Wealth, Uninsurable Idiosyncratic Risk and International Risk-Sharing

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Introduction

Motivation

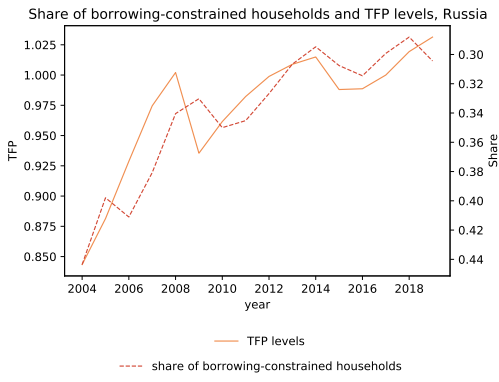
Traditional approach:
Representative household smoothes consumption via current account

Research question:
How wealth and idiosyncratic risk affect international capital flows?

Key mechanism:
Mainly, through savings

- extensive margin: the share of consumption smoothers
- intensive margin: amount of precautionary savings
- distribution is endogeneous

Share of constrained households rises with TFP in Russia, but not in the US



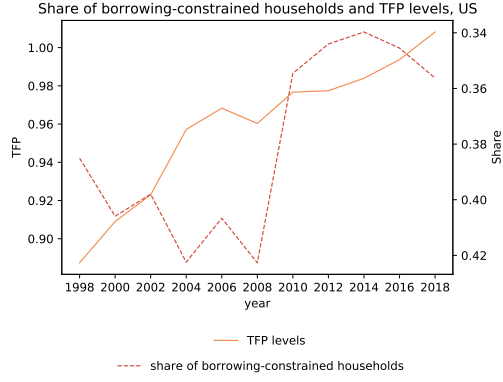


Figure: Share of borrowing-constrained households along business cycle

Liquid assets positions by country

Research Design

- Two countries: US and Russia
- Empirically: quantify savings responses of the households to TFP shocks using household-level data and local projections
- Model: analyze dynamics of the capital flows in a general equilibrium heterogeneous agent model, produce counterfactuals

Key Results

1. Counter- (pro-) cyclical share of borrowing-constraint households in Russia (US)
   - idiosyncratic risk is more important than wealth
2. Current Account is more countercyclical in HANK than in RANK
3. In expansions US is long in illiquid and short in liquid assets, Russia holds the opposite position
   - both wealth levels and idiosyncratic risk shape countries' portfolios

Literature Review

- Open Economy HANK
  - CA: Ferra, Mitman, and Romei, 2021 and 2020, Zhou, 2022, Hottman and Monarch, 2021, Hillrichs and Vannoorenberghe, 2021
  - ExRate: Auclert, Rognlie, et al., 2021, Guo, Ottonello, and Perez, 2020
- Intertemporal Approach to Current Account

  Obstfeld and Rogoff, 1996, Mendoza, Quadrini, and Rıos-Rull, 2009, Angeletos and Panousi, 2011
- Demand for Liquid/Safe Assets

  Kekre and Lenel, 2021, Chien and Naknoi, 2015, Gourinchas and Rey, 2007
- HANK/TANK/RANK Comparison

  Kaplan, Moll, and G. L. Violante, 2018, Bayer, Born, and Luetticke, 2020

Outline

1. Data Description
2. Empirical Impulse Responses to TFP shocks
3. Model Description
4. Model Impulse Responses to TFP Shocks
5. Decomposition of Capital Flows

Data and Empirical IRFs

Data

- Household-level panels: PSID from 1999-2019, RLMS from 2000-2020
- Identification of TFP shocks: Penn World Table 10.0 and series constructed by J. Fernald
- Identification of borrowing-constrained households:
  - US: Kaplan, G. Violante, and Weidner (2014)
  - Russia: Imagine an unpleasant situation in which all members of your family lost their sources of income. How long do you think your family would be able to live at your present level - in other words, without decreasing your expenditures - without any income? Consider only your savings, not selling any of your possessions.

Distribution of answers

Gini coefficients

Empirical Specification

Local projections methodology (Jordà, 2005)

$$z_{i,t} = \mu_i + D^j(L)g_t + H^j(L)g_t \cdot X_{i,t} + \beta_1^j X_{i,t} + \eta_{i,t} \quad (1)$$

$$y_{i,t} = \nu_i + B^j(L)y_{i,t-1} + C^j(L)\hat{z}_{i,t} + \beta_2^j X_{i,t} + \varepsilon_{i,t} \quad (2)$$

where $j = 1, 2, 3, 4$ (income and wealth percentiles),
$y_{i,t}$ dummy for being borrowing-constrained, $z_{i,t}$ is income, g_t are TFP shocks, and $X_{i,t}$ are controls

Empirical Impulse Responses

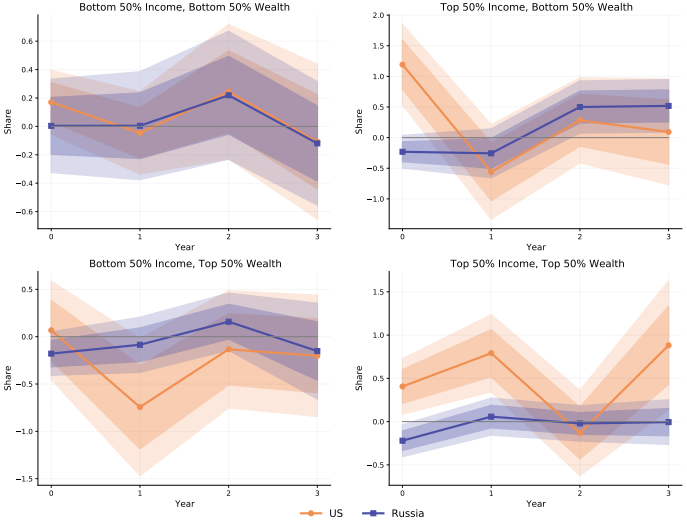


Figure: **Responses of probabilities of being borrowing-constrained to income shocks.**

Quantitative Model

Households

Labor income

$$\xi_t = (1 - \tau_t) e_t w_t n_t \tag{3}$$

Bellman equation

$$\begin{aligned} V(e_t, a_{t-1}, b_{t-1}) = & \max_{c_t, a_t, b_t} u(c_t, n_t) + \beta E_e V(e_{t+1}, a_t, b_t) \\ \text{s.t.} \quad & c_t + a_t + b_t = \xi_t + (1 + r_t^a) a_{t-1} + (1 + r_t^b) b_{t-1} - \Phi(a_t, a_{t-1}) \\ & a_t \geqslant 0, \quad b_t \geqslant \underline{b} \end{aligned} \tag{4}$$

Portfolio adjustment costs

$$\Phi(a_t, a_{t-1}) = \frac{\chi_1}{\chi_2} \left| \frac{a_t - (1 + r_t^a) a_{t-1}}{(1 + r_t^a) a_{t-1} + \chi_0} \right|^{\chi_2} [(1 + r_t^a) a_{t-1} + \chi_0] \tag{5}$$

Households

Consumption, Export, Import

$$C_{H,t} = (1-\gamma)\left(\frac{p_{H,t}}{p_t}\right)^{-\eta} C_t \tag{6}$$

$$C_{F,t} = \gamma\left(\frac{p_{F,t}}{p_t}\right)^{-\eta} C_t \tag{7}$$

$$C^*_{H,t} = \left(\frac{p_{H,t}}{p_{F,t}}\right)^{-\eta_f} Y^*_{F,t} \tag{8}$$

Labor Hours' Supply

$$\varphi n_t^{\rho} = \int u_c(e_t, a_{t-1}, b_{t-1}) \frac{\partial \xi_t}{\partial n_t} dD(e_t, a_{t-1}, b_{t-1}) \tag{9}$$

Firm's Problem

$$J_{s,t}\left(k_{s,t-1}\right) = \max_{p_{s,t},k_{s,t},I_{s,t},N_{s,t}} \left\{ \frac{p_{s,t}}{p_t} y_{s,t} - w_t N_{s,t} - I_{s,t} - \frac{\eta}{2\kappa} \ln(1+\pi_{s,t})^2 Y_t + \frac{J_{t+1}(k_{s,t})}{1+r_{t+1}} \right\} \tag{10}$$

s.t.
$$k_{s,t} = (1-\delta)k_{s,t-1} + I_{s,t} - \frac{1}{2\delta\varepsilon_I}\left(\frac{k_{s,t}-k_{s,t-1}}{k_{s,t-1}}\right)^2 k_{s,t-1} \tag{11}$$

$$p_{s,t} = \left(\frac{Y_t}{y_{s,t}}\right)^{\frac{1}{\eta}} p_{H,t} \tag{12}$$

$$y_{s,t} = z_{s,t} k_{s,t-1}^{\nu} N_{s,t}^{1-\nu} \tag{13}$$

Rates

Uncovered Interest Rate Parity

$$1 + i_t = (1 + r_t^*)\frac{\mathcal{E}_{t+1}}{\mathcal{E}_t} - \phi(exp(-NFA_t) - 1) \tag{14}$$

No arbitrage condition and Fisher equation

$$v_t = \frac{d_{t+1} + v_{t+1}}{1 + r_{t+1}}, \quad 1 + r_t = \frac{1 + i_t}{1 + \pi_t} \tag{15}$$

Financial Intermediary and Policy

Financial Intermediary

$$(1+r_t^b) = \left(\frac{B_t^g}{\mathcal{B}_t}\right)(1+r_t-\omega) + \left(1-\frac{B_t^g}{\mathcal{B}_t}\right)(1+r_t^*-\omega)\frac{q_t}{q_{t-1}} \tag{16}$$

$$(1+r_t^a) = \left(\frac{v_t}{\mathcal{A}_t}\right)\frac{d_t+v_t}{v_{t-1}} + \left(1-\frac{v_t}{\mathcal{A}_t}\right)(1+r_t^*)\frac{q_t}{q_{t-1}} \tag{17}$$

Fiscal Policy

$$\tau_t w_t N_t = r_t B^g + G_t, \tag{18}$$

Monetary Policy

$$i_t = \overline{r} + \phi_\pi \pi_{H,t} \tag{19}$$

Assets and Market Clearing

Dynamics of Net Foreign Assets

$$NX_t = \frac{p_{H,t}}{p_t} C^*_{H,t} - \frac{p_{F,t}}{p_t} C_{F,t} \tag{20}$$

$$NFA_t = (1 + \tilde{r}_t) NFA_{t-1} + NX_t \tag{21}$$

$$CA_t = NX_t + r_t NFA_{t-1} \tag{22}$$

Market clearing conditions

$$Y_t - \omega \mathcal{B}_t - \Phi_t = \mathcal{C}_t + G_t + I_t + NX_t, \tag{23}$$

$$\mathcal{A}_t + \mathcal{B}_t = v_t + B^g + NFA_t, \tag{24}$$

Calibration

Table: Parameter Values, Description and Source

Parameter	Description	Value and source, US	Value and source, Russia
Wealth Targets			
χ_1	Portfolio adj. cost scale	10.11, target $\mathcal{B}_h = 1.04Y$	0.55, target $\mathcal{B}_h = 1.64Y$
χ_2	Portfolio adj. cost curvature	1.985, target htm= 0.38	2.4, target htm=0.33
p/Y	Steady state price of equity	11.2, target $p + Bg = 14Y$	5.04 target $p + Bg = 5.32Y$
B^g	Bond supply	2.8, Auclert, Bardóczy, et al., 2019	0.28, calculated from total government bonds supply
Income Process			
ρ_z	Autocorrelation of earnings	0.966, Auclert, Bardóczy, et al., 2019	0.579, estimated with RLMS
σ_z	Cross-sectional std of log earnings	0.92, Auclert, Bardóczy, et al., 2019	2.09, estimated with RLMS
Firms			
δ	Depreciation rate	0.02, Auclert, Bardóczy, et al., 2019	0.025, Semko, 2013
ε_I	Capital adj. costs parameter	4, Auclert, Bardóczy, et al., 2019	12.05, Malakhovskaya and Minabutdinov, 2014

Portfolios in other countries

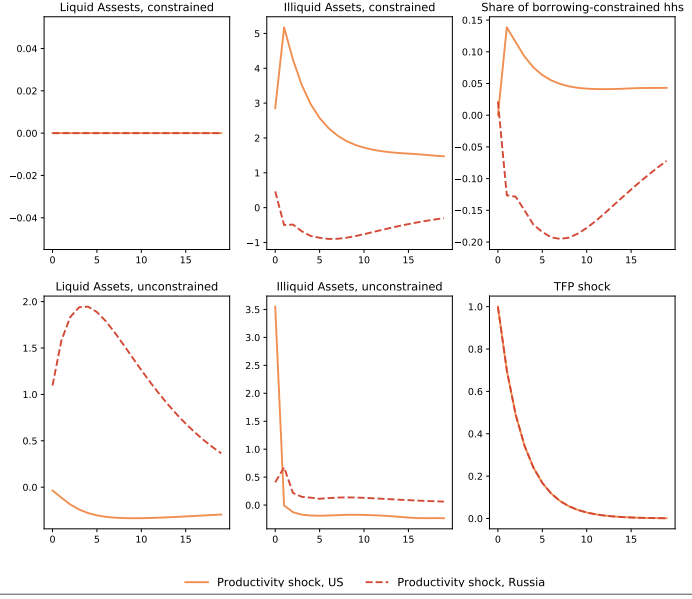
Model Fit

Table: Income and Asset Distributions, and Asset Elasticities.

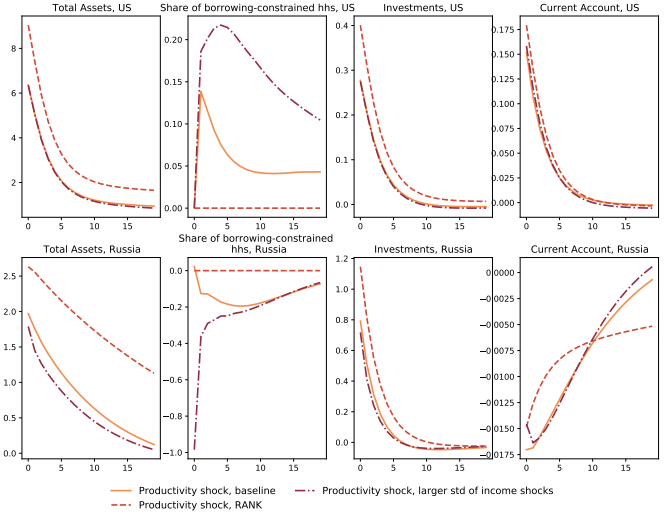
Statistics	Data, US	Model, US	Data, Russia	Model, Russia
Wealth distribution				
Mean Liquid Assets/GDP	0.26	0.26	0.41	0.41
Mean Illiquid/GDP	2.92	2.99	0.92	0.92
Share of borrowing-constrained hhs	0.38	0.38	0.33	0.33
Gini coefficients				
Income	0.52	0.41	0.58	0.63
Liquid assets	0.98	0.75	-	0.64
Illiquid assets	0.81	0.52	0.67	0.43
Elasticities[1]				
Share of borrowing-constrained to income	[0.41, 0.02]	[0.02, 0.02]	[-0.10, -0.04]	[-0.03, -0.05]
Corr(Bonds / GDP, GDP)	-0.08	-0.02	0.21	0.52
Corr(Equities / GDP, GDP)	0.06	0.30	0.21	0.52

Model Impulse Responses

Productivity Shock: the Mechanism

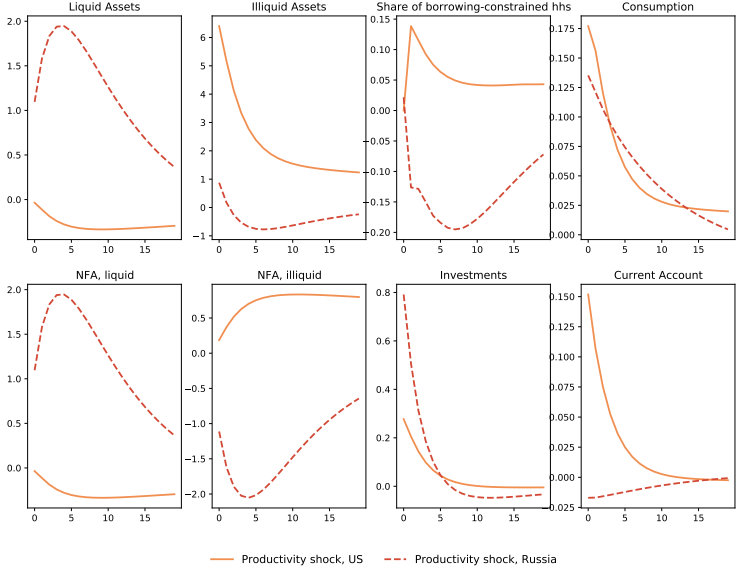


Productivity Shock: HANK vs RANK

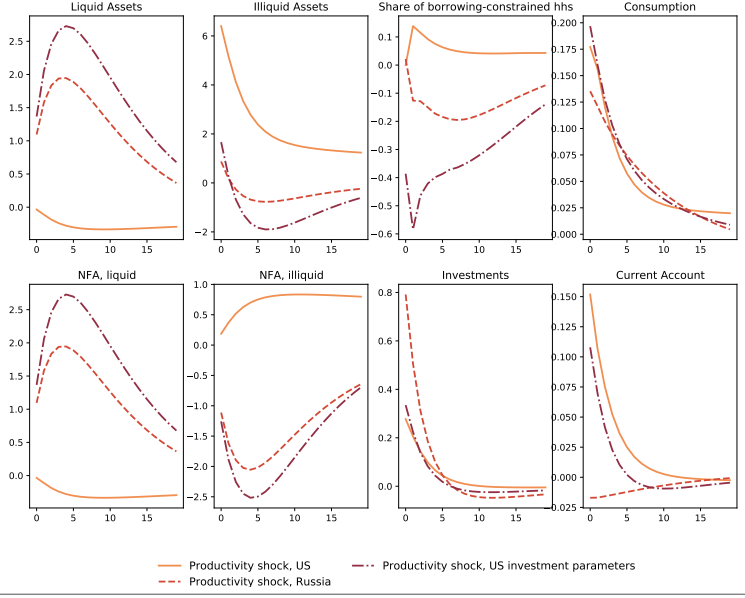


Scatter plot: inequality and countercyclicality

Productivity Shock: Country Comparison



Productivity Shock: Counterfactual Analysis



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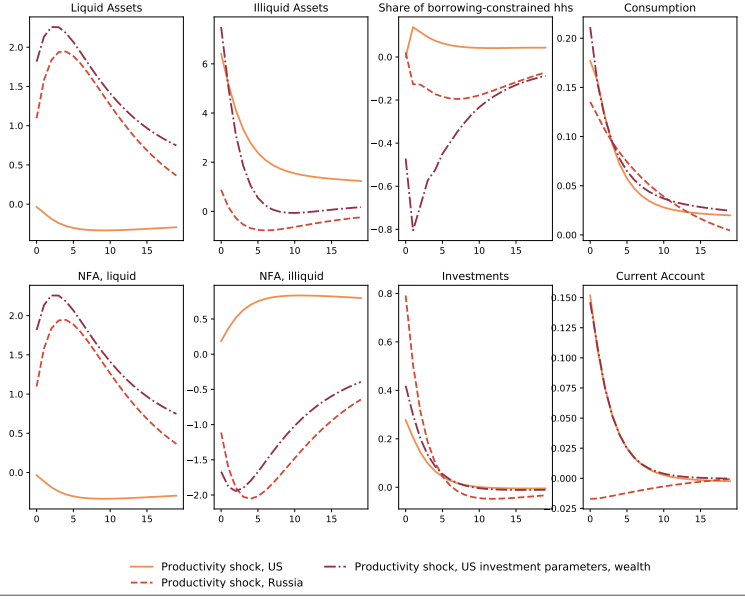

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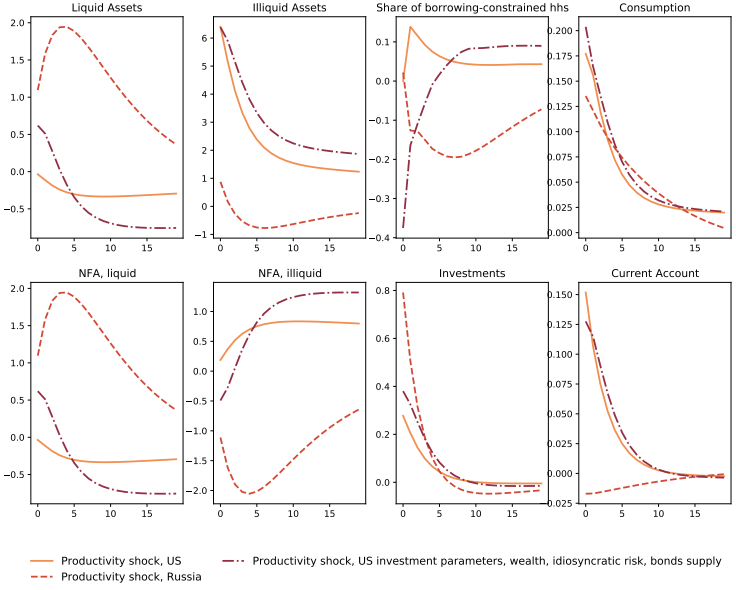
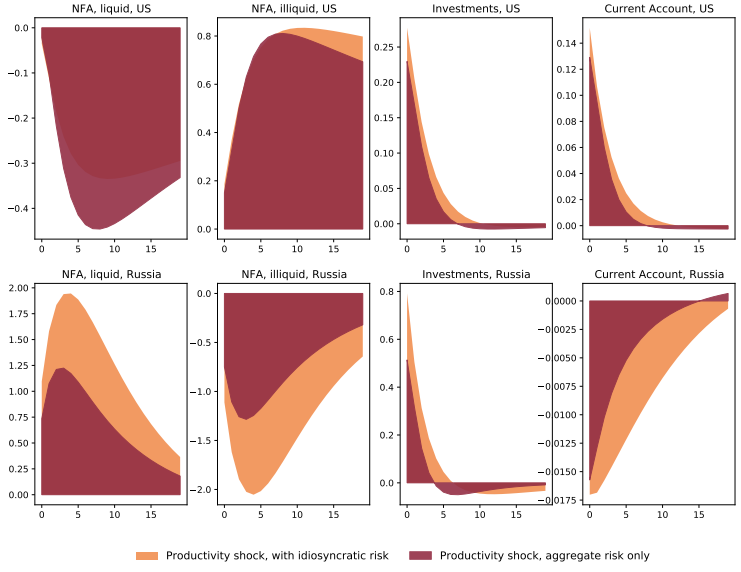


Decomposition of Capital Flows

Productivity Shock:Decomposition of Capital Flows



Productivity Shock: Decomposition of Capital Flows

Table: Decomposition of Cumulative Responses to a Productivity Shock.

Country	Current Account		NFA, illiquid		NFA, liquid	
	aggregate	idiosyncratic	aggregate	idiosyncratic	aggregate	idiosyncratic
US	70%	30%	96%	4%	128%	-28%
Russia	48%	52%	57%	43%	57%	43%

Conclusions

Wealth distribution and idiosyncratic risk affect current account through

- the share of consumption smoothers
- amount of precautionary savings
- evolution of the distribution

Implications:

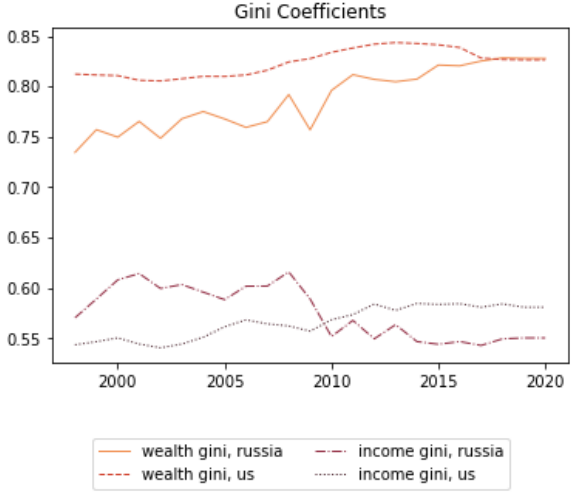
- procyclical share of borrowing-constraint households
- procyclical demand for illiquid and countercyclical for liquid assets vis-a-vis the rest of the world

when levels of wealth are high and idiosyncratic risk is low

Thank you!

Appendix

Inequality Comparison



back

Households in EMEs hold more liquid assets

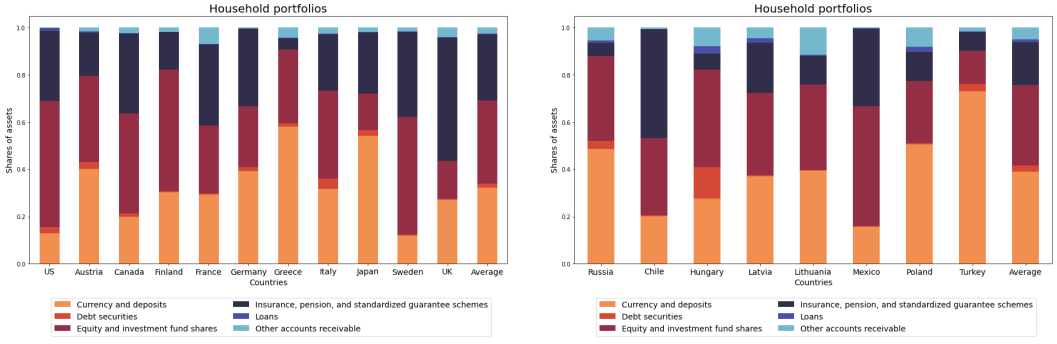


Figure: Household portfolios. Developed and emerging countries.

Household demand translates into cross-country flows

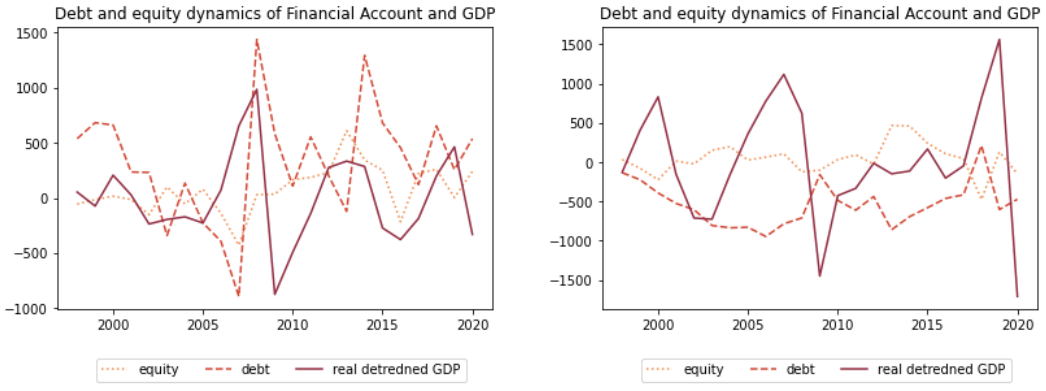
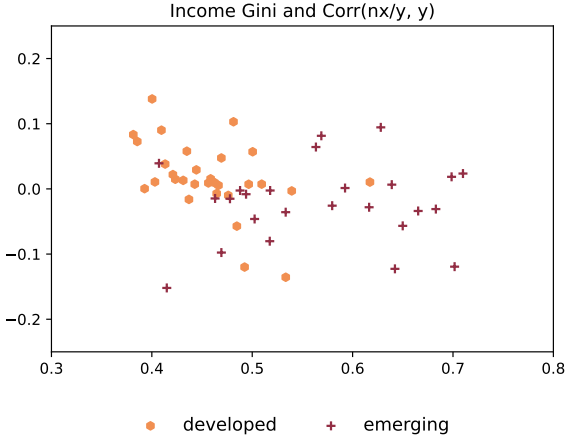


Figure: **Cyclicality of equity and debt. Russia and US.**

EMEs are more unequal and more countercyclical CA



The X-axis shows income Gini. Y-axis shows a correlation of nx/y and y.

back

Firm's first-order conditions

Investment, Labor and Capital

$$q_{s,t} = 1 + \frac{1}{\delta \varepsilon_I}\left(\frac{k_{s,t} - k_{s,t-1}}{k_{s,t-1}}\right), \quad w_t = (1-\nu)\frac{y_{s,t}}{N_{s,t}} mc_{s,t} \tag{25}$$

$$(1 + r_{t+1}) q_{s,t} = \nu z_{t+1}\left(\frac{N_{s,t+1}}{k_{s,t}}\right)^{1-\nu} mc_{s,t+1} - \tag{26}$$

$$- \left[\frac{k_{s,t+1}}{k_{s,t}} - (1-\delta) + \frac{1}{2\delta\varepsilon_I}\left(\frac{k_{s,t+1} - k_{s,t}}{k_{s,t}}\right)^2\right] + \frac{k_{s,t+1}}{k_{s,t}} q_{s,t+1}$$

Phillips curve

$$\log(1+\pi_{s,t}) = \kappa(mc_{s,t} - \frac{1}{\mu_p}\frac{p_{s,t}}{p_t}) + \frac{Y_{t+1}}{Y_t}\log(1+\pi_{s,t+1})\frac{1}{1+r_{t+1}} \tag{27}$$

Calibration Tables

Calibration

Table: US: Parameter Values, Description and Source

Parameter	Description	Value and source
Households		
β	Time discount factor	0.977, target interest rate
χ_0	Portfolio adj. cost pivot	0.25, Straub
σ	EIS	0.5, Straub
ρ	Inverse Frisch elasticity	1, Straub
φ	Disutility parameter	1.78 (target $N = 1$)
Open economy		
γ	Home-bias	0.4, Ottonello2020
$\eta = \eta_f$	Elasticity of substitution for home vs. foreign goods	1.5, Ottonello2020

Calibration

Table: US: Parameter Values, Description and Source

Parameter	Description	Value and source
Asset Markets		
r	Real interest rate	0.0125, Straub
ψ	Liquidity premium	0.005, Straub
Production		
μ_w	Wage markup	1.1, Straub
K/Y	Steady state capital-output ratio	10, Straub
κ	Slope of the Phillips curve	0.1, Straub
Monetary and Fiscal Policy		
ϕ	Coefficient on inflation in Taylor rule	1.5, Straub
ϕ_y	Coefficient on output gap in Taylor rule	0, Straub
τ	Tax rate	0.36, , target $G/Y = 0.2$

Calibration

Table: Russia: Parameter Values, Description and Source

Parameter	Description	Value and source
Households		
β	Time discount factor	0.935, target interest rate
χ_0	Portfolio adj. cost pivot	0.25, Straub
σ	EIS	0.5, Semko2013
ρ	Inverse Frisch elasticity	1, Semko2013
φ	Dis-utility parameter	1.33 (target $N = 1$)
Open economy		
γ	Home-bias	0.26, Malakhovskaya2014
$\eta = \eta_f$	Elasticity of substitution for home vs. foreign goods	0.67, Semko2013

Calibration

Table: Russia: Parameter Values, Description and Source

Parameter	Description	Value and source
Asset Markets		
r	Real interest rate	0.0125, Straub
ψ	Liquidity premium	0.005, Straub
Production		
μ_w	Wage markup	1.2, Semko2013
K/Y	Steady state capital-output ratio	9.26, target $\alpha = 0.33$ Malakhovskaya2014
κ	Slope of the Phillips curve	0.38, Malakhovskaya2014
Monetary and Fiscal Policy		
ϕ	Coefficient on inflation in Taylor rule	1.5, Straub
ϕ_y	Coefficient on output gap in Taylor rule	0, Straub
τ	Tax rate	0.29, target $G/Y = 0.2$

Steady State and Data Moments

Table: Income and Asset Distributions

Statistics	Data, US	Model, US	Data, Russia	Model, Russia
Wealth distribution				
Mean Liquid Assets/GDP	0.26	0.26	0.41	0.41
Mean Illiquid/GDP	2.92	2.99	0.92	0.92
Hand-to-mouth share	0.38	0.38	0.33	0.33
Gini coefficients				
Income	0.52	0.41	0.58	0.63
Liquid assets	0.98	0.75	-	0.64
Illiquid assets	0.81	0.52	0.67	0.43

Earning Process Estimation Fit, Russia

Table: Moments from the data and from the estimated process

Moment	Data	Model
Variance: annual log earnings	5.41	4.29
Variance: 1-year change	6.38	6.38
Variance: 5-year change	7.55	8.58
Frac. 1-year change $< 10\%$	0.20	0.03
Frac. 1-year change $< 20\%$	0.35	0.06
Frac. 1-year change $< 50\%$	0.60	0.16

Estimation Income Process, Russia

Table: Alternative Targets and Weighting Matrices.

Parameter	Target Only Variances, $W = I$	Target Variances, $W = I$	Target Std, $W = I$	Target Variances, W rescaled by means	Target Variances, two-step GMM
Persistence	0.542	0.54	0.579	0.678	0.9
Standard deviation	2.14	2.15	2.09	1.78	2.0

Additional Model Graphs

Steady State Distributions

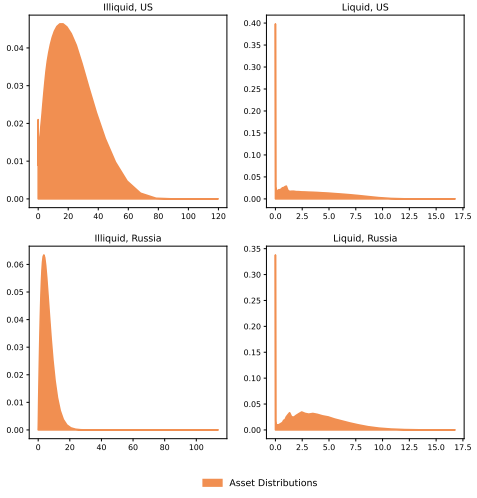
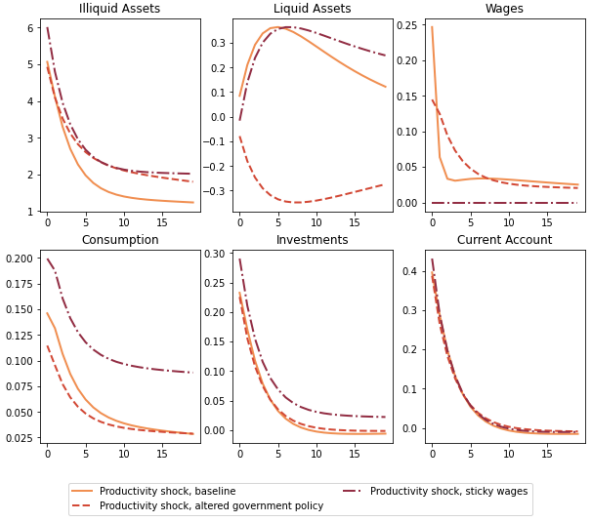
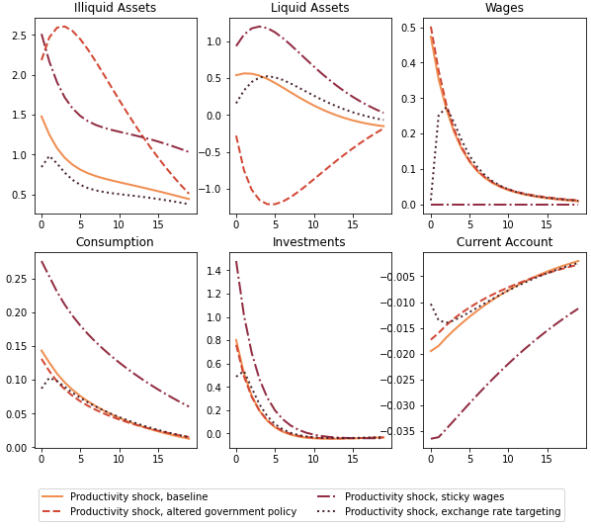


Figure: Distribution of Assets in the HANK models calibrated to the US and Russian Economies.

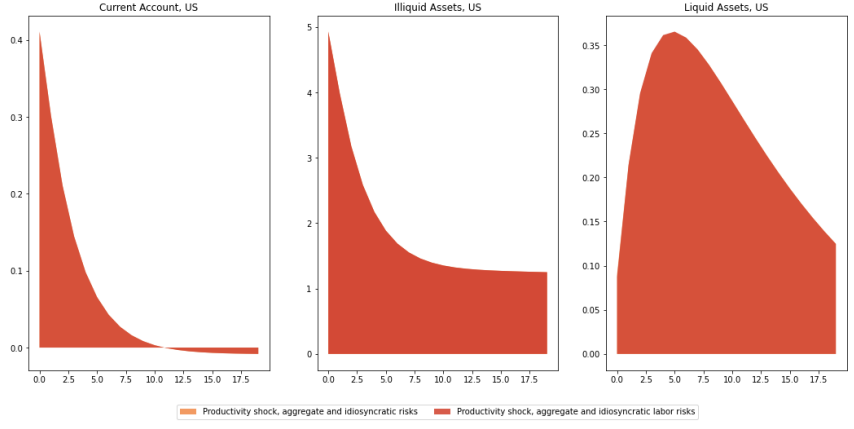
Productivity Shock: The Role of Income Distribution, US



Productivity Shock: The Role of Income Distribution, Russia



Decomposition with Return Risk, US



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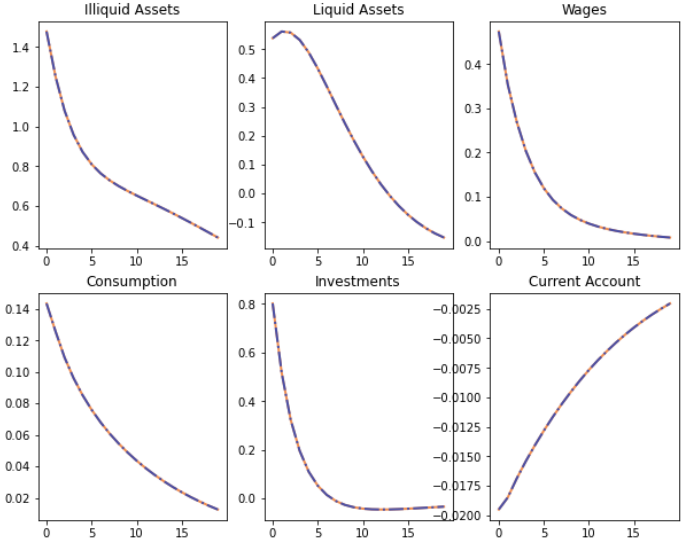
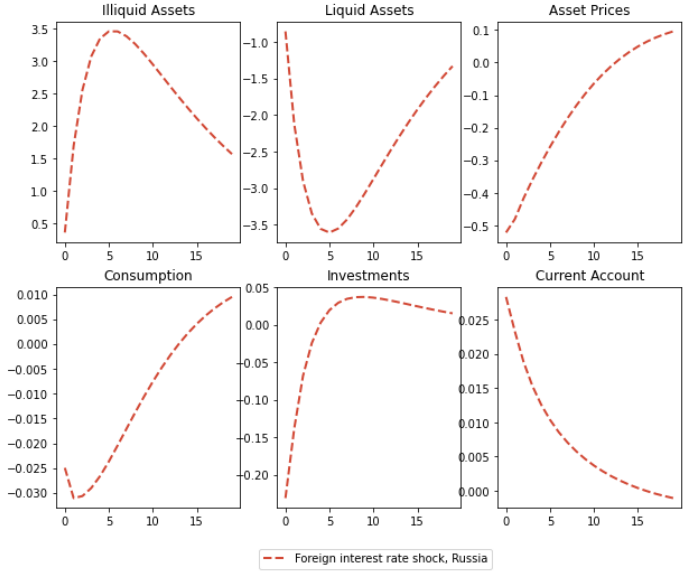

Illiquid Assets
Liquid Assets
Wages
Consumption
Investments
Current Account

Foreign Monetary Policy Shock: Russia



Productivity Shock: Financial Intermediary

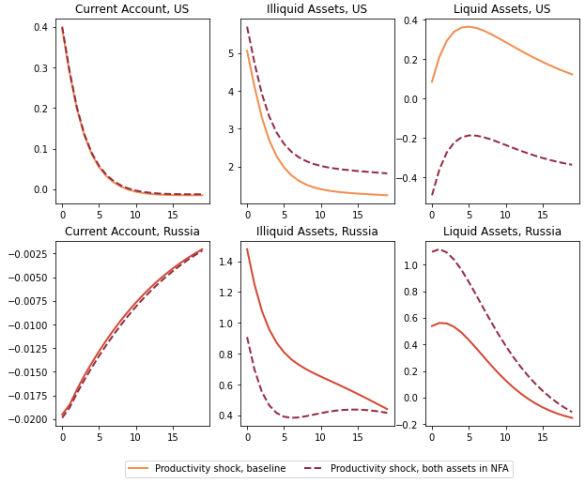


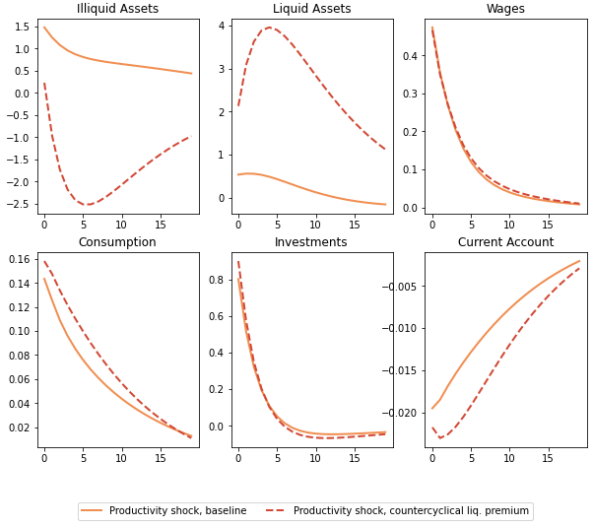
Figure: Impulse Responses to a TFP Shock with a Different Specification of Financial Intermediary.

Model Experiments

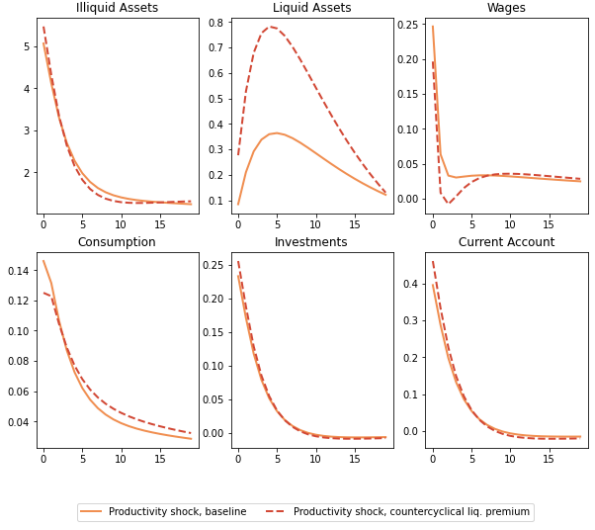
Countercyclical liquidity premium

$$\psi_t = \overline{\psi} - \gamma_\psi (Y - \overline{Y}) \tag{28}$$

Productivity Shock: Countercyclical Liquidity Premium, Russia



Productivity Shock: Countercyclical Liquidity Premium, US



Additional Data Graphs and Tables

Household Asset Portfolios

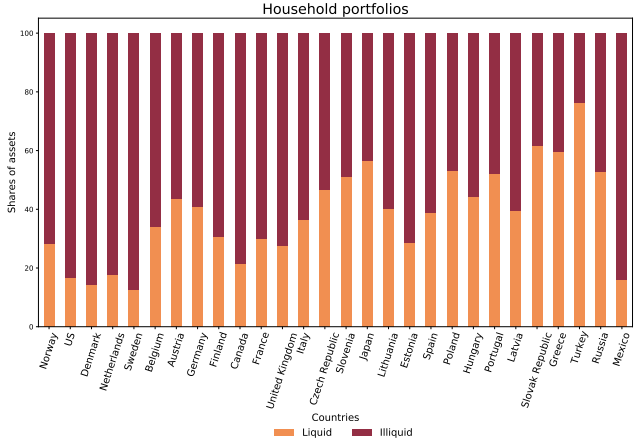


Figure: Household Portfolios.

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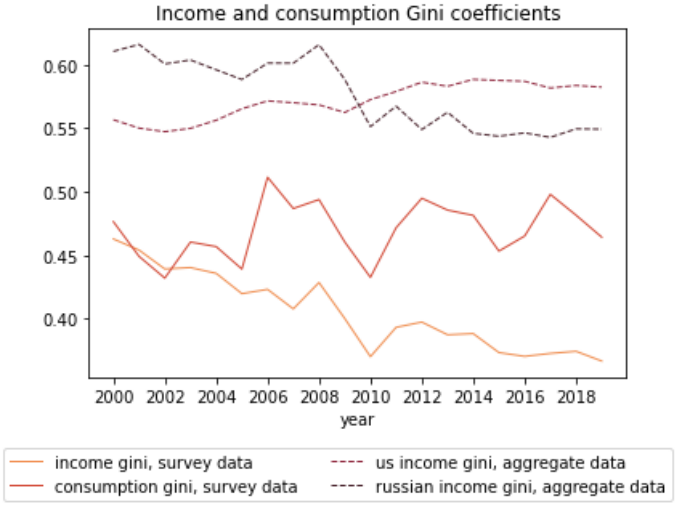
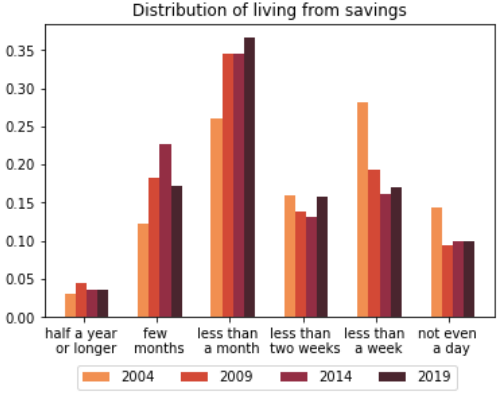
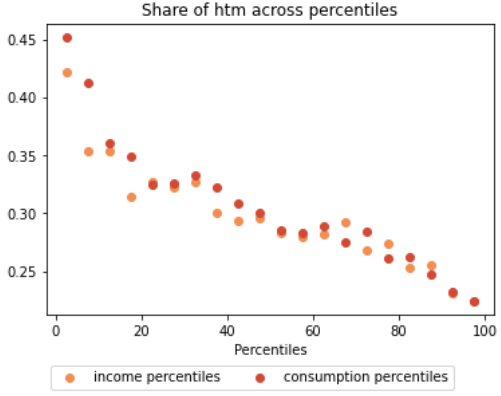
Income and Consumption Inequality



Borrowing-constrained Households, Russia





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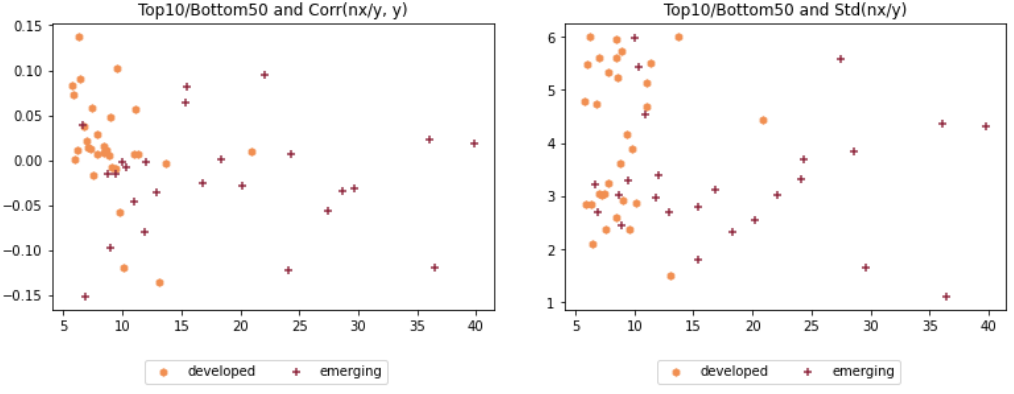
EMEs are more unequal and have more countercyclical CA



The X-axis shows Top10/Bottom50 ratio. Y-axis shows a correlation of nx/y and y. Standard deviation is shown in logs.

Sample Statistics, US

Table: Sample Statistics Across Income and Wealth Percentiles, US.

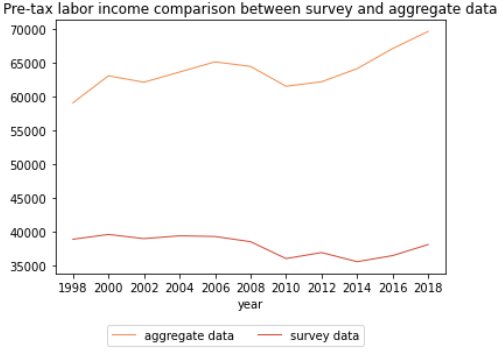
Variables	bottom 50% income, bottom 50% wealth	top 50% income, bottom 50% wealth	bottom 50% income, top 50% wealth	top 50% income, top 50% wealth
htm	0.66	0.51	0.24	0.20
poor htm	0.47	0.19	0.0	0.0
wealthy htm	0.19	0.32	0.24	0.20
income	0.26	0.75	0.31	1.05
labor income	0.26	0.73	0.30	1.00
asset income	0.001	0.01	0.007	0.05
wealth	-0.08	-0.09	3.69	2.09
liquid wealth	-0.08	-0.10	1.89	0.72
non-liquid wealth	0.004	0.009	1.80	1.37

Sample Statistics, Russia

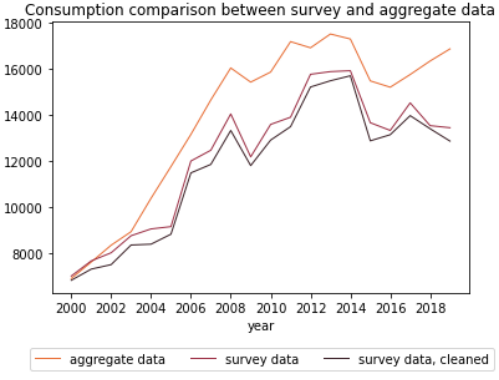
Table: Sample Statistics Across Income and Wealth Percentiles, Russia.

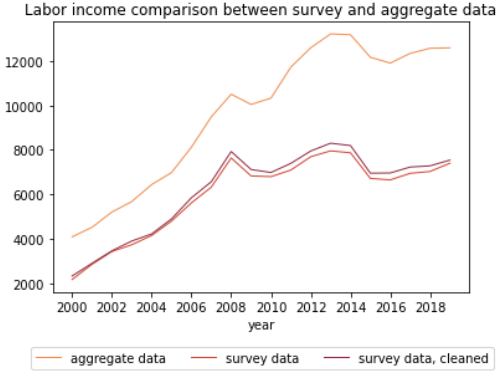
Variables	bottom 50% income, bottom 50% wealth	top 50% income, bottom 50% wealth	bottom 50% income, top 50% wealth	top 50% income, top 50% wealth
htm	0.42	0.33	0.34	0.28
poor htm	0.32	0.27	0.0	0.0
wealthy htm	0.10	0.06	0.34	0.28
income	0.58	1.95	0.63	1.96
non-liquid wealth	-0.004	-0.026	0.52	0.80

Aggregate vs Survey Data, US

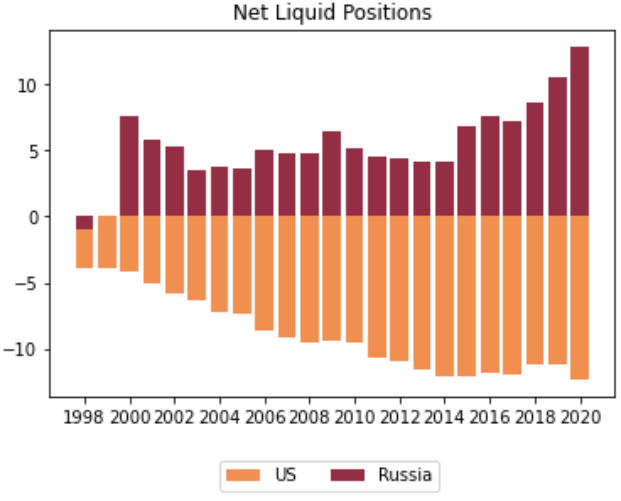


Aggregate vs Survey Data, Russia





Net Liquid Positions



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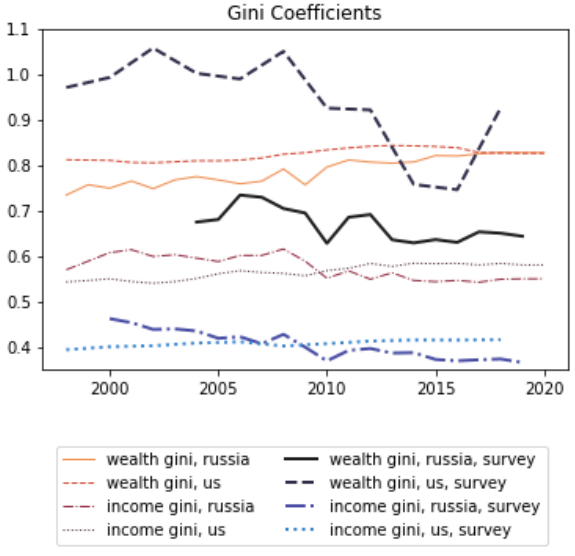
Gini Coefficients



Distributional Moments

Table: **Income distributions.**

	Russia	US
mean	0.63	0.63
std	0.52	0.59
skewness	3.1	10.0
kurtosis	22.2	279.6
1%	0.06	0.07
5%	0.13	0.13
10%	0.18	0.18
25%	0.29	0.30
50%	0.50	0.51
75%	0.80	0.80
90%	1.20	1.16
95%	1.53	1.47
99%	2.53	2.44

Additional Empirical Results

Cumulative Responses

Table: Cumulative is calculated by summing up responses for four years after the shock.

Variable, Country	Cumulative IRFs with 90% CI			
	Income Poor, Wealth Poor	Income Rich, Wealth Poor	Income Poor, Wealth Rich	Income Rich, Wealth Rich
	Hand-to-Mouth			
htm, US	0.16 (-0.23 0.56)	-0.27 (-0.88 0.34)	-0.23 (-0.84 0.38)	0.58 (0.03 1.13)
htm, Russia	0.08 (-0.23 0.39)	-0.24 (-0.51 0.03)	-0.01 (-0.29 0.27)	-0.26 (-0.41 -0.10)
	Other Variables			
liquid, US	-0.23 (-2.82 2.36)	-0.42 (-3.25 2.41)	1.98 (-1.03 4.98)	-1.80 (-4.90 1.30)
non-liquid, US	-0.60 (-1.86 0.65)	5.14 (0.46 9.83)	-0.29 (-3.14 2.56)	-1.78 (-5.14 1.60)
consumption, Russia	-0.17 (-0.73 0.39)	0.52 (0.18 0.86)	0.53 (-0.09 1.15)	0.92 (0.63 1.22)
	First Stage			
income, US	-0.01 (-0.03 0.02)	0.09 (0.06 0.11)	-0.06 (-0.10 -0.02)	0.05 (0.03 0.07)
income, Russia	-0.01 (-0.03 0.02)	0.02 (-0.003 0.03)	-0.01 (-0.03 0.01)	0.02 (0.01 0.04)

Empirical Impulse Responses, US

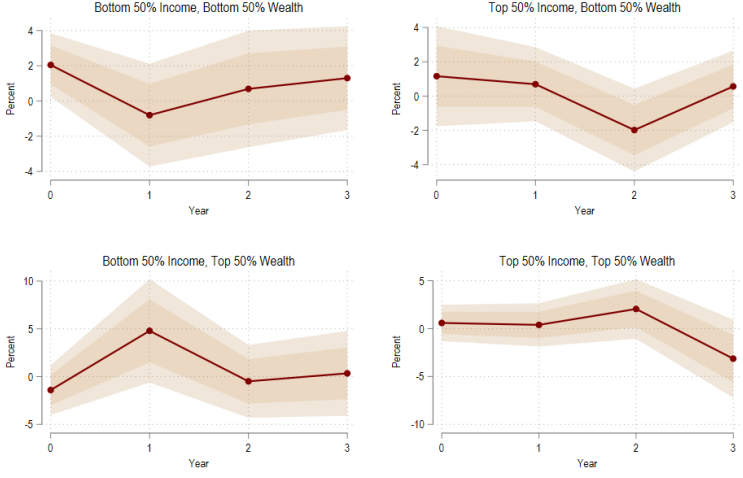


Figure: Impulse Responses of Liquid Assets to Income Shocks.

Empirical Impulse Responses, US

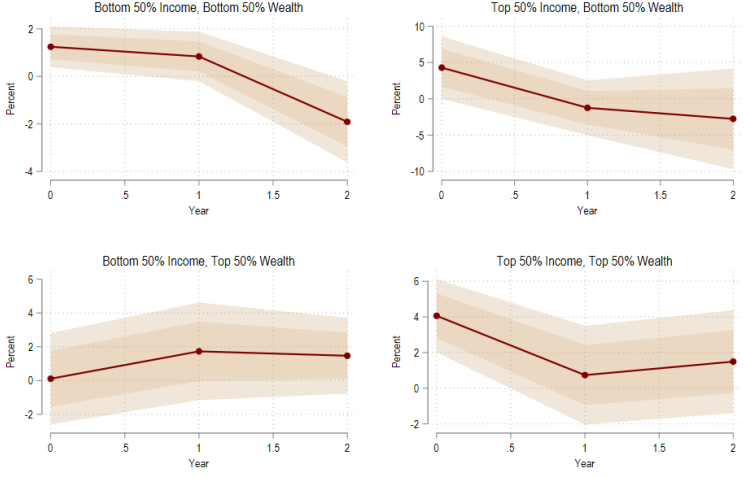


Figure: Impulse Responses of Non-liquid Assets to Income Shocks.

Empirical Impulse Responses, Russia

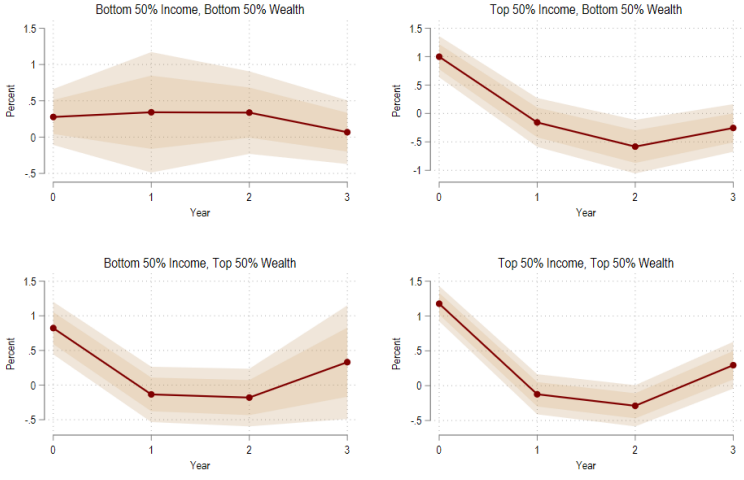


Figure: Impulse Responses of Consumption to Income Shocks.

Empirical Impulse Responses, US

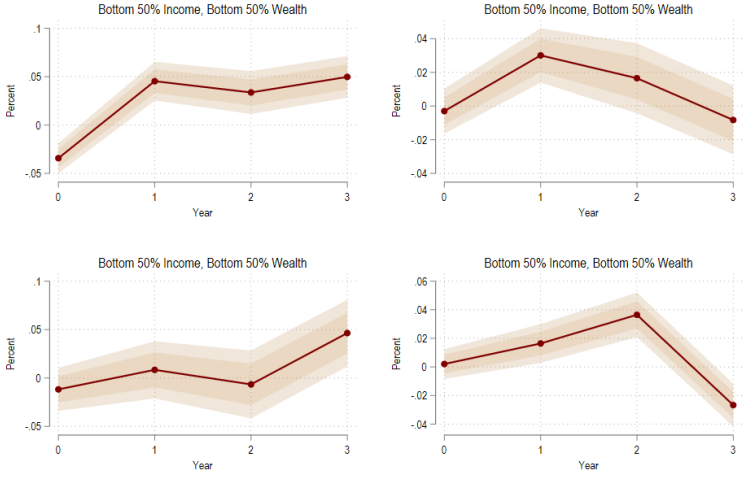


Figure: Impulse Responses of Hand-to-mouth to Income Shocks, One Stage.

Empirical Impulse Responses, Russia

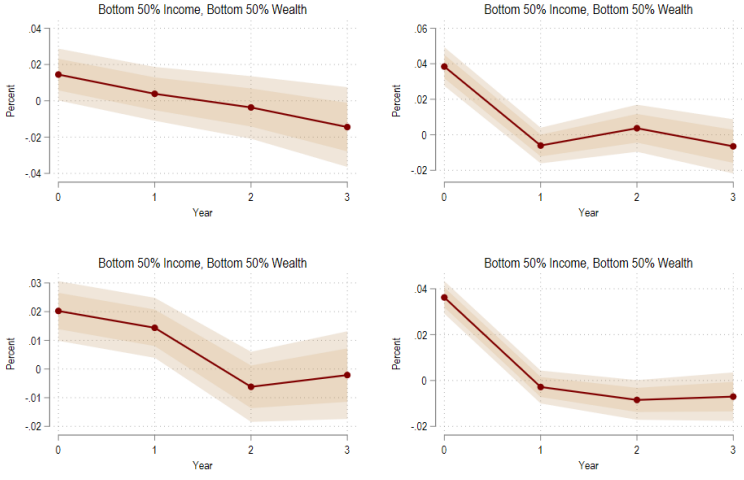


Figure: Impulse Responses of Hand-to-mouth to Income Shocks, One Stage.