# ECON 747 – LECTURE 9:
# EARNINGS-BASED BORROWING CONSTRAINTS AND MACROECONOMIC FLUCTUATIONS

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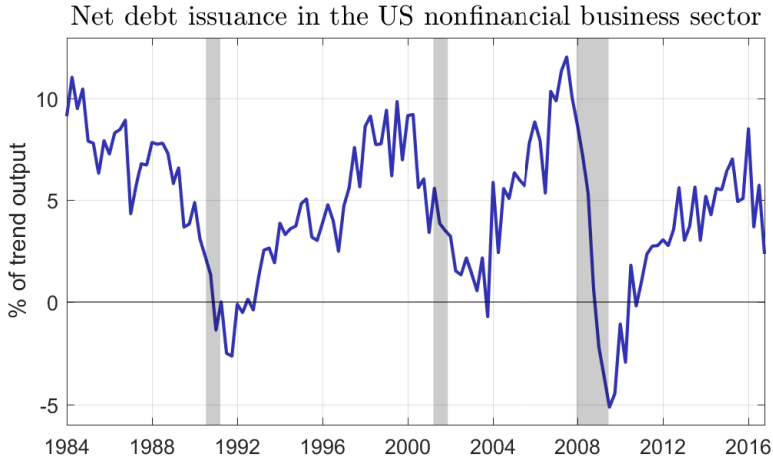
- This lecture will be a presentation of my job market paper
- As you will see, it fits right into the course content: it is about how credit constraints of firms affect macroeconomic fluctuations!
- I may digress a little bit here and there and let you know about the experience on the academic job market ...


Net debt issuance in the US nonfinancial business sector
% of trend output
10
5
0
-5
1984
1988
1992
1996
2000
2004
2008
2012
2016

# MOTIVATION

- Firm credit displays large swings over the business cycle
- Research studies how constraints to credit interact with economic activity
  - Collateral constraints are a prominent example

# MOTIVATION

- Firm credit displays large swings over the business cycle
- Research studies how constraints to credit interact with economic activity
  - Collateral constraints are a prominent example
- This paper: macro consequences of earnings-based constraint on firm debt
  - Motivated by direct microeconomic evidence
  - Generates more plausible firm credit dynamics than collateral constraints, both in macro data and in micro data
  - Affects fundamental conclusions about macro fluctuations and policy tradeoffs

# OVERVIEW: 1 & 2 OUT OF 4

1. Micro evidence on covenants in US corporate loans
   - Pervasive use of loan covenants linked to earnings (EBITDA)
   - Firms can borrow more/less when current earnings high/low

2. Formalize earnings-based borrowing constraint in simple model
   - Debt dynamics different than with collateral constraint
   - Focus on responses to investment shocks
   - Firm debt $\uparrow$ with earnings-based constraint, as earnings $\uparrow$
   - Firm debt $\downarrow$ with collateral constraint, as capital value $\downarrow$

# OVERVIEW: 3 & 4 OUT OF 4

## 3. Verify model predictions in aggregate and firm-level US data

- Study aggregate debt responses to investment shocks (SVAR)
- Study heterogeneous responses across borrower types (panel local projection)
- Aggregate debt ↑, earnings-based debt ↑, collateral debt ↓

## 4. Study quantitative macroeconomic consequences

- Formally derive direct link between earnings-based constraint and price markups
- Estimate medium-scale New Keynesian DSGE model
- Constraint implies procyclical markups, increases importance of supply shocks

# MAIN CONTRIBUTIONS OF THIS PAPER

- Related work:
  - Lian and Ma (2019) document prevalence of cash flow-based relative to asset-based firm borrowing empirically
  - Greenwald (2018) studies income-based in addition to asset-based borrowing limits in mortgage contracts

- Key contributions of my paper:
  1. Develop model-driven strategy to test for economic relevance of earnings-based constraints in both macro and micro data
  2. Demonstrate that constraint alters fundamental conclusions about business cycles and macro policy through interaction with markups

Literature details

# OUTLINE FOR REST OF THE TALK

1. Micro evidence on earnings-based borrowing constraints
2. Framework to distinguish credit constraints
   - Derive differential predictions relative to collateral constraint in simple model
3. Distinguish credit constraints in macro and micro data
   - Investment shock responses in aggregate data (SVAR)
   - Investment shock responses in firm-level data (panel local projection)
4. Derive relation of constraint with sticky prices and markups
5. Estimate quantitative DSGE model
6. Conclusion

# 1. MICRO EVIDENCE

# How do US corporations borrow?

- LPC Dealscan: detailed loan-level data for $\approx 75\%$ of US commercial loan market Coverage
  - Roughly 50k loan issuances for 15k firms, 1994-2015
- Pervasive feature: **loan covenants**
  - Explicit restrictions on financial indicators
- Breaches of covenants are frequent and have large effects
  - Roughly 30% of firms in 10-year window
  - Sharp drops in investment, employment, borrowing
  - See e.g. Roberts and Sufi (2009a), Chodorow-Reich and Falato (2017)

# THE IMPORTANCE OF EARNINGS

| | Covenant type | Median | Mean | Freq. (%) |
|---|---|---|---|---|
| 1 | Max Debt to EBITDA | 3.75 | 4.60 | 60.5 |
| 2 | Min EBITDA to Interest | 2.50 | 2.56 | 46.7 |
| 3 | Min EBITDA to Fixed Charge | 1.25 | 1.42 | 22.1 |
| 4 | Max. Leverage ratio | 0.60 | 0.64 | 21.3 |
| 5 | Max. Capex | 20M | 194M | 15.1 |
| 6 | Net Worth | 126M | 3.2B | 11.5 |

EBITDA is *earnings before interest, taxes, depreciation and amortization*
$\rightarrow$ widely used measure of operational profitability

- Bottom line: covenants based on earnings very prevalent

# WHY EARNINGS?

- Can borrowing constraint on earnings be rationalized from optimal behavior?
  - Mechanisms: (1) directly pledging earnings (2) contingent control and limited information (3) regulation
- I lay out a formal microfoundation based on limited contract enforcement and valuation by multiples
- I discuss how corporate finance literature conceptualizes covenants theoretically, provide details on regulatory aspects

# TAKING STOCK OF MICRO EVIDENCE

- Micro evidence indicates environment in which movements in current earnings affect firms' access to debt

- How important is this link for aggregate fluctuations?
  - Formalize as earnings-based borrowing constraint on firm debt
  - Investigate whether earnings-based constraint changes transmission of shocks
  - Study quantitative consequences and implications for policy tradeoffs

Additional channels | Coll vs. cov | Other debt types

# 2. MACRO MODEL

# BORROWING CONSTRAINT FORMULATION

- Debt access of firm is restricted by multiple of earnings:

$$\frac{b_t}{1+r_t} \leq \theta_\pi \pi_t$$

- Consistent with definition of EBITDA: $\pi_t = y_t - w_t n_t$
- Compare to traditional collateral constraint:

$$\frac{b_t}{1+r_t} \leq \theta_k \mathbb{E}_t p_{k,t+1}(1-\delta)k_t$$

- Study calibrations in which either one or the other constraint is present

Microfoundation

# MODEL ENVIRONMENT

- Neoclassical production economy

  + Tax advantage for firm debt
  (Hennessy and Whited, 2005)

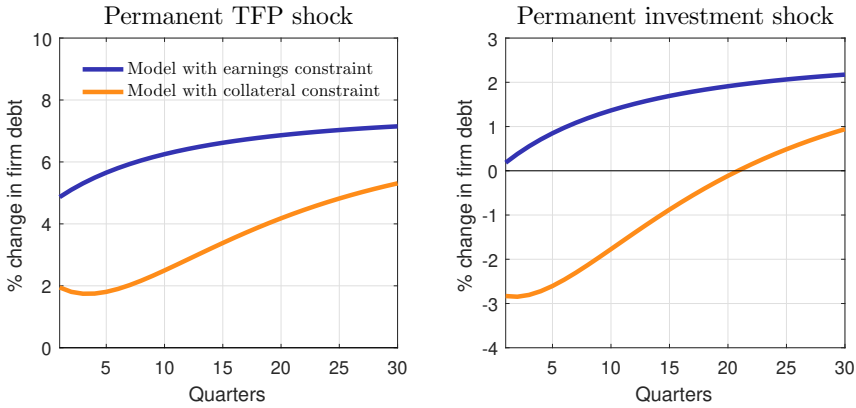
  + Dividend payout adjustment cost
  (Jermann and Quadrini, 2012)

  + Investment adjustment cost
  (capital price affected by inv. shocks and varying Tobin's $q$)

  + Borrowing constraint
  (collateral or earnings-based)

Firm problem | Model details | Calibration details | MEI vs IST

# MODEL IRFS OF FIRM DEBT




- Bottom line: same sign of IRF to TFP shock, opposite sign for investment shock
- First paper to use investment shocks as a tool to distinguish financial constraints

Inv margin

# INTUITION ON INVESTMENT SHOCK

Resource constraint and capital accumulation (no adjustments costs for simplicity)

$$\begin{aligned} c + i &= y \\ k' &= (1-\delta)k + \mathbf{v}i \end{aligned}$$

Combine these equations $\Rightarrow 1/\mathbf{v}$ is the relative price:

$$c + k'/\mathbf{v} = y + (1-\delta)k/\mathbf{v}$$

Borrowing in consumption units (collateral vs. earnings):

$$b' \leq \theta_k(1-\delta)\frac{k'}{\mathbf{v}'} \qquad vs. \qquad b' \leq \theta_\pi \pi$$

$\Rightarrow$ Boom with less debt vs. boom with more debt in response to permanent $\mathbf{v} \uparrow$

# ILLUSTRATION OF INVESTMENT SHOCK

- Think about an **airline** that purchases and uses airplanes
- Imagine a shock that makes the production of **airplanes** more efficient and lowers their relative price
- Implication of this shock for borrowing differs sharply depending on constraint
- If airlines use airplanes as collateral, their falling relative value **tightens the collateral constraint**
- By contrast, the **earnings-based constraint is relaxed** as cheaper airplanes increase the airline's profitability

Stock/flow intuition

# 3.1. EMPIRICAL VERIFICATION OF MODEL PREDICTIONS: AGGREGATE DATA

# SVAR: TWO IDENTIFICATION SCHEMES

1. Long-run restrictions following Fisher (2006)
   - Identify unique driver of long-run dynamics in relative investment price
   - Restrictions consistent with my model

2. Medium-horizon restrictions following Francis et al. (2014)
   - Identify main driver of dynamics at chosen horizon, e.g. 5 years

- I also set up a Monte Carlo experiment in which I estimate the SVAR on data simulated from the model

## SVAR SPECIFICATION

Consider the $MA(\infty)$ representation of an SVAR:

$$Y_t = B(L)^{-1} u_t,$$

with $Y_t = [dlog(p_{kt}) \;\; dlog(y_t/n_t) \;\; log(n_t)]'$.

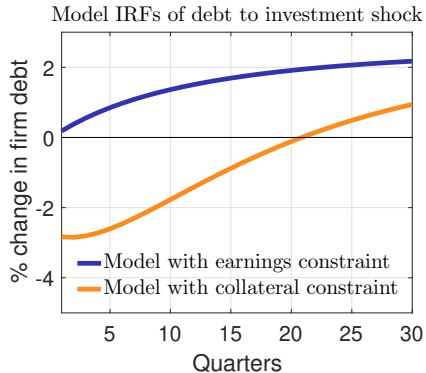
Long-run restrictions on $B(1)^{-1} = [B_0 - B_1 - ... - B_p]^{-1}$:

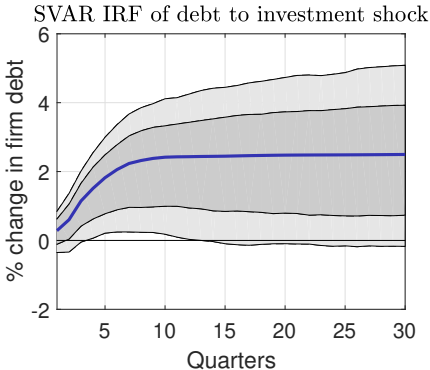
1. $p_{kt}$ only affected by first shock
2. $y_t/n_t$ only affected by first and second shock

Add other variables of interest: earnings, capital, debt

Settings

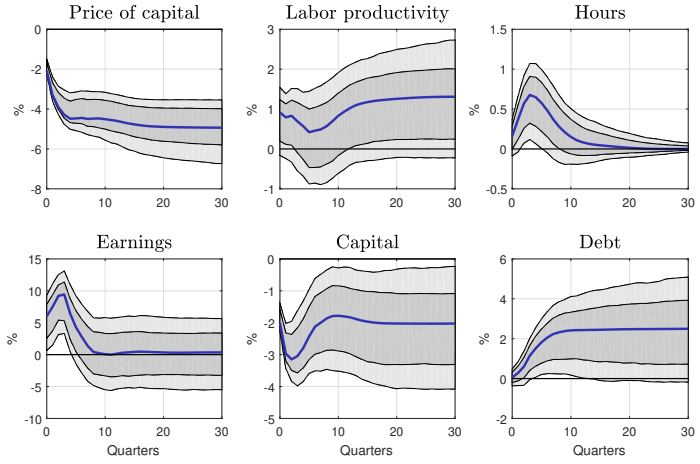
# SVAR: DEBT IRFS TO INVESTMENT SHOCK




- Bottom line: aggregate debt response consistent with earnings-based constraint, not with collateral constraint

# SVAR: ALL IRFS TO INVESTMENT SHOCK




- Bottom line: other responses consistent with model and previous SVAR studies

Used equipment | TFP responses | Medium-horizon | Simulated data | Robustness | Hist decomp

## 3.2. EMPIRICAL VERIFICATION OF MODEL PREDICTIONS: FIRM-LEVEL DATA

# IDEA OF FIRM-LEVEL ANALYSIS

- Merge Compustat and Dealscan:
  $\sim 100,000$ firm-quarter obs for $\sim 4,000$ distinct firms, 1994-2015
- Obtain micro responses to macro shock: Jordà (2005) method in a panel setting
- My paper is the first to do so for technological (rather than monetary) shocks
- To the extent that SVAR identification credible, the macro investment shock is an exogenous regressor
- Key idea: split responses across borrower types (earnings/collateral)

Summary stats

# SPECIFICATION OF LOCAL PROJECTION

Estimate the horizon $h$ IRF of total debt of firm $i$ from running

$$log(b_{i,t+h}) = \alpha_h + \beta_h \hat{u}_{IST,t} + \boldsymbol{\gamma X_{i,t-1}} + \eta_{i,t+h}$$

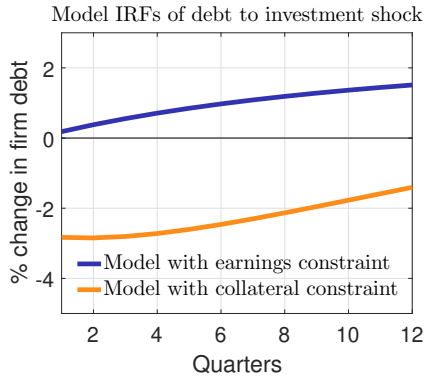
and obtaining estimates of $\beta_h$, $h = 0, 1, 2, \ldots, H$

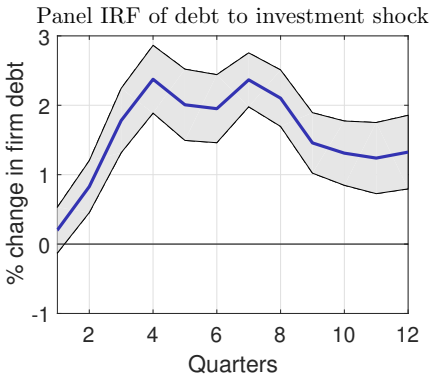
Heterogeneous IRFs for 'earnings borrowers', 'collateral borrowers'

$$\begin{aligned} log(b_{i,t+h}) &= \alpha_h + \beta_h \hat{u}_{IST,t} + \boldsymbol{\gamma X_{i,t-1}} \\ &+ \beta_h^{earn} \mathbb{1}_{i,t,earn} \times \hat{u}_{IST,t} + \alpha_h^{earn} \mathbb{1}_{j,t,earn} \\ &+ \beta_h^{coll} \mathbb{1}_{i,t,coll} \times \hat{u}_{IST,t} + \alpha_h^{coll} \mathbb{1}_{i,,t,coll} + \eta_{i,t+h} \end{aligned}$$

Specification details

# FIRM-LEVEL DEBT RESPONSE TO INVESTMENT SHOCK

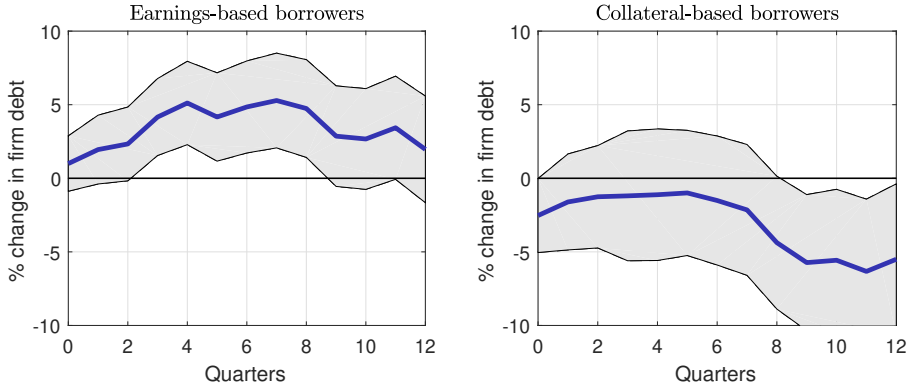



- Bottom line: average firm debt response also consistent with earnings-based constraint, not with collateral constraint

# HETEROGENEOUS IRFS ACROSS BORROWER TYPES

## SPECIFICATION: 3-DIGIT INDUSTRY FE, SIZE, SALES GROWTH, OTHER MACRO SHOCKS

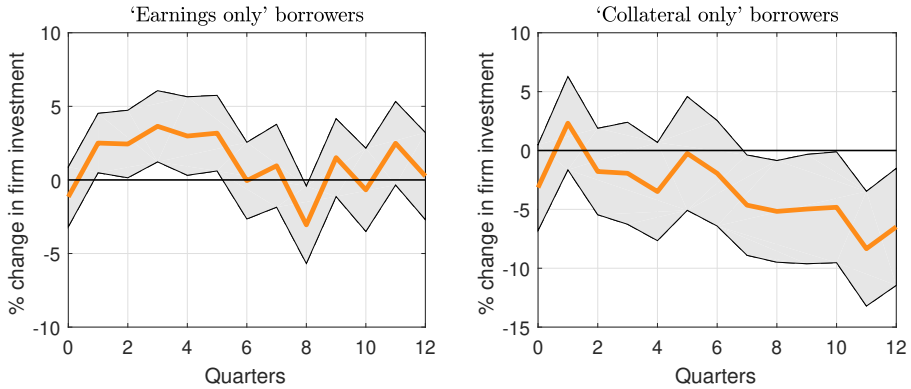



- Bottom line: split of debt response across borrower types consistent with model prediction across alternative constraints

Formal test | Alternative classification | IV setting | 4 groups

# HETEROGENEOUS IRFS ACROSS BORROWER TYPES

## INVESTMENT RESPONSE




- Bottom line: similar pattern for firm investment (though volatile)

# TAKING STOCK

- Proposed mechanism: positive investment shock raises debt levels if borrowing constraint is relaxed by the shock
  - Not the case with collateral constraint
  - True with earnings-based constraint

- Aggregate dynamics suggest that the earnings-based constraint more relevant for the economy as a whole

- Heterogeneous firm-level responses to the shocks are directly supportive of the suggested theoretical mechanism

# 4. EARNINGS-BASED CONSTRAINTS, STICKY PRICES & MARKUP CYCLICALITY

# NEW KEYNESIAN MODELS AND PRICE MARKUPS

- Does constraint matter for "big questions"?
- Starting point: sticky prices key ingredient in quantitative macro models
- Consequence of price stickiness in NK models
  - Demand shocks $\rightarrow$ countercyclical markups
  - Supply shocks $\rightarrow$ procyclical markups
- See for example discussion by Nekarda and Ramey (2019)
- Distinction between supply and demand shocks key for stabilization tradeoffs

- Consider the earnings-based borrowing constraint

$$\frac{b_t}{P_t(1+r_t)} \leq \theta_\pi \pi_t$$

- Using the definition of earnings and assuming Cobb-Douglas production technology, this can be rewritten as

$$\frac{b_t}{P_t(1+r_t)} \leq \theta_\pi y_t \left(1-(1-\alpha)\boldsymbol{\mathcal{M}_t^{-1}}\right),$$

where $\boldsymbol{\mathcal{M}_t}$ is the markup, the ratio of price to marginal cost

# MARKUPS AND CREDIT CONSTRAINTS

- *Direct* positive relation between markup and debt with earnings-based constraint (but not with collateral constraint)
- In the data, credit is highly procyclical, so procyclical markups make it easier for NK models to match the data
- Procyclical markups in NK models if ...
  1. Supply shocks more important than demand shocks
  2. Prices not meaningfully sticky

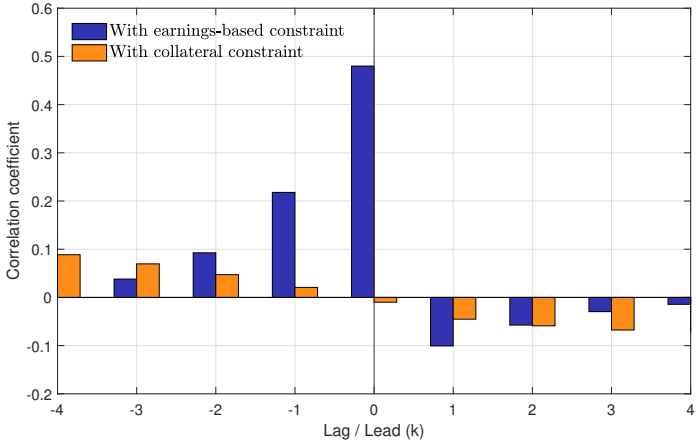
  or a combination of the two holds
- Relative strength of these forces? Quantitative question!
  - Answer by estimating a New Keynesian DSGE model

# 5. QUANTITATIVE DSGE MODEL WITH ADDITIONAL SHOCKS AND FRICTIONS

# QUANTITATIVE MODEL

- Medium-scale NK model à la Smets and Wouters (2007) NK model details
- Estimate two versions with Bayesian methods on US data
  1. Earnings-based constraints
  2. Collateral constraints
- Potentially, many differences can be studied: parameters, moments, IRFS for many shocks, many variables ...
- Organize results around markups, sticky prices, supply vs. demand shocks
  - Directly relevant for policy tradeoffs
  - Highlights interaction with core NK transmission channel $\Rightarrow$ many other applications

# QUANTITATIVE MODEL: MARKUP CYCLICALITY




Model-implied correlation between output $(t)$ and markup $(t+k)$

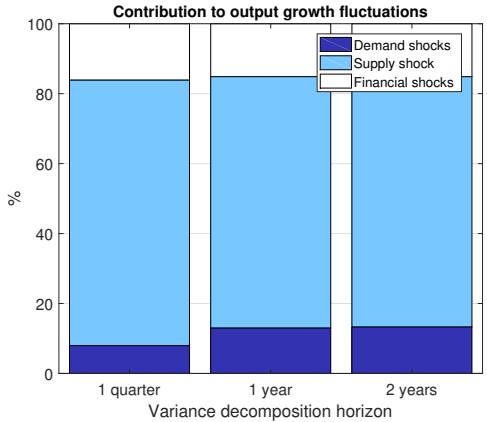
- Bottom line: earnings-based constraint implies procyclical markups

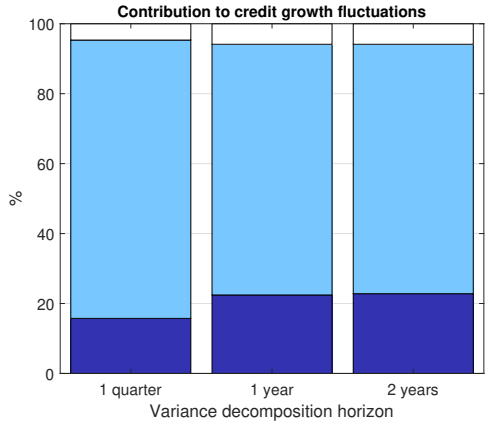
# QUANTITATIVE MODEL: ESTIMATED RIGIDITIES

| **Credit constraint in model:** | **earnings-based** | **collateral** |
|---|---|---|
| Rotemberg price adjustment parameter | 4.71 | 6.97 |
| (90% HPD interval) | (4.51,4.95) | (4.97,8.50) |
| | | |
| Calvo wage adjustment parameter | 0.84 | 0.69 |
| (90% HPD interval) | (0.78,0.89) | (0.64,0.75) |

- Bottom line: earnings-based constraint implies lower price rigidities but higher wage rigidities than collateral constraint

# QUANTITATIVE MODEL: SUPPLY VS. DEMAND SHOCKS

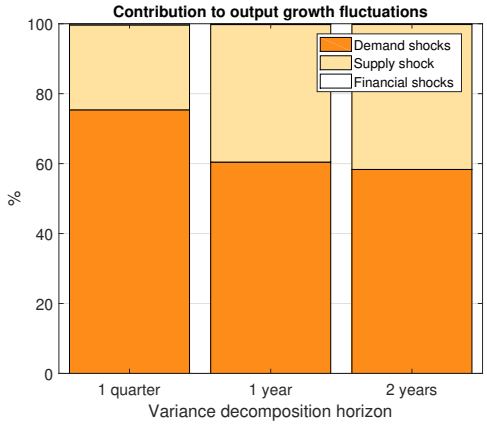


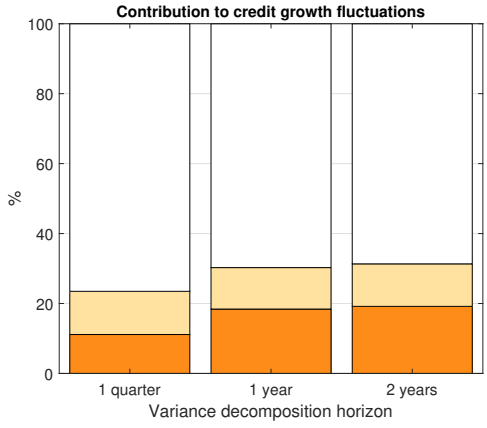




- Bottom line: supply shocks important with earnings-based constraint

Decompositions

# QUANTITATIVE MODEL: SUPPLY VS. DEMAND SHOCKS




- Bottom line: demand shocks important with collateral constraint

Decompositions

# QUANTITATIVE MODEL: BORROWING CONSTRAINT

- In comparison with a traditional collateral constraint, an earnings-based constraints implies
  1. Procyclical markups
  2. Lower price rigidity
  3. Supply shocks more important than demand shocks
- Constraint interacts *fundamentally* with the New Keynesian transmission mechanism and basic policy tradeoffs
- While scope of my analysis is to emphasize this interaction, it follows from these results that a variety of applications of NK DSGEs can be revisited!

# 6. CONCLUSION

# CONCLUSION

- Start from empirical insight that movements in current earnings affect firms' ability to borrow
- Develop model-driven strategy to show relevance of earnings-based constraint in macro and micro data
- Earnings-based borrowing constraint interacts fundamentally with the key framework for quantitative macro questions
- As a whole, evidence makes the case for macroeconomists to change the benchmark way of modeling firm credit constraints

# APPENDIX SLIDES

# RELATION TO THE LITERATURE

- **Literature on financial frictions in macroeconomic fluctuations**

  Kiyotaki and Moore (1997, 2012), Bernanke, Gertler, and Gilchrist (1999), Geanakoplos (2010), Gertler and Karadi (2011), Liu, Wang, and Zha (2013), Jermann and Quadrini (2012), ...

  - **Direct micro evidence → new type of friction in business cycle model**

- **Empirical corporate finance literature on loan covenants**

  Dichev and Skinner (2002), Chava and Roberts (2008), Sufi (2009), Roberts and Sufi (2009b), Bradley and Roberts (2015), Falato and Liang (2017), Chodorow-Reich and Falato (2017), Lian and Ma (2019), ...

  - **Borrowing against earnings → consequences for aggregate fluctuations**

- **Literature on investment shocks**

  Greenwood, Hercowitz, and Huffman (1988), Greenwood, Hercowitz, and Krusell (2000), Fisher (2006), Justiniano, Primiceri, and Tambalotti (2010, 2011), Schmitt-Grohe and Uribe (2012), ...

  - **Examine borrowing dynamics that arise from investment shocks**

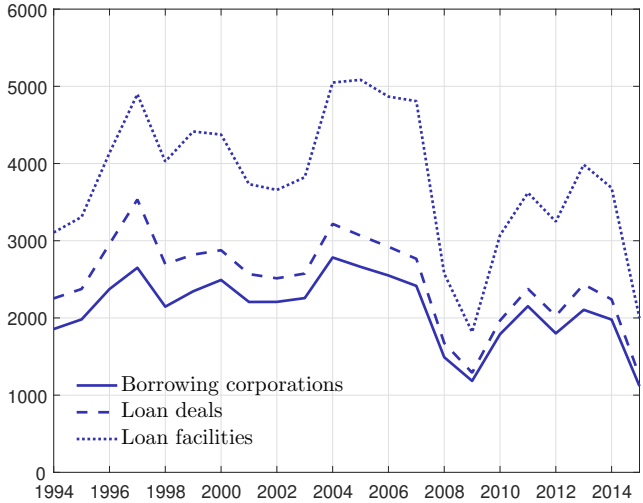
- **Existing papers in which flow variables restrict borrowing**

  Kiyotaki (1998), Jappelli and Pagano (1989), Mendoza (2006), Bianchi (2011), Korinek (2011), Schmitt-Grohe and Uribe (2016a, 2016b), Greenwald (2018), ...

  - **Study differences between flow and stock constraints in detail**

Back to main

# LOAN-LEVEL DATA: SAMPLE COVERAGE




Back to main

# ADDITIONAL WAYS IN WHICH EARNINGS MATTER

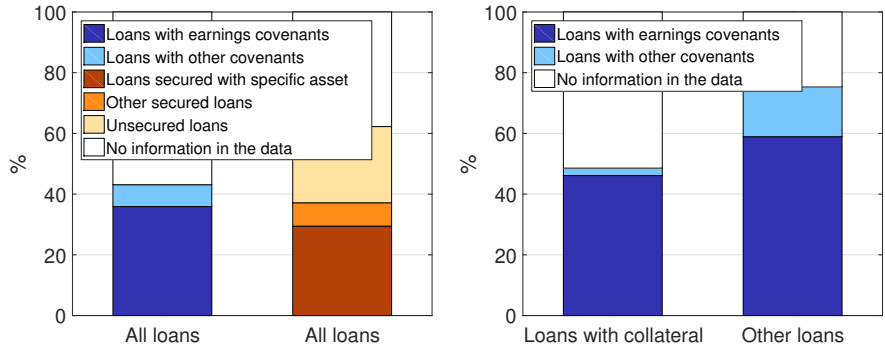
- Loan covenants not the only mechanism by which firms' borrowing ability is linked to their current earnings

- Examples:

  1. Credit ratings: S&P assesses 'risk profile' by evaluating 'core ratios'
     $\rightarrow$ strong emphasis on EBITDA
  2. Lenders' internal risk models
  3. Earnings multiples that lenders consider informally

Back to main

# COVENANTS VS. COLLATERAL IN THE DATA




- Bottom line: both are used in practice, jointly and individually

Back to main

# OTHER DEBT TYPES

- My analysis excludes debt securities (e.g. corporate bonds), which are often are not explicitly secured with collateral
- In the 2016 US flow of funds:
  - Outstanding loans: 7.6 tn USD
  - Outstanding debt securities: 5.8 tn USD
- Other studies find collateral to be unimportant in these debt types, see e.g. Azariadis, Kaas, and Wen (2016)
- I take this as additional motivation for considering other variables that may restrict debt access

Back to main

# MICROFOUNDATION: OVERVIEW

- In a detailed appendix to the paper I provide the following:
  1. An explicit formal rationalization, in which there is limited contract enforcement, that is, the borrower can divert funds
     - Collateral: lender can seize asset and sell it subject to transaction cost
     - Earnings-based constraint: lender can seize and operate the firm. Due to limited information, she values this contingency by applying a multiple
  2. A discussion of the literature on financial covenants and how this literature conceptualizes covenants from a theoretical point of view
  3. A discussion of regulatory aspects of earnings-based borrowing restrictions

Back to main

# FORMAL RATIONALIZATION: COLLATERAL

- Suppose that at the end of period $t$, when all transactions have been settled, the firm can default on its debt liabilities $\frac{b_{k,t}}{1+r_{k,t}}$
- Suppose legal environment is such that in the event of default the lender can address a court which grants it the right to seize the firm's collateral at the beginning of $t+1$. Lender sells collateral after depreciation at market prices, but incurs transaction cost which is a fraction $(1-\theta_k)$ of the resale value of capital
- Suppose lender and borrower are able to renegotiate. Borrower can offer a settlement payment $s_{k,t}$ to the lender, in combination with a promise to repay the amount of defaulted liabilities
- Settlement amount that lender agrees to to needs to satisfy

$$s_{k,t} + \frac{b_{k,t}}{1+r_{k,t}} \geq \theta_k \mathbb{E}_t p_{k,t+1}(1-\delta)k_t.$$

- For firm to never choose to default, value of operating in absence of default must exceed the value of the firm after successful renegotiation.

$$\begin{aligned} s_{k,t} &\geq 0 \\ \theta_k \mathbb{E}_t p_{k,t+1}(1-\delta)k_t - \frac{b_{k,t}}{1+r_{k,t}} &\geq 0, \end{aligned}$$

which can be rearranged to the collateral constraint Back to main

# FORMAL RATIONALIZATION: EARNINGS CONSTRAINT

- Now environment is such that when the firm defaults on its liabilities $\frac{b_{\pi,t}}{1+r_{\pi,t}}$ at the end of $t+1$, the court grants the lender the right to seize ownership of the firm. She can either operate the firm herself or sell it.
- Importantly, however, the lender is uncertain about the value of the firm in this case. Denote $\tilde{V}_{d,t}^{end}$ the end-of-period value of the firm after ownership rights have been transferred to lender.
- In order to determine this uncertain value, the lender uses the common practice of valuation by multiples.
- Specifically, it evaluates firm ownership after default by using fixed multiple of the last available realization of a fundamental profitability indicator, EBIDTA:

$$\tilde{V}_{d,t}^{end} \approx \theta_\pi \pi_t.$$

- The required settlement amount in the renegotiation process needs to satisfy the inequality

$$\begin{aligned} s_{\pi,t} &\geq 0 \\ \theta_\pi \pi_t - \frac{b_{k,t}}{1+r_{k,t}} &\geq 0, \end{aligned}$$

which can be arranged to the earnings-based constraint Back to main

# THE FIRM'S PROBLEM

$$\max \ \mathbb{E}_0 \sum_{t=0}^{\infty} \Lambda_t d_t$$

subject to

$$\begin{aligned}
d_t + \frac{\psi}{2}(d_t - \bar{d})^2 + i_t &= \pi_t + \frac{b_{\pi,t}}{R_{\pi,t}} + \frac{b_{k,t}}{R_{k,t}} - b_{\pi,t-1} - b_{k,t-1} \\
\pi_t &\equiv y_t - w_t n_t \\
y_t &= \boldsymbol{z_t} k_{t-1}^{\alpha} n_t^{1-\alpha} \\
k_t &= (1-\delta)k_{t-1} + \boldsymbol{v_t}\left[1 - \frac{\phi}{2}\left(\frac{i_t}{i_{t-1}} - 1\right)^2\right] i_t
\end{aligned}$$

as well as

$$\frac{b_{\pi,t}}{1 + r_{\pi,t}} \leq \theta_\pi \pi_t$$

or

$$\frac{b_{k,t}}{1 + r_{k,t}} \leq \theta_k \mathbb{E}_t p_{kt+1}(1-\delta)k_t$$

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# MODEL DETAILS: MORE ON FIRM'S PROBLEM

- $\Lambda_t$ in the objective function denotes the firm owner's stochastic discount factor between periods $0$ and $t$.
- There is a tax advantage for debt, following e.g. Hennessy and Whited (2005):

$$R_{j,t} = 1 + r_{j,t}(1 - \tau_j), \quad j \in \{\pi, k\}$$

- Calibrate model so that either one or other constraint is present: each constraint can be shut off by parameterizing $\theta_j = \mu_{j,t} = \tau_j = 0$, for $j \in \{k, \pi\}$ and $\forall t$

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# MODEL DETAILS: FIRM OPTIMALITY CONDITIONS

The firm's optimality conditions with respect to $n_t$, $b_{k,t}$, $b_{\pi,t}$ and $k_t$ and $i_t$ are derived as follows ($\psi = 0$):

$$F_{n,t} = w_t$$

$$R_{k,t}\mathbb{E}_t\left\{\frac{\Lambda_{t+1}}{\Lambda_t}\right\} + \mu_{k,t}\frac{R_{k,t}}{1+r_{k,t}} = 1,$$

$$R_{\pi,t}\mathbb{E}_t\left\{\frac{\Lambda_{t+1}}{\Lambda_t}\right\} + \mu_{\pi,t}\frac{R_{\pi,t}}{1+r_{\pi,t}} = 1,$$

$$Q_t = \mathbb{E}_t\left\{\frac{\Lambda_{t+1}}{\Lambda_t}\left[(1-\delta)Q_{t+1} + F_{k,t+1} + \mu_{\pi,t+1}\theta_\pi F_{k,t+1}\right] + \mu_{k,t}\theta_k(1-\delta)p_{k,t+1}\right\}$$

$$Q_t v_t[(1-\Phi_t) - \Phi_{1,t}i_t] + \mathbb{E}_t\left\{\frac{\Lambda_{t+1}}{\Lambda_t}Q_{t+1}v_{t+1}\Phi_{-1,t+1}i_{t+1}\right\} = 1$$

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# MODEL DETAILS: HOUSEHOLD AND GOVERNMENT

The household's objective is to maximize expected discounted lifetime utility

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t (log(c_t) + \chi \; log(1 - n_t)),$$

subject to the budget constraint

$$c_t + \frac{b_{\pi,t}}{1 + r_{\pi,t}} + \frac{b_{k,t}}{1 + r_{k,t}} + p_t s_t + T_t = w_t n_t + b_{\pi,t-1} + b_{k,t-1} + s_{t-1}(d_t + p_t).$$

Government budget balance requires

$$T_t = \frac{b_{k,t}}{R_{k,t}} - \frac{b_{k,t}}{(1 + r_{k,t})} + \frac{b_{\pi,t}}{R_{\pi,t}} - \frac{b_{\pi,t}}{(1 + r_{\pi,t})}.$$

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# MODEL DETAILS: HH OPTIMALITY CONDITIONS

The household's optimality conditions with respect to $n_t$, $b_{k,t}$, $b_{\pi,t}$ and $s_t$ are

$$
\begin{aligned}
u_{c_t} w_t + u_{n_t} &= 0 \\
u_{c_t} &= \beta(1 + r_{k,t}) \mathbb{E}_t u_{c_{t+1}} \\
u_{c_t} &= \beta(1 + r_{\pi,t}) \mathbb{E}_t u_{c_{t+1}} \\
u_{c_t} p_t &= \beta \mathbb{E}_t (d_{t+1} + p_{t+1}) u_{c_{t+1}},
\end{aligned}
$$

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# MODEL CALIBRATION

| Parameter | Value | Comment on parameterization |
|---|---|---|
| | *(a) Structural parameters* | |
| $\alpha$ | 0.33 | Capital share of output of $1/3$ |
| $\delta$ | 0.025 | Depreciation rate of 2.5% per quarter |
| $\overline{\phi}$ | 4 | Prior of Smets and Wouters (2007) |
| $\beta$ | 0.9752 | Target steady state annualized interest rate of $6.6\%$* |
| $\chi$ | 1.87 | Target $n = 0.3$ in steady state |
| $\psi$ | 0.46 | Jermann and Quadrini (2012) |
| | *(b) Model with earnings-based constraint only* | |
| $\theta_k$ | 0 | Shut off collateralized borrowing |
| $\tau_k$ | 0 | Shut off collateralized borrowing |
| $\theta_\pi$ | 4.6 x 4 | Weighted average value of debt-to-EBITDA covenants* |
| $\tau_\pi$ | 0.35 | Following Hennessy and Whited (2005) |
| | *(c) Model with collateral constraint only* | |
| $\theta_k$ | 0.817 | Match steady state debt of parameterization in Panel (b) |
| $\tau_k$ | 0.35 | Following Hennessy and Whited (2005) |
| $\theta_\pi$ | 0 | Shut off earnings-based borrowing |
| $\tau_\pi$ | 0 | Shut off earnings-based borrowing |

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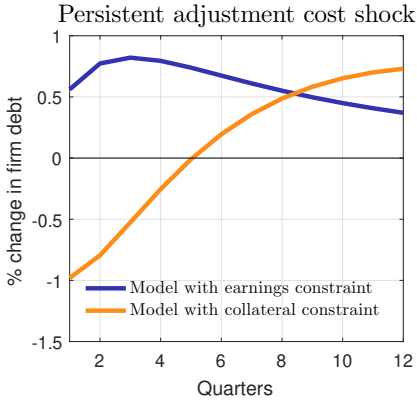
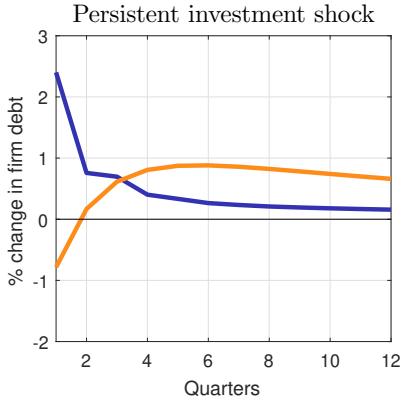
# MODEL IRFS TO OTHER INVESTMENT MARGIN SHOCKS

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# MORE INTUITION: STOCKS VS. FLOWS

- Asset pricing theory: the value of an asset equals the net present value of flows derived from the asset
  - Hayashi (1982): $q_t k_t = \sum_{\tau}^{\infty} \Lambda_{t,\tau} \, d_{t+\tau}$
- "Asset-based" and "flow-based" borrowing the same?
- Two aspects are different in the constraint I propose
  1. **Timing**: current flows rather than NPV
  2. **Definition**: earnings rather than dividends
- *Definition* drives the different dynamics

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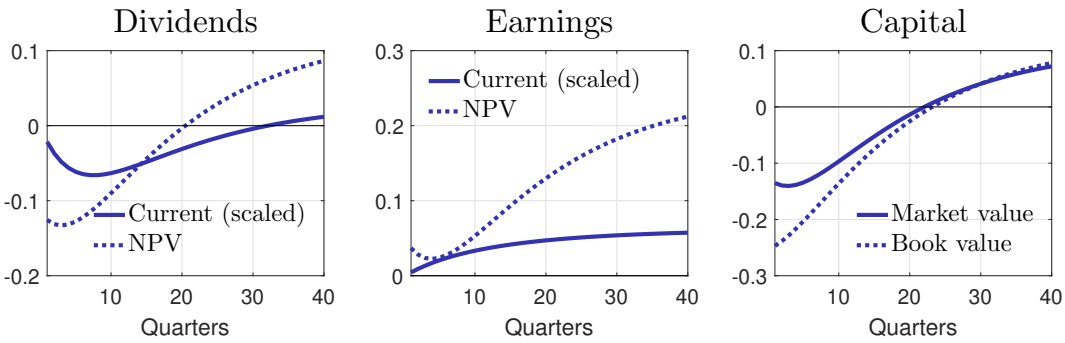
# MECHANICS BEHIND INVESTMENT SHOCK IRFS




- Bottom line: positive response driven by "earnings vs. dividends", instead of "current flow vs. NPV of flow"

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# IST VS. MEI

- The term $v_t$ can reflect two distinct exogenous disturbances:
  1. Investment-specific technology (IST): productivity at turning consumption into investment
  2. Marginal efficiency of investment (MEI): productivity at turning investment into capital
- In one-sector models, they collapse to the same wedge, but 1 corresponds empirically to inverse relative price of investment
- Detailed discussions in Justiniano, Primiceri, and Tambalotti, (2010, 2011), Schmitt-Grohe and Uribe (2012)
- In my model, both IST and MEI give rise to my predictions
- In my empirical verification, I identify IST shocks as I rely on the equipment investment deflator for identification

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# SVAR: DATA AND SAMPLE

- Use data for US nonfinancial business sector
- Nominal data deflated with consumption deflator for nondurable goods & services
- For investment price, use equipment deflator
  - In loan data, equipment category is largest one, three times larger than real estate
    Collateral types
  - Use Gordon-Cummins-Violante price for robustness NIPA vs. GCV
- Show results for 1952:Q1 - 2016:Q4 sample, with 4 lags and 68% bands based on bootstrapping techniques

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# FREQUENCY OF COLLATERAL CATEGORIES

| Collateral type | Number of loan facilities | Volume in bn USD |
|---|---|---|
| Property & Equipment | 2292 | 353 |
| Accounts Receivable and Inventory | 1801 | 332 |
| Intangibles | 1367 | 238 |
| Cash and Marketable Securities | 989 | 328 |
| Real Estate | 737 | 142 |
| Ownership of Options/Warrants | 104 | 19 |
| Patents | 84 | 12 |
| Plant | 50 | 12 |
| Agency Guarantee | 25 | 6 |

The table excludes the categories “unknown”, “all”, and “other”

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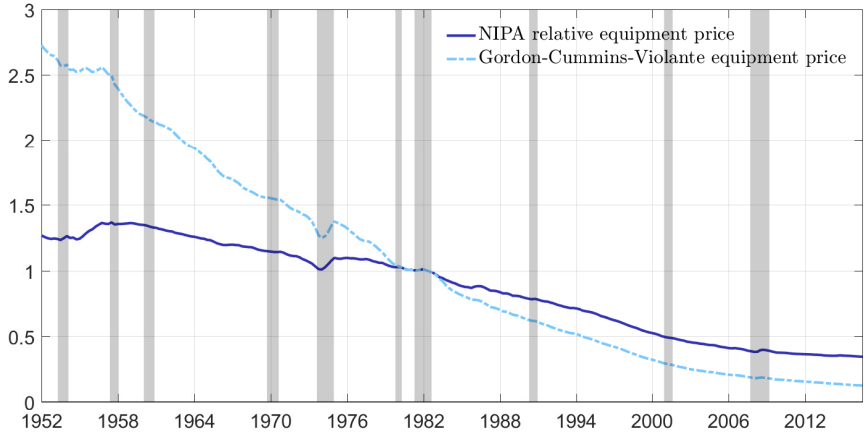
# THE RELATIVE PRICE OF EQUIPMENT

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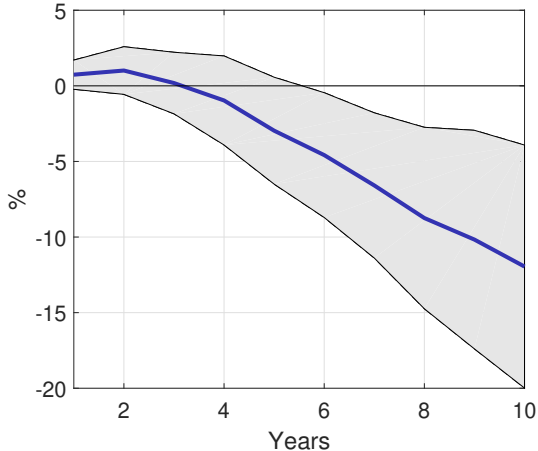
# RESPONSE OF USED EQUIPMENT PRICES (AIRPLANES)




- Bottom line: shock also reduces price of *used* capital

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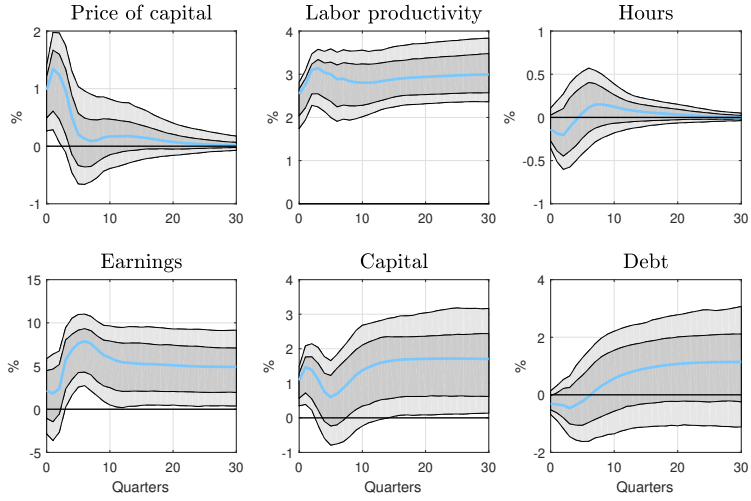
# SVAR: IRFS TO TFP SHOCK

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# SVAR: MEDIUM-HORIZON RESTRICTIONS

- Proposed to overcome weaknesses of the long-run identification method (see e.g. Faust and Leeper, 1997)
- Idea: Identify a shock such that its forecast error variance decomposition share for a the price of equipment at a specific finite horizon $h$ is maximized
- Implementation: take initial estimate of $B_0^{-1}$ (e.g. simple Choleski), then take an orthonormal rotation of this matrix such that the identifying restriction is satisfied
  - Specifically, I maximize the cumulated FEVD based on $DB_0^{-1}$ up to horizon $h$ by finding the optimal $D$, such that $D'D = I$

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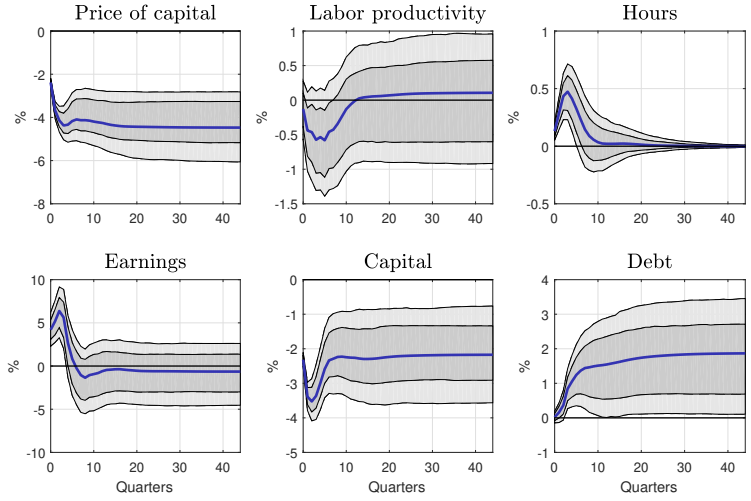
# SVAR: IRFS WITH MEDIUM-HORIZON RESTRICTIONS

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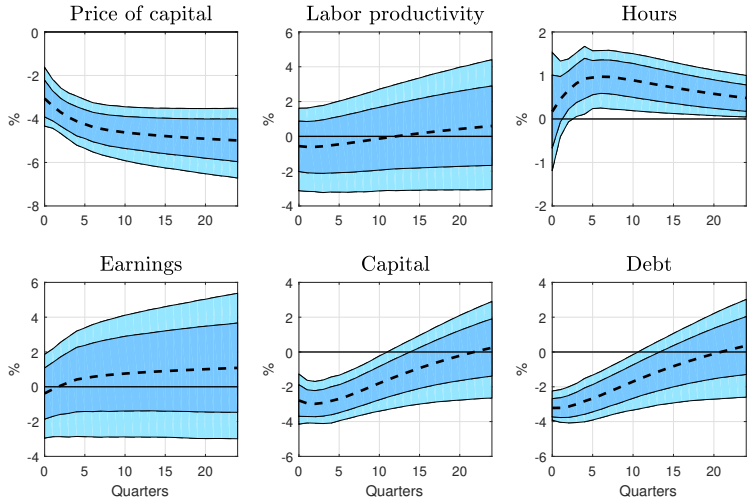
# SVAR RESULTS FOR SIMULATED DATA

## DATA GENERATED FROM COLLATERAL CONSTRAINT MODEL

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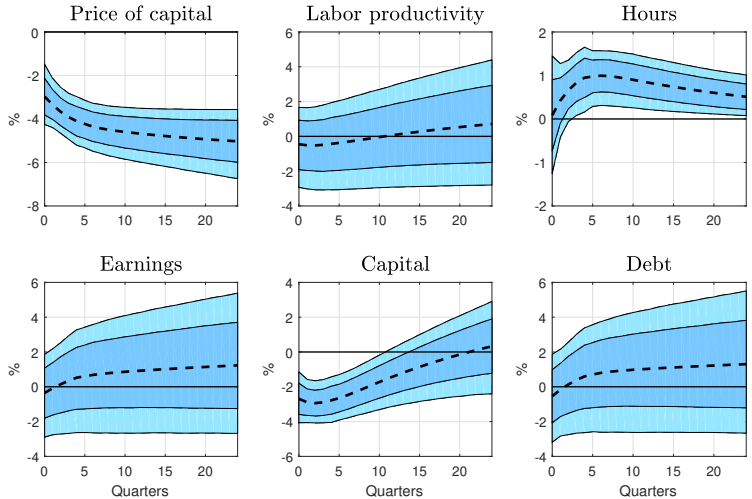
# SVAR RESULTS FOR SIMULATED DATA

## DATA GENERATED FROM EARNINGS-BASED CONSTRAINT MODEL

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# SVAR: GENERAL ROBUSTNESS CHECKS

- Split sample in the early 1980s
  - First part of the sample: shapes of the IRFs are preserved, while bands get wider
  - Second part of the sample: debt response again positive and significant, but somewhat more hump-shaped
- For firm debt, use loans and debt securities separately
  - Total debt IRF mainly driven by the loan dynamics, while response for debt securities is very noisy, and even negative for the first three quarters
- Use GVC equipment price instead of relative NIPA deflators
  - The results are very similar

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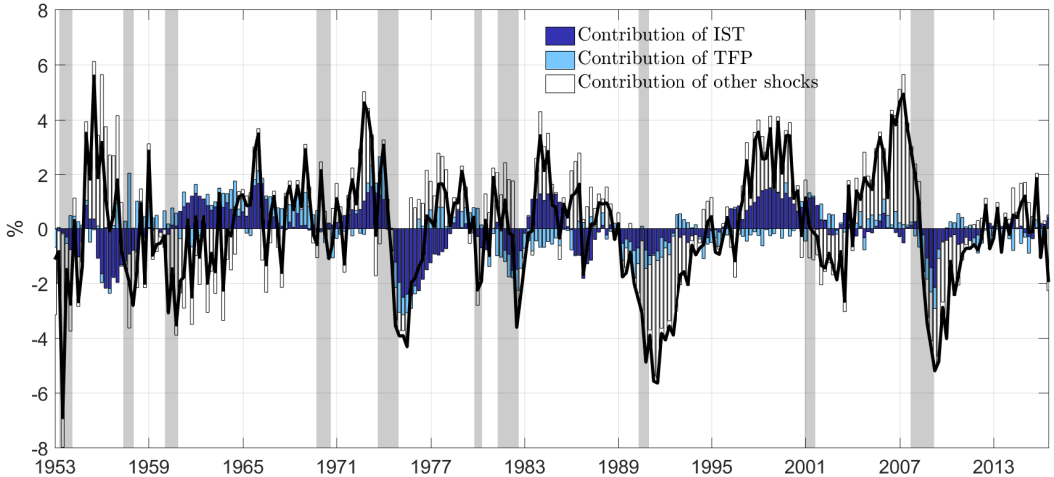
# SVAR: HISTORICAL DECOMPOSITION OF DEBT

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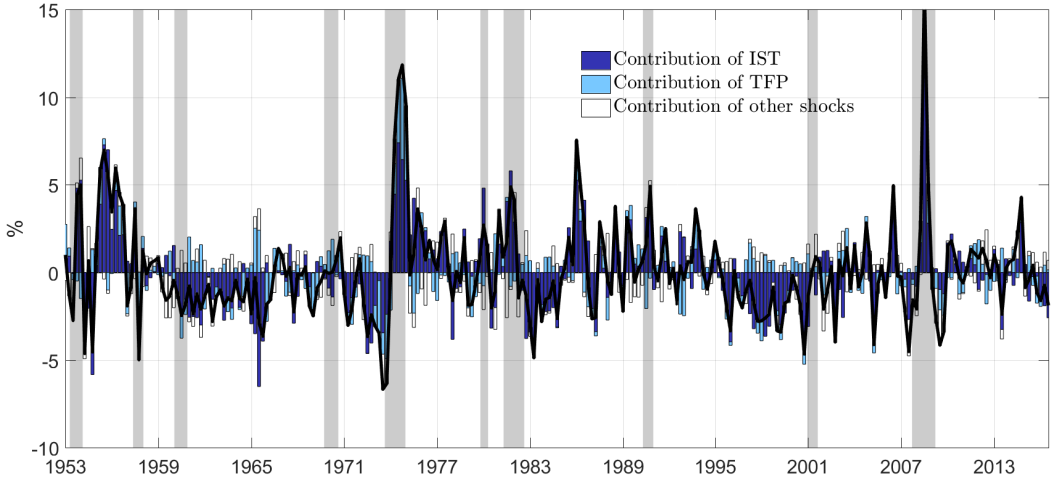
# HISTORICAL DECOMPOSITION OF EQUIPMENT PRICE

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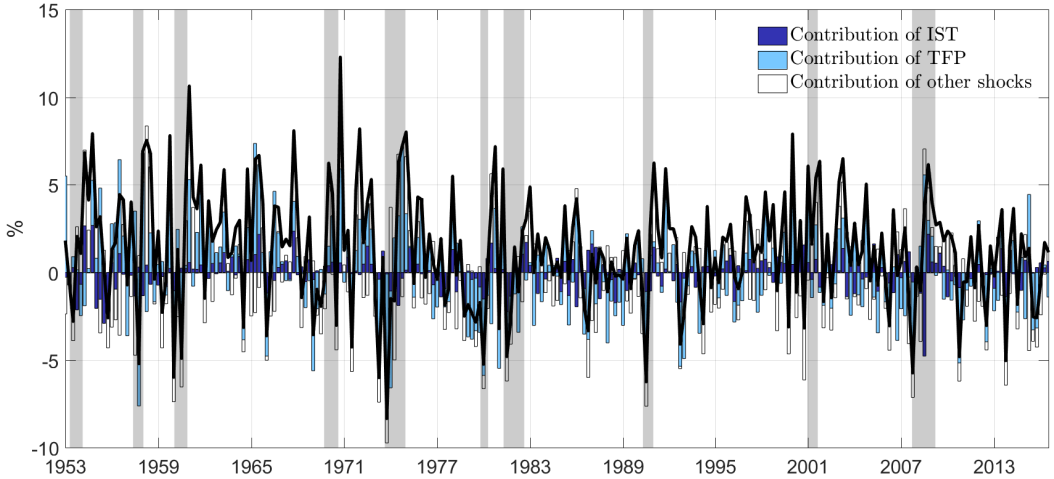
# HISTORICAL DECOMPOSITION OF PRODUCTIVITY

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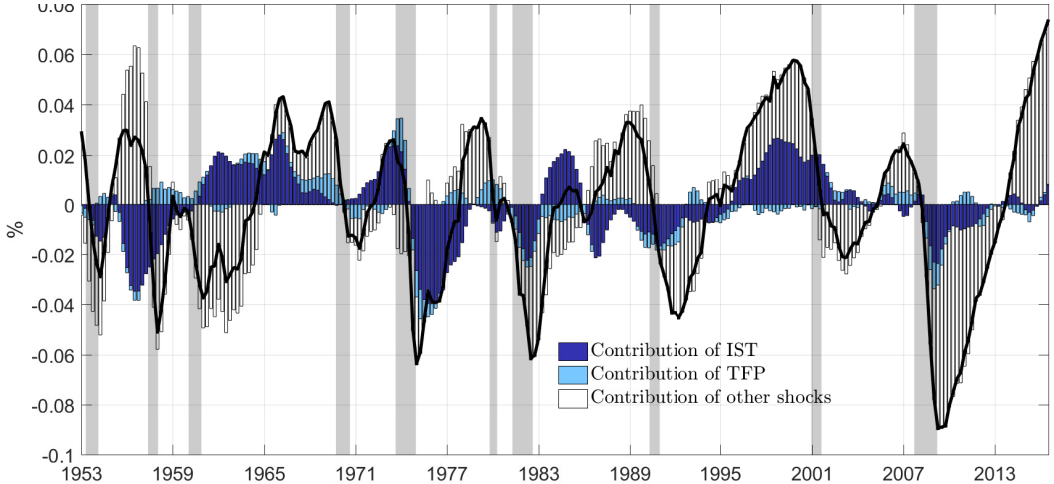
# HISTORICAL DECOMPOSITION OF HOURS WORKED

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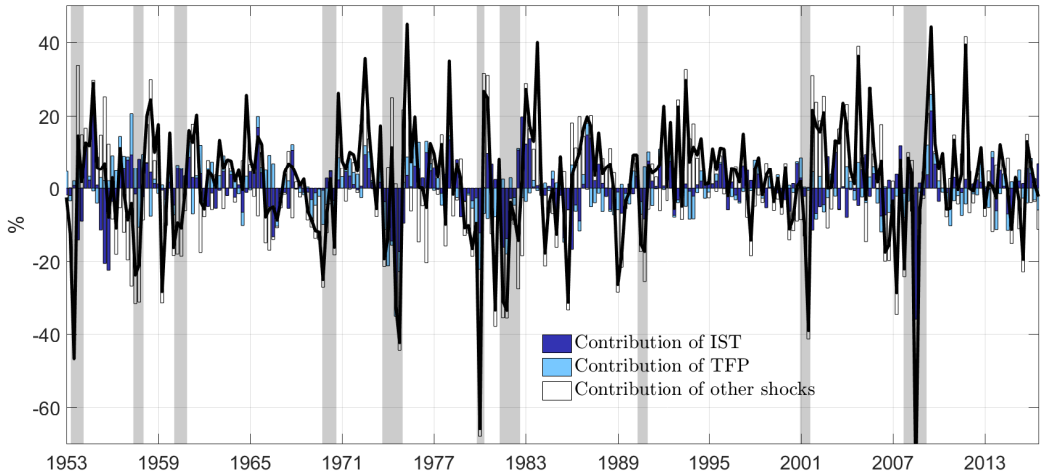
# HISTORICAL DECOMPOSITION OF CAPITAL

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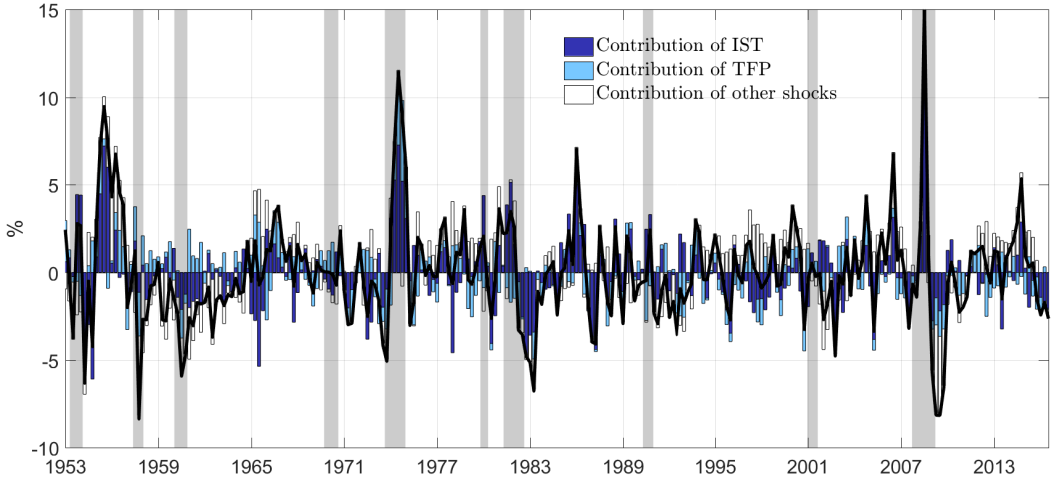
# HISTORICAL DECOMPOSITION OF EARNINGS

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# SUMMARY STATISTICS: COMPUSTAT-DEALSCAN

TABLE: FULL COMPUSTAT-DEALSCAN PANEL ($N = 4,484$)

| | Firm-qrt obs | Mean | SD | Min | Median | Max |
|---|---|---|---|---|---|---|
| Real total assets (bn 2009 USD) | 153,554 | 4.6 | 16.2 | 0.0 | 0.8 | 542.7 |
| Real sales (bn 2009 USD) | 153,554 | 1.0 | 3.7 | 0.0 | 0.2 | 124.3 |
| Real sales growth (percent) | 149,049 | 3.4 | 16.6 | -27.6 | 1.9 | 43.3 |
| Employment (thousands) | 136,575 | 14.3 | 53.5 | 0.0 | 2.8 | 2200.0 |
| Real debt liab. (bn 2009 USD) | 153,554 | 1.4 | 6.4 | 0.0 | 0.2 | 339.6 |
| Cash ratio | 153,543 | 0.1 | 0.1 | 0.0 | 0.0 | 0.9 |
| Market-to-book ratio | 140,325 | 1.8 | 1.8 | 0.5 | 1.4 | 45.0 |
| Book leverage (broad) | 153,543 | 0.6 | 0.2 | 0.1 | 0.6 | 1.3 |
| Book leverage (narrow) | 153,543 | 0.4 | 0.2 | 0.0 | 0.3 | 0.9 |

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# SUMMARY STATISTICS: COMPUSTAT-DEALSCAN

| | Firm-qrt obs | Mean | SD | Min | Median | Max |
|---|---|---|---|---|---|---|
| Panel (a): Borrowers with earnings-based covenants only ($N = 1,721$) | | | | | | |
| Real total assets (bn 2009 USD) | 46,680 | 5.4 | 17.2 | 0.0 | 1.6 | 455.6 |
| Real sales (bn 2009 USD) | 46,680 | 1.1 | 2.7 | 0.0 | 0.4 | 55.0 |
| Real sales growth (percent) | 46,044 | 4.9 | 16.3 | -27.6 | 2.8 | 43.3 |
| Employment (thousands) | 43,164 | 17.7 | 40.8 | 0.0 | 5.4 | 707.9 |
| Real debt liab. (bn 2009 USD) | 46,680 | 1.8 | 6.1 | 0.0 | 0.4 | 251.9 |
| Cash ratio | 46,668 | 0.1 | 0.1 | 0.0 | 0.0 | 0.9 |
| Market-to-book ratio | 43,848 | 1.7 | 1.0 | 0.5 | 1.5 | 16.8 |
| Book leverage (broad) | 46,668 | 0.6 | 0.2 | 0.1 | 0.6 | 1.3 |
| Book leverage (narrow) | 46,668 | 0.4 | 0.2 | 0.0 | 0.3 | 0.9 |
| Panel (b): Borrowers with collateral only ($N = 1,470$) | | | | | | |
| Real total assets (bn 2009 USD) | 28,128 | 3.5 | 10.2 | 0.0 | 0.6 | 192.8 |
| Real sales (bn 2009 USD) | 28,128 | 0.8 | 3.0 | 0.0 | 0.1 | 86.3 |
| Real sales growth (percent) | 26,652 | 4.7 | 17.6 | -27.6 | 2.8 | 43.3 |
| Employment (thousands) | 25,860 | 12.5 | 52.6 | 0.0 | 2.1 | 1900.0 |
| Real debt liab. (bn 2009 USD) | 28,128 | 1.5 | 4.4 | 0.0 | 0.2 | 131.1 |
| Cash ratio | 28,128 | 0.1 | 0.1 | 0.0 | 0.0 | 0.9 |
| Market-to-book ratio | 25,428 | 1.7 | 1.5 | 0.5 | 1.3 | 45.0 |
| Book leverage (broad) | 28,128 | 0.7 | 0.3 | 0.1 | 0.7 | 1.3 |
| Book leverage (narrow) | 28,128 | 0.5 | 0.3 | 0.0 | 0.4 | 0.9 |

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# SUMMARY STATISTICS: COMPUSTAT-DEALSCAN

| | Firm-qrt obs | Mean | SD | Min | Median | Max |
|---|---|---|---|---|---|---|
| Penal (c): Borrowers with both ($N = 1,855$) | | | | | | |
| Real total assets (bn 2009 USD) | 44,124 | 2.2 | 9.8 | 0.0 | 0.6 | 513.3 |
| Real sales (bn 2009 USD) | 44,124 | 0.5 | 1.3 | 0.0 | 0.1 | 51.9 |
| Real sales growth (percent) | 42,864 | 6.0 | 17.8 | -27.6 | 3.5 | 43.3 |
| Employment (thousands) | 41,652 | 9.2 | 24.0 | 0.0 | 2.6 | 355.0 |
| Real debt liab. (bn 2009 USD) | 44,124 | 1.0 | 5.6 | 0.0 | 0.2 | 307.5 |
| Cash ratio | 44,124 | 0.1 | 0.1 | 0.0 | 0.0 | 0.9 |
| Market-to-book ratio | 40,764 | 1.6 | 0.9 | 0.5 | 1.3 | 12.0 |
| Book leverage (broad) | 44,124 | 0.6 | 0.2 | 0.1 | 0.6 | 1.3 |
| Book leverage (narrow) | 44,124 | 0.5 | 0.3 | 0.0 | 0.5 | 0.9 |
| Panel (d): Borrowers without either ($N = 844$) | | | | | | |
| Real total assets (bn 2009 USD) | 20,424 | 12.8 | 26.4 | 0.0 | 4.2 | 375.8 |
| Real sales (bn 2009 USD) | 20,424 | 2.6 | 5.6 | 0.0 | 0.7 | 66.0 |
| Real sales growth (percent) | 20,040 | 4.7 | 17.8 | -27.6 | 2.7 | 43.3 |
| Employment (thousands) | 14,724 | 39.4 | 83.9 | 0.0 | 10.3 | 1383.0 |
| Real debt liab. (bn 2009 USD) | 20,424 | 3.8 | 10.2 | 0.0 | 1.2 | 216.3 |
| Cash ratio | 20,424 | 0.1 | 0.1 | 0.0 | 0.0 | 0.9 |
| Market-to-book ratio | 18,048 | 1.7 | 1.0 | 0.5 | 1.4 | 12.7 |
| Book leverage (broad) | 20,424 | 0.6 | 0.2 | 0.1 | 0.6 | 1.3 |
| Book leverage (narrow) | 20,424 | 0.4 | 0.2 | 0.0 | 0.3 | 0.9 |

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# FIRM-LEVEL DATA AND IMPLEMENTATION

- Endogenous selection into being particular borrower type
  1. Control for firm size, firms sales growth, 3-digit industry FE
  2. Control for firm FE and sales growth
- In all specifications add one lag of log(debt), two lags of the shock, time trend
- Add macro control based on orthogonalized debt innovations
- Two alternative ways to construct $\mathbb{1}_{i,t,coll}$
- Loan info "sparse", sample reduced with $\mathbb{1}_{i,t,earn}$ and $\mathbb{1}_{i,t,coll}$
- Compute 90% bands, S.E. clustered at 3-digit industry level

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# FORMAL TEST

| | Classification based on specific assets | Classification based on secured revolvers |
|---|---|---|
| $\beta_0^{earn} - \beta_0^{coll}$ | 0.0328 | -0.0029 |
| | (0.0213) | (0.0248) |
| $\beta_1^{earn} - \beta_1^{coll}$ | 0.0308 | 0.0004 |
| | (0.0318) | (0.0285) |
| $\beta_2^{earn} - \beta_2^{coll}$ | 0.0340 | 0.0162 |
| | (0.0282) | (0.0307) |
| $\beta_3^{earn} - \beta_3^{coll}$ | 0.0511 | 0.0511 |
| | (0.0334) | (0.0365) |
| $\beta_4^{earn} - \beta_4^{coll}$ | 0.0600* | 0.0464 |
| | (0.0345) | (0.0404) |
| $\beta_5^{earn} - \beta_5^{coll}$ | 0.0491 | 0.0384 |
| | (0.0331) | (0.0370) |
| $\beta_6^{earn} - \beta_6^{coll}$ | 0.0581* | 0.0400 |
| | (0.0351) | (0.0395) |
| $\beta_7^{earn} - \beta_7^{coll}$ | 0.0688* | 0.0642* |
| | (0.0353) | (0.0356) |
| $\beta_8^{earn} - \beta_8^{coll}$ | 0.0865** | 0.0813** |
| | (0.0355) | (0.0358) |
| $\beta_9^{earn} - \beta_9^{coll}$ | 0.0810** | 0.0725* |
| | (0.0389) | (0.0386) |
| $\beta_{10}^{earn} - \beta_{10}^{coll}$ | 0.0773* | 0.0624 |
| | (0.0406) | (0.0403) |
| $\beta_{11}^{earn} - \beta_{11}^{coll}$ | 0.0927** | 0.0893** |
| | (0.0420) | (0.0432) |
| $\beta_{12}^{earn} - \beta_{12}^{coll}$ | 0.0690 | 0.0658 |
| | (0.0433) | (0.0442) |

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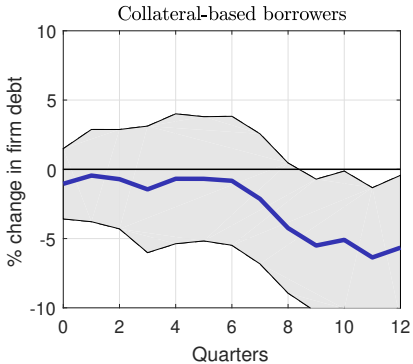
# HETEROGENEOUS IRFS ACROSS BORROWER TYPES

## ALTERNATIVE BORROWER CLASSIFICATION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# IV SPECIFICATION (1/3)

$$
\begin{aligned}
log(b_{i,t+h}) = \alpha_h + \beta_h p_{k,t} + \boldsymbol{\gamma X_{i,t-1}} \\
+ \beta_h^{earn} \mathbb{1}_{i,t,earn} \times p_{k,t} + \alpha_h^{earn} \mathbb{1}_{i,t,earn} \\
+ \beta_h^{coll} \mathbb{1}_{i,t,coll} \times p_{k,t} + \alpha_h^{coll} \mathbb{1}_{i,t,coll} + \gamma t + \eta_{i,t+h}
\end{aligned}
$$

where $p_{k,t}$ is defined as in in the SVAR model. This equation is then estimated by using $\hat{u}_{IST,t}$ as an IV for $p_{k,t}$

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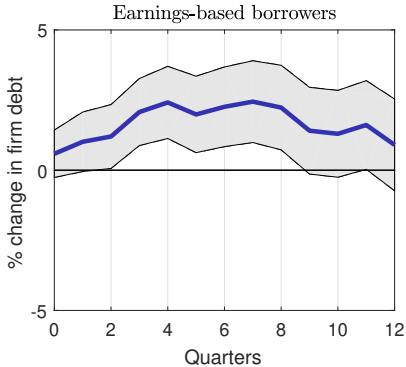
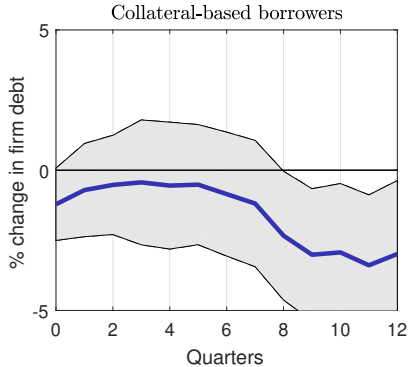
# IV SPECIFICATION (2/3)

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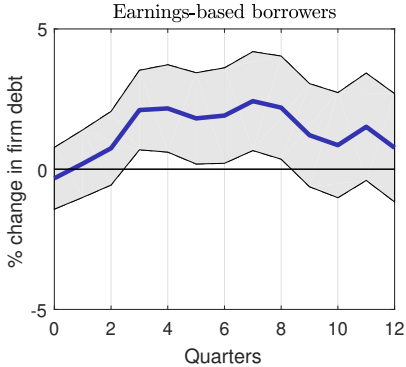
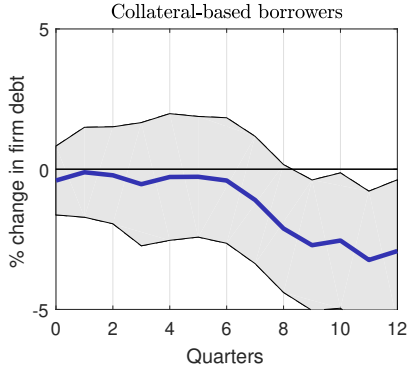
# IV SPECIFICATION (3/3)

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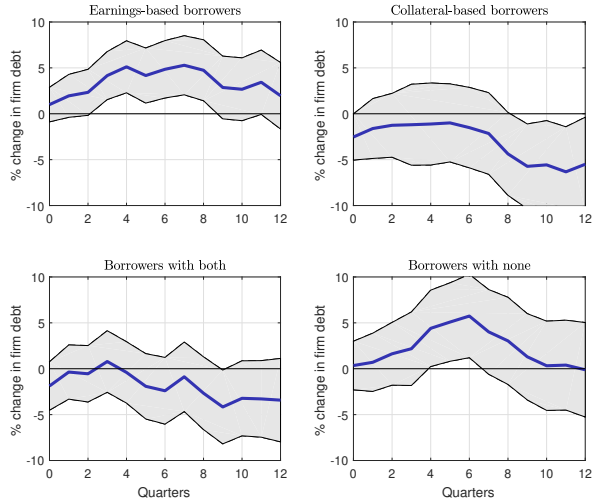
# HETEROGENEOUS IRFS ACROSS BORROWER TYPES

## SPECIFICATION WITH: 3-DIGIT INDUSTRY FE, FIRM SIZE, AND SALES GROWTH

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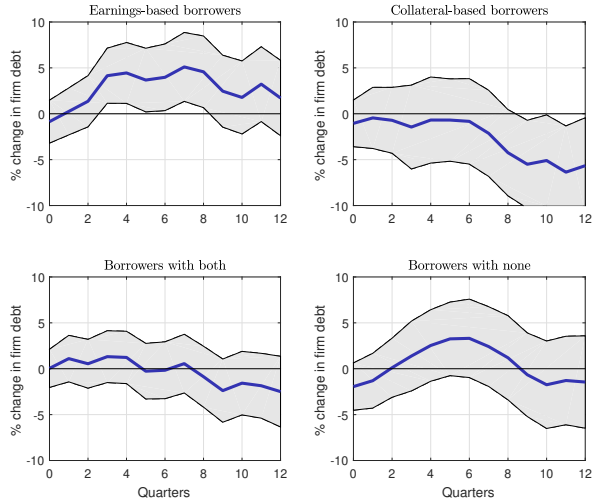
# HETEROGENEOUS IRFS ACROSS BORROWER TYPES

## ALTERNATIVE BORROWER CLASSIFICATION

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# QUANTITATIVE MODEL: DETAILS

- Closely related model: Jermann and Quadrini (2012) variation of Smets and Wouters (2007)
- Continuum of households supply differentiated labor in monopolistic competition s.t. Calvo-style wage setting
- Continuum of firms supply differentiated consumption good in monopolistic competition s.t. Rotemberg price setting
- Firms own and accumulate the capital stock, borrow from household's subject to tax advantage and constraint
- Monetary authority which follows a Taylor rule, government with exogenous spending shocks
- Use 8 observables (including business sector credit) and 8 shocks

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# QUANTITATIVE MODEL: DETAILS

Differences to Smets and Wouters (2007):

- Firms rather than households own and accumulate capital
- Rotemberg price adjustment costs rather than Calvo pricing
- The monetary policy maker targets output deviations from steady state rather than from the natural level
- Firms have access to debt and receive a tax advantage on debt

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# FULL DECOMPOSITIONS WITH EARNINGS-BASED CONSTRAINT

| Variable | Horizon | TFP | Inv | Pref | Price | Wage | Gov | Mon | Fin |
|---|---|---|---|---|---|---|---|---|---|
| Output growth | 1 quarter | 19.79 | 0.28 | 0.03 | 56.12 | 0.04 | 6.60 | 1.06 | 16.08 |
| | 1 year | 18.90 | 0.54 | 0.04 | 52.91 | 0.04 | 10.07 | 2.38 | 15.11 |
| | 2 years | 18.84 | 0.56 | 0.04 | 52.67 | 0.04 | 9.99 | 2.74 | 15.12 |
| Consumption growth | 1 quarter | 27.03 | 0.52 | 34.50 | 10.86 | 0.04 | 3.40 | 21.77 | 1.88 |
| | 1 year | 42.75 | 0.54 | 22.45 | 11.15 | 0.06 | 2.08 | 18.68 | 2.28 |
| | 2 years | 47.65 | 0.89 | 20.29 | 10.26 | 0.07 | 1.88 | 16.87 | 2.09 |
| Investment growth | 1 quarter | 16.73 | 23.26 | 0.18 | 11.91 | 0.03 | 0.84 | 45.70 | 1.35 |
| | 1 year | 20.44 | 19.10 | 0.22 | 14.41 | 0.05 | 0.66 | 43.21 | 1.91 |
| | 2 years | 20.33 | 19.12 | 0.22 | 14.46 | 0.05 | 0.67 | 43.25 | 1.91 |
| Inflation | 1 quarter | 33.71 | 0.82 | 0.08 | 48.11 | 0.07 | 8.41 | 0.04 | 8.77 |
| | 1 year | 28.93 | 0.80 | 0.07 | 45.43 | 0.06 | 13.23 | 2.51 | 8.97 |
| | 2 years | 28.86 | 0.81 | 0.07 | 45.33 | 0.06 | 13.15 | 2.67 | 9.05 |
| Interest rate | 1 quarter | 0.02 | 0.20 | 0.01 | 28.48 | 0.00 | 0.65 | 51.86 | 18.79 |
| | 1 year | 5.31 | 1.68 | 0.04 | 15.69 | 0.02 | 0.29 | 64.73 | 12.23 |
| | 2 years | 10.57 | 2.63 | 0.06 | 14.06 | 0.04 | 0.27 | 61.40 | 10.97 |
| Employment growth | 1 quarter | 48.37 | 2.46 | 0.03 | 24.79 | 0.03 | 7.02 | 11.68 | 5.62 |
| | 1 year | 44.24 | 2.40 | 0.03 | 22.52 | 0.03 | 14.19 | 11.40 | 5.19 |
| | 2 years | 44.09 | 2.52 | 0.03 | 22.49 | 0.03 | 14.14 | 11.47 | 5.22 |
| Wage growth | 1 quarter | 32.96 | 0.74 | 0.04 | 48.54 | 0.02 | 8.55 | 0.00 | 9.15 |
| | 1 year | 28.87 | 0.80 | 0.05 | 45.95 | 0.02 | 13.41 | 1.80 | 9.11 |
| | 2 years | 28.72 | 0.83 | 0.05 | 45.76 | 0.02 | 13.31 | 2.19 | 9.13 |
| Credit growth | 1 quarter | 37.02 | 0.54 | 0.07 | 42.50 | 0.07 | 13.16 | 1.97 | 4.66 |
| | 1 year | 30.25 | 0.86 | 0.07 | 41.37 | 0.06 | 17.73 | 3.78 | 5.88 |
| | 2 years | 30.08 | 0.89 | 0.07 | 41.17 | 0.06 | 17.56 | 4.29 | 5.88 |

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# FULL DECOMPOSITIONS WITH COLLATERAL CONSTRAINT

| Variable | Horizon | TFP | Inv | Pref | Price | Wage | Gov | Mon | Fin |
|---|---|---|---|---|---|---|---|---|---|
| Output growth | 1 quarter | 16.03 | 15.26 | 7.01 | 8.03 | 0.21 | 30.33 | 22.78 | 0.34 |
| | 1 year | 29.21 | 13.43 | 5.7 | 9.22 | 0.89 | 22.42 | 18.89 | 0.25 |
| | 2 years | 31.12 | 13.25 | 5.51 | 9.19 | 1.13 | 21.07 | 18.5 | 0.24 |
| Consumption growth | 1 quarter | 20.71 | 0.01 | 43.72 | 4.85 | 0.89 | 0.25 | 29.55 | 0.00 |
| | 1 year | 36.76 | 0.09 | 33.21 | 6.26 | 1.72 | 0.38 | 21.58 | 0.01 |
| | 2 years | 40.76 | 0.21 | 30.61 | 6.45 | 2.02 | 0.41 | 19.54 | 0.01 |
| Investment growth | 1 quarter | 10.78 | 57.46 | 0.01 | 4.18 | 0.44 | 0.04 | 25.65 | 1.44 |
| | 1 year | 18.71 | 51.69 | 0.01 | 5.81 | 0.94 | 0.11 | 21.72 | 1.01 |
| | 2 years | 21.1 | 49.51 | 0.04 | 6.15 | 1.23 | 0.15 | 20.88 | 0.95 |
| Inflation | 1 quarter | 47.32 | 1.62 | 2.54 | 43.42 | 0.76 | 1.27 | 3.02 | 0.05 |
| | 1 year | 49.39 | 3.73 | 4.85 | 31.73 | 0.96 | 3.22 | 6.00 | 0.13 |
| | 2 years | 46.57 | 4.68 | 5.57 | 29.86 | 0.89 | 5.13 | 7.08 | 0.22 |
| Interest rate | 1 quarter | 3.41 | 0.28 | 0.33 | 3.28 | 0.06 | 0.31 | 92.32 | 0.01 |
| | 1 year | 5.93 | 0.77 | 0.87 | 3.40 | 0.12 | 0.64 | 88.25 | 0.02 |
| | 2 years | 6.06 | 0.94 | 1.06 | 3.49 | 0.12 | 0.98 | 87.31 | 0.04 |
| Employment growth | 1 quarter | 71.29 | 5.82 | 2.12 | 0.28 | 0.36 | 12.01 | 7.98 | 0.14 |
| | 1 year | 70.18 | 6.33 | 2.22 | 0.89 | 0.60 | 11.23 | 8.42 | 0.13 |
| | 2 years | 69.75 | 6.59 | 2.22 | 1.01 | 0.70 | 10.97 | 8.62 | 0.12 |
| Wage growth | 1 quarter | 53.94 | 0.05 | 1.13 | 41.4 | 2.66 | 0.00 | 0.81 | 0.00 |
| | 1 year | 63.64 | 0.09 | 0.84 | 32.87 | 1.97 | 0.00 | 0.58 | 0.00 |
| | 2 years | 64.13 | 0.10 | 0.87 | 32.38 | 1.95 | 0.00 | 0.57 | 0.00 |
| Credit growth | 1 quarter | 4.26 | 0.00 | 0.90 | 7.97 | 0.12 | 0.56 | 9.67 | 76.52 |
| | 1 year | 4.42 | 2.11 | 0.90 | 7.33 | 0.11 | 0.51 | 14.89 | 69.72 |
| | 2 years | 4.70 | 2.87 | 0.91 | 7.32 | 0.14 | 0.52 | 14.88 | 68.66 |

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