How Does Monetary Policy Affect Household Indebtedness?

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[1] The views expressed in this presentation are those of the authors, and do not in any way represent the views of Norges Bank.

Motivation

- Household debt increased faster than income in most countries over the past 40 years
- Household indebtedness high on policy agendas
- Debates on indebtedness typically center on primary deficits
  - Potentially misleading due to mechanical effects (I. Fisher, 1933):

$$\underbrace{\Delta b_{t+1}}_{\text{Change in debt-to-income}} \approx \overbrace{d_t}^{\text{Primary Deficit}} + \underbrace{(i_t - g_t - \pi_t) b_t}_{\text{Fisher Effects}}$$

  - Influence of monetary policy on debt-to-income is ambiguous due to responses of inflation (π_t) and income (g_t) (Svensson 2018)

Questions

1. How important are **primary deficits** vs. **Fisher effects** for the evolution of debt-to-income over time and **across different households** h?

$$\Delta b_{h,t+1} \approx d_{h,t} + (i_{h,t} - g_{h,t} - \pi_t)\, b_{h,t}$$

   - in particular among the highly leveraged and financially "vulnerable"

2. How does monetary policy affect the debt-to-income ratio among different households?
   - primary deficits or Fisher effects?

Main Findings

Answers from Norwegian micro data:

1. Descriptive accounting exercise over 1993-2015:
   - Aggregate: DTI mainly driven by primary deficits - ca. $65 - 75\%$
   - Heterogeneity: Fisher effects matter for households with high DTI

2. Monetary policy shocks - if $i \uparrow 1$ ppt:
   - Aggregate: DTI $\downarrow$ by $1 - 3$ ppt
     - Primary deficit channel dominates Fisher effect channel
   - Heterogeneity: Similar results across distributions
     - Initial DTI levels, unemployment risk, housing tenure

- Upshot: Behavior dominates mechanical effects

Literature

- Debt Dynamics
  - Macro: Mason and Jayadev (2014)
  - Micro: Bernstein and Koudijs (2021)
- Debt and macroeconomic crises
  - Empirical: Jorda, Schularick and Taylor (2013, 2015, 2016); Mian and Sufi (2013, 2014); Mian, Sufi and Verner (2017); Glick and Lansing (2010)
  - Theory: Farhi and Werning (2016); Korinek and Simsek (2016); Mian, Straub and Sufi (2020)
- Monetary policy and household debt-to-income
  - Macro evidence: Bauer and Granziera (2017)
  - Micro evidence: Di Maggio, Kermani, Keys, Piskorski, Ramcharan and Seru (2017)
  - Models and policy: Svensson (2018); Garriga, Sustek and Kydland (2018); Gelain, Lansing and Natvik (2018); Auclert (2019); Kinnerud (2020)
- Macroprudential policy: IMF, BIS, Norges Bank, Riksbanken, etc...

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Data

- Population tax record data covering all Norwegian individuals
  - From 1993 to 2015
  - End-of-year values
  - Third-party reporting
  - Household identifiers
- Norway taxes wealth
- $\Rightarrow$ High-quality balance sheet data
  - Income
  - Asstes
  - Liabilities
  - Household characteristics
- Note: Debt = All debt including mortgages

Institutional setting in Norway

- **Household debt:**
  - Primarily mortgages
  - $>$ 90% of all mortgages have adjustable interest rates
  - Borrower-based measures since 2010
    - LTV requirements (2010)
    - Stress test of debt-service ability (2012)
    - DTI requirements (2017)
- **Monetary policy:**
  - De facto inflation targeting since 1999
  - Increased emphasis on financial stability after 2009
  - Period with moderate inflation

Summary Statistics 1994–2015

		Debt-to-income Quintiles				
Variable	**All**	**1**	**2**	**3**	**4**	**5**
Age	53.61	67.46	55.75	51.83	47.67	43.24
Less than high school education	0.33	0.50	0.38	0.30	0.24	0.22
High school education	0.37	0.33	0.37	0.39	0.39	0.38
College education	0.30	0.17	0.25	0.31	0.37	0.40
Debt-to-income b in %	153.67	8.14	32.34	96.79	207.24	428.32
Debt B (USD 1,000)	99.66	4.19	19.88	64.94	151.30	260.90
Income Y (USD 1,000)	60.12	43.70	60.01	65.30	71.57	63.06
Real income growth g in %	3.85	2.81	2.35	3.25	4.29	6.47
Interest rate r in %	5.21	5.34	4.86	5.35	5.21	5.20
Inflation π in %	2.01					
Predicted job separation rate, %	5.60	5.66	5.37	5.40	5.47	5.95
Observations	30 mill					

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Accounting Framework

- Law-of-motion for nominal debt:

$$P_t B_{t+1} = P_t D_t + (1 + i_t) P_{t-1} B_t$$

- Define $b_{t+1} = \frac{P_t B_{t+1}}{P_t Y_t}$ and $d_t = \frac{P_t D_t}{P_t Y_t}$. Exact expression:

$$b_{t+1} = d_t + \frac{1 + i_t}{1 + \pi_t} \frac{1}{1 + g_t} b_t$$

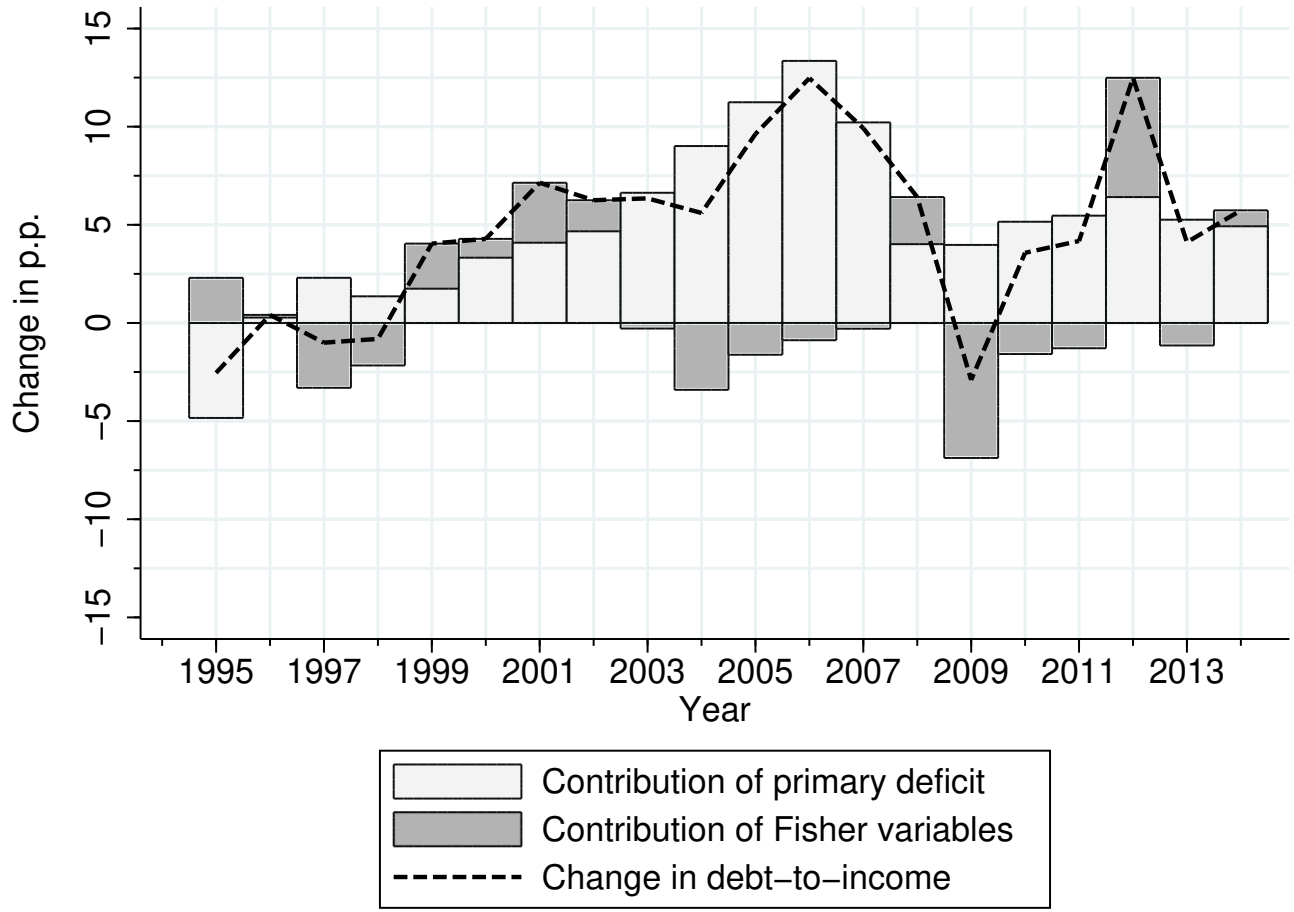
- Linearize to isolate the different Fisher effects:

$$\underbrace{\Delta b_{t+1}}_{\text{Change in debt-to-income}} \approx \overbrace{d_t}^{\text{Primary Deficit}} + \underbrace{(i_t - g_t - \pi_t) b_t}_{\text{Fisher Effects}}$$

- Next slides: each component calculated at household level
  $\Rightarrow$ plot (group) means over time

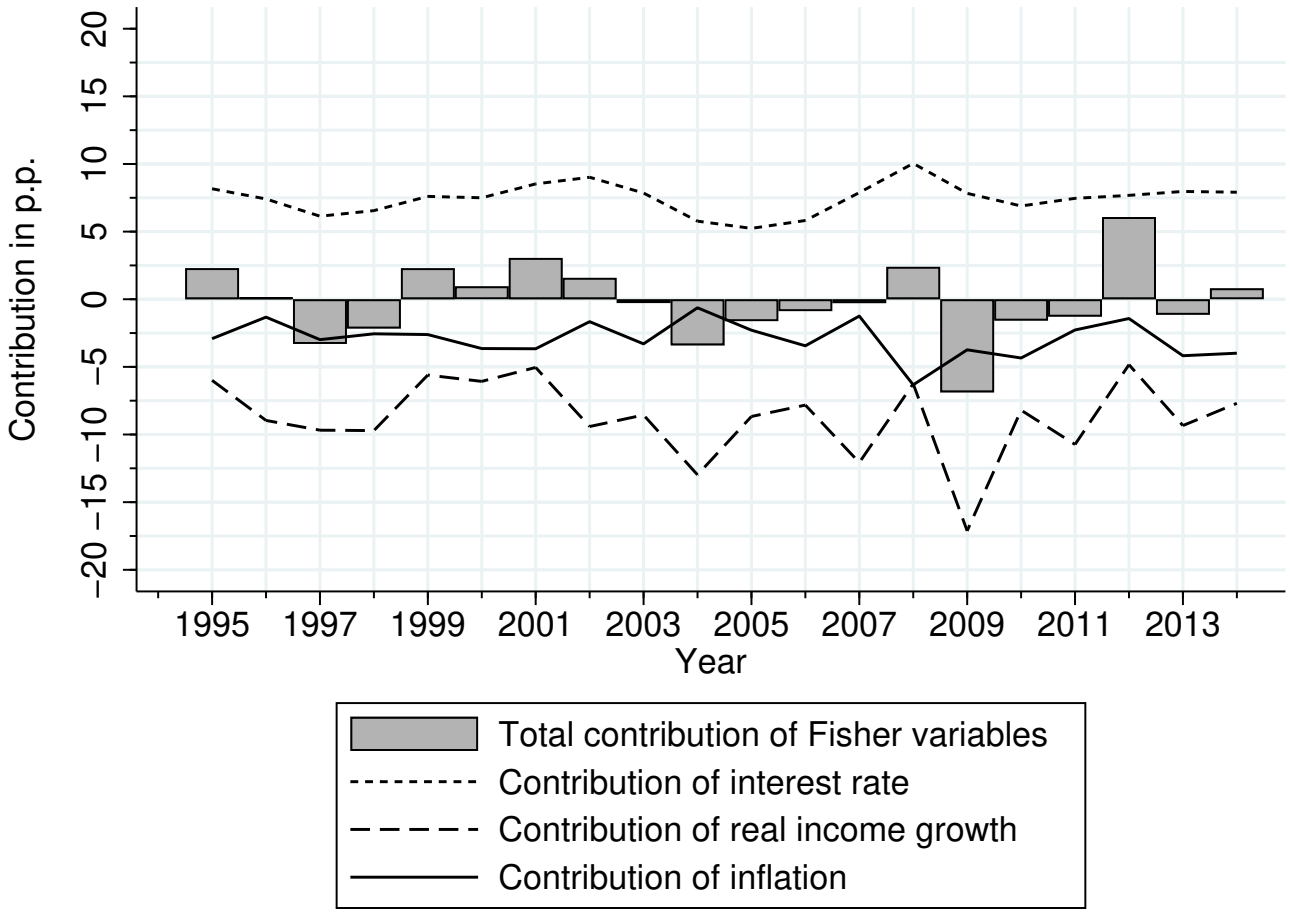
Accounting - Fisher Effects vs. Primary Deficit over Time

- Changes in DTI primarily driven by primary deficits (65 – 75%)



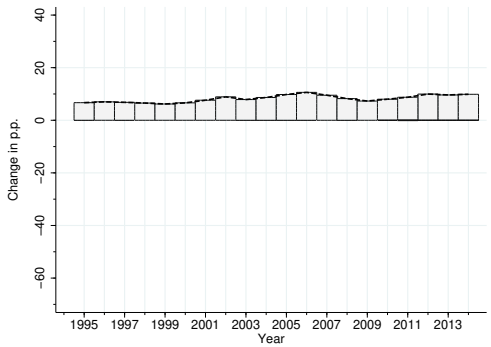
Accounting - Fisher Effects Decomposed

- Fisher variables: g-effects $\approx$ i-effects $>$ π-effects

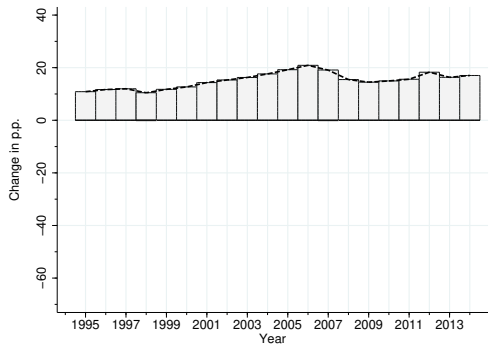


Primary Deficits vs. Fisher Effects by DTI level

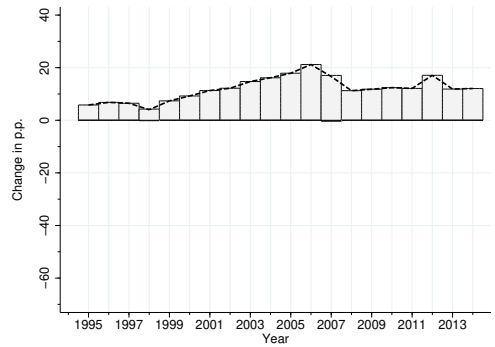
- Fisher effects matter only among the high-DTI households



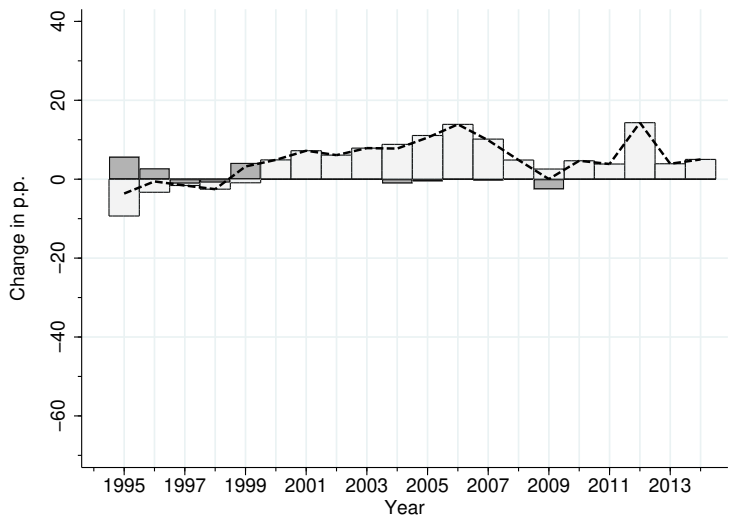
(a) Quintile 1



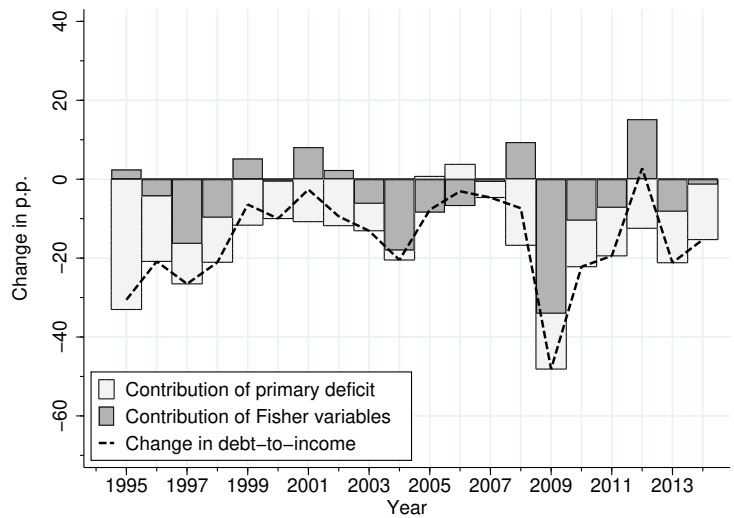
(b) Quintile 2



(c) Quintile 3



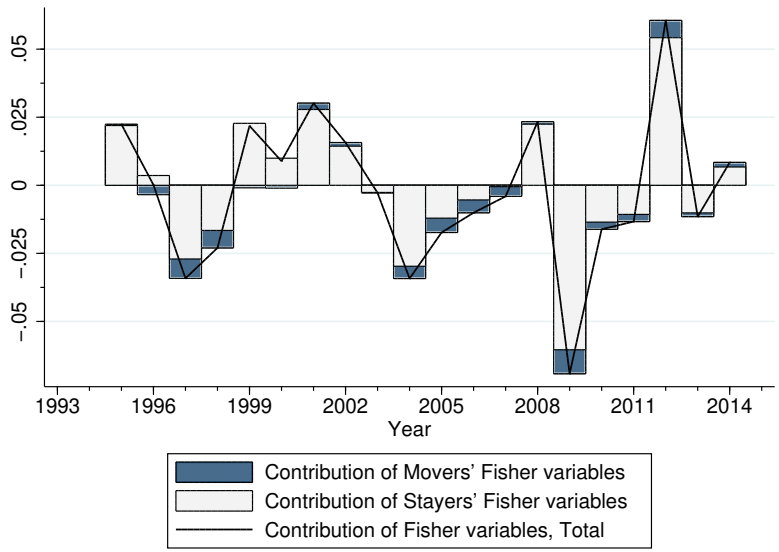
(d) Quintile 4



(e) Quintile 5

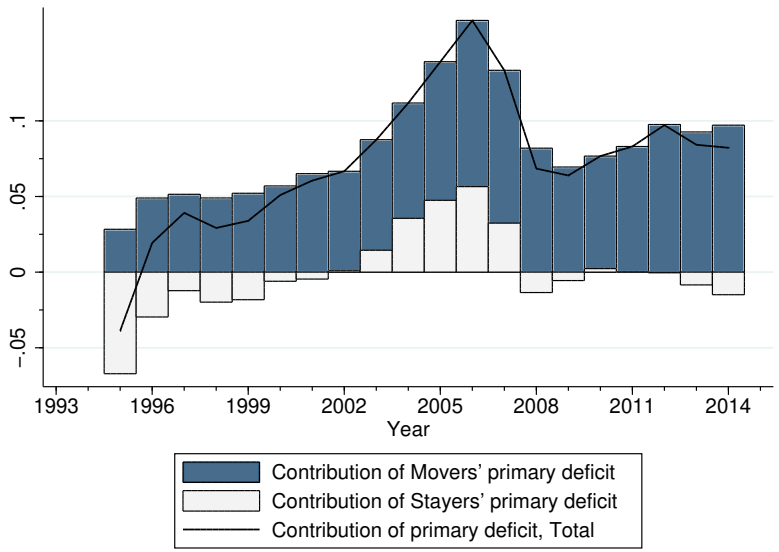
Movers vs. Stayers

Fisher effects come from stayers



(a) Fisher Effects

Primary deficits come from movers



(b) Primary Deficits

Accounting - Summary

- Aggregate DTI movements mainly driven by primary deficits
- ... but Fisher effects are important among highly indebted households (who don't move)

Does this carry over to the effects of monetary policy on DTI?

Monetary Policy Responses

- How do interest changes affect DTI?

$$\underbrace{\Delta b_t}_{\text{Change in debt-to-income}} \approx \overbrace{d_t}^{\text{Primary Deficit}} + \underbrace{(i_t - g_t - \pi_t) b_t}_{\text{Fisher Effects}}$$

$$i_t \uparrow \Rightarrow \text{ Primary deficit } \downarrow \text{ and Fisher effects } \uparrow$$

Responses to Monetary Policy

- Monetary policy shocks from Holm, Paul and Tischbirek (2021)
- Outcomes: household level DTI, Fisher effects and primary deficits

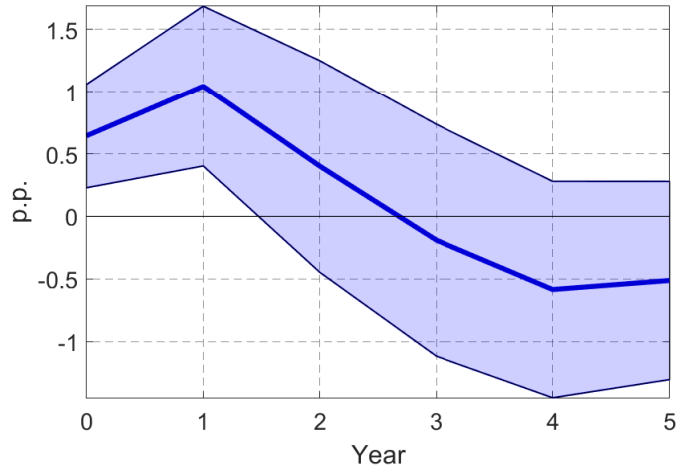
- **Local projection:** For household i and time period t

$$y_{i,t+h} - y_{i,t-1} = \delta_i^h + \beta^h \cdot \epsilon_t^{MP} + \gamma' \mathbf{X}_{i,t-1} + u_{i,t}^h$$

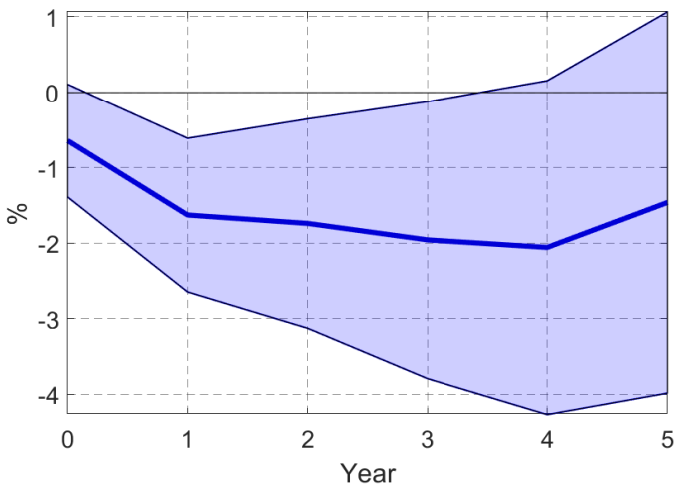
- **Within-group estimation:** For household i in group g

$$y_{i,t+h} - y_{i,t-1} = \delta_i^h + \beta_g^h \cdot \epsilon_t^{MP} + \gamma_g' \mathbf{X}_{i,t-1} + u_{i,t}^h, \qquad \forall\ i \in g$$

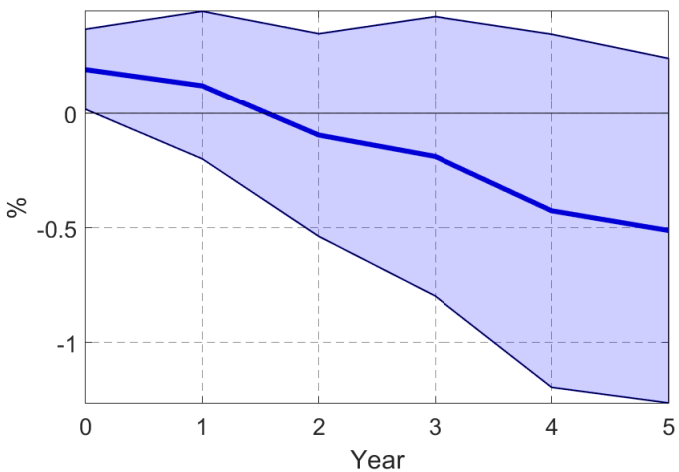
Responses to Monetary Policy in Macro Data



(a) Policy Rate

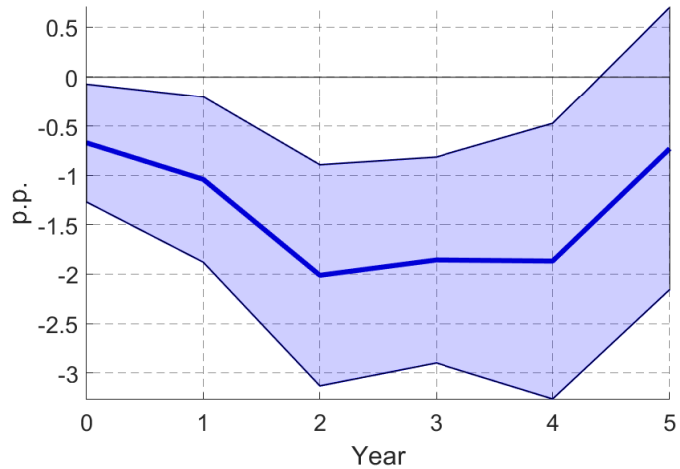


(b) GDP

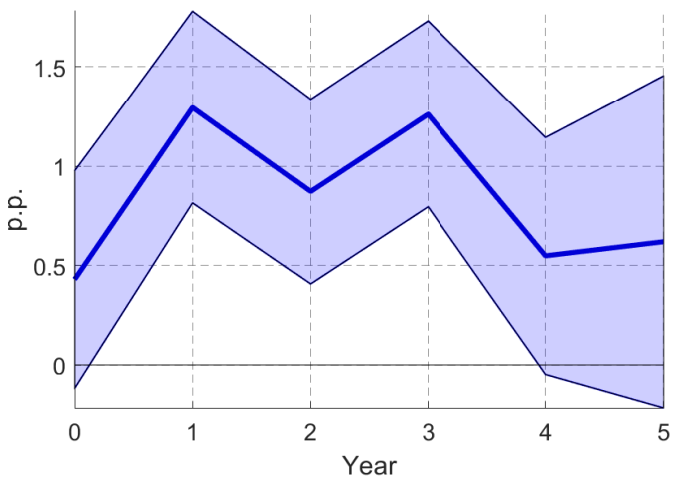


(c) CPI

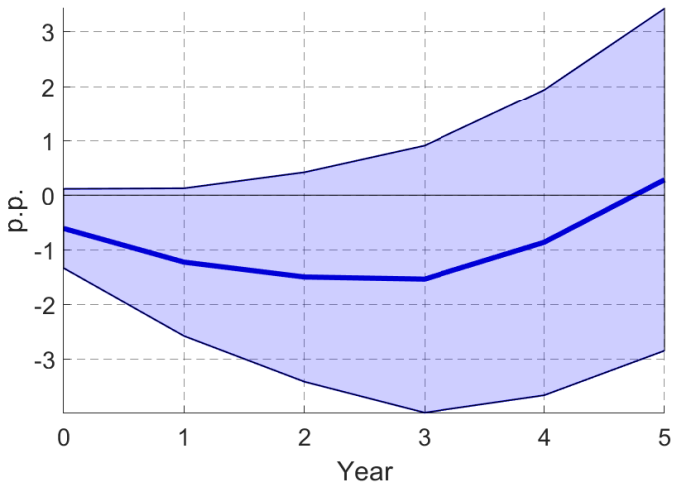
Average DTI Responses to Monetary Policy



(a) DTI

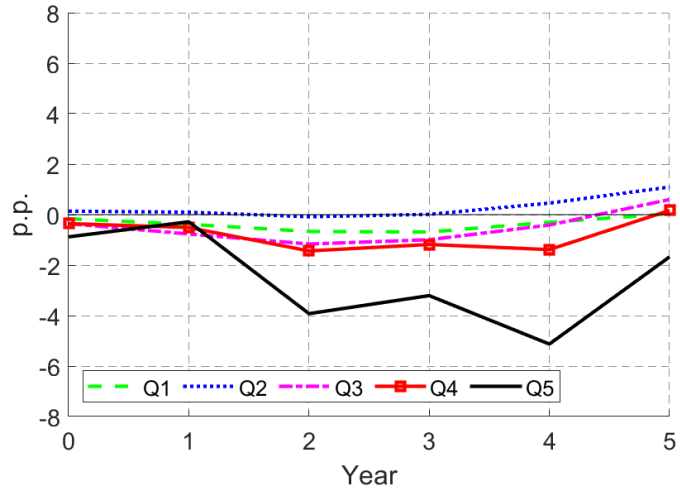


(b) Fisher Effects

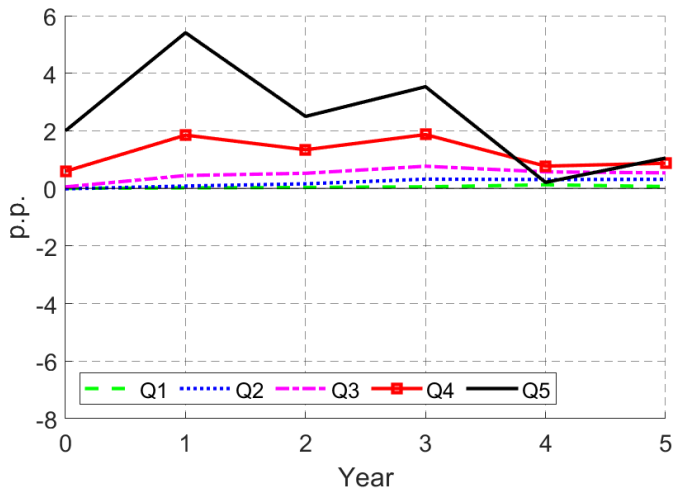


(c) Primary Deficit

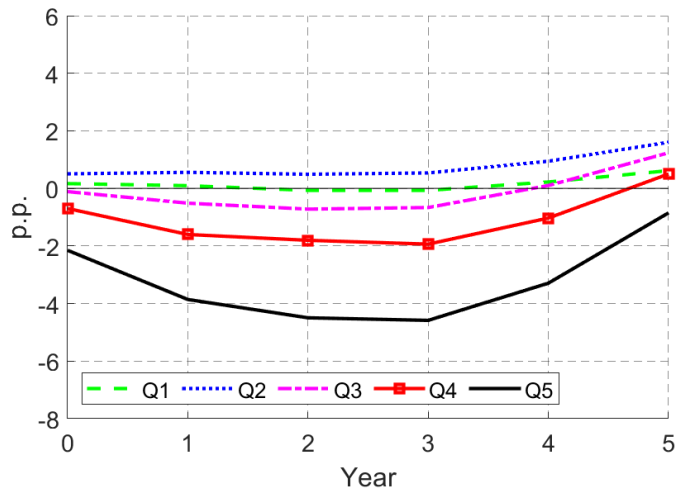
Responses to Monetary Policy by DTI Quintiles



(a) DTI



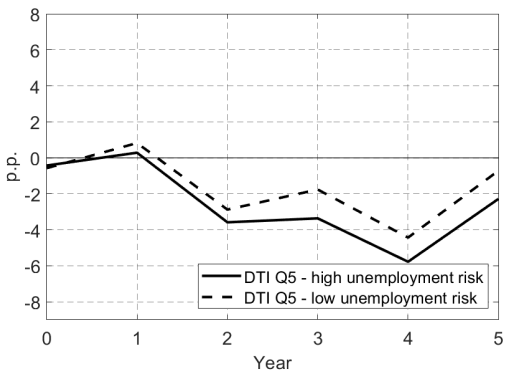
(b) Fisher Effects



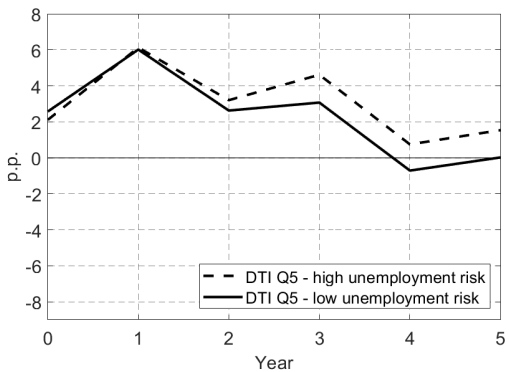
(c) Primary Deficit

Responses to Monetary Policy by Job Loss Probability

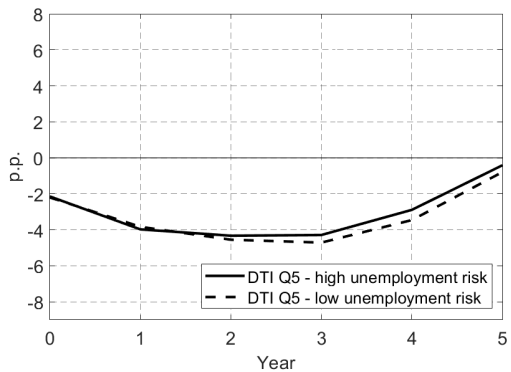
- How does MP affect the most financially vulnerable households?
  - One measure: high debt + risk of income loss
- Split households by above versus below median job separation risk
  - Probit regression: $unemployment_{t+1}$ on $industry_t$ and $tenure_t$



(a) DTI



(b) Fisher Effects



(c) Primary Deficit

Behavior or Cash Flow Effects?

- "Primary deficits" are total household expenditures on debt service
  - -(*Repayment* + *interest*)
- Primary deficit responses partly reflect mechanical cash flow effects

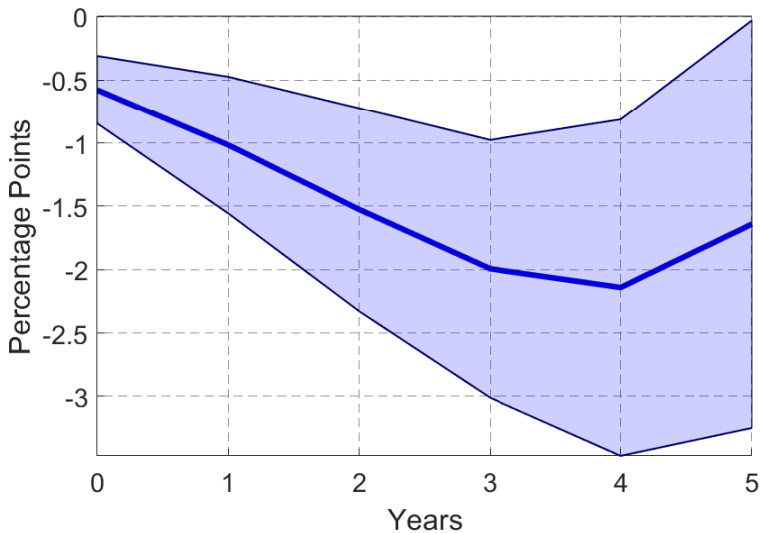
Decomposition to isolate behavior from cash flow effects:

$$b_{t+1} = \frac{B^n_{t+1}}{Y^n_t - iB^n_t}$$

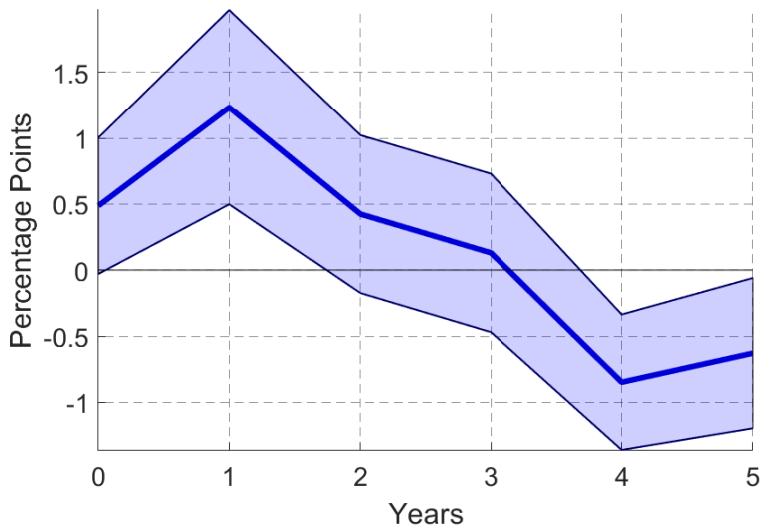
- iB^n_t are the directly observed interest expenditures in year t

$$\Delta b_{t+1} \approx b_t \left(\frac{B^n_{t+1} - B^n_t}{B^n_t} - \frac{Y^n_t - Y^n_{t-1}}{Y^n_{t-1} - iB^n_{t-1}} + \frac{iB^n_t - iB^n_{t-1}}{Y^n_{t-1} - iB^n_{t-1}} \right)$$

Isolating Behavior From Cash Flow Effects

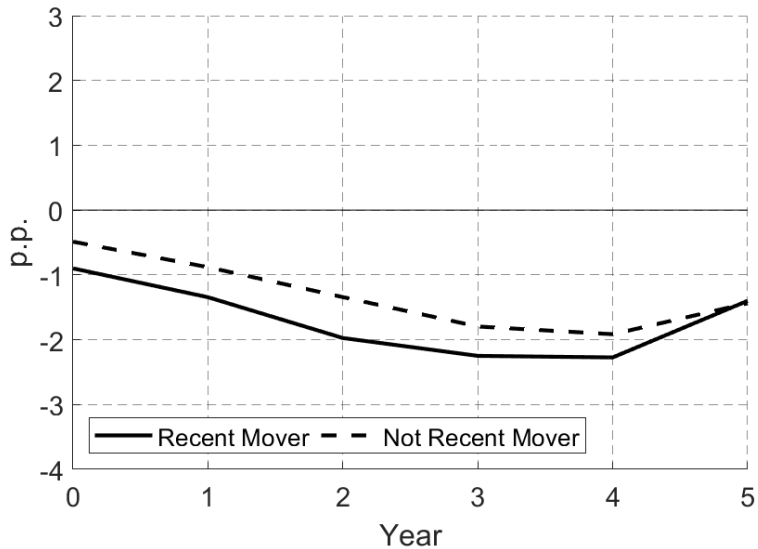


(a) Nominal Debt

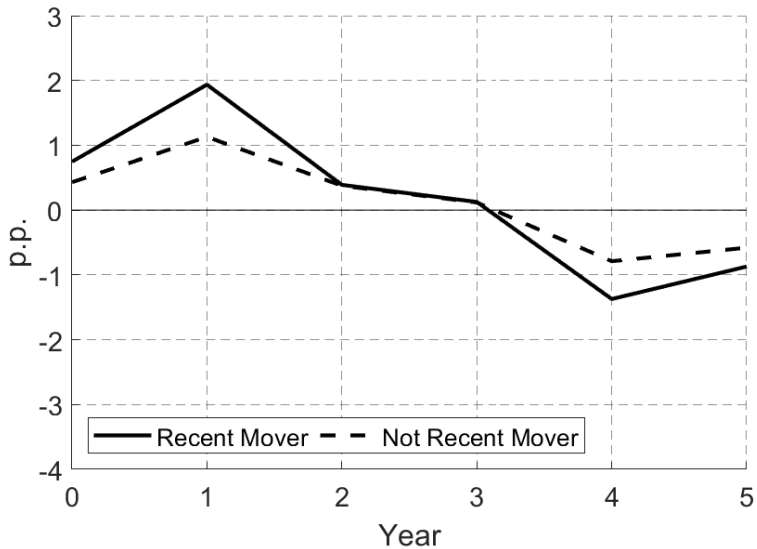


(b) Interest Expenses

Same Pattern even among Recent Movers



(a) Debt



(b) Interest Expenses

Conclusion

Decomposition of DTI growth

- Aggregate: Primary deficits dominate
- Heterogeneity: Fisher effects important for the highly leveraged

MP shocks and DTI

- Main channel is primary deficits
  - ... even among the highly leveraged and recent movers
  - ... also among the most "vulnerable"
- Upshot: Behavior, not mechanics

Monetary policy implications

- Interest hikes reduce debt burden $\approx$ conventional logic
  - ... but the effects are moderate
  - ... still likely that inflation reduces DTI among leveraged households

Appendix

Calculating Components of Debt Dynamics

Key accounting identity:

$$\underbrace{\Delta b_{h,t+1}}_{\text{Change in Leverage}} \approx \underbrace{d_{h,t}}_{\text{Primary Deficit}} + \underbrace{(i_{h,t} - g_{h,t} - \pi_t) b_{h,t}}_{\text{Fisher Effects}}$$

- **Debt-to-income, $b_{h,t}$:**

$$b_{h,t} = \frac{Debt_{h,t-1}}{Income_{h,t-1}}$$

- **Change DTI, $\Delta b_{h,t}$:**

$$\Delta b_{h,t} = b_{h,t+1} - b_{h,t}$$

- **Inflation, π_t:**

$$\pi_t = \frac{CPI_t}{CPI_{t-1}} - 1$$

- **Interest rates, $i_{h,t}$:**

$$i_{h,t} = \begin{cases} \frac{InterestExpenses_{h,t}}{Debt_{h,t}}, & \text{if } Debt_{h,t} > 0 \\ \bar{i}_t, & \text{if } Debt_{i,t} = 0 \end{cases}$$

- **Income growth, $g_{h,t}$:**

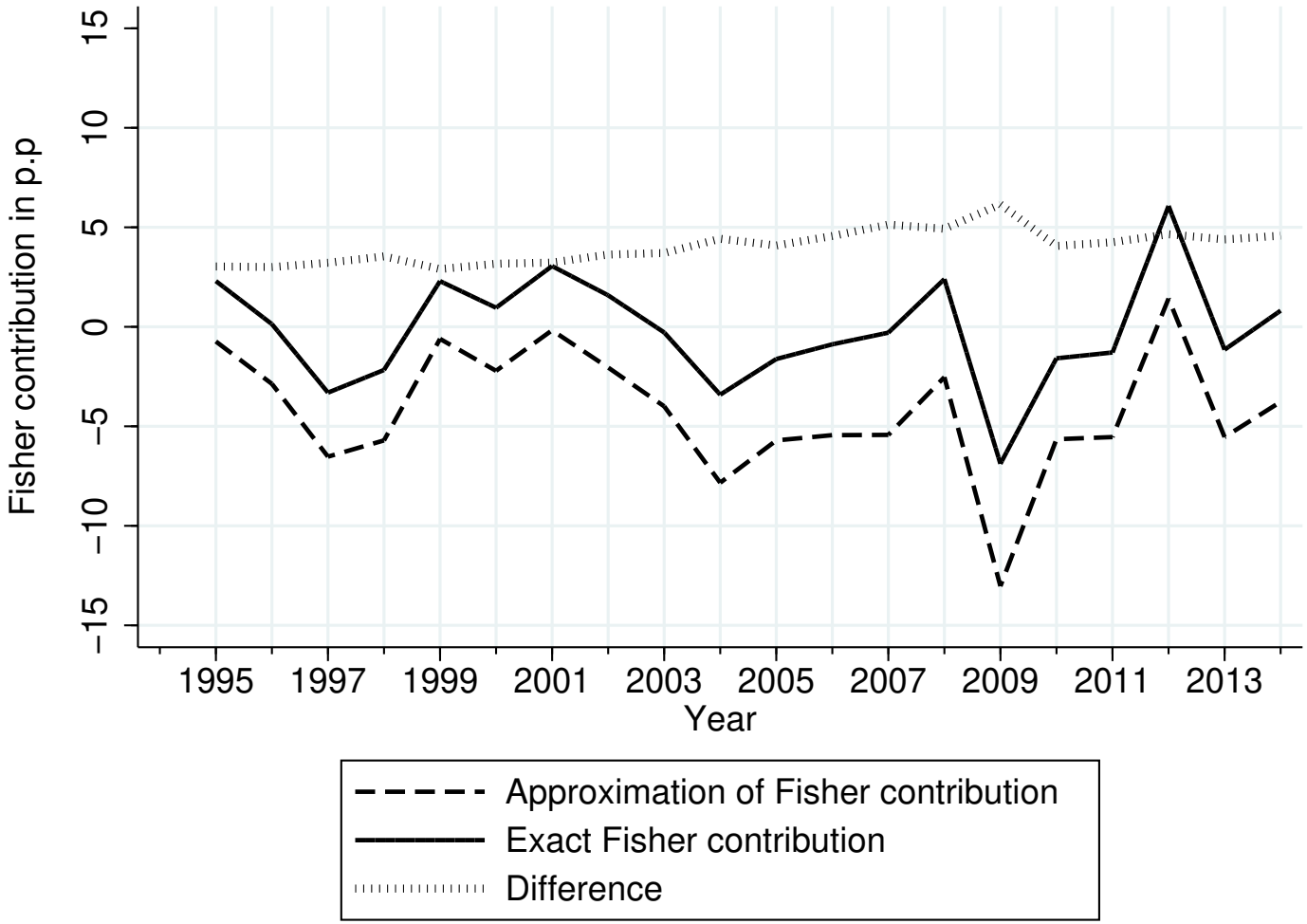
$$g_{h,t} = \frac{Income_{h,t}}{Income_{h,t-1}} - 1$$

- **Primary deficit, $d_{i,t}$:**

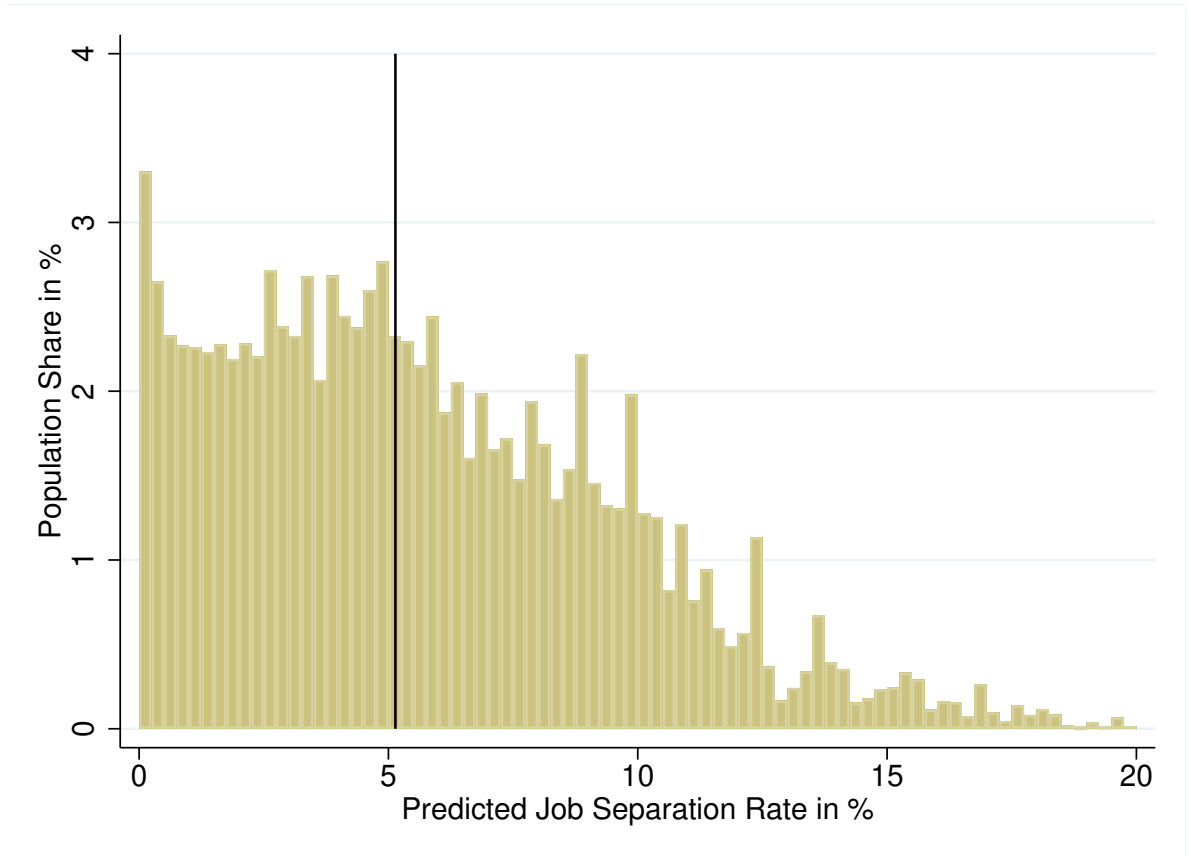
$$d_{h,t} = b_{h,t+1} - \frac{1 + i_{h,t}}{1 + \pi_t} \frac{1}{1 + g_{h,t}} b_{h,t}$$

Approximation Error

Figure: Exact versus approximate Fisher effects.



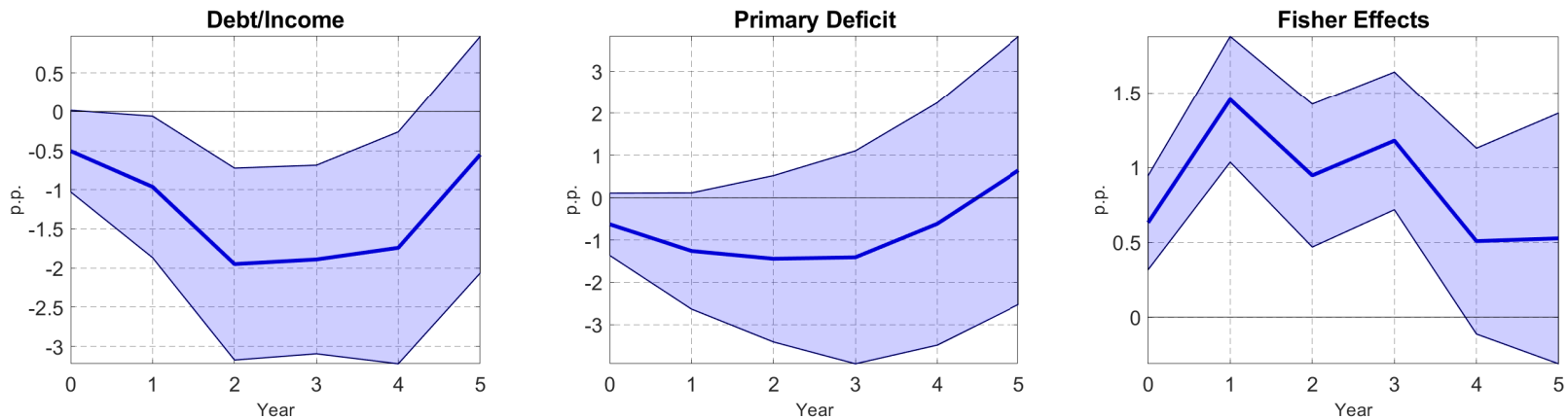
Split by Job Loss Probability



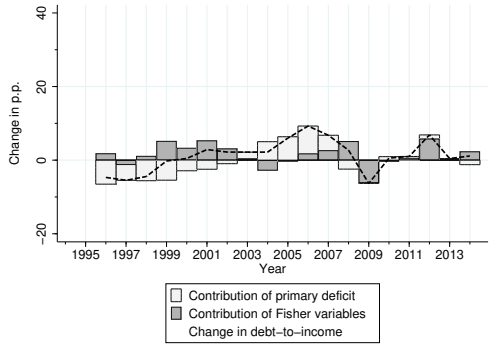
Back

Average MP-Shock Effects without post-2008 Period

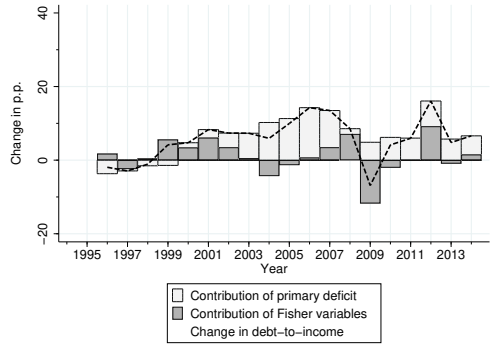
Figure: Average debt-to-income responses to monetary policy. Robustness to dropping years after 2008.



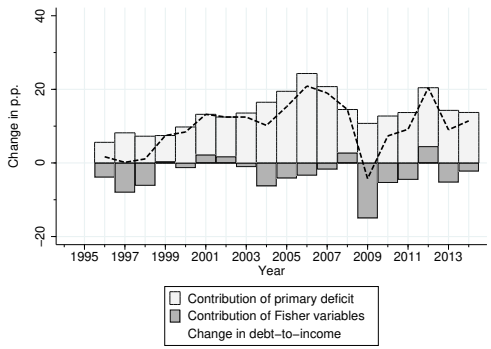
Accounting - Primary Deficits vs Fisher Effects by U-Risk



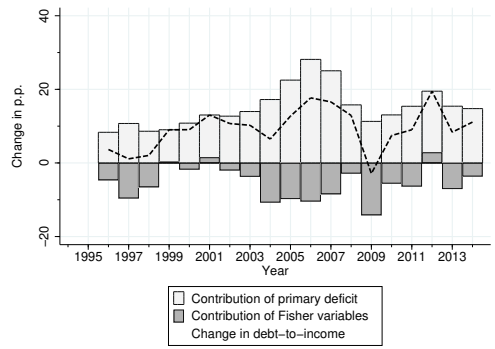
(a) Quintile 1



(b) Quintile 2



(c) Quintile 4



(d) Quintile 5

Accounting - Decomposition of DTI Growth by U-Risk