Fiscal and Monetary Policy with Heterogeneous Agents

Adrien Auclert

Boston University, April 2024

Modeling the effect of fiscal stimulus

- Past 20 years: increasing use of fiscal transfers for aggregate stabilization
  - Global financial crisis, Covid crisis, European energy price crisis

Modeling the effect of fiscal stimulus

- Past 20 years: increasing use of fiscal transfers for aggregate stabilization
  - Global financial crisis, Covid crisis, European energy price crisis
- Widespread view that these boosted activity, inflation, and “excess savings”

Modeling the effect of fiscal stimulus

- Past 20 years: increasing use of fiscal transfers for aggregate stabilization
  - Global financial crisis, Covid crisis, European energy price crisis
- Widespread view that these boosted activity, inflation, and “excess savings”

USA | Jul 11 2023

Pandemic Stimulus Still Supporting Spending

by: Peter D'Antonio & Daniel Golden | in: Viewpoints

The economy remains resilient and core measures of inflation are stubbornly high in the face of the most aggressive Fed tightening in decades. This resilience is partly a result of government stimulus programs during the COVID-19 pandemic. These programs generated a stockpile of excess savings that has continued to support household spending through rising inflation and higher interest rates. The Fed needs to counter that fiscal expansion in its fight against inflation.

Modeling the effect of fiscal stimulus

- Past 20 years: increasing use of fiscal transfers for aggregate stabilization
  - Global financial crisis, Covid crisis, European energy price crisis
- Widespread view that these boosted activity, inflation, and “excess savings”
- Standard modern macro models are inadequate to study these effects
  - Ricardian equivalence: zero effect on activity or inflation by assumption

Modeling the effect of fiscal stimulus

- Past 20 years: increasing use of fiscal transfers for aggregate stabilization
  - Global financial crisis, Covid crisis, European energy price crisis
- Widespread view that these boosted activity, inflation, and “excess savings”
- Standard modern macro models are inadequate to study these effects
  - Ricardian equivalence: zero effect on activity or inflation by assumption
- Old-style Keynesian models are also inadequate
  - Static analysis: no effect of excess savings on future activity and inflation

Modeling the effect of fiscal stimulus

- Past 20 years: increasing use of fiscal transfers for aggregate stabilization
  - Global financial crisis, Covid crisis, European energy price crisis
- Widespread view that these boosted activity, inflation, and “excess savings”
- Standard modern macro models are inadequate to study these effects
  - Ricardian equivalence: zero effect on activity or inflation by assumption
- Old-style Keynesian models are also inadequate
  - Static analysis: no effect of excess savings on future activity and inflation

$\rightarrow$ New paradigm needed for fiscal policy counterfactuals

Modeling the effect of monetary policy

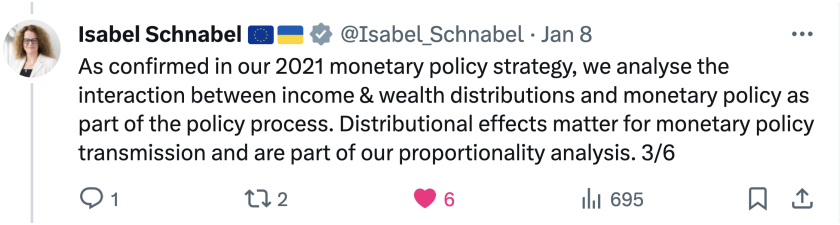
- 20 years ago, most models of monetary policy ignored distributional effects
  - Central banker view that redistribution was not their role
  - “Representative agent” paradigm within macroeconomics

Modeling the effect of monetary policy

- 20 years ago, most models of monetary policy ignored distributional effects
  - Central banker view that redistribution was not their role
  - “Representative agent” paradigm within macroeconomics
- Increasing recognition of limits of this view
  - eg, redistribution between borrowers and savers, QE boosting asset prices

Modeling the effect of monetary policy

- 20 years ago, most models of monetary policy ignored distributional effects
  - Central banker view that redistribution was not their role
  - “Representative agent” paradigm within macroeconomics
- Increasing recognition of limits of this view
  - eg, redistribution between borrowers and savers, QE boosting asset prices
- Today: the landscape has completely changed!



HANK as a new paradigm

- Paradigm shift in modeling of fiscal and monetary policy: “HANK”
    1. Microfounded as in modern macro models
    2. Non Ricardian: fiscal transfers affect economic activity and inflation
    3. Behave similarly to old Keynesian models, but take dynamics into account
    4. Explicitly model two-way feedback between policy and distribution

HANK as a new paradigm

- Paradigm shift in modeling of fiscal and monetary policy: “HANK”
    1. Microfounded as in modern macro models
    2. Non Ricardian: fiscal transfers affect economic activity and inflation
    3. Behave similarly to old Keynesian models, but take dynamics into account
    4. Explicitly model two-way feedback between policy and distribution
- Most central banks have HANK development teams today

HANK as a new paradigm

- Paradigm shift in modeling of fiscal and monetary policy: “HANK”
    1. Microfounded as in modern macro models
    2. Non Ricardian: fiscal transfers affect economic activity and inflation
    3. Behave similarly to old Keynesian models, but take dynamics into account
    4. Explicitly model two-way feedback between policy and distribution
- Most central banks have HANK development teams today

Slowly diffusing to fiscal policy institutions as well

- eg evaluation of fiscal consolidation plans by French government

This presentation

- Take stock of the progress in the literature in the past decade:

1. Introduce canonical “HANK” model
2. Derive core results for fiscal and monetary policy
3. Discuss main extensions and preview some open questions

This presentation

- Take stock of the progress in the literature in the past decade:

1. Introduce canonical “HANK” model
2. Derive core results for fiscal and monetary policy
3. Discuss main extensions and preview some open questions

- Illustrate usefulness of a “sequence-space” approach to macro modeling

This presentation

- Take stock of the progress in the literature in the past decade:

1. Introduce canonical “HANK” model
2. Derive core results for fiscal and monetary policy
3. Discuss main extensions and preview some open questions

- Illustrate usefulness of a “sequence-space” approach to macro modeling
- Based on papers with Matt Rognlie and Ludwig Straub, together with Rishabh Aggarwal, Bence Bardóczy, Hugo Monnery, Martin Souchier, ...

This presentation

- Take stock of the progress in the literature in the past decade:

1. Introduce canonical “HANK” model
2. Derive core results for fiscal and monetary policy
3. Discuss main extensions and preview some open questions

- Illustrate usefulness of a “sequence-space” approach to macro modeling
- Based on papers with Matt Rognlie and Ludwig Straub, together with Rishabh Aggarwal, Bence Bardóczy, Hugo Monnery, Martin Souchier, ...
- Upcoming chapter in the Annual Review of Economics (w/ Rognlie+Straub)

The canonical HANK model

- Households face idiosyncratic risk to their efficiency level e_{it} (Markov Chain)

$$\begin{aligned} \max \ & \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left(u(c_{it}) - v\left(n_{it}\right)\right) \\ & c_{it} + a_{it} \leq (1 + r_{t-1}) a_{it-1} + e_{it} \left(1 - \tau_t\right) w_t n_{it} \\ & a_{it} \geq \underline{a} \end{aligned}$$

$r_t \equiv$ real interest rate, $\tau_t \equiv$ tax rate, $w_t \equiv$ wage, $\underline{a} \equiv$borrowing constraint

- Households face idiosyncratic risk to their efficiency level e_{it} (Markov Chain)

$$\begin{aligned} \max \ & \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left(u(c_{it}) - v\left(n_{it}\right)\right) \\ & c_{it} + a_{it} \leq (1 + r_{t-1}) a_{it-1} + e_{it} \left(1 - \tau_t\right) w_t n_{it} \\ & a_{it} \geq \underline{a} \end{aligned}$$

  $r_t \equiv$ real interest rate, $\tau_t \equiv$ tax rate, $w_t \equiv$ wage, $\underline{a} \equiv$borrowing constraint

- Fiscal policy sets τ_t, spends G_t and has debt B_t, with

$$B_t = \left(1 + r_{t-1}\right) B_{t-1} + G_t - \tau_t w_t \int n_{it} di$$

  sets plans for G_t, τ_t compatible with intertemporal budget constraint

- Households face idiosyncratic risk to their efficiency level e_{it} (Markov Chain)

$$\begin{aligned} \max \ & \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left(u(c_{it}) - v\left(n_{it}\right)\right) \\ & c_{it} + a_{it} \leq (1 + r_{t-1}) a_{it-1} + e_{it} \left(1 - \tau_t\right) w_t n_{it} \\ & a_{it} \geq \underline{a} \end{aligned}$$

  $r_t \equiv$ real interest rate, $\tau_t \equiv$ tax rate, $w_t \equiv$ wage, $\underline{a} \equiv$borrowing constraint

- Fiscal policy sets τ_t, spends G_t and has debt B_t, with

$$B_t = \left(1 + r_{t-1}\right) B_{t-1} + G_t - \tau_t w_t \int n_{it} di$$

  sets plans for G_t, τ_t compatible with intertemporal budget constraint

- Production from labor: $Y_t = N_t$; perfect competition + flexible prices: $w_t = 1$

The canonical HANK model, continued

- So far: completely standard "**HA**" macro model

  [Deaton, Carroll, Bewley, Huggett, Aiyagari...]

The canonical HANK model, continued

- So far: completely standard "**HA**" macro model

  [Deaton, Carroll, Bewley, Huggett, Aiyagari...]

- From "**NK**" tradition, assume sticky wages. Implications:
  - Labor rationed, equal allocation rule $n_{it} = N_t = Y_t$
  - Phillips curve for inflation, $\pi_t = \kappa \int \left(v'(n_{it}) - \frac{\epsilon}{\epsilon - 1}(1 - \tau_t) w_t e_{it} u'(c_{it}) \right) di + \beta \pi_{t+1}$

The canonical HANK model, continued

- So far: completely standard "**HA**" macro model

  [Deaton, Carroll, Bewley, Huggett, Aiyagari...]

- From "**NK**" tradition, assume sticky wages. Implications:
  - Labor rationed, equal allocation rule $n_{it} = N_t = Y_t$
  - Phillips curve for inflation, $\pi_t = \kappa \int \left(v'(n_{it}) - \frac{\epsilon}{\epsilon - 1}(1 - \tau_t) w_t e_{it} u'(c_{it}) \right) di + \beta \pi_{t+1}$
- Monetary policy sets r_t (using rule for nominal rate $i_t = r_t + \pi_{t+1}$)

The canonical HANK model, continued

- So far: completely standard "**HA**" macro model

  [Deaton, Carroll, Bewley, Huggett, Aiyagari...]

- From "**NK**" tradition, assume sticky wages. Implications:
  - Labor rationed, equal allocation rule $n_{it} = N_t = Y_t$
  - Phillips curve for inflation, $\pi_t = \kappa \int \left(v'(n_{it}) - \frac{\epsilon}{\epsilon - 1}(1 - \tau_t) w_t e_{it} u'(c_{it}) \right) di + \beta \pi_{t+1}$
- Monetary policy sets r_t (using rule for nominal rate $i_t = r_t + \pi_{t+1}$)
- Goods market clearing:

$$Y_t = G_t + \int c_{it} di$$

The canonical HANK model, continued

- So far: completely standard "**HA**" macro model

  [Deaton, Carroll, Bewley, Huggett, Aiyagari...]

- From "**NK**" tradition, assume sticky wages. Implications:
  - Labor rationed, equal allocation rule $n_{it} = N_t = Y_t$
  - Phillips curve for inflation, $\pi_t = \kappa \int \left(v'(n_{it}) - \frac{\epsilon}{\epsilon - 1}(1 - \tau_t) w_t e_{it} u'(c_{it}) \right) di + \beta \pi_{t+1}$
- Monetary policy sets r_t (using rule for nominal rate $i_t = r_t + \pi_{t+1}$)
- Goods market clearing:

$$Y_t = G_t + \int c_{it} di$$

- That's it! Simplest possible merger of **HA**+**NK**

  [literature took lots of detours to get here!]

Analyzing equilibrium in the sequence space

- Substituting in what we have so far, writing $T_t = \tau_t Y_t$ for total tax revenue:

$$\max_{c_{it}, a_{it}} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left(u(c_{it}) - v\left(Y_t\right) \right)$$

$$c_{it} + a_{it} \leq (1 + r_{t-1}) a_{it-1} + e_{it} \left(Y_t - T_t \right)$$

$$a_{it} \geq \underline{a}$$

Analyzing equilibrium in the sequence space

- Substituting in what we have so far, writing $T_t = \tau_t Y_t$ for total tax revenue:

$$\max_{c_{it}, a_{it}} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left(u(c_{it}) - v\left(Y_t\right) \right)$$

$$c_{it} + a_{it} \leq (1 + r_{t-1}) a_{it-1} + e_{it} \left(Y_t - T_t \right)$$

$$a_{it} \geq \underline{a}$$

- Household decisions affected only by aggregates $\{r_t\}$, $\{Y_t - T_t\}$

  $\rightarrow$ $\int c_{it} di$ is given by a "sequence-space function" $\mathcal{C}_t \left(\{r_s\}, \{Y_s - T_s\} \right)$

Analyzing equilibrium in the sequence space

- Substituting in what we have so far, writing $T_t = \tau_t Y_t$ for total tax revenue:

$$\max_{c_{it}, a_{it}} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left(u(c_{it}) - v\left(Y_t\right)\right)$$
$$c_{it} + a_{it} \leq (1 + r_{t-1}) a_{it-1} + e_{it}\left(Y_t - T_t\right)$$
$$a_{it} \geq \underline{a}$$

- Household decisions affected only by aggregates $\{r_t\}$, $\{Y_t - T_t\}$

  $\rightarrow$ $\int c_{it} di$ is given by a "sequence-space function" $\mathcal{C}_t\left(\{r_s\}, \{Y_s - T_s\}\right)$

- Substituting this function back into goods market clearing:

$$Y_t = G_t + \mathcal{C}_t\left(\{r_s, Y_s - T_s\}\right) \tag{1}$$

Analyzing equilibrium in the sequence space

- Substituting in what we have so far, writing $T_t = \tau_t Y_t$ for total tax revenue:

$$\max_{c_{it}, a_{it}} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left(u(c_{it}) - v\left(Y_t\right)\right)$$
$$c_{it} + a_{it} \leq (1 + r_{t-1}) a_{it-1} + e_{it}\left(Y_t - T_t\right)$$
$$a_{it} \geq \underline{a}$$

- Household decisions affected only by aggregates $\{r_t\}$, $\{Y_t - T_t\}$

  $\rightarrow$ $\int c_{it} di$ is given by a "sequence-space function" $\mathcal{C}_t\left(\{r_s\}, \{Y_s - T_s\}\right)$

- Substituting this function back into goods market clearing:

$$Y_t = G_t + \mathcal{C}_t\left(\{r_s, Y_s - T_s\}\right) \tag{1}$$

- Given fiscal policy $\{G_t, T_t\}$ and monetary policy $\{r_t\}$, the solution $\{Y_t\}$ to this fixed-point equation determines equilibrium

Fiscal policy

Fiscal policy in HANK: the intertemporal Keynesian cross

- Suppose monetary policy sets $r_t = r$. Equation (1) is just:

$$Y_t = G_t + \mathcal{C}_t\left(\{Y_s - T_s\}\right)$$

Fiscal policy in HANK: the intertemporal Keynesian cross

- Suppose monetary policy sets $r_t = r$. Equation (1) is just:

$$Y_t = G_t + \mathcal{C}_t\left(\{Y_s - T_s\}\right)$$

- Linearize this sequence-space system, writing $d\mathbf{Y} = \{dY_0, dY_1, \ldots\}$ etc:

$$d\mathbf{Y} = d\mathbf{G} - \mathbf{M}d\mathbf{T} + \mathbf{M}d\mathbf{Y} \tag{2}$$

  here $\mathbf{M}$, the Fréchet derivative of $\mathcal{C}$ wrt $\mathbf{Y}$, is a "sequence-space Jacobian"

  [Auclert-Bardóczy-Rognlie-Straub ECTA 2021]

- $M_{ts} \equiv \frac{\partial \mathcal{C}_t}{\partial Y_s}$ gives "intertemporal marginal propensities to consume"

Fiscal policy in HANK: the intertemporal Keynesian cross

- Suppose monetary policy sets $r_t = r$. Equation (1) is just:

$$Y_t = G_t + \mathcal{C}_t\left(\{Y_s - T_s\}\right)$$

- Linearize this sequence-space system, writing $d\mathbf{Y} = \{dY_0, dY_1, \ldots\}$ etc:

$$d\mathbf{Y} = d\mathbf{G} - \mathbf{M}d\mathbf{T} + \mathbf{M}d\mathbf{Y} \tag{2}$$

  here $\mathbf{M}$, the Fréchet derivative of $\mathcal{C}$ wrt $\mathbf{Y}$, is a "sequence-space Jacobian"

  [Auclert-Bardóczy-Rognlie-Straub ECTA 2021]

- $M_{ts} \equiv \frac{\partial \mathcal{C}_t}{\partial Y_s}$ gives "intertemporal marginal propensities to consume"
- (2) is like Keynesian cross, but dynamic: "intertemporal Keynesian cross"

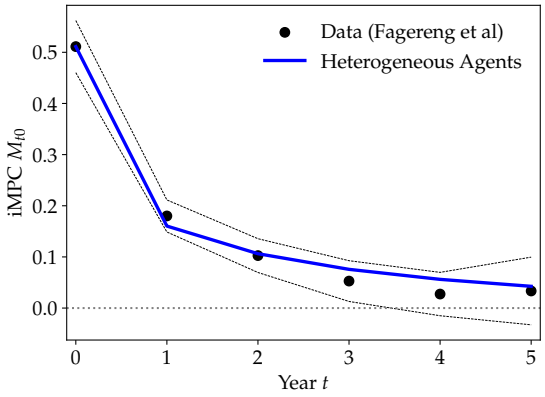
  [Auclert-Rognlie-Straub JPE forthcoming]

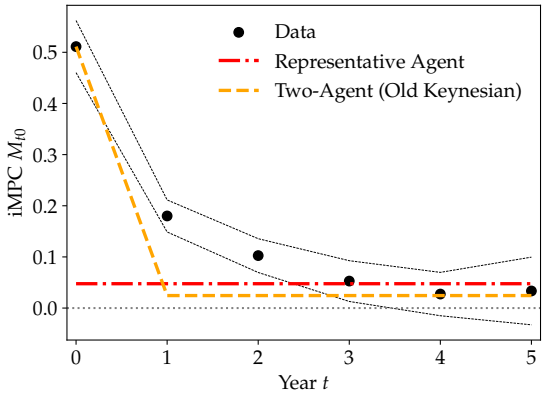
M in model vs data

- M_{to} is average path of household spending after one-time transfer

M in model vs data

- M_{t0} is average path of household spending after one-time transfer
- Compare calibrated model to evidence from Fagereng Holm Natvik 2021:

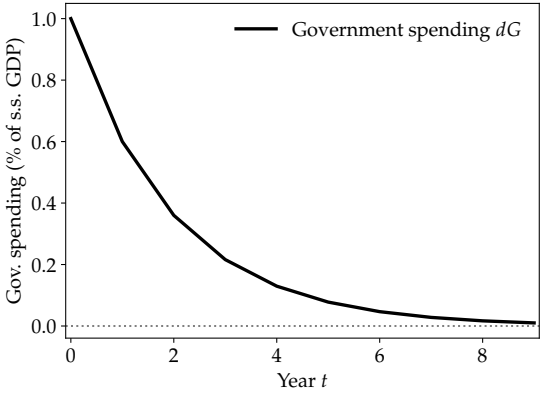


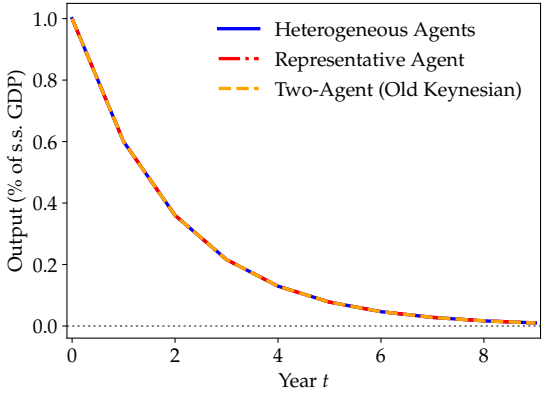


$\rightarrow$ In HA model, agents spend down the transfer slowly over time, as in data

Spending multipliers according to the IKC

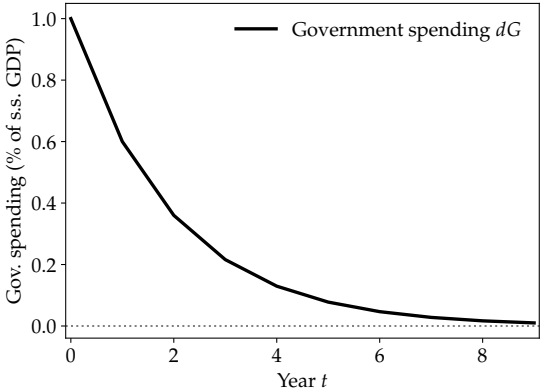
- First solve for effect of balanced-budget spending, $d\mathbf{G} = d\mathbf{T}$

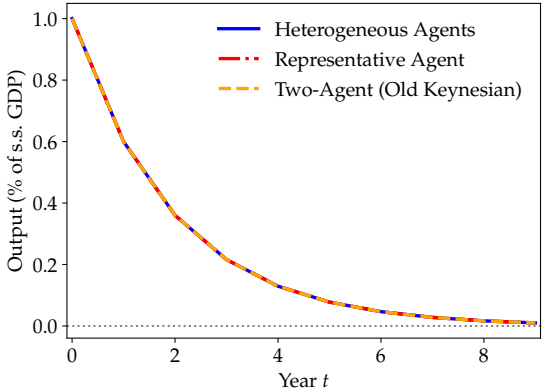




Spending multipliers according to the IKC

- First solve for effect of balanced-budget spending, $d\mathbf{G} = d\mathbf{T}$



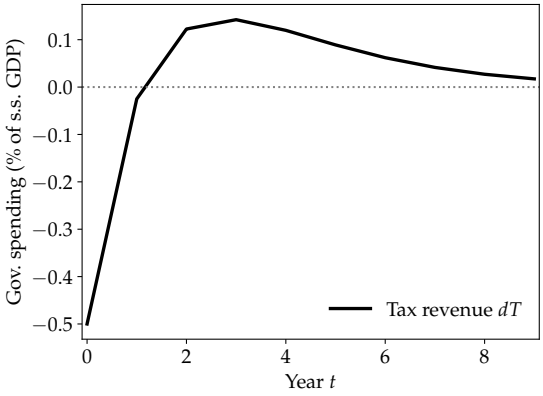


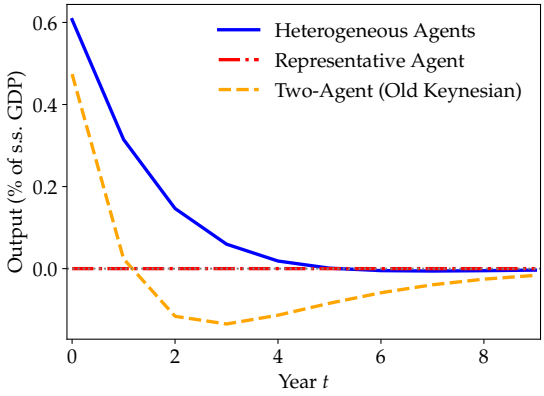
- Analytical solution: $d\mathbf{Y} = d\mathbf{G}$ ("balanced budget multiplier")

[Gelting 1941, Haavelmo 1945]

Transfer multipliers according to the IKC

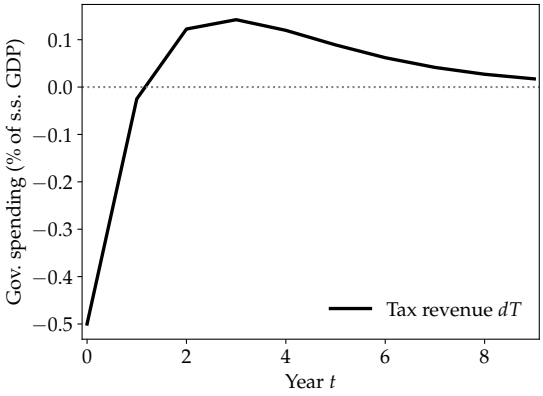
- Next solve for a pure fiscal transfer, $d\mathbf{G} = 0$, $d\mathbf{T} \neq 0$ (with $\sum (1+r)^{-t} dT_t = 0$)

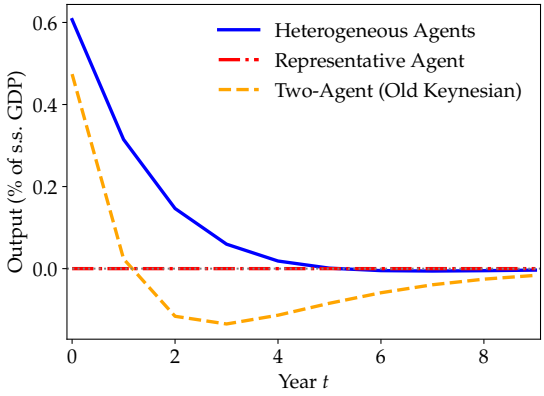




Transfer multipliers according to the IKC

- Next solve for a pure fiscal transfer, $d\mathbf{G} = 0$, $d\mathbf{T} \neq 0$ (with $\sum (1+r)^{-t} dT_t = 0$)

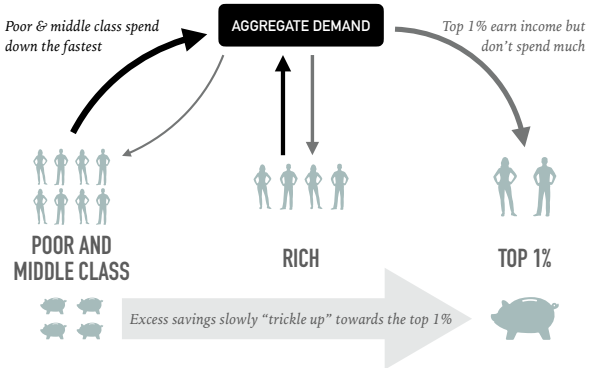




→ With data-consistent **M**, fiscal transfers are more powerful & persistent

Why such persistent effects from transfers?

- Government issues debt to finance transfers: someone must hold it!



- cf "Trickling Up of Excess Savings" [Auclert-Rognlie-Straub AEA P&P 2023]

Monetary policy

- Now, remove fiscal policy: $G = T = B = 0$. Equation (1) becomes:

$$Y_t = \mathcal{C}_t\left(\{r_s\}, \{Y_s\}\right)$$

- Linearizing as before:

$$d\mathbf{Y} = \mathbf{M}^r d\mathbf{r} + \mathbf{M} d\mathbf{Y}$$

here $\mathbf{M}^r$ is another sequence space Jacobian, with elements $M^r_{ts} \equiv \partial \mathcal{C}_t / \partial r_s$

- Now, remove fiscal policy: $G = T = B = 0$. Equation (1) becomes:

$$Y_t = \mathcal{C}_t\left(\{r_s\}, \{Y_s\}\right)$$

- Linearizing as before:

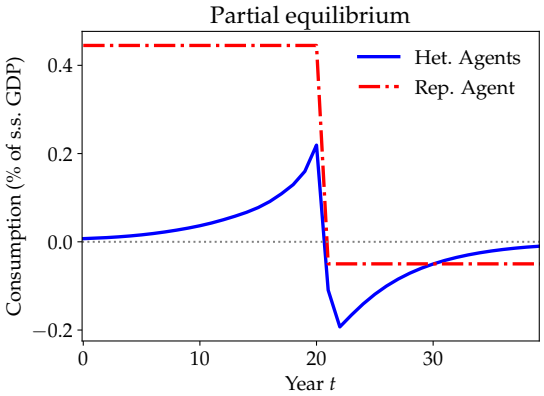
$$d\mathbf{Y} = \mathbf{M}^r d\mathbf{r} + \mathbf{M} d\mathbf{Y}$$

  here $\mathbf{M}^r$ is another sequence space Jacobian, with elements $M^r_{ts} \equiv \partial \mathcal{C}_t / \partial r_s$

- Early idea in the field: [McKay-Nakamura-Steinsson AER 2016]
  - In HA, future interest rates r_s have limited impact on consumption today C_0
  - So, maybe HANK helps solve the "forward guidance puzzle"

Forward guidance puzzle in HANK

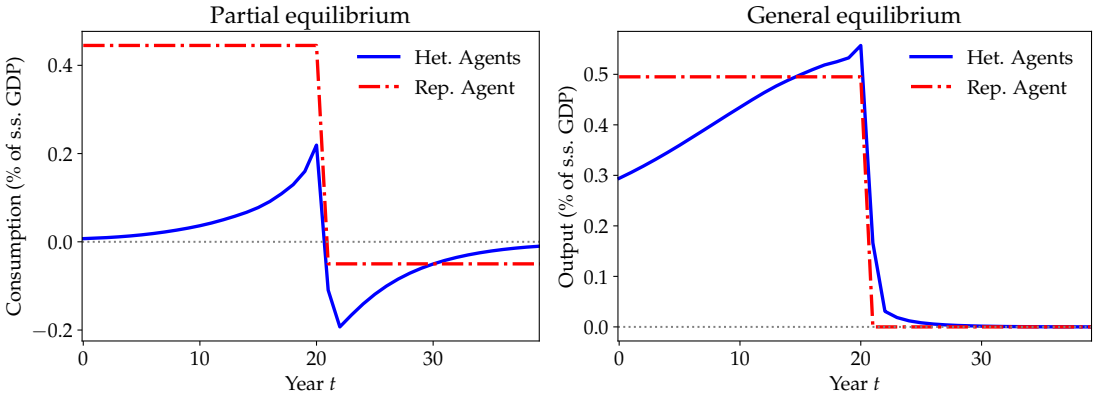
- Consider partial equilibrium: $d\mathbf{C} = \mathbf{M}^r d\mathbf{r}$ for 100bp cut to $d\mathbf{r}$ in year 20



- Seems promising!

Forward guidance puzzle in HANK

- Now general equilibrium: fixed point of $d\mathbf{Y} = \mathbf{M}^r d\mathbf{r} + \mathbf{M} d\mathbf{Y}$



- Forward guidance puzzle reappears in GE!

What is happening? Direct vs indirect effects

- Have

$$d\mathbf{Y} = d\mathbf{C} = \underbrace{\mathbf{M}^r \cdot d\mathbf{r}}_{\text{Direct effect}} \downarrow + \underbrace{\mathbf{M} \cdot d\mathbf{Y}}_{\text{Indirect effect}} \uparrow$$

Two competing effects of market incompleteness! direct $\downarrow$, indirect $\uparrow$

What is happening? Direct vs indirect effects

- Have

$$d\mathbf{Y} = d\mathbf{C} = \underbrace{\mathbf{M}^r \cdot d\mathbf{r}}_{\text{Direct effect}} \downarrow + \underbrace{\mathbf{M} \cdot d\mathbf{Y}}_{\text{Indirect effect}} \uparrow$$

  Two competing effects of market incompleteness! direct $\downarrow$, indirect $\uparrow$

- HANK always makes indirect effect of monetary policy larger

  [Kaplan-Moll-Violante AER 2019]

What is happening? Direct vs indirect effects

- Have

$$d\mathbf{Y} = d\mathbf{C} = \underbrace{\mathbf{M}^r \cdot d\mathbf{r}}_{\text{Direct effect}} \downarrow + \underbrace{\mathbf{M} \cdot d\mathbf{Y}}_{\text{Indirect effect}} \uparrow$$

  Two competing effects of market incompleteness! direct $\downarrow$, indirect $\uparrow$

- HANK always makes indirect effect of monetary policy larger

  [Kaplan-Moll-Violante AER 2019]

- ... but it is not clear what the overall effect is in general !

- In particular, in the limit of zero liquidity ($\underline{a} \to 0$), one can show that:

$$\mathbf{M}^r \cdot d\mathbf{r} = (\mathbf{I} - \mathbf{M})\, d\mathbf{C}^{RA}$$

  and so, $d\mathbf{Y} = d\mathbf{C}^{RA}$ in the HA model!! [Werning 2015]

Taking stock

- In the canonical HANK model, relative to the standard rep agent model:

1. Balanced-budget government spending has similar aggregate effects
2. Deficit-financed spending/transfers are much more powerful and persistent
3. Monetary policy has similar aggregate effects
4. But, the transmission mechanism relies much more on indirect effects

Going beyond the canonical model

Other important topics in HANK

- **Countercyclical income risk**
  - Moving away from equal allocation rule $n_{it} = N_t$ towards more realistic models of unemployment risk, can get a lot more action from HANK models
  - Feedback loop: future recessions $\rightarrow$ income risk $\rightarrow$ current recession
  - This *aggravates* the forward guidance puzzle

    [Ravn-Sterk JME 2017, Acharya-Dogra ECTA 2020, Bilbiie 2023]

Other important topics in HANK

- **Countercyclical income risk**
  - Moving away from equal allocation rule $n_{it} = N_t$ towards more realistic models of unemployment risk, can get a lot more action from HANK models
  - Feedback loop: future recessions $\rightarrow$ income risk $\rightarrow$ current recession
  - This *aggravates* the forward guidance puzzle

    [Ravn-Sterk JME 2017, Acharya-Dogra ECTA 2020, Bilbiie 2023]
- **Maturity structure of assets and liabilities**
  - With long-maturity assets, capital gains after interest rate cuts $\Rightarrow$ redistribution from poor to rich
  - This makes the effects of monetary policy less powerful [Auclert AER 2019]

Other important topics in HANK

- **Countercyclical income risk**
  - Moving away from equal allocation rule $n_{it} = N_t$ towards more realistic models of unemployment risk, can get a lot more action from HANK models
  - Feedback loop: future recessions $\rightarrow$ income risk $\rightarrow$ current recession
  - This *aggravates* the forward guidance puzzle

    [Ravn-Sterk JME 2017, Acharya-Dogra ECTA 2020, Bilbiie 2023]
- **Maturity structure of assets and liabilities**
  - With long-maturity assets, capital gains after interest rate cuts $\Rightarrow$ redistribution from poor to rich
  - This makes the effects of monetary policy less powerful [Auclert AER 2019]
- **Nominal denomination of assets and liabilities**
  - With nominal debt, inflation after rate cuts $\Rightarrow$ redistribution from rich to poor
  - This makes the effects of monetary policy more powerful

    [Doepke-Schneider JPE 2006, Auclert AER 2019, Pallotti 2024]

More exciting work

- **Incorporating behavioral effects in HANK**
  - Imperfect information, cognitive discounting, hyperbolic discounting… can rationalize high MPCs, and keep forward guidance puzzle in check [Gabaix AER 2020, Angeletos Huo AER 2021, Laibson-Moll-Maxted QJE 2024…]
  - Combine well with sequence-space methods [Auclert-Rognlie-Straub 2020]

More exciting work

- **Incorporating behavioral effects in HANK**
  - Imperfect information, cognitive discounting, hyperbolic discounting… can rationalize high MPCs, and keep forward guidance puzzle in check [Gabaix AER 2020, Angeletos Huo AER 2021, Laibson-Moll-Maxted QJE 2024…]
  - Combine well with sequence-space methods [Auclert-Rognlie-Straub 2020]
- **Estimating HANK**
  - Medium-scale models useful for central bank policy analysis and forecasting [Auclert-Rognlie-Straub 2020, Bayer-Born-Luetticke AER 2024, Del Negro et al 2023, HANK teams in many central banks]

More exciting work

- **Incorporating behavioral effects in HANK**
  - Imperfect information, cognitive discounting, hyperbolic discounting… can rationalize high MPCs, and keep forward guidance puzzle in check [Gabaix AER 2020, Angeletos Huo AER 2021, Laibson-Moll-Maxted QJE 2024…]
  - Combine well with sequence-space methods [Auclert-Rognlie-Straub 2020]
- **Estimating HANK**
  - Medium-scale models useful for central bank policy analysis and forecasting [Auclert-Rognlie-Straub 2020, Bayer-Born-Luetticke AER 2024, Del Negro et al 2023, HANK teams in many central banks]
- **Open-economy aspects**
  - Distributional effects of exchange rate changes [de Ferra-Mitman-Romei 2020, Auclert-Souchier-Rognlie-Straub 2020, Guo-Ottonello-Perez 2023]
  - Current account implications of fiscal deficits [Aggarwal et al 2023]
  - Effect of energy crisis on household spending and implications for fiscal transfer policy [Auclert et al 2023, Bayer et al 2023, Langot et al 2023]

Conclusion

- HANK: new paradigm for the analysis of fiscal and monetary policy
- Lots of exciting results and ongoing developments
  (illiquid accounts, endogenous portfolio choice, asset pricing, optimal monetary and fiscal policy, and more!)

Conclusion

- HANK: new paradigm for the analysis of fiscal and monetary policy
- Lots of exciting results and ongoing developments
  (illiquid accounts, endogenous portfolio choice, asset pricing, optimal monetary and fiscal policy, and more!)
- To dig deeper:
  - Solution toolbox `https://github.com/shade-econ/sequence-jacobian`
  - Course material `https://aauclert.people.stanford.edu/teaching`
- The literature is just getting started !