left(\frac{\Pi_{t+1}}{\bar{\Pi}}\right) = \frac{C_t^R}{C_{t+1}^R}\left(\frac{\Pi_t}{\bar{\Pi}}\right)^{\phi}, \qquad \text{(How } \Pi_{t+1} \text{ depends on } \Pi_t \text{ and the real rate)}$$

$$(b_t - \bar{b}) = \left[\beta^{-1}\frac{C_t^R}{C_{t-1}^R} - \psi\right](b_{t-1} - \bar{b}) + (s_t - \bar{s}) + \bar{b}\left[\beta^{-1}\frac{C_t^R}{C_{t-1}^R} - \beta^{-1}\right], \qquad \text{(GBC: } t \geq 1)$$

$$(b_0 - \bar{b}) = \beta^{-1}\left(\frac{\bar{\Pi}}{\Pi_0} - 1\right)\bar{b} + (s_0 - \bar{s}). \qquad \text{(GBC: } t = 0)$$

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- $s_t > \bar{s}$ until time period T, and then $s_t = \bar{s}$ for $t \geq T + 1$

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- $s_t > \bar{s}$ until time period T, and then $s_t = \bar{s}$ for $t \geq T+1$
- How TVC is satisfied *depends* on the fiscal policy parameter ψ
  - When $\psi > 0$, debt dynamics satisfies the TVC regardless of the value of b_{T+1}
  - When $\psi \leq 0$, the TVC requires $b_{T+1} = \bar{b}$, which can be achieved when monetary policy allows inflation to adjust by the required amount

Effects of Redistribution Policy—Inflation: Monetary Regime

- Under the ***monetary regime***, $\psi > 0$ ***and*** $\phi > 1$
- Inflation for $t \geq T+1$ becomes

$$\Pi_t = \bar{\Pi}, \quad \forall t \geq T+1$$

- Pin down Π_t from $t=0$ to T along the *saddle path* and derive the initial inflation:

$$\frac{\Pi_0}{\bar{\Pi}} = C^R\left(\bar{s}\right)^{\frac{1}{\phi^{T+1}}}\left[\frac{1}{C^R\left(s_T\right)C^R\left(s_{T-1}\right)\cdots C^R\left(s_0\right)}\right]^{\frac{1}{\phi}} = \prod_{t=0}^{T}\left[\frac{C^R\left(\bar{s}\right)}{C^R\left(s_t\right)}\right]^{\frac{1}{\phi}}$$

- An increase in transfers is inflationary as $C^R\left(s_t\right)$ declines below the pre-transfer level
- The effect is *transitory*: When the redistribution program ends, inflation returns immediately to the steady-state value

Effects of Redistribution Policy—Inflation: Fiscal Regime

- Under the ***fiscal regime,*** $\psi \leq 0$ ***and*** $\phi < 1$
- A simple case: one-time transfer increase ($s_0 > \bar{s}$ and $s_t = \bar{s}$ afterwards)

Effects of Redistribution Policy—Inflation: Fiscal Regime

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- A simple case: one-time transfer increase ($s_0 > \bar{s}$ and $s_t = \bar{s}$ afterwards)
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$$b_0 = \bar{b} - \bar{b}\left[\beta^{-1}\frac{C^R(\bar{s})}{C^R(s_0)} - \psi\right]^{-1}\left[\beta^{-1}\frac{C^R(\bar{s})}{C^R(s_0)} - \beta^{-1}\right]$$

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  - For $b_1 = \bar{b}$, Π_0 adjusts:

$$\frac{\Pi_0}{\bar{\Pi}} = \frac{1}{1 - \frac{\beta}{\bar{b}}(s_0 - \bar{s}) - \beta\left[\beta^{-1}\frac{C^R(\bar{s})}{C^R(s_0)} - \psi\right]^{-1}\left[\beta^{-1}\frac{C^R(\bar{s})}{C^R(s_0)} - \beta^{-1}\right]}$$

  - The redistribution policy is more *inflationary* under fiscal regime than monetary regime
  - The one-time transitory increase in transfers has *persistent* effects on inflation

Effects of Redistribution Policy—Inflation: Fiscal Regime

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- A simple case: one-time transfer increase ($s_0 > \bar{s}$ and $s_t = \bar{s}$ afterwards)
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  - The *interest rate channel* cause Π_0 to increase by *more* than it would in an analogous model with a representative household
  - This term results from increased interest payments that exert an upward pressure on b_1 which is offset by a further decrease in b_0, generated by a greater increase in Π_0

Summary so far

- More inflationary under fiscal regime than monetary regime
- Irrelevance of financing schemes for output, consumption and welfare
  - Flexible prices
    - No feedback from inflation to real variables
    - No Keynesian demand channel
  - Both types of taxes are non-distortionary
    - Lump-sum tax
    - Inflation tax
- Introduce several realistic features that break the uniformity of the two regimes in terms of the multipliers.

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1. Simple Model
2. **Quantitative Model**
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Quantitative Model

- A quantitative model with an application for the economic crisis induced by COVID
  - Transfer policy, as embedded in the CARES Act
- A two-sector production structure, sticky prices, and labor taxes
  - Two distinct sectors where the two types of households work
  - Sticky prices under Calvo friction
  - Distortionary labor taxes on the Ricardian household to finance transfers
- Analyze how the implications of increasing transfers to HTM households, hit disproportionately in the COVID crisis, depend on the monetary-fiscal policy mix

Ricardian Sector: Households

- Ricardian (*R*) households, of measure $1-\lambda$, solve the problem

$$\max_{\{C_t^R, L_t^R, b_t^R\}} \sum_{t=0}^{\infty} \beta^t \exp(\eta_t^{\xi}) \left[\frac{\left(C_t^R\right)^{1-\sigma}}{1-\sigma} - \chi \frac{\left(L_t^R\right)^{1+\varphi}}{1+\varphi} \right]$$

subject to a sequence of flow budget constraints

$$C_t^R + b_t^R = R_{t-1} \frac{1}{\Pi_t^R} b_{t-1}^R + \left(1 - \tau_{L,t}^R\right) w_t^R L_t^R + \Psi_t^R$$

- η_t^{ξ} is a discount factor shock; $\tau_{L,t}^R$ is labor tax
- C_t^R is a CES aggregator of the goods produced in the two sectors

$$C_t^R = \left[(\alpha)^{\frac{1}{\varepsilon}} \left(C_{R,t}^R\right)^{\frac{\varepsilon-1}{\varepsilon}} + (1-\alpha)^{\frac{1}{\varepsilon}} \left(\exp(\zeta_{H,t}) C_{H,t}^R\right)^{\frac{\varepsilon-1}{\varepsilon}} \right]^{\frac{\varepsilon}{\varepsilon-1}}$$

  - $\zeta_{H,t}$ is a demand shock that is specific for *HTM* goods

HTM Sector: Households

- *HTM*-households' labor endowment is exogenously fixed and can change with a shock
- In each period, they consume wage income and government transfers

$$C_t^H = w_t^H \overline{L^H}(1 + \eta_t^{\xi}) + s_t^H,$$

  where η_t^{ξ} is HTM labor supply shock
- The aggregate consumption C_t^H is a CES aggregator of sector-specific goods

$$C_t^H = \left[(1-\alpha)^{\frac{1}{\varepsilon}} \left(\exp\left(\zeta_{H,t}\right) C_{H,t}^H \right)^{\frac{\varepsilon-1}{\varepsilon}} + (\alpha)^{\frac{1}{\varepsilon}} \left(C_{R,t}^H \right)^{\frac{\varepsilon-1}{\varepsilon}} \right]^{\frac{\varepsilon}{\varepsilon-1}}$$

  - $\zeta_{H,t}$ is a demand shock that is specific for *HTM* goods

Ricardian and HTM Sector: Firms

- Monopolistically competitive firms produce differentiated varieties
- The production function is linear (labor market is sector specific)
- Firms face a standard downward sloping demand curve
- Firms set prices according to the Calvo friction

Government

- The government (nominal) flow budget constraint is

$$B_t + T_t^L = R_{t-1} B_{t-1} + P_t^R s_t,$$

where T_t^L is tax revenues and s_t is exogenous and deterministic transfer

- Monetary and tax policy rules are of the feedback types given by

$$\frac{R_t}{\bar{R}} = \max\left\{ \frac{1}{\bar{R}}, \left(\frac{(1-\lambda)\,\Pi_t^R + \lambda \Pi_t^H}{\bar{\Pi}} \right)^{\phi} \right\}, \;\; \tau_{L,t}^R - \bar{\tau}_L^R = \psi_L (b_{t-1} - \bar{b}).$$

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  - *Monetary regime* features high enough monetary (ϕ) and tax (ψ_L) rule coefficients
  - *Fiscal regime* features low enough tax (ψ_L=0) and monetary (ϕ=0) rule coefficients

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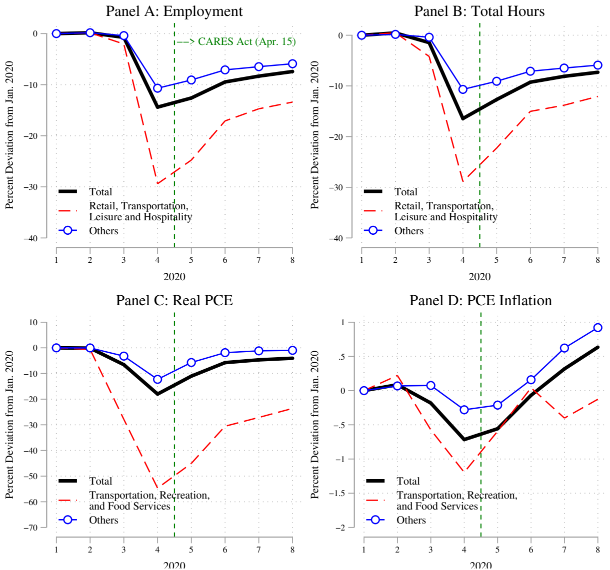
Data and Calibration

- Pick parameter values based on long-run averages or from the literature for the structural and policy parameters
- Calibrate the three shocks to match exactly employment and inflation dynamics during the COVID crisis (for six months)
- Decompose the U.S. economy into two sectors
  - HTM sector: transportation, recreation, and food service sector
  - Ricardian sector: the rest of the economy
- Calibrate the size of transfers using the amounts in CARES Act (3.4 percent of GDP)
  - $293 billion to provide one-time tax rebates
  - $268 billion to expand unemployment benefits
  - $150 billion in transfers to state and local governments

Sectoral Dynamics During Covid Crisis



Data and Calibration

Data and Model Moments

	Value	Description	Sources
Households			
β	0.9932	Time preference	2-month frequency
σ	1.7	Inverse of EIS	Del Negro et al. (2015)
φ	2.2	Inverse of Frisch elasticity	Del Negro et al. (2015)
χ	94.6	Labor supply disutility parameter	Steady-state $\bar{L}^R = 0.3$
λ	0.23	Fraction of HTM households	Employment share of HTM sectors
α	0.72	Consumption weight on Ricardian goods	Consumer Expenditure Surveys data
Firms			
θ	6.0	Elasticity of substitution across firms	Steady-state markup: 20% (Hall, 2018)
ε	0.8	Elasticity of substitution between Ricardian and HTM goods	Assigned
ω^R	0.833	Calvo parameter for Ricardian sector	Del Negro et al. (2015)
ω^H	0.0	Calvo parameter for HTM sector	Assigned
Government			
$\frac{\bar{b}}{6\bar{Y}}$	0.509	Steady-state debt to GDP	Data (1990Q1–2020Q1)
$\frac{\bar{T}^L}{\bar{Y}}$	0.122	Steady-state labor tax revenue to GDP	Data (1990Q1–2020Q1)
$\frac{\bar{s}}{\bar{Y}}$	0.127	Steady-state transfers to GDP	Data (1990Q1–2020Q1)
Monetary and Fiscal Policy Rules			
ϕ	(1.3, 0.0)	Interest rate response to inflation	Del Negro et al. (2015)
ψ_L	(0.4, 0.0)	Labor tax rate response to debt	Assigned
Shocks			
η_t^H	(-17%, -19%, -13%)	Size of HTM labor supply shock	Total hours for HTM sectors
η_t^ξ	(-43%, -45%, -19%)	Size of discount factor shock	Total hours excluding HTM sectors
$\zeta_{H,t}$	(-23%, -19%, 0.01%)	Size of HTM sector demand shock	PCE Inflation for HTM sectors
s_t	26.8%	Size of transfer distribution	2020 CARES Act

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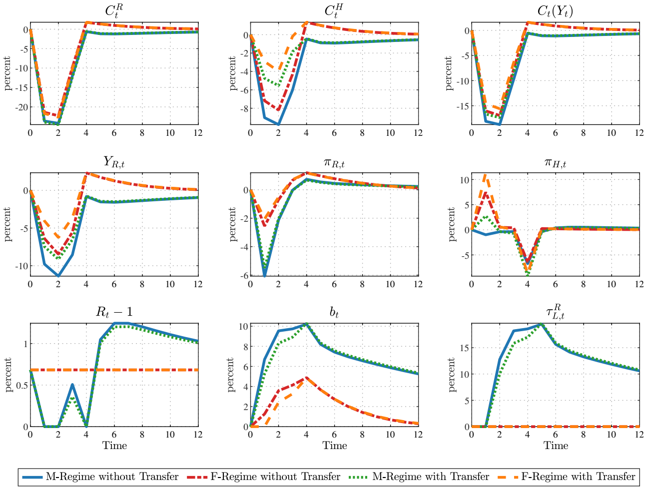
Dynamic Effects of Transfer Policy

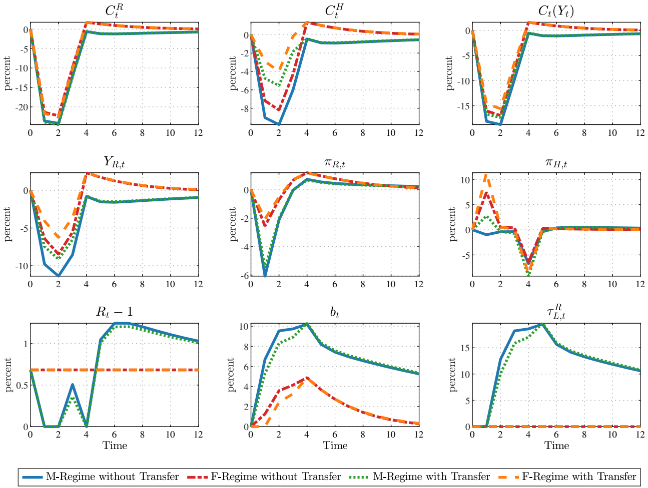
- Show how key variables evolve over time in response to the COVID shocks
- Illustrate the effects of an increase in transfers for the two regimes
- Four different scenarios
    - *Monetary regime* *with* and *without* transfers to the *HTM*-households
    - *Fiscal regime* *with* and *without* transfers to the *HTM*-households
- Duration of redistribution policy is three periods (six months), which coincides with the duration of the shocks

Redistribution Policy with Different Policy Regimes



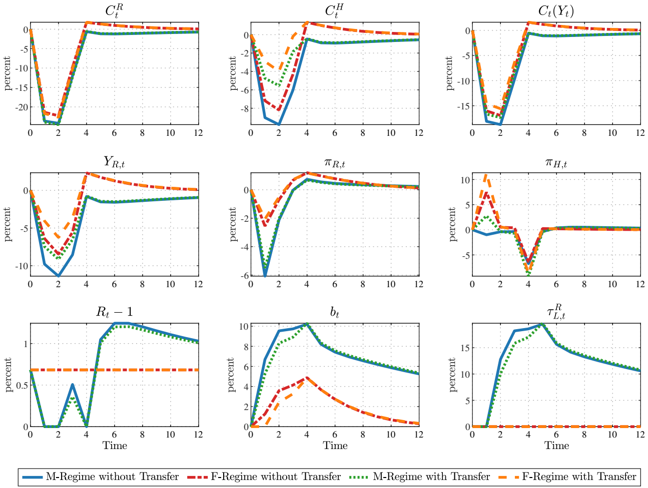
- Short-run contractions in output and consumption and a decline in inflation

Redistribution Policy with Different Policy Regimes



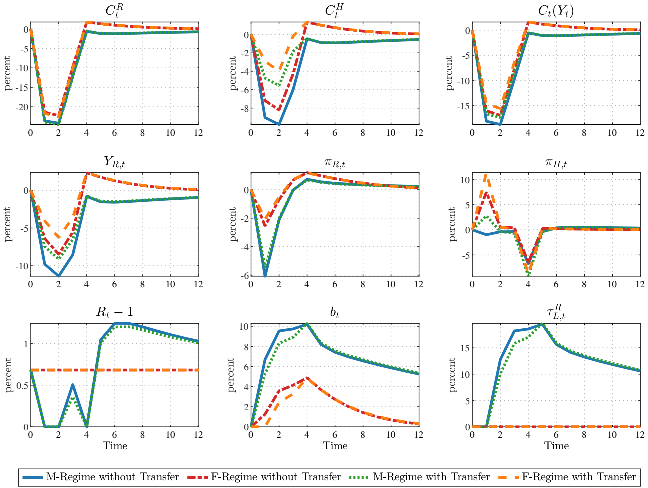
- Short-run contractions in output and consumption and a decline in inflation
- Smaller contractions in output and consumption of both types in the *fiscal regime* than in the *monetary regime*

Redistribution Policy with Different Policy Regimes



- Short-run contractions in output and consumption and a decline in inflation
- Smaller contractions in output and consumption of both types in the *fiscal regime* than in the *monetary regime*
  1. Strong and persistent inflation ⇒ Large expansionary effects on output due to nominal rigidities

Redistribution Policy with Different Policy Regimes



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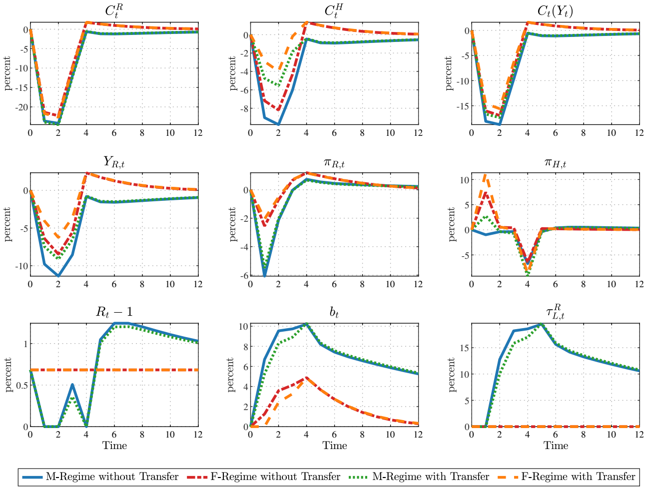
- Smaller contractions in output and consumption of both types in the *fiscal regime* than in the *monetary regime*

1. Strong and persistent inflation ⇒ Large expansionary effects on output due to nominal rigidities
2. Binding ZLB leads to a bigger drop in the monetary regime

Redistribution Policy with Different Policy Regimes



- Short-run contractions in output and consumption and a decline in inflation
- Smaller contractions in output and consumption of both types in the *fiscal regime* than in the *monetary regime*

1. Strong and persistent inflation ⇒ Large expansionary effects on output due to nominal rigidities
2. Binding ZLB leads to a bigger drop in the monetary regime
3. The redistribution program is more inflationary in the fiscal regime

Transfer Multipliers

Definition

	Monetary Regime				Fiscal Regime			
	$\mathcal{M}_t^M(Y)$	$\mathcal{M}_t^M(Y_R)$	$\mathcal{M}_t^M(C^R)$	$\mathcal{M}_t^M(C^H)$	$\mathcal{M}_t^F(Y)$	$\mathcal{M}_t^F(Y_R)$	$\mathcal{M}_t^F(C^R)$	$\mathcal{M}_t^F(C^H)$
Impact Multipliers	1.256	1.662	-0.211	6.059	3.072	4.094	1.368	8.653
4-Year Cumulative Multipliers	1.351	1.708	-0.116	6.154	7.983	9.646	5.789	15.165

- Multipliers computed with monetary regime and no transfers as baseline
- Aggregate and Ricardian sector output multipliers both above 1 in the monetary regime due to the binding ZLB and sticky prices

Transfer Multipliers

Definition

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- Multipliers computed with monetary regime and no transfers as baseline
- Aggregate and Ricardian sector output multipliers both above 1 in the monetary regime due to the binding ZLB and sticky prices
- Multipliers are ***even higher in the fiscal regime***
  - C^R multiplier is positive due to sticky prices and persistent inflation dynamics

Inspecting the Mechanisms

Why is the F regime so much better in this particular environment?

- Inflation is expansionary with sticky prices
- Labor taxes are distortionary
- Inflationary pressure generates little relative price distortion in a deep recession

Welfare Effects of Transfer Policy

Definition Short-Run Welfare

	Monetary Regime		Fiscal Regime	
	Long-run	Short-run ($t = 4$)	Long-run	Short-run ($t = 4$)
Ricardian Household	-0.022	-0.921	0.065	0.636
HTM Household	0.097	3.272	0.244	4.983

- The values are the % point deviation from the welfare of the baseline model under the monetary regime without transfers

Welfare Effects of Transfer Policy

▸ Definition ▸ Short-Run Welfare

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Welfare Effects of Transfer Policy

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- The values are the % point deviation from the welfare of the baseline model under the monetary regime without transfers
- Given the redistribution program, inflation taxes, as used in the fiscal regime, produce better welfare outcomes than labor taxes, as used in the monetary regime
- Redistribution policy under fiscal regime generates a ***Pareto improvement***

Mechanism and Sensitivity Analysis

- Decomposition of Transfer Multipliers ▸ Multipliers
- Transfer multipliers without COVID shocks ▸ Multipliers
- Different duration of the redistribution program ▸ M-Regime ▸ F-Regime ▸ Multipliers ▸ Welfare
- Different cross-sector elasticity of substitution ($\varepsilon = 1.2$) ▸ IRFs ▸ Multipliers
- Different tax rule response parameter ($\psi_L = 0.1$) ▸ IRFs ▸ Multipliers
- Exclude \$600 individual tax rebates in the CARES Act (Coibion et al., 2020) ▸ Multipliers

Outline

1. Simple Model
2. Quantitative Model
3. Data and Calibration
4. Quantitative Results
5. **Conclusion**

Conclusion

- How transfers are ultimately financed is key for their effectiveness
  - Inflation-financed transfers are significantly more effective than tax-financed transfers
  - The fiscal regime produces high and persistent inflation through the direct and the indirect (interest rate) channels
  - Quantitative exercise shows that inflation-financed transfers fight deflationary pressures in a COVID-recession-like environment
  - Such inflation-induced expansionary effects produce a Pareto improvement
- Future work
  - A richer form of heterogeneity across sectors as well as households
  - Long-term debt and the effects on long-term yields

Appendix

Data and Model Moments

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	Time	Data	Model
Panel A: Targeted moments (percent deviation from January)			
Total Hours for retail, transportation, leisure/hospitality	April	-16.7%	-16.7%
	June	-18.8%	-18.8%
	August	-13.2%	-13.2%
Total Hours excluding retail, transportation, leisure/hospitality	April	-6.58%	-6.58%
	June	-8.57%	-8.57%
	August	-6.13%	-6.13%
PCE Inflation for recreation, transportation, food services	April	-0.99%	-0.99%
	June	-0.39%	-0.39%
	August	-0.37%	-0.37%
Panel B: Non-targeted moments (percent deviation from January)			
PCE Inflation excluding recreation, transportation, food services	April	-0.14%	-6.07%
	June	-0.06%	-2.13%
	August	0.74%	-0.03%
Real PCE for recreation, transportation, food services	April	-41.1%	-16.7%
	June	-37.6%	-18.8%
	August	-25.2%	-13.2%
Real PCE excluding recreation, transportation, food services	April	-7.74%	-9.79%
	June	-3.78%	-11.4%
	August	-1.06%	-8.54%
Real GDP (percent deviation from Q1)	Q2	-8.99%	-13.3%
	Q3	-2.25%	-0.69%

Definition: Transfer Multipliers

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- The transfer multiplier for output under regime $i \in \{M, F\}$ is defined as

$$\mathcal{M}_t^i(Y) = \left(\frac{\sum_{h=0}^{t} \beta^h (\tilde{Y}_h^i - Y_h^M)}{\sum_{h=0}^{t} \beta^h s_h} \right),$$

where $\tilde{Y}_h^i$ is output at horizon h under i-regime *with* transfers, Y_h^M is output at horizon h under the monetary regime *without* transfers, and s_h is transfers at horizon h

Definition: Welfare Gains

Back

- We define our measure of welfare gain for household of type $i \in \{R, H\}$, $\mu_{t,k}^{i}$, as

$$\sum_{j=0}^{t} \beta^{j} U\left(C_{j}^{i}, L_{j}^{i}\right) = \sum_{j=0}^{t} \beta^{j} U\left(\left(1+\mu_{t,k}^{i}\right) \bar{C}^{i}, \bar{L}^{i}\right),$$

  where $\left\{\bar{C}^{i}, \bar{L}^{i}\right\}$ is the steady-state level of type-i household's consumption and hours, and $\{C_{j}^{i}, L_{j}^{i}\}$ are the time path of type-i household's consumption and hours

- The values in the table are the % point deviation from the welfare of the baseline model under the monetary regime without transfers.

Short-Run Welfare Gains Comparison

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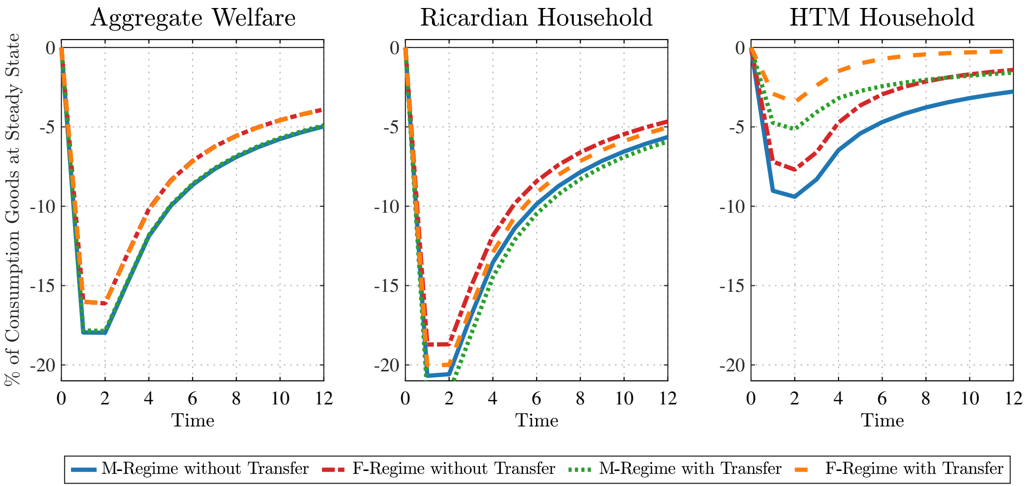

Inspecting the Mechanisms of Transfer Multipliers

The output multiplier under regime $i \in \{M, F\}$ can be decomposed as:

$$\mathcal{M}_t^i(Y) = \underbrace{\left(\frac{\sum_{h=0}^t \beta^h (\tilde{Y}_h^i - \tilde{Y}^i_{\text{no shock},h})}{\sum_{h=0}^t \beta^h s_h} \right)}_{\text{COVID Effect with Transfer}} + \underbrace{\left(\frac{\sum_{h=0}^t \beta^h (\tilde{Y}^i_{\text{no shock},h} - \bar{Y})}{\sum_{h=0}^t \beta^h s_h} \right)}_{\text{Transfer Effect without COVID Shocks}} - \underbrace{\left(\frac{\sum_{h=0}^t \beta^h (Y_h^M - \bar{Y})}{\sum_{h=0}^t \beta^h s_h} \right)}_{\text{COVID Effect without Transfer}}$$

- The third effect is the same across regimes, while the first two are different as they compute the effect for a given regime.

Decomposition of Transfer Multipliers

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	Monetary Regime				Fiscal Regime			
	$\mathcal{M}_t^M(Y)$	$\mathcal{M}_t^M(Y_R)$	$\mathcal{M}_t^M(C^R)$	$\mathcal{M}_t^M(C^H)$	$\mathcal{M}_t^F(Y)$	$\mathcal{M}_t^F(Y_R)$	$\mathcal{M}_t^F(C^R)$	$\mathcal{M}_t^F(C^H)$
Panel A: Impact Multipliers								
Total Effect	1.256	1.662	-0.211	6.059	3.072	4.094	1.368	8.653
COVID Effect with Transfer	-15.387	-6.244	-16.404	-12.059	-13.967	-4.276	-15.179	-9.999
Transfer Effect without COVID	0.792	0.925	-0.597	5.338	1.188	1.391	-0.243	5.872
COVID Effect without Transfer	-15.852	-6.980	-16.790	-12.780	-15.852	-6.980	-16.790	-12.780
Panel B: 4-Year Cumulative Multipliers								
Total Effect	1.351	1.708	-0.116	6.154	7.983	9.646	5.789	15.165
COVID Effect with Transfer	-16.708	-10.534	-16.981	-15.812	-10.172	-2.707	-11.162	-6.930
Transfer Effect without COVID	0.957	1.120	-0.449	5.562	1.053	1.233	-0.364	5.691
COVID Effect without Transfer	-17.102	-11.121	-17.314	-16.404	-17.102	-11.121	-17.314	-16.404

Transfer Multipliers without COVID Shocks

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	Monetary Regime				Fiscal Regime			
	$\mathcal{M}_t^M(Y)$	$\mathcal{M}_t^M(Y_R)$	$\mathcal{M}_t^M(C^R)$	$\mathcal{M}_t^M(C^H)$	$\mathcal{M}_t^F(Y)$	$\mathcal{M}_t^F(Y_R)$	$\mathcal{M}_t^F(C^R)$	$\mathcal{M}_t^F(C^H)$
Panel A: Without COVID shocks under sticky price								
Impact Multipliers	0.792	0.925	-0.597	5.338	1.188	1.391	-0.243	5.872
2-Year Cumulative Multipliers	1.043	1.221	-0.372	5.677	1.060	1.241	-0.357	5.700
4-Year Cumulative Multipliers	0.957	1.120	-0.449	5.562	1.053	1.233	-0.364	5.691
Panel B: Without COVID shocks under flexible price								
Impact Multipliers	0.494	0.577	-0.863	4.938	0.494	0.577	-0.863	4.938
2-Year Cumulative Multipliers	0.164	0.192	-1.159	4.495	0.494	0.577	-0.863	4.938
4-Year Cumulative Multipliers	-0.100	-0.115	-1.395	4.14	0.494	0.577	-0.863	4.938
Panel C: Without COVID shocks under flexible price and lump-sum tax adjustment								
Impact Multipliers	0.494	0.577	-0.863	4.938	0.494	0.577	-0.863	4.938
2-Year Cumulative Multipliers	0.494	0.577	-0.863	4.938	0.494	0.577	-0.863	4.938
4-Year Cumulative Multipliers	0.494	0.577	-0.863	4.938	0.494	0.577	-0.863	4.938

Monetary Regime: Different Duration of Redistribution Policy

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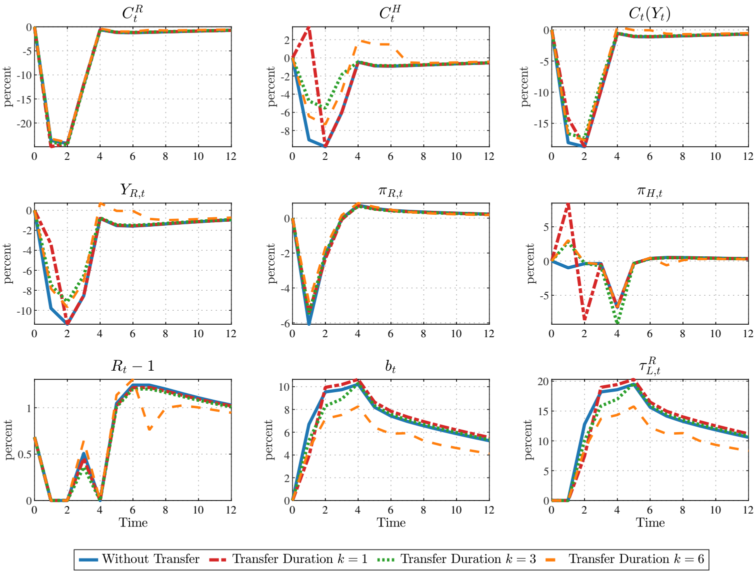

Fiscal Regime: Different Duration of Redistribution Policy

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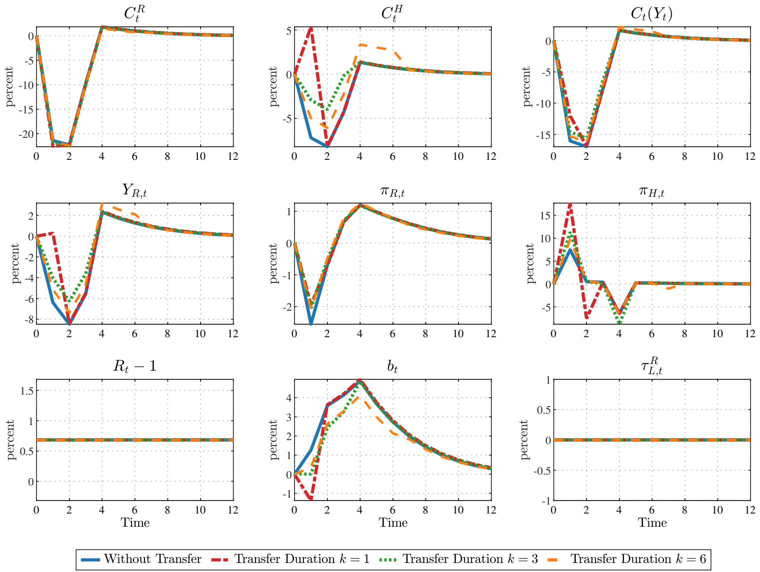

Multipliers with Different Transfer Distribution

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	Monetary Regime			Fiscal Regime		
Transfer Duration	$k=1$	$k=3$	$k=6$	$k=1$	$k=3$	$k=6$
Panel A: Impact multiplier						
$\mathcal{M}_{24}^{i}(Y)$	1.150	1.256	2.100	1.793	3.072	4.938
$\mathcal{M}_{24}^{i}(Y_R)$	1.534	1.662	2.775	2.412	4.094	6.565
$\mathcal{M}_{24}^{i}(C^R)$	-0.305	-0.211	0.525	0.252	1.368	2.993
$\mathcal{M}_{24}^{i}(C^H)$	5.913	6.059	7.256	6.839	8.653	11.305
Panel B: 4-year cumulative multiplier						
$\mathcal{M}_{24}^{i}(Y)$	1.158	1.351	2.562	8.040	7.983	7.791
$\mathcal{M}_{24}^{i}(Y_R)$	1.544	1.708	3.088	9.787	9.646	9.352
$\mathcal{M}_{24}^{i}(C^R)$	-0.298	-0.116	0.972	5.829	5.789	5.627
$\mathcal{M}_{24}^{i}(C^H)$	5.924	6.154	7.765	15.277	15.165	14.873

Long-run Welfare with Different Transfer Distribution

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	Monetary Regime			Fiscal Regime		
Transfer Duration	$k=1$	$k=3$	$k=6$	$k=1$	$k=3$	$k=6$
Ricardian Household	-0.029	-0.022	0.001	0.061	0.065	0.064
HTM Household	0.088	0.097	0.121	0.241	0.244	0.236

Redistribution Policy with Different Policy Regimes ($\varepsilon = 1.2$)

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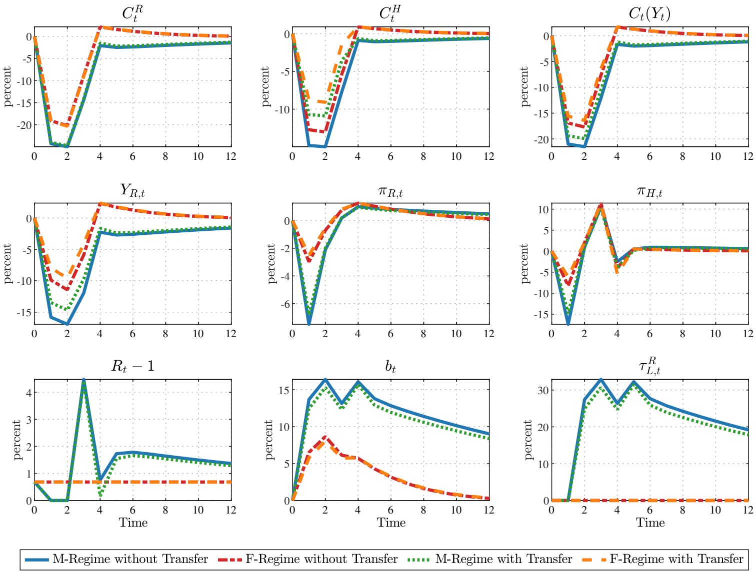

Transfer Multipliers ($\varepsilon = 1.2$)

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	Monetary Regime				Fiscal Regime			
	$\mathcal{M}_t^M(Y)$	$\mathcal{M}_t^M(Y_R)$	$\mathcal{M}_t^M(C^R)$	$\mathcal{M}_t^M(C^H)$	$\mathcal{M}_t^F(Y)$	$\mathcal{M}_t^F(Y_R)$	$\mathcal{M}_t^F(C^R)$	$\mathcal{M}_t^F(C^H)$
Impact Multipliers	1.418	1.651	0.214	5.358	4.740	5.557	3.779	7.885
2-Year Cumulative Multipliers	1.920	2.169	0.744	5.767	10.413	11.685	9.804	12.409
4-Year Cumulative Multipliers	2.146	2.418	0.985	5.946	12.630	14.123	12.162	14.160

Redistribution Policy with Different Policy Regimes ($\psi_L = 0.1$)

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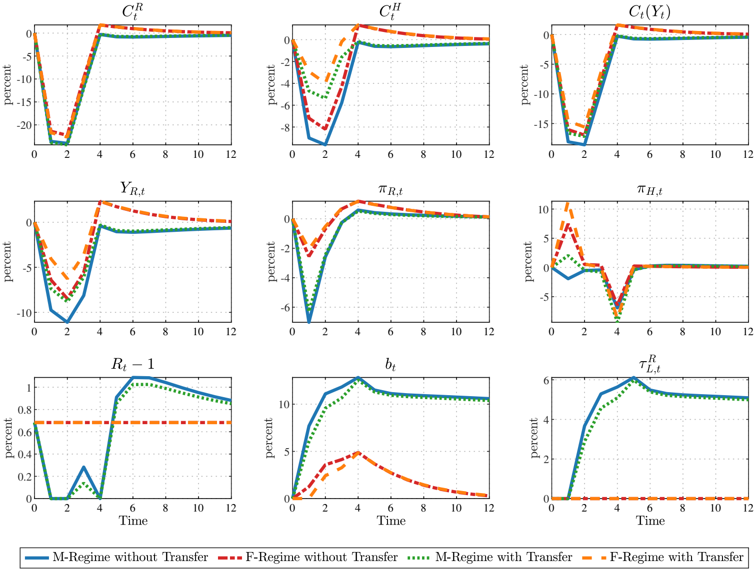

Transfer Multipliers ($\psi_L = 0.1$)

Back

	Monetary Regime				Fiscal Regime			
	$\mathcal{M}_t^M(Y)$	$\mathcal{M}_t^M(Y_R)$	$\mathcal{M}_t^M(C^R)$	$\mathcal{M}_t^M(C^H)$	$\mathcal{M}_t^F(Y)$	$\mathcal{M}_t^F(Y_R)$	$\mathcal{M}_t^F(C^R)$	$\mathcal{M}_t^F(C^H)$
Impact Multipliers	1.283	1.698	-0.187	6.097	3.047	4.061	1.346	8.617
2-Year Cumulative Multipliers	1.417	1.789	-0.058	6.245	5.859	7.164	3.888	12.309
4-Year Cumulative Multipliers	1.475	1.856	-0.006	6.322	6.804	8.266	4.734	13.579

Transfer Multipliers (Excluding $600 Individual Tax Rebates)

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	Monetary Regime				Fiscal Regime			
	$\mathcal{M}_t^M(Y)$	$\mathcal{M}_t^M(Y_R)$	$\mathcal{M}_t^M(C^R)$	$\mathcal{M}_t^M(C^H)$	$\mathcal{M}_t^F(Y)$	$\mathcal{M}_t^F(Y_R)$	$\mathcal{M}_t^F(C^R)$	$\mathcal{M}_t^F(C^H)$
Panel A: Impact Multipliers								
Total Effect	1.254	1.655	-0.212	6.054	4.363	5.802	2.493	10.487
COVID Effect with Transfer	-26.592	-11.179	-28.272	-21.093	-23.884	-7.502	-25.926	-17.200
Transfer Effect without COVID	0.787	0.920	-0.601	5.332	1.188	1.389	-0.242	5.871
COVID Effect without Transfer	-27.059	-11.915	-28.661	-21.815	-27.059	-11.915	-28.661	-21.815
Panel B: 4-Year Cumulative Multipliers								
Total Effect	1.349	1.702	-0.118	6.150	12.721	15.300	10.010	21.595
COVID Effect with Transfer	-28.802	-18.402	-29.226	-27.415	-17.530	-4.920	-19.187	-12.105
Transfer Effect without COVID	0.959	1.120	-0.448	5.563	1.058	1.237	-0.359	5.697
COVID Effect without Transfer	-29.192	-18.983	-29.556	-28.002	-29.192	-18.983	-29.556	-28.002