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The Effects of Monetary Policy Shocks on Inequality in Japan[1]

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[1]The views expressed are those of authors and do not necessarily reflect those of the BOJ/BIS.

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Motivation: growing interest on inequality

Impacts of monetary easing on inequality have attracted increasing attention recently

- Cohan (2014): "Mr. Bernanke's extraordinary QE program, started in the wake of the financial crisis, has only widened the gulf between haves and have-nots."

- Krugman (2014): "The belief that QE systematically favors the kinds of assets the wealthy own is wrong or at least overstated."

- Bernanke (2015): "Monetary policy is a blunt tool which certainly affects the distribution of income and wealth, although whether the net effect is to increase or reduce inequality is *not clear*."

Existing empirical studies

Empirical observations are mixed

- Coibion et al. (2017): Income and consumption inequality across U.S. households respond counter-cyclically to monetary policy shocks
  - Interest rate ⇑ → Inequality ⇑
- Mummtaz and Theophipoulou (2016): The same result holds in the U.K.
- Saiki and Frost (2014): The opposite is true when using Japanese data
  - Interest rate ⇓ → Inequality ⇑
- Domanski et al. (2016): Unconventional monetary policy may have widened wealth inequality, in particular through an upsurge in stock prices

Questions and Findings

Question 1:

- Does a monetary policy *affects* inequalities?
  ⇒ Yes, MP shocks matter in **earnings** inequality. But the direction is different from the US/UK and it depends on the sample period. The effects **disappear recently**.

Question 2:

- Does the unconventional monetary policy (QE) matter for the relationship between monetary policy and inequality?
  ⇒ Probably, no. No regime switch. More **continuous changes in economic environment** such as labor market.

Question 3:

- What kind of *transmission mechanism* works?
  ⇒ One possiblity: **labor market flexibility**.

What we do

This paper

- Study the distributional effects of monetary policy, using the micro-level data on Japanese households.
- Draw the broad picture of the effects:
  1. focusing on inequality measures of income, consumption, and wealth based on the micro-level data
  2. using both the theoretical model and the data
  3. using a fairly long-span data sample: periods of conventional and unconventional monetary policy regimes

Potential transmission channels

1. Earnings heterogeneity channel ← **Japan: This paper**
   - the response of earnings to a monetary policy shock differs
2. Job creation channel
   - job creation/destruction following a MP shock
3. Income composition channel ← **US: Coibion et al. (2017)**
   - the income composition of different income types differs
4. Portfolio channel
   - the size and composite of asset portfolio differs
5. Saving redistribution channel ← **Doepke and Schneider (2006)**
   - a transfer from lenders to borrowers by a subsequent rise in inflation caused by monetary easing

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I. Data & Estimation

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FIES

Family Income and Expenditure Survey (FIES)

- Monthly survey on household income and expenditures
  - January 1981 – December 2008
  - The number of observations: 8,000
  - Panel data: 6 months
  - Two-or-more household members only
    - Single household available only after 2002
- Focus on full-time employees (household head): 25–59
  - Self-employed, retirees and unemployed are excluded
- Construct *quarterly series* of variables on economic inequality
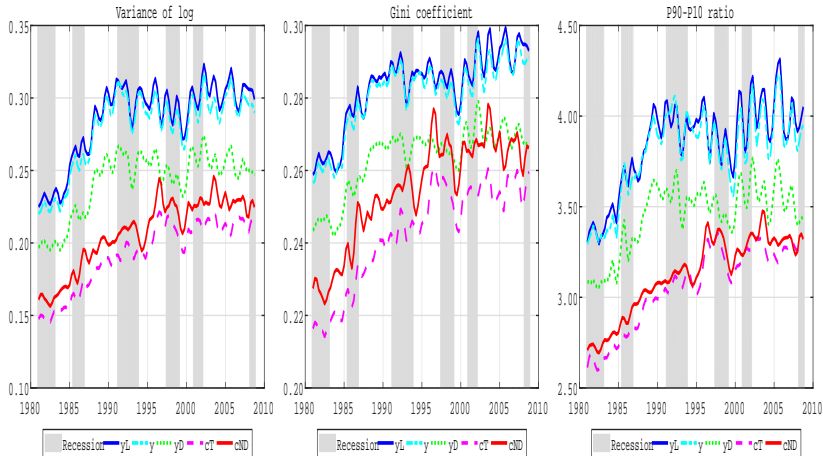 - for time series analysis

FIES (cont.)

Definition of Variables

1. Earnings y_L
   - Sum of labor income of *all* household members
2. Total income y: y_L + capital income + private transfer
3. Disposable income y_D: y + public transfers - taxes/premiums
4. Nondurable expenditures c_{ND}
   - Housing, purchasing cars and other durables are excluded
5. Total expenditure c_T: c_{ND} + durables (housing excluded)

- Equivalized by OECD equivalent scale

▶ DETAILS

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Time path of inequality measures

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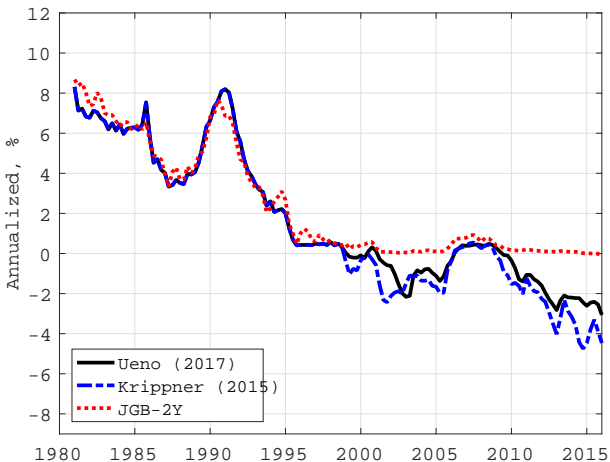0000000

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Estimation methodology

Estimate the impulse responses of inequality measures to a monetary policy shock, using the LLP by Jordà (2005):

$$\underbrace{Y_{t+h}}_{\text{inequality at } t+h} - Y_t = \alpha_h + \Pi_h(L)M_t + \underbrace{\varepsilon_{t+h}}_{\text{innovation}}$$

$$M_t = \begin{bmatrix} \Delta TFP_t \\ Factor_t \\ \Delta R_t \end{bmatrix} \Leftarrow \text{Monetary policy variable}$$
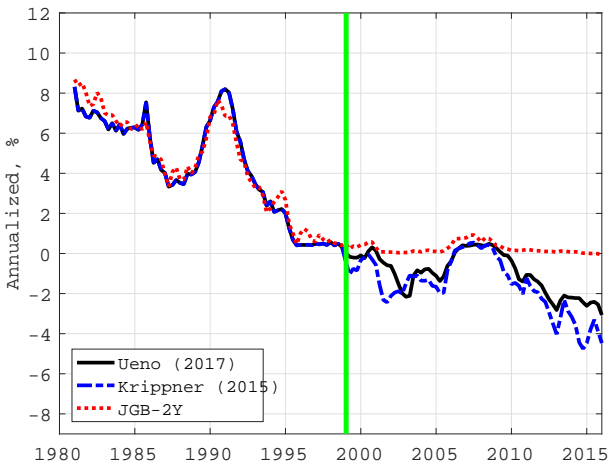
• Advantages of LLP:
  ○ Robustness to model misspecifications:
    ⇒ choice of explanatory variables and the number of lags
  ○ Flexibility of model specifications

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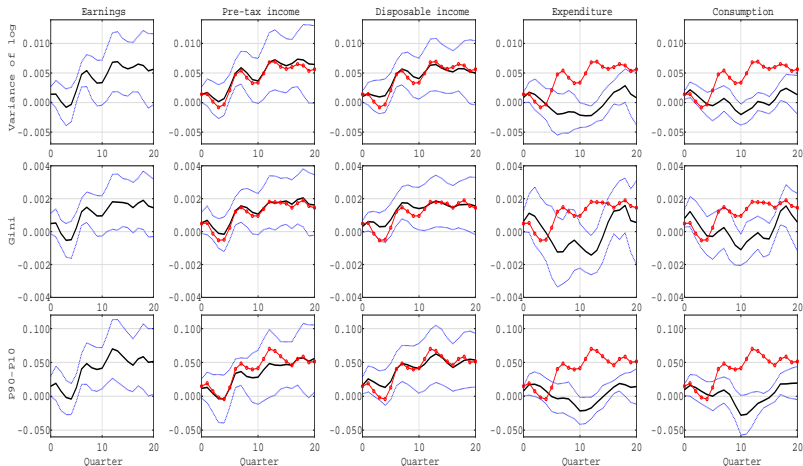ooooooooo

Monetary policy instrument

- **Baseline**: 1981Q1-1998Q4, **Shadow rate**: after 1999Q1

Monetary policy instrument

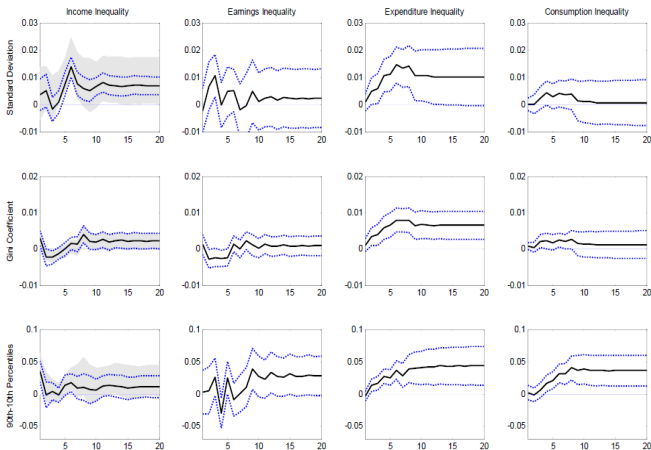- **Baseline**: 1981Q1-1998Q4, **Shadow rate**: after 1999Q1

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Responses of inequality measures: Baseline

U.S. Economy
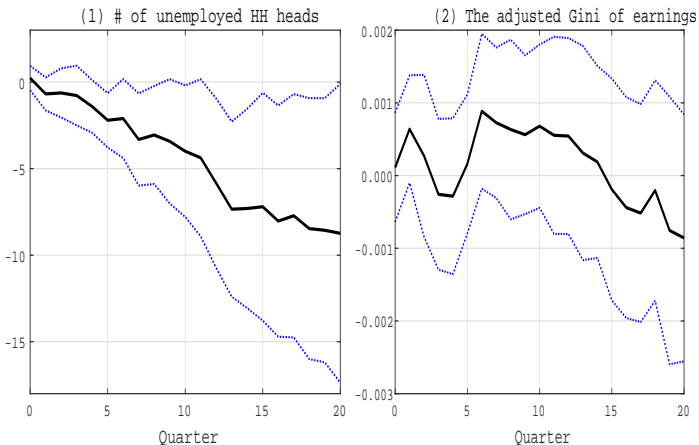

FIGURE 4: RESPONSE OF ECONOMIC INEQUALITY TO A CONTRACTIONARY MONETARY POLICY SHOCK
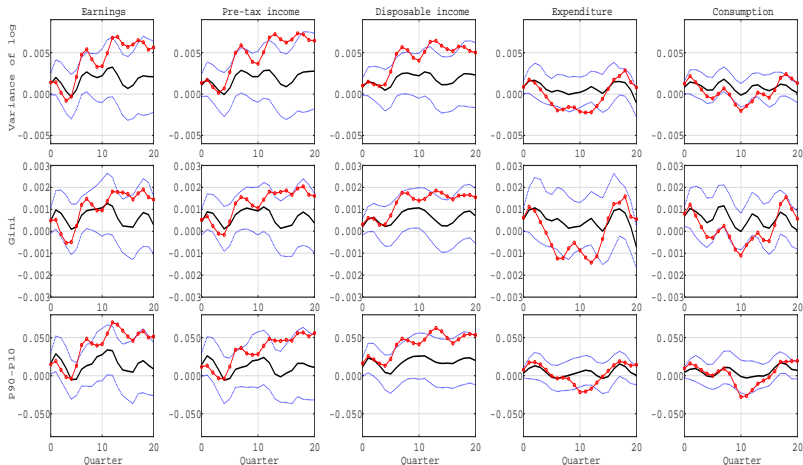
• Figure 4 in Coibion et al. (2017)

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Channel through job creation

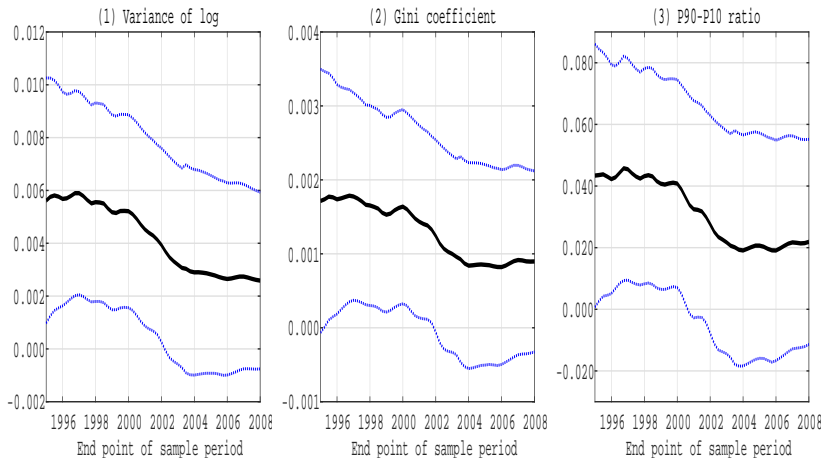(1) # of unemployed HH heads   (2) The adjusted Gini of earnings

Adjusted Gini

Responses of inequality: 1981-2008

- Red line: 1981-1998, Black line: 1981-2008

Changes in responses of earnings inequality over time

Empirical observations

1. Impact of expansionary monetary policy on income inequality is *procyclical*, arises mainly from procyclical response of earnings inequality. ⇒ **Earnings heterogeneity channel matters in Japan**

2. Once-prevailing distributional effects **diminish** during 2000s

3. Possibility that a decline in earnings inequality due to job creation channel counters its rise from earnings heterogeneity channel

4. Transmission of income inequality to consumption inequality is less than one-to-one

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Accounting for observations

To address to these observations, we conduct three additional analyses:

1. Two-sector DSGE model with attached labor inputs
   - illustrate how the distributional effects of monetary policy change with the structure of the economy
2. Industry-level aggregate data sets
3. Micro-level data on households' financial assets and liabilities
   - check whether the model's predictions accord with the data

II. Model
(under revision)

Literature: Theory

Models of inequality:

- Monetary policy shock:
  - Guerrieri and Lorenzoni (2012), Gornemann et al. (2016), Auclert (2019), McKay et al. (2016)
- Fiscal policy:
  - Oh and Reis (2012), McKay and Reis (2015)
- Income inequality and Pareto distribution:
  - Gabaix et al. (2016)
- Business cycle and heterogeneity:
  - Challe et al. (2017)
- Mechanism behind earnings inequality in **HANK**
  ⇒ idiosyncratic risks (stochastic, but exogenous)

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Our model

- Two production sectors (X and Z)
  - each of which has final goods firms and intermediate goods firms
  - consumption composite consists of goods X and goods Z
- Two households (X and Z)
  - each of which has two types of members: "attached" and "mobile"
  - "Attached" supplies its labor inputs to one of two sectors
  - "Mobile" can supply its labor inputs to both sectors

Objectives of households

- Each type of households (X and Z) maximizes:

$$U_{s,t} = \mathbb{E}_t \left[\sum_{q=0}^{\infty} \beta^q u(C_{s,t+q}, C_{s,t+q-1}, N_{s,t+q}, H_{s,t+q}) \right]$$

$$u(\cdot,\cdot,\cdot,\cdot,) = \log(C_{s,t+q} - bC_{s,t+q-1}) - \theta \frac{N_{s,t+q}^{1+\eta}}{1+\eta} - \phi \frac{H_{s,t+q}^{1+\eta}}{1+\eta}$$

- N: attached labor input, H: mobile labor input
- β: discount factor, C: consumption, b: habit

Budget constraint

- For $s = X, Z$, the budget constraint:

$$
C_{s,t} + \frac{B_{s,t}}{P_t} \geq \left[\begin{array}{c} \frac{W_{s,t}}{P_t} N_{s,t} + \frac{W_t}{P_t} H_{s,t} \\ + \left(\frac{\Pi_{X,t} + \Pi_{Z,t}}{P_t} \right) \gamma_{\Pi_s} + \left(\frac{R_{X,t} K_X + R_{Z,t} K_Z}{P_t} \right) \gamma_{K_s} \\ + R_{t-1} \frac{B_{s,t-1}}{P_t} + \kappa_B \left(\frac{B_{s,t}}{P_t} \right)^2 \end{array} \right],
$$

- γ_{Π_s}: share of dividends, γ_{K_s}: share of capital stock
- κ_B: adjustment costs of bond holding
- Capital stock is fixed at some level

Firm's price setting and gross output

- In sector X, the intermediate firm i choose the prices to solve:

$$\max_{P_{X,t}(i)} \mathbb{E} \left[\sum_{q=0}^{\infty} \beta^{t+q} \frac{\Lambda_{t+q}}{\Lambda_t} \frac{\Pi_{t+q,X}(i)}{P_{t+q}} \right]$$

- subject to

$$\Pi_{X,t+q,X}(i) = P_{X,t+q}(i) x_{t+q}(i) - MC_{X,t+q}(i) x_{t+q}(i)$$
$$- \frac{\kappa_X}{2} \left(\frac{P_{X,t+q}(i)}{P_{X,t+q-1}(i)} - 1 \right)^2 P_{X,t+q} X_{t+q},$$
$$x_t(i) = A N_{X,t}(i)^{\alpha\mu} U_{X,t}(i)^{\alpha(1-\mu)} K_{X,t}(i)^{1-\alpha}$$

Rest of the model

- Production technology of gross output:

$$\bar{X}_t = \left[\int_0^1 x_t(i)^{1-\frac{1}{\varepsilon}} \, di \right]^{\frac{\varepsilon}{\varepsilon-1}}$$

- The *aggregator* constructs the composite of consumption goods using the aggregate technology
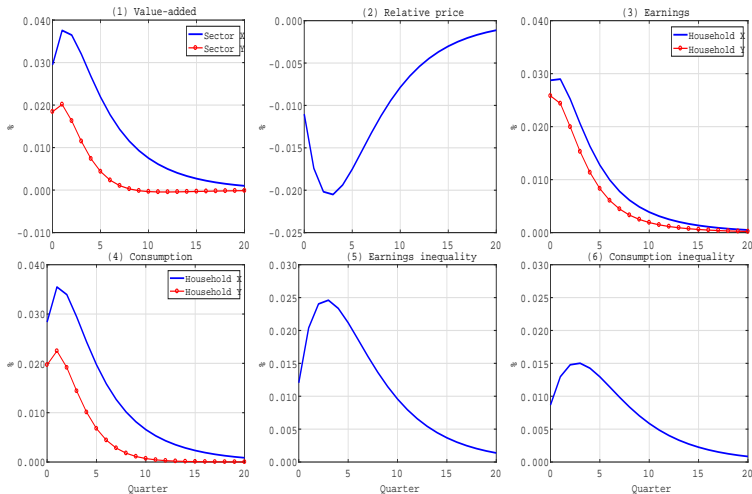
$$C_t = X_t^{\rho} Z_t^{1-\rho}$$

- Monetary policy:

$$\log R_t = \rho_n \log R_{t-1} + (1 - \rho_n)\varphi \log \pi_t + \epsilon_{R,t}$$
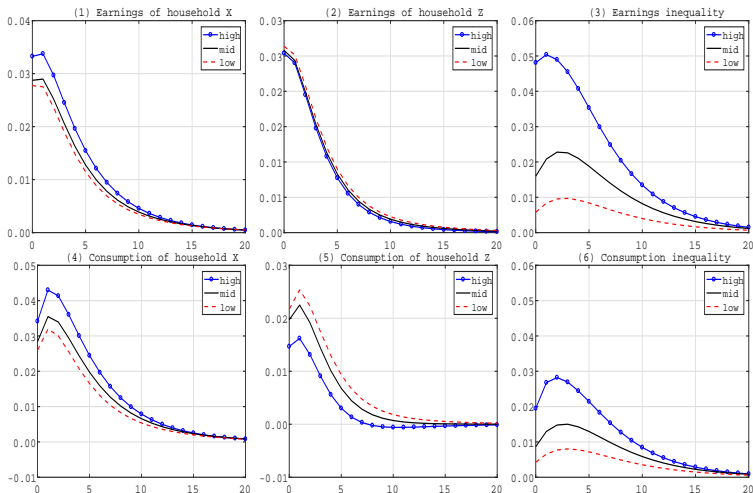
Setup

- Assume that $\rho > 1 - \rho$ and $\kappa_X > \kappa_Z$
- Other parameters are symmetric
- Then
  - X receives *higher earnings* than Z at steady state
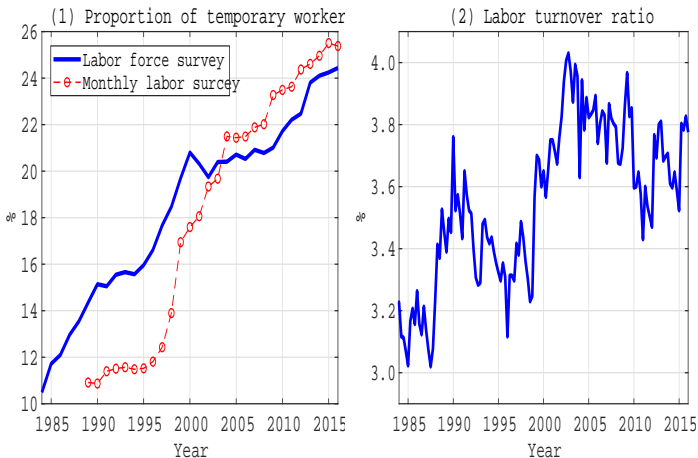 - Monetary policy affects two sectors *differently* around steady state

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Expansionary monetary policy shock

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Labor market flexibility: $\mu \in \{0.4, 0.6, 0.8\}$

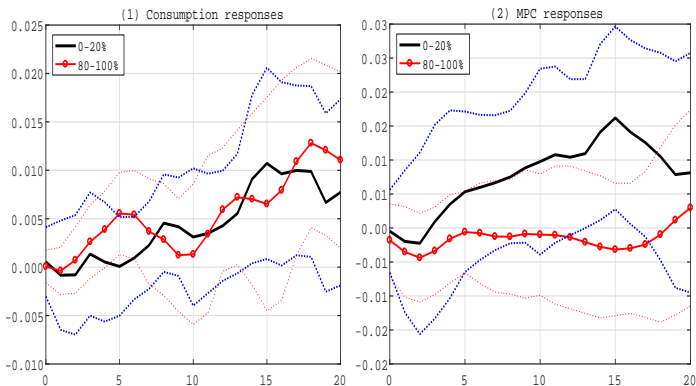# Labor market flexibility in Japan

Transmission to consumption inequality

- Why didn't consumption inequality increase as much as income inequality?
  - Responses of consumption of households are all weak?
  - Or other possible explanations?

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# Responses of consumption and the MPC

- by income quintiles

Transmission to consumption inequality

- Why is the MPC conditional on monetary policy shocks *higher* in the low income quintile?
    1. Distributional effects via financial asset holdings
    2. Difference in consumption behavior across households

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Distribution of financial assets matters
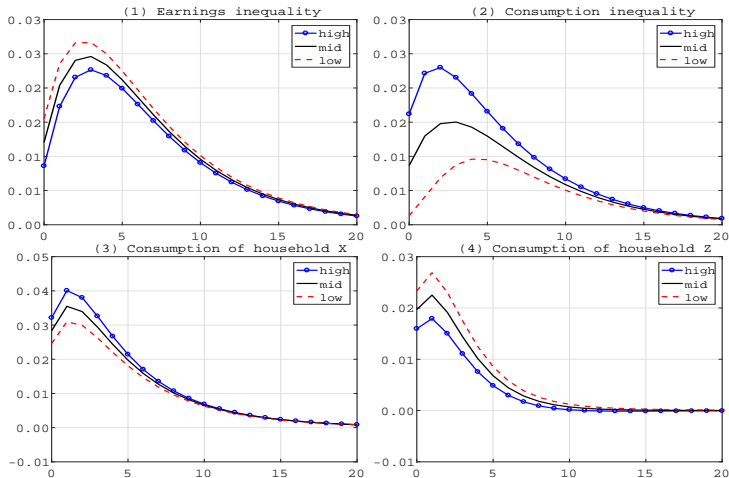
- $\gamma_{K_X} \in \{0.4, 0.5, 0.6\}$

Conclusion

Empirically and theoretically study how monetary policy shocks are transmitted to inequality.

- Findings:
  - Distributional effects of monetary policy were once present, but have become statistically insignificant during the 2000s
  - Transmission of income inequality to consumption inequality is minor
- Takeaways:
  - Labor market flexibility is central to the dynamics of income inequality after the monetary policy shocks
  - Distributions of financial assets and liabilities don't play a significant role
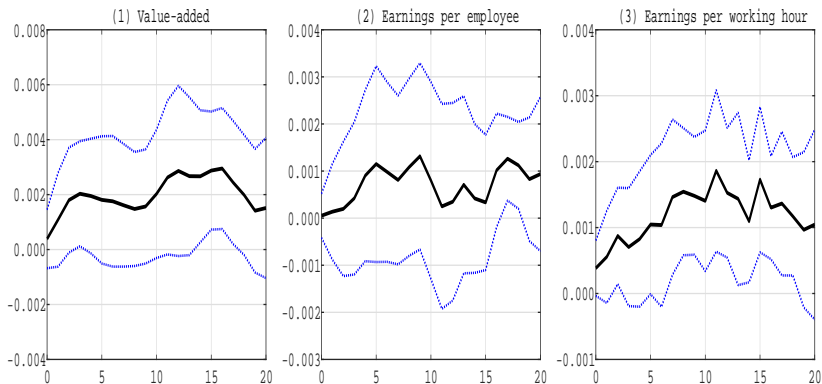
Thank you!

Appendix Figures

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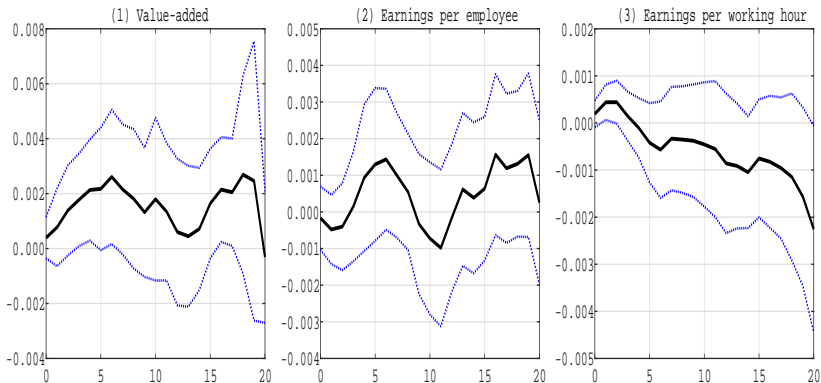○○○●○○○○○○

Responses of macro variables
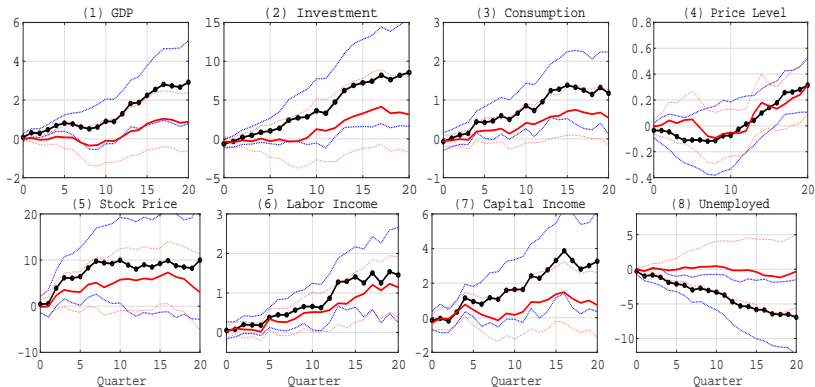
Cross-firm heterogeneity to earnings inequality: baseline

Cross-firm heterogeneity to earnings inequality: 1981-2008

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Data Details

Data Details

Definition of Variables

- Labor income y:
  - sum of monthly labor income of household members, which include household head, his/her spouse and other household members
- Nondurable expenditure c:
  - food; repair and maintenance of houses; fuel, light and water charges; domestic utensils, non-durable goods, and services; clothing and footwear; medical care; transportation and communication, excluding purchase of vehicles and bicycles; education; culture and recreation, excluding recreational durable goods; and other consumption expenditure, excluding remittance

‹ RETURN

Adjusted Gini

Adjusted Gini coefficient

$$G^* \equiv \frac{\sum_{i=1}^{\bar{N}} \sum_{j=1}^{\bar{N}} |x_i - x_j|}{2\bar{N} \sum_{i=1}^{\bar{N}}} = G\frac{N}{\bar{N}} + \frac{\bar{N} - N}{\bar{N}}$$

• Assumption: earnings of unemployed $= 0$

‹ RETURN