The Trickling Up of Excess Savings

Adrien Auclert, Matt Rognlie and Ludwig Straub
European Central Bank, March 2023

Excess savings and aggregate demand

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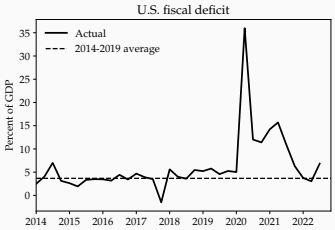
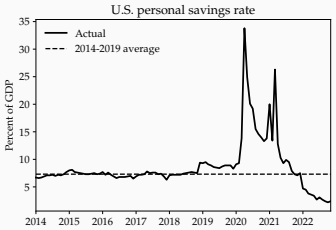
- Personal savings rate shot up...





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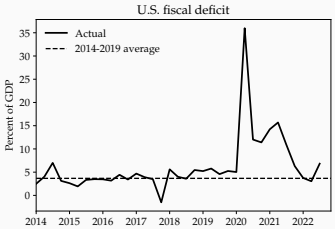

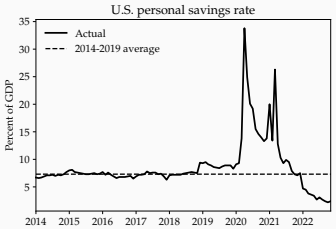

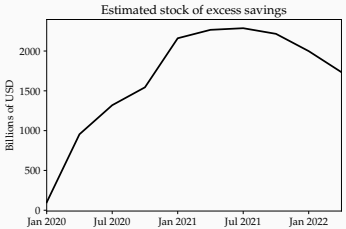

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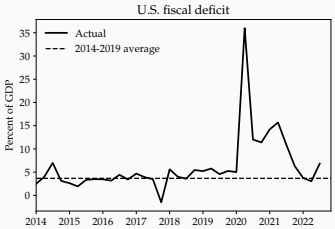

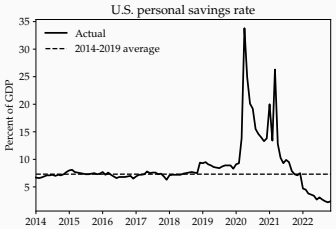

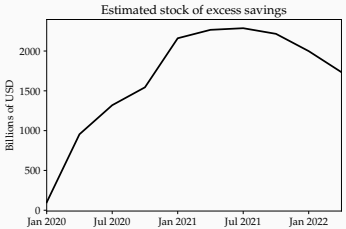

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- Widespread view: this matters for demand. But few formal frameworks!

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- Three views out there:
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- HANK suggests a fourth view:
  - Households spend down excess savings: this does affect demand, as in 3.
  - But general equilibrium, as in 1. and 2.
  - Key: one's spending is another person's income!

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- Bottom line: excess savings could be responsible for current elevated consumer spending and inflation; in spite of monetary tightening

Model

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- Type i agent has lower instantaneous MPC m_i, $m_1 > m_2 > \cdots > m_N = 0$
  - Microfoundation 1: bond-in-utility (BU) with different curvature over assets
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- Nominal wage rigidity: type i earns fraction θ_i of total income Y_t, $\sum_{i=1}^{N} \theta_i = 1$.
- For now, monetary policy reacts by maintaining $r_t = 0$ constant

Level-1 expectations

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  - All in first-order deviation relative to steady state
- Then the model is just:

$$c_{it} = m_i a_{it}, \qquad \dot{a}_{it} = \theta_i Y_t - c_{it}, \qquad Y_t = \sum_{i=1}^{N} c_{it} \tag{1}$$

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- Simple version of the intertemporal Keynesian Cross! [Auclert, Rognlie, Straub 2018]

Partial equilibrium

- Start with partial equilibrium, $Y_t = 0$. Then (1) is

$$c_{it} = m_i a_{it}, \qquad \dot{a}_{it} = -c_{it}, \qquad C_t = \sum_{i=1}^{N} c_{it}$$

[here aggregate consumption $C_t \neq Y_t$]

$\rightarrow$ Standard differential equation, separate for each type:

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- Solve and aggregate:

$$C_t = \sum_{i=1}^{N-1} m_i e^{-m_i t} a_{i0}$$

- Simple mapping from distribution of a_{i0} across m_i to aggregate demand!
  - BU/OLG model has exponential "iMPCs" [Auclert, Rognlie, Straub 2018]

Calibration

- Calibrate to $N = 3$ types, U.S. in 2022Q2
  - Total excess savings is $B = 6.7\%$ of GDP [\$1.7trn, Aladangady et al]
  - Bottom 80% with $mpc_1 = 0.4$, next 19% with $mpc_2 = 0.2$, top 1% with $mpc_3 = 0$
    [Convert quarterly mpc to continuous time m via $mpc_i = 1 - e^{-m_i}$]
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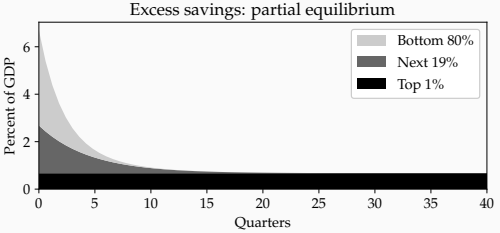

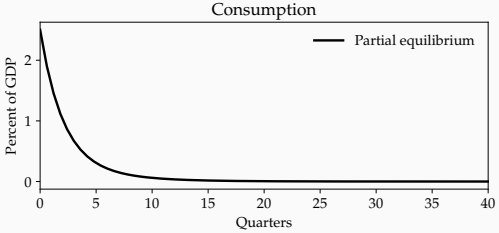

$\rightarrow$ Half life of effects on demand is 3 quarter (cf consensus view!)

General equilibrium

- Now go back to model where $C_t = Y_t$. (1) is now:

$$\dot{a}_{it} = \theta_i \sum_{j=1}^{N-1} m_j a_{jt} - m_i a_{it}$$

  Coupled system of equations! What changes? A lot!

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Theorem (Long-run trickling up)

In the long run, type N owns all the debt: $\lim_{t\to\infty} a_{Nt} = B$.

- Why? Asset market must clear, $\sum_{i=1}^{N} a_{it} = B$: someone holds the debt.
- If anyone but type N has positive assets, they spend it down
- This raises type i's income so their assets

Theorem (Trickling up dynamics)

Assume that $m_i a_{io}/\theta_i$ decreases in i. Then,

$$\forall t < t', \forall n < N \qquad \sum_{i=1}^{n} a_{it'} < \sum_{i=1}^{n} a_{it}$$

- In words: no matter where we look in the distribution of excess savings, as time passes, the wealth held by all lower types is falling, and the wealth held by all higher types is rising

Slow dissipation

Theorem (Slow dissipation)

In the long-run, $Y_t \sim e^{-\lambda t}$ *where* $\lambda < m_{N-1}$

- In words: aggregate demand and excess savings dissipate at a strictly slower rate than it does in the partial equilibrium calculation (where it eventually decays at rate m_{N-1})

Phase diagram in 3-type case

- Case $N = 3$ makes this especially easy to see: there, $a_3 = B - (a_1 + a_2)$ and

$$\begin{pmatrix} \dot{a}_1 \\ \dot{a}_2 \end{pmatrix} = \begin{pmatrix} -m_1(1-\theta_1) & \theta_1 m_2 \\ \theta_2 m_1 & -m_2(1-\theta_2) \end{pmatrix} \begin{pmatrix} a_1 \\ a_2 \end{pmatrix}$$

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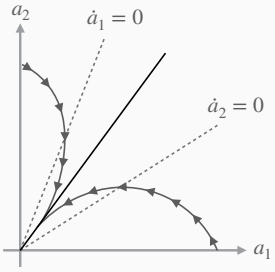

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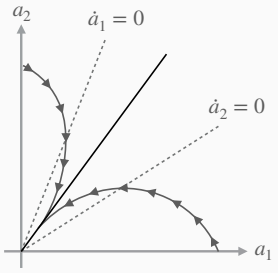
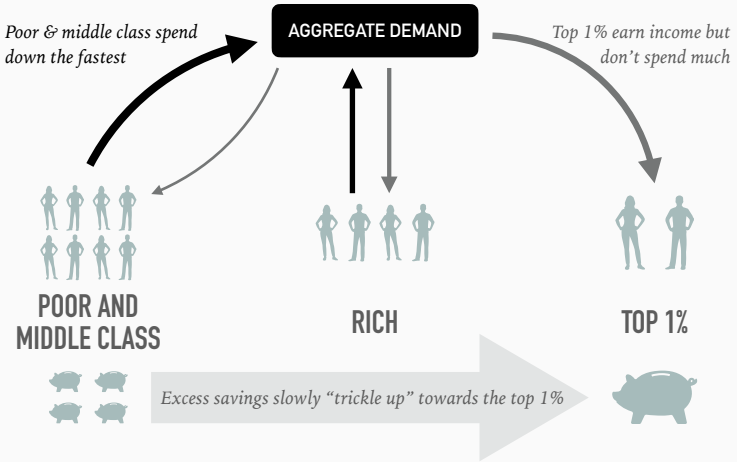


$\rightarrow$ If share of assets to type 1 agents is sufficiently high, type 2 assets are hump shaped

Visualizing the trickling up effect



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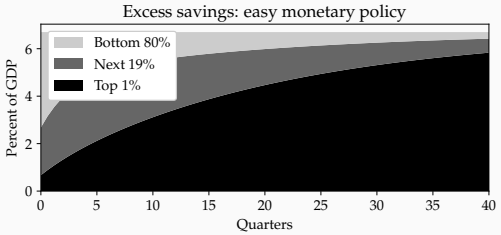

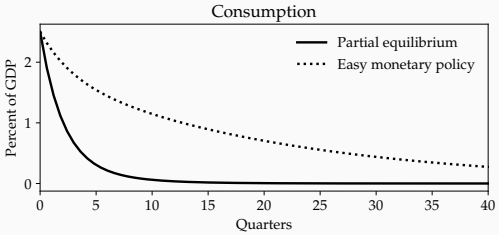

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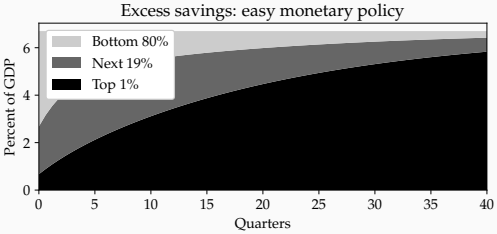

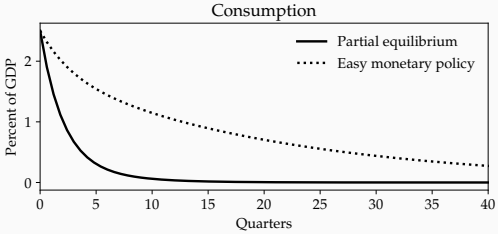

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- Fundamental difference between HANK and RANK/TANK: deficit-financed fiscal stimulus has persistent effects on demand [Auclert, Rognlie, Straub]

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- So far: unresponsive monetary policy
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- Mon policy may respond by raising rates, due to boom and/or inflation
- How does this affect equilibrium adjustment?
- Still true that wealth has to trickle up, but mp may speed up the process
- How much?

Calibration with monetary response

- Maintain level-1 thinking, but now r_t adjusts. Assume EIS $= 0.5$.
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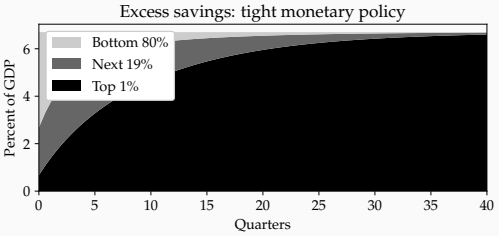

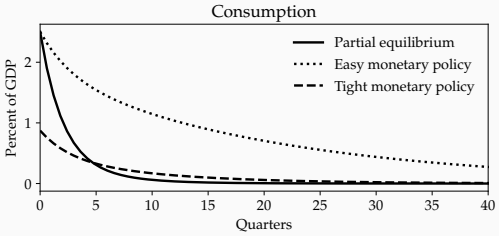

$\rightarrow$ Does significantly dampen boom, but duration of demand effect still 8Q

Taking a step towards HANK: rational expectations

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- Equations with rational expectations almost as simple:

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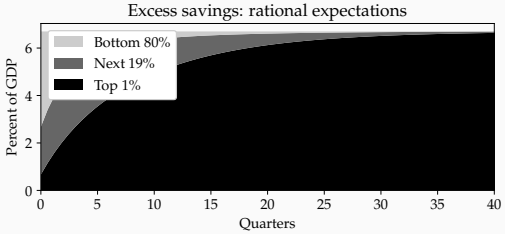
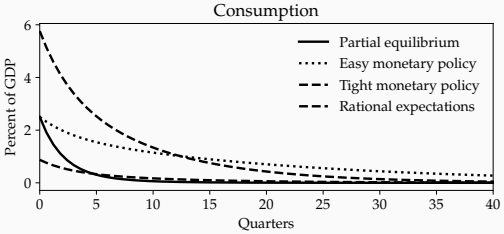
- Solution a little more involved (but still much simpler than usual HANK!)

Calibration with rational expectations

- Go back to our $r_t = 0$ monetary response





$\rightarrow$ Boom is significantly larger. Duration of demand effect now 8Q

Summary of quantitative results

	Duration of output and excess savings		
Scenario	Output Y	Middle-class a_1	Rich a_2
Partial equilibrium	3	2	4
Benchmark	20	19	22
Lower MPCs ($mpc_1 = 0.3$, $mpc_2 = 0.1$)	38	34	43
More excess savings to rich ($a_{10} = a_{20} = 0.45B$)	21	20	22
More earnings to rich ($\theta_1 = 0.3$, $\theta_2 = 0.55$)	23	19	26
Rational expectations	8	6	10
Tight monetary policy ($\phi = 1.5$)	8	7	11

What stops the spending-income feedback?

- In closed economy, transfers financed by permanent increase in debt must raise aggregate private wealth forever
- If agents tend to spend down this wealth, they'll raise someone's income
- Factors than can stop this:
  1. Rising real rates
  2. Open economy: spend on foreign goods $\rightarrow$ twin deficit [Aggarwal et al 2023]
  3. Government seeing higher tax revenue (boom in Y for given tax rate) and paying down the debt [Angeletos et al 2023]
- Typically we'll see trickling up in addition to 1–3.
  - Intuitively, these forces create more "sinks" for demand.
  - Open question how much each does!

Conclusion

- Simple framework connecting the distribution of excess savings to the dynamics of aggregate demand
- In GE, spending down generates income, so savings for someone else
- Effects persistent as they trickle up the distribution
- Monetary policy speeds up trickling up, but only modestly
- Tractable version of HANK, easy to see effect of alternative assumptions
- Code available online: `https://github.com/shade-econ/trickling-up`