A time-varying finance-led model for U.S. business cycles

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Presentation outline

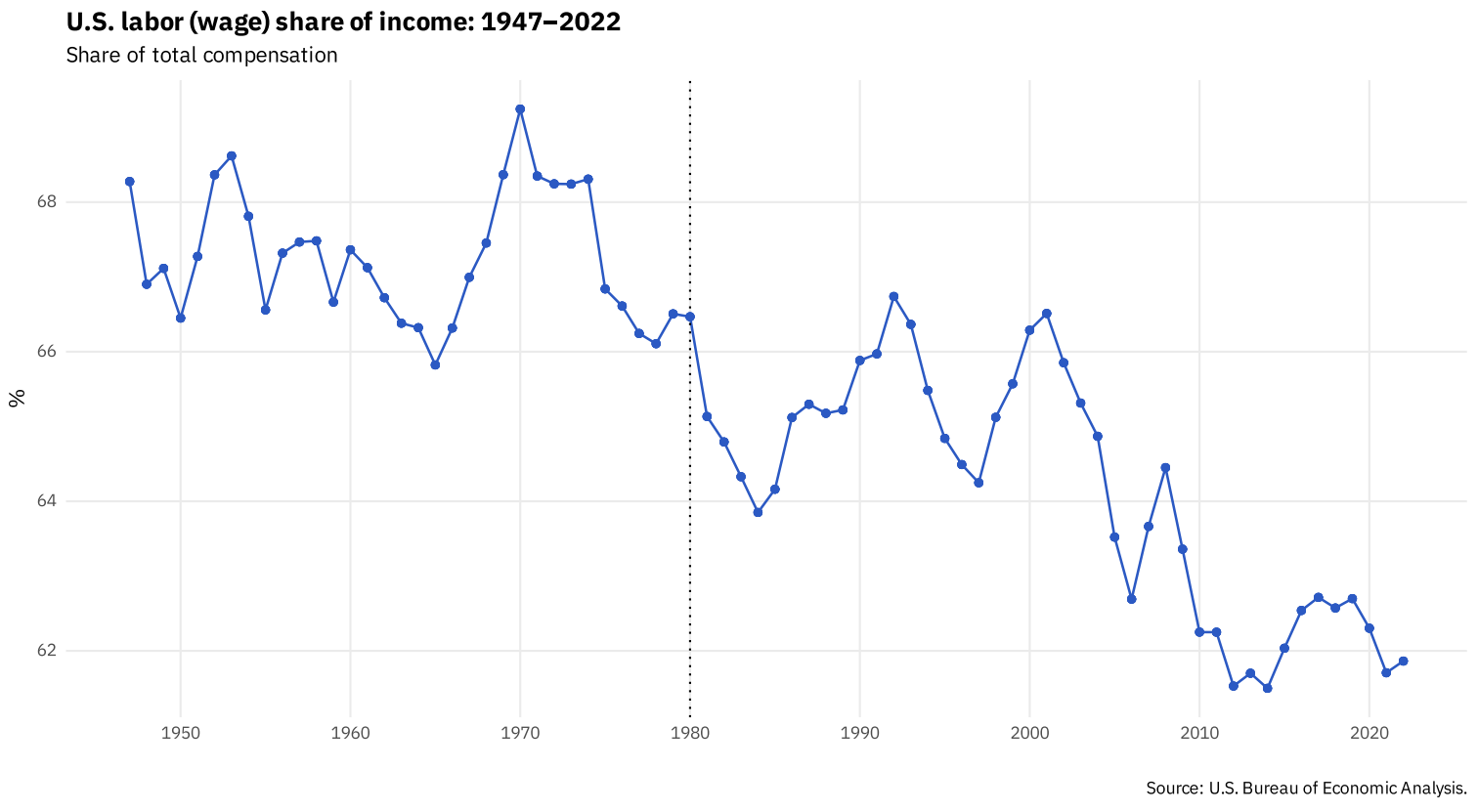
1. Introduction/Motivation
2. Related literature
3. Data & empirics
4. Results
5. Conclusions
6. Technical appendix

Introduction

Motivation

$$\text{Aggregate Income} = \text{Wages} + \text{Profits} + \text{Interest} + \text{Rents} + \text{Capital Depreciation}$$

The stylized fact I



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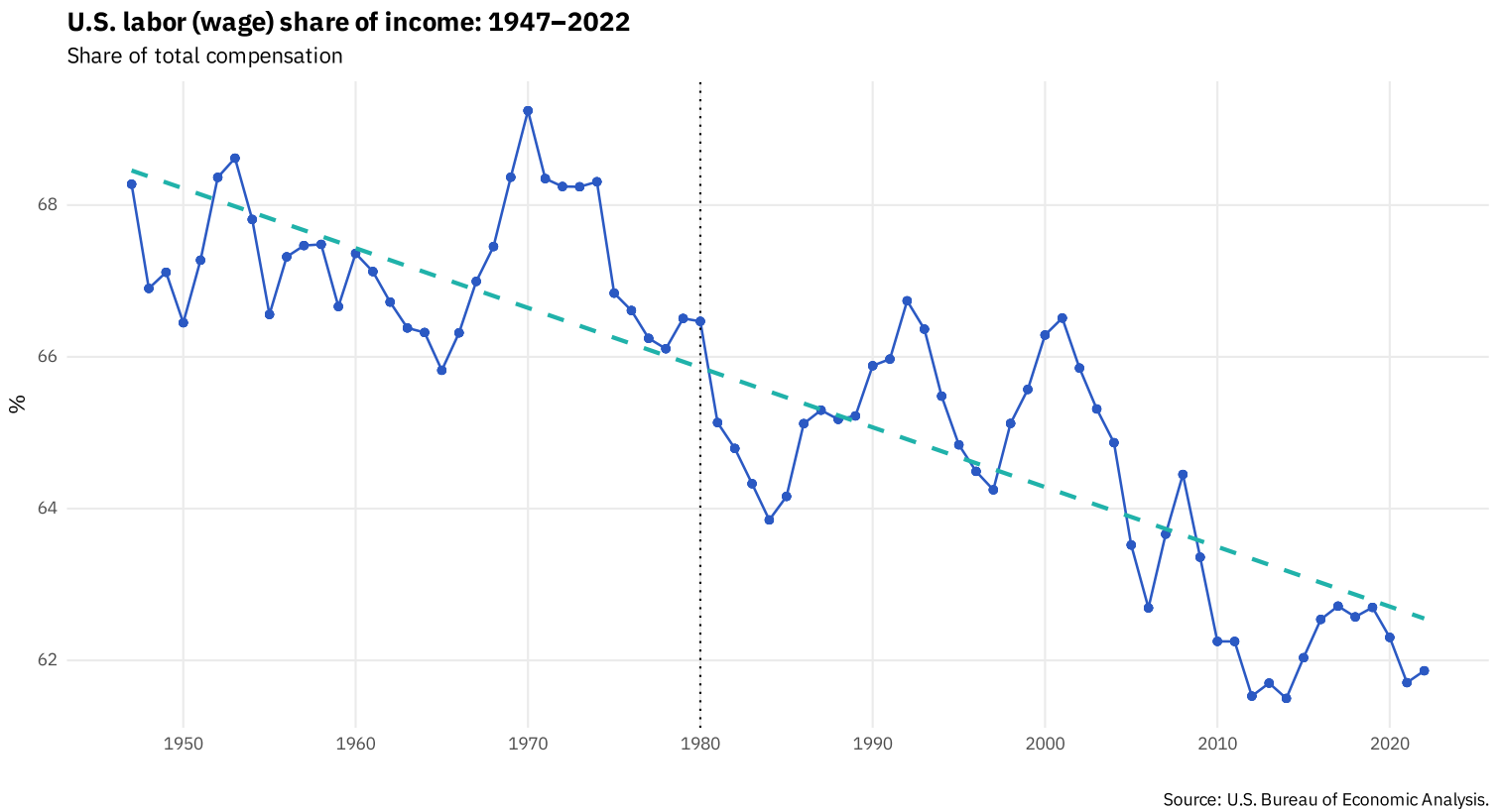
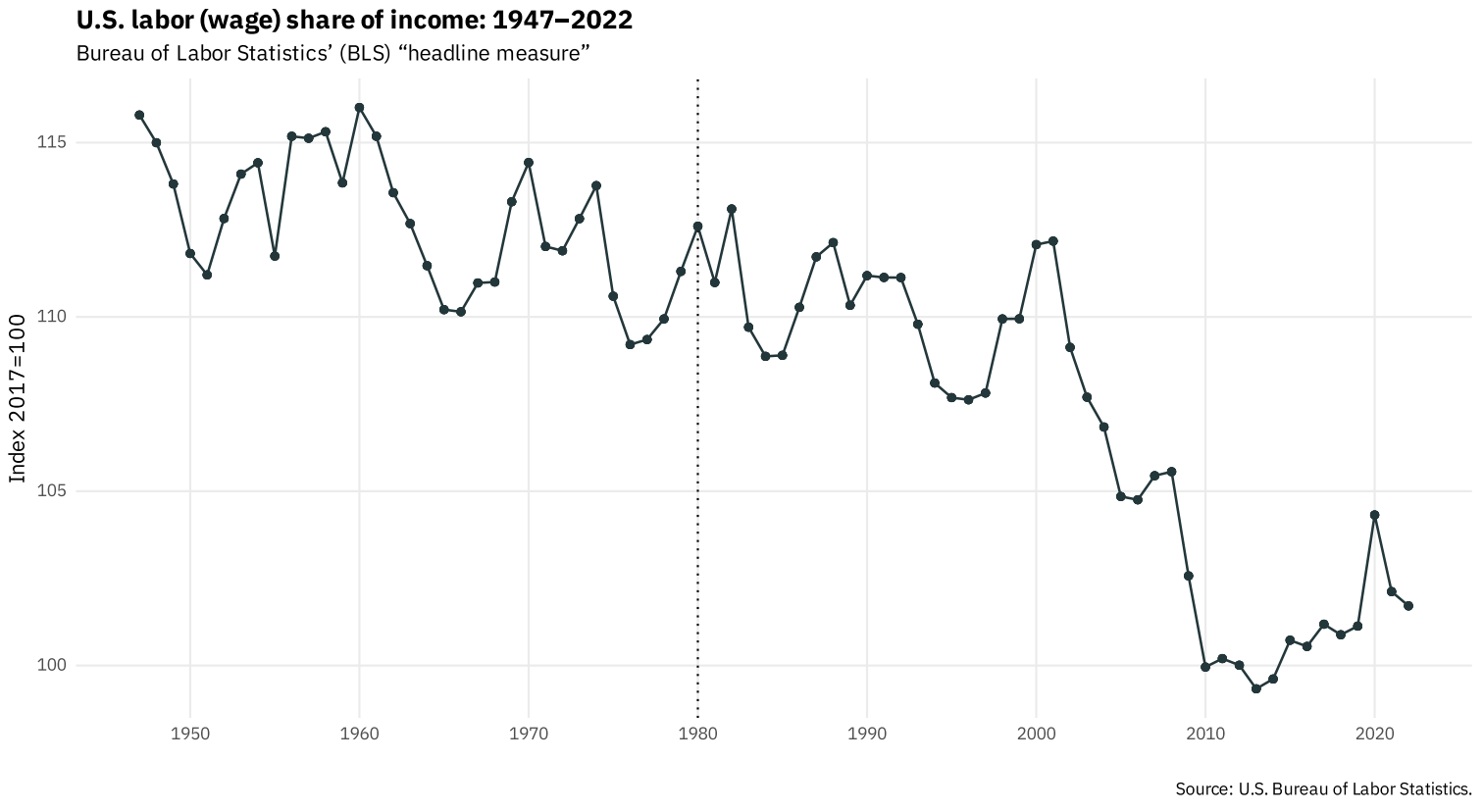


The stylized fact II



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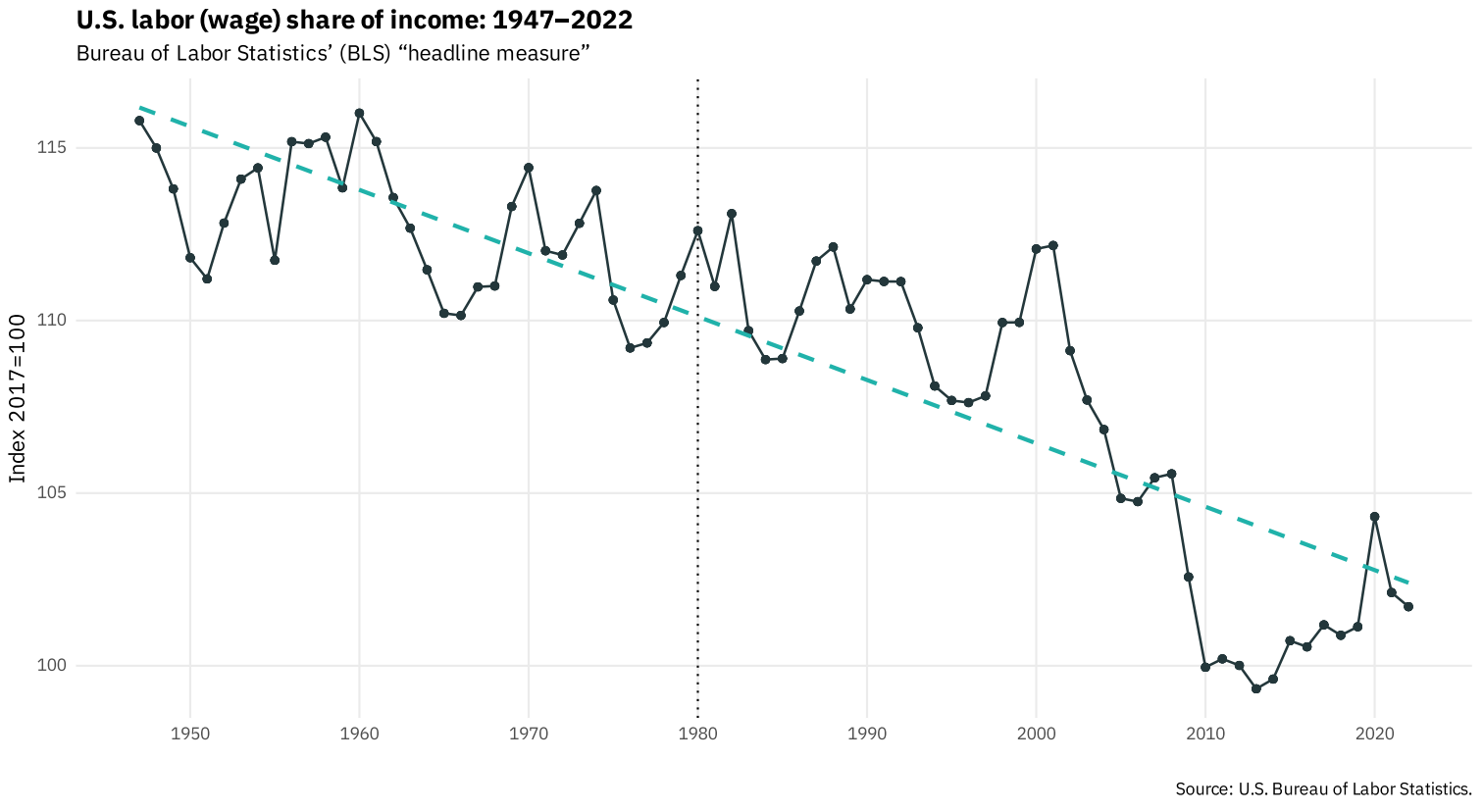

A theoretical reference

`Goodwin (1967)`

12. A Growth Cycle[1]

SOCIALISM, CAPITALISM AND ECONOMIC GROWTH, 1967, ED. C. H. FEINSTEIN

Presented here is a starkly schematised and hence quite unrealistic model of cycles in growth rates. This type of formulation now seems to me to have better prospects than the more usual treatment of growth theory or of cycle theory, separately or in combination. Many of the bits of reasoning are common to both, but in the present paper they are put together in a different way.

The following assumptions are made for convenience:

(1) Steady technical progress (disembodied);
(2) Steady growth in the labour force;
(3) Only two factors of production, labour and 'capital' (plant and equipment), both homogeneous and non-specific;
(4) All quantities real and net;
(5) All wages consumed, all profits saved and invested.

These assumptions are of a more empirical, and disputable, sort:

(6) A constant capital–output ratio;
(7) A real wage rate which rises in the neighbourhood of full employment.

(5) could be altered to constant proportional savings, thus changing the numbers but not the logic of the system. (6) could be softened but it would mean a serious complicating of the structure of the model.

Symbols used are:

q is output;
k is capital;
w is wage rate;
$a = a_0 e^{\alpha t}$ is labour productivity; α constant;
σ is capital–output ratio (inverse of capital productivity);
w/a is workers' share of product, $(1 - w/a)$ capitalists';

A theoretical reference

`Goodwin (1967)`:

- An analysis of the **business cycle**;
- A never-ending **conflict**/**symbiosis** between capital and labor.

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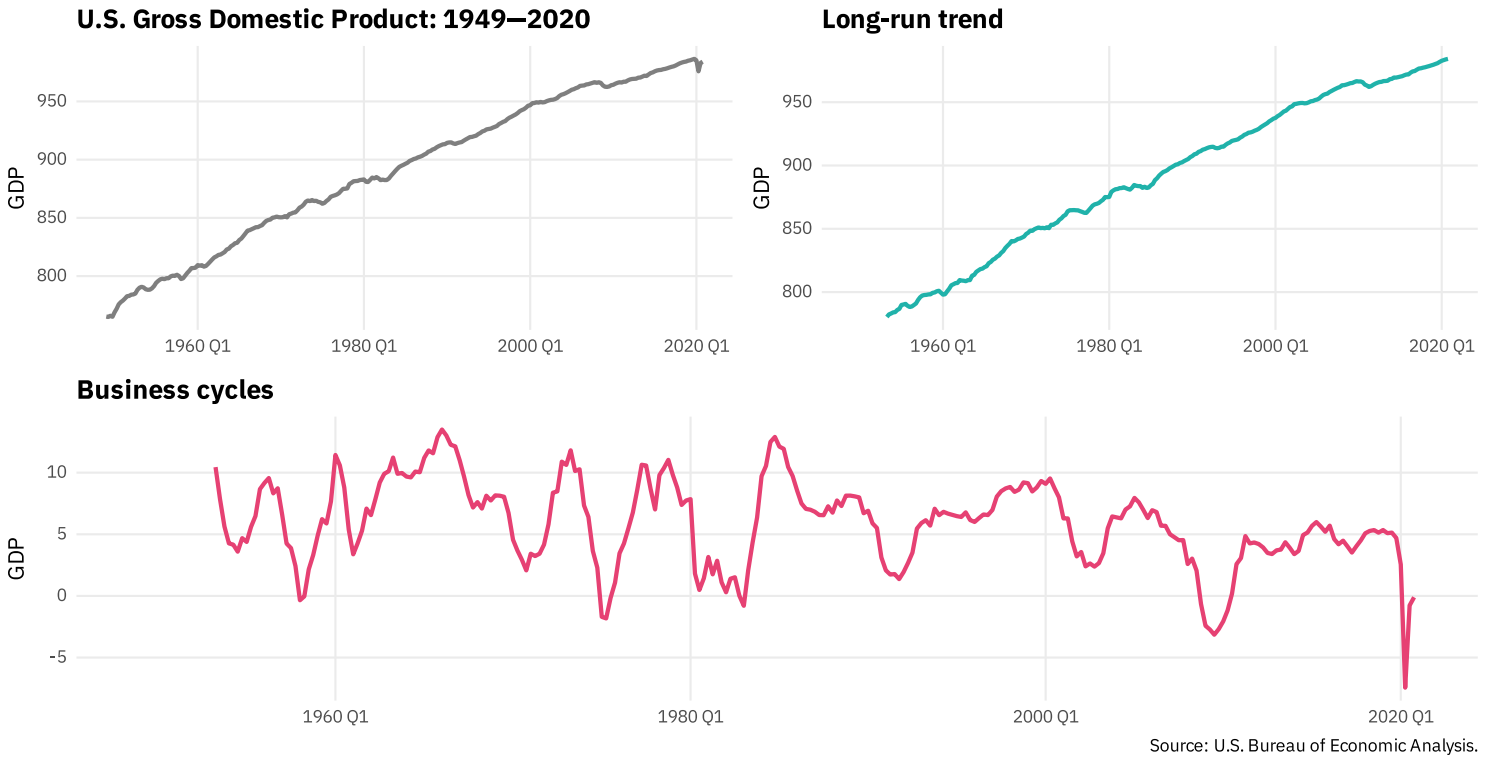
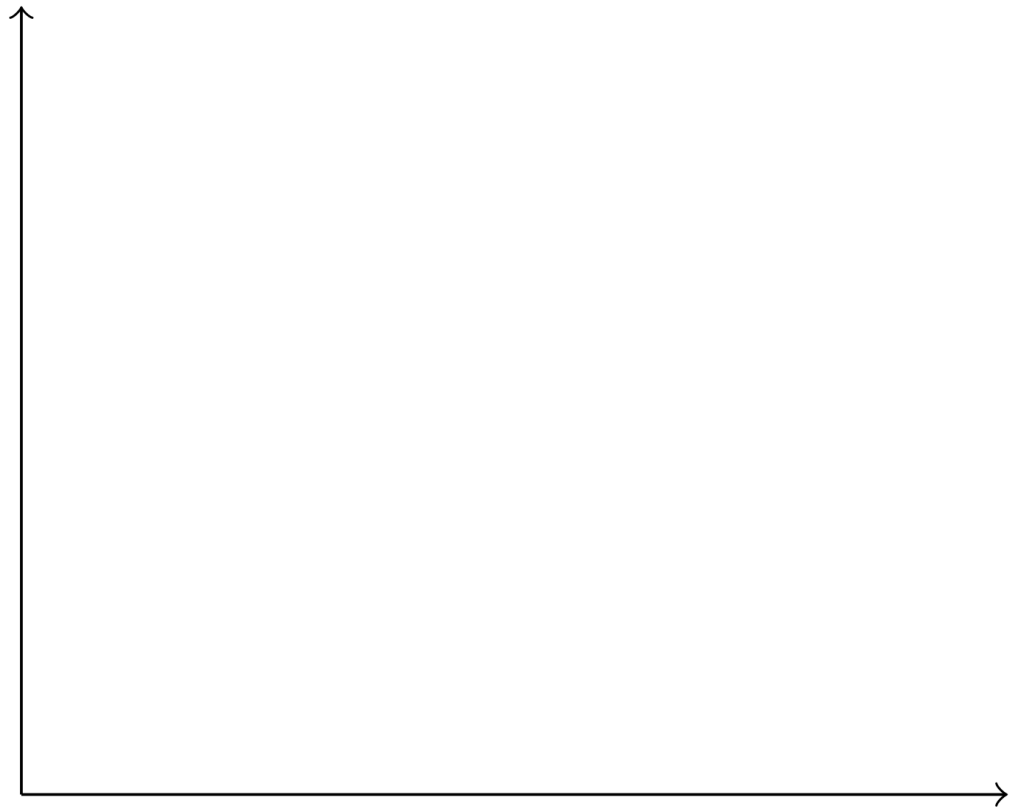
Business cycles in a nutshell



Source: U.S. Bureau of Economic Analysis.

Into a picture...



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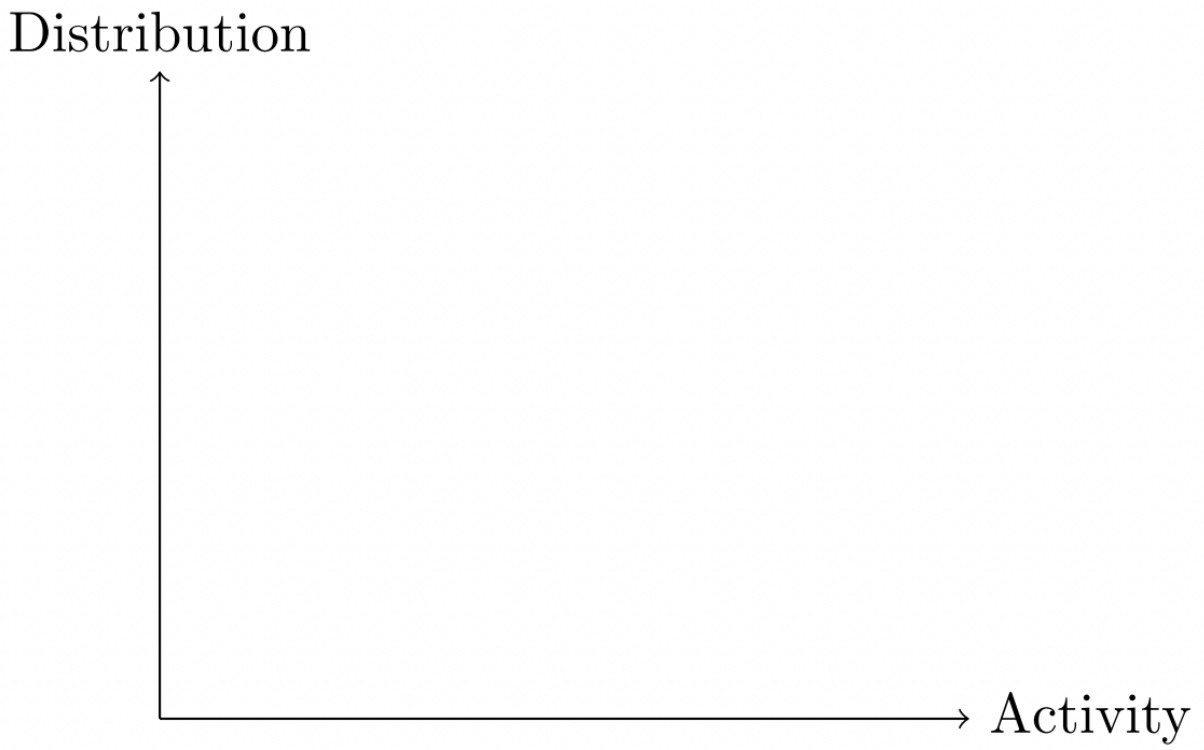
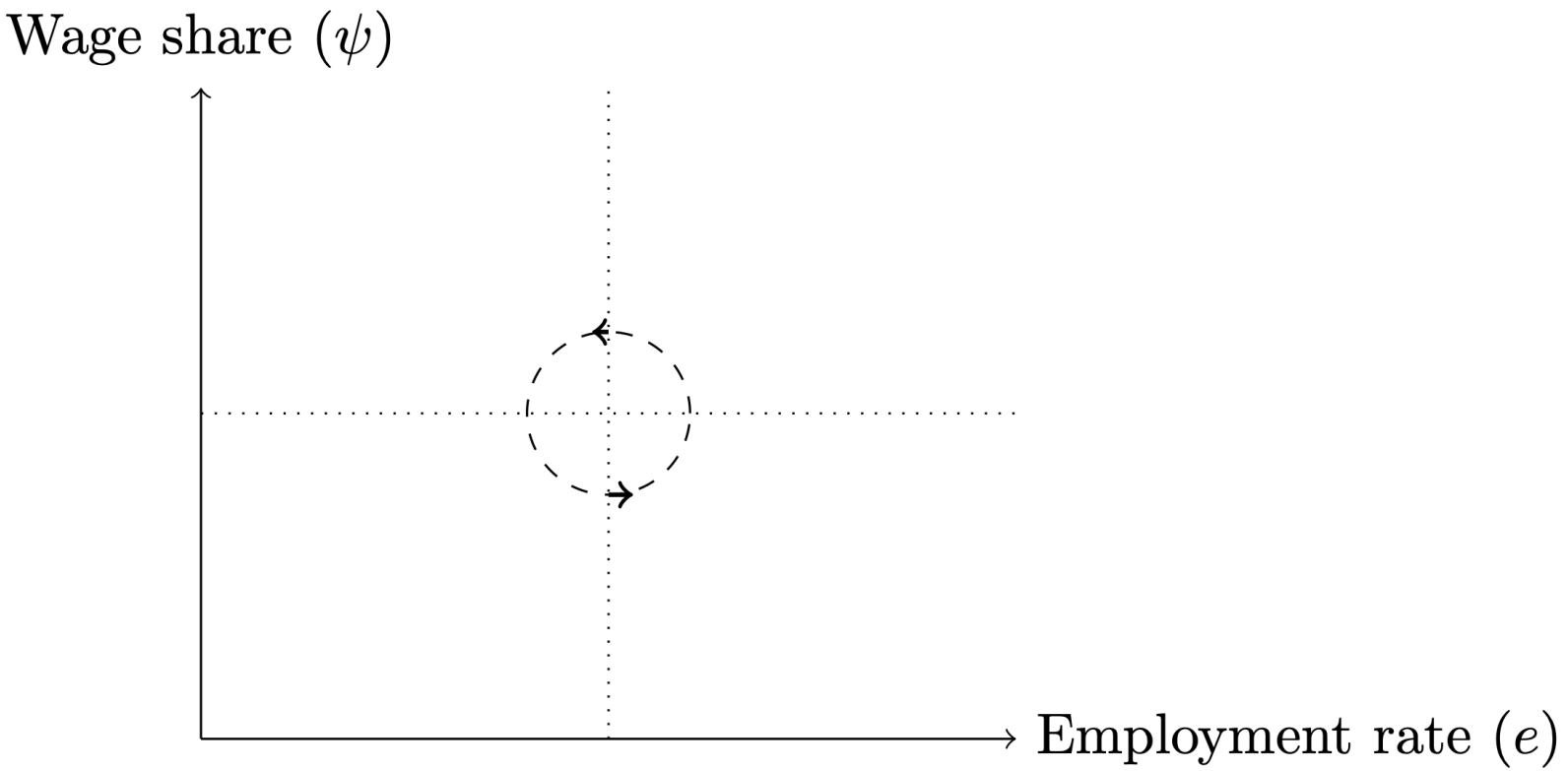
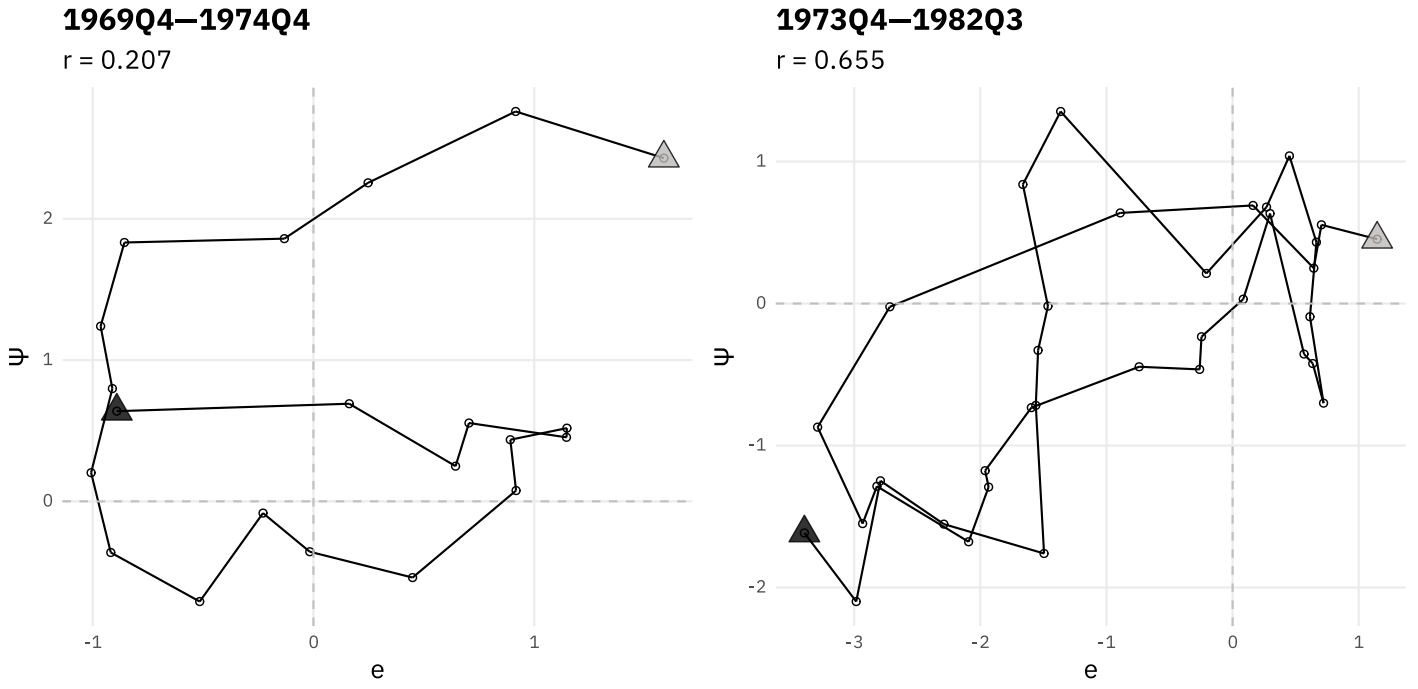


The "Goodwin pattern"



What does reality say?

Gray triangles: cycles's ***first*** quarter; **Black** triangles: cycle's ***last*** quarter.



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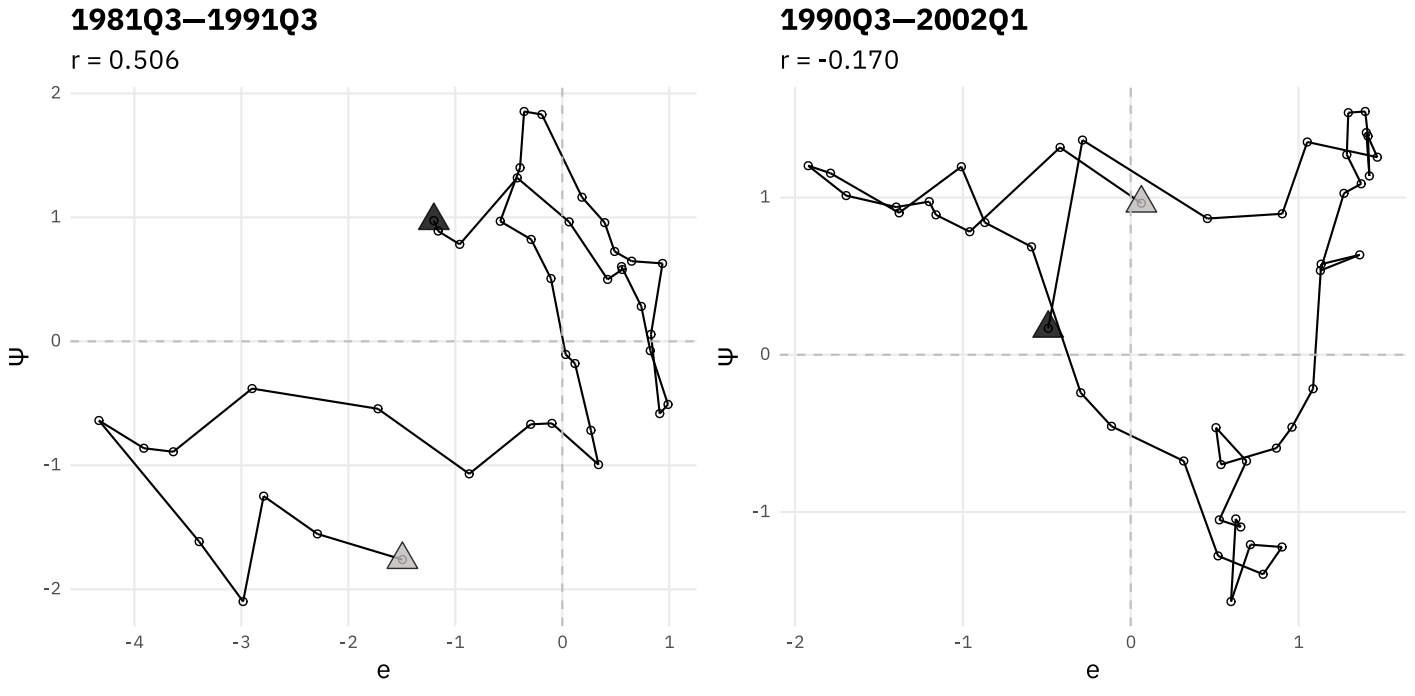

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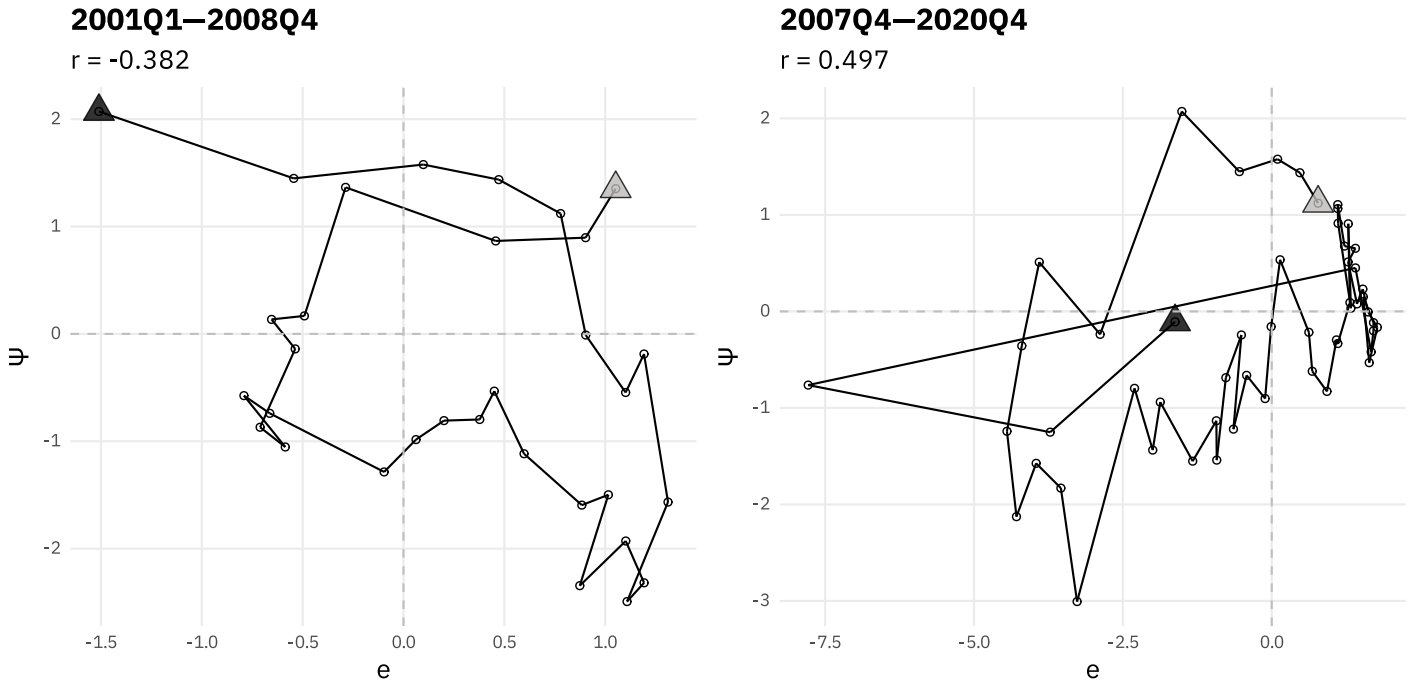


Contribution(s)

A few **limitations** of `Goodwin's (1967)` original story:

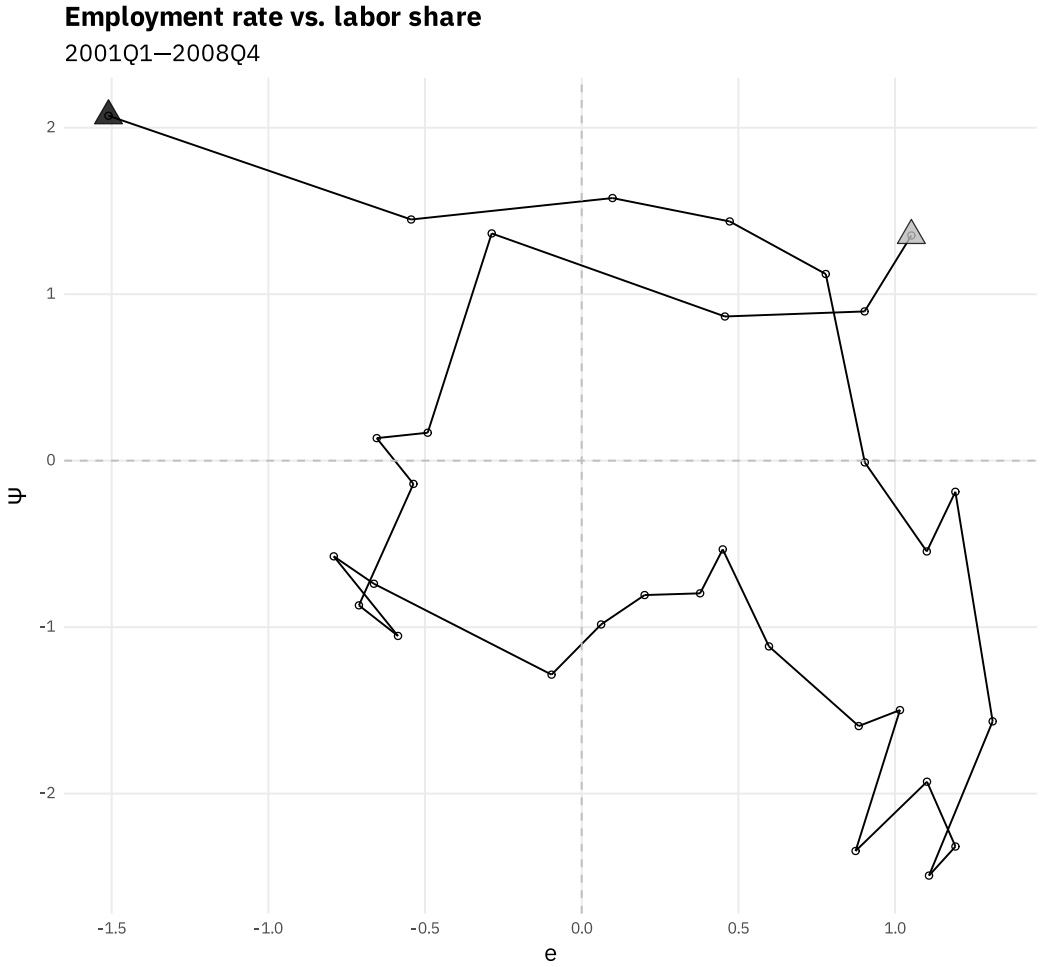
- What makes the economy **recover**?
- What **stops** a recovery process?
- How can this analysis be combined with the economy's **financial** side?

Related literature

Related literature

(1) Demand & distributive regimes:

- What is the **mechanism** behind this pattern?



Related literature

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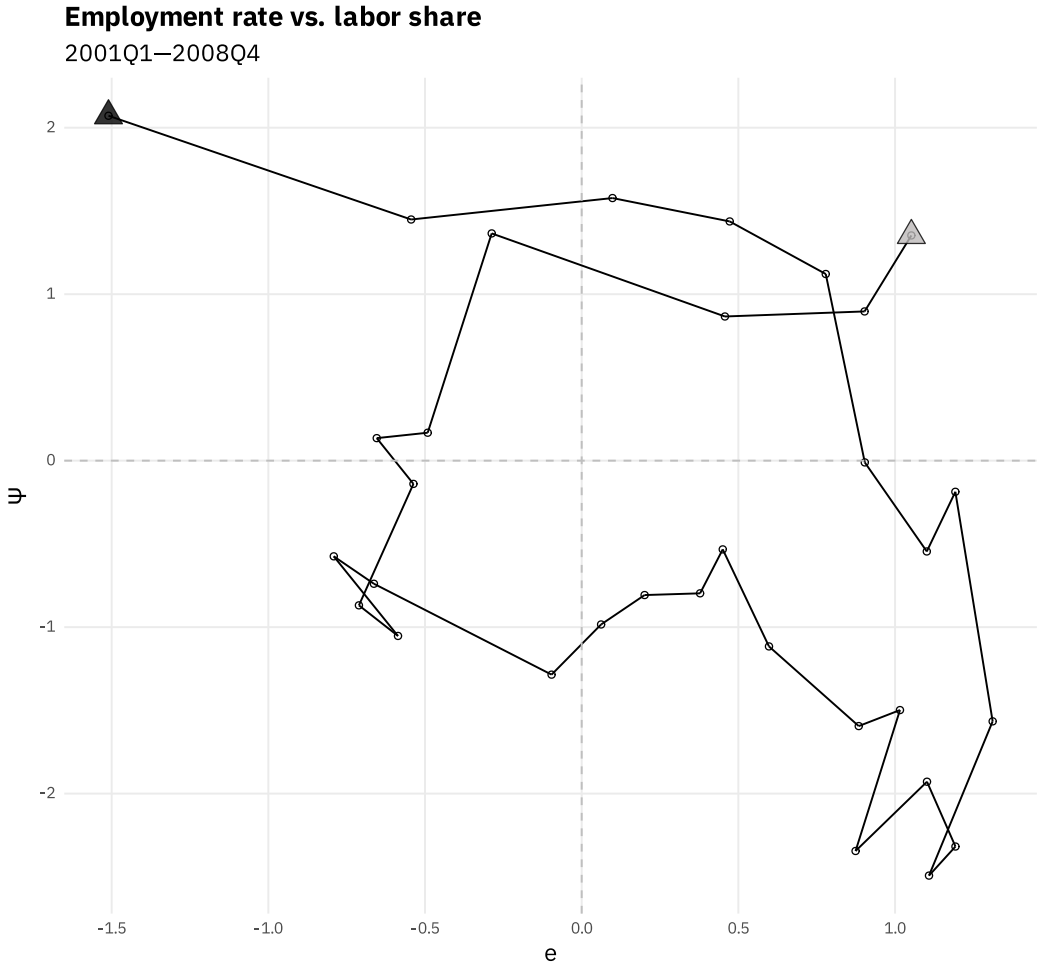
- **Profit-led demand** & **profit-squeeze distribution**



Related literature

(1) Demand & distributive regimes:

- What is the **mechanism** behind this pattern?
- **Profit-led demand** & **profit-squeeze distribution**
  - `Barrales et al. (2022)`
  - `Santetti et al. (2023)`

However, have these regimes *weakened*?

- `Goldstein (1999)`
- `Setterfield (2023)`
- `Carrillo-Maldonando & Nikiforos (2024)`

Related literature

(1) Demand & distributive regimes:

- What is the **mechanism** behind this pattern?
- **Profit-led demand** & **profit-squeeze distribution**
- **However**, have these regimes *weakened*?

(2) Financial connections:

- *Residential investment* **leads** the business cycle
  - `Davis & Heathcote (2005)`
  - `Barbosa-Filho et al. (2008)`
  - `Fiebiger (2018)`
- Role of *financial institutions*
  - `Foley (1987)`
  - `Taylor (2012)`
  - `Adrian & Shin (2010)`
  - `Stockhammer & Michell (2017)`

Related literature

(1) Demand & distributive regimes:

- What is the **mechanism** behind this pattern?
- **Profit-led demand** & **profit-squeeze distribution**
- **However**, have these regimes *weakened*?

Here, a comprehensive analysis

- **Real-financial** connections;
- Have these regimes **actually** weakened?

(2) Financial connections:

- *Residential investment* **leads** the business cycle
- Role of *financial institutions*

Data & empirics

Data & empirics

Four system variables:

- Labor share of income (ψ);
- Employment rate (e);
- Residential investment (g);
- Interest rate spread (s).

Data & empirics

Four system variables:

- **Labor share of income** (ψ)
  - Source: U.S. Bureau of Economic Analysis (BEA).
  - Ratio between total *compensation* (including public employment) and the sum of the latter and net *interest*, *rental* income, corporate *profits*, and capital *depreciation*.

- **Employment rate** (e)
  - Source: U.S. Bureau of Labor Statistics (BLS).
  - Remainder to 100 of the civilian unemployment rate (%).

Data & empirics

Four system variables:

- **Residential investment** (g)
  - Source: BEA's National Income and Product Accounts (NIPA), Table 1.1.3.
  - Index (2012=100).

- **Interest rate spread** (s)
  - Source: U.S. Federal Reserve (Fed) System.
  - Difference between the market yield on U.S. Treasury securities at **10-year** maturity rate and the **3-month** Treasury bills secondary market rate.

- **Sample period**: 1953Q2—2022Q4.
- Focus on the variables' **cyclical components**.

Data and empirics

How to *translate* **theory** into an **empirical** model?

Establish a **temporal ordering** of events:

1. **Residential investment** decisions (g) follow from **financial conditions** (s);
2. **Employment rate** (e) responds to **residential investment** decisions (g);
3. The **wage share** (ψ) is the last variable to respond, after **employment** (e) changes.

Data & empirics

The model is estimated using **Bayesian inference**:

$$P(\theta \mid y) = \frac{P(\theta)\ P(y \mid \theta)}{P(y)}$$

where:

- $P(\theta)$: *prior* probability of an unknown parameter θ;
- $P(y \mid \theta)$: *likelihood* function;
- $P(y)$: normalizing constant;
- $P(\theta \mid y)$: posterior (updated) probability.

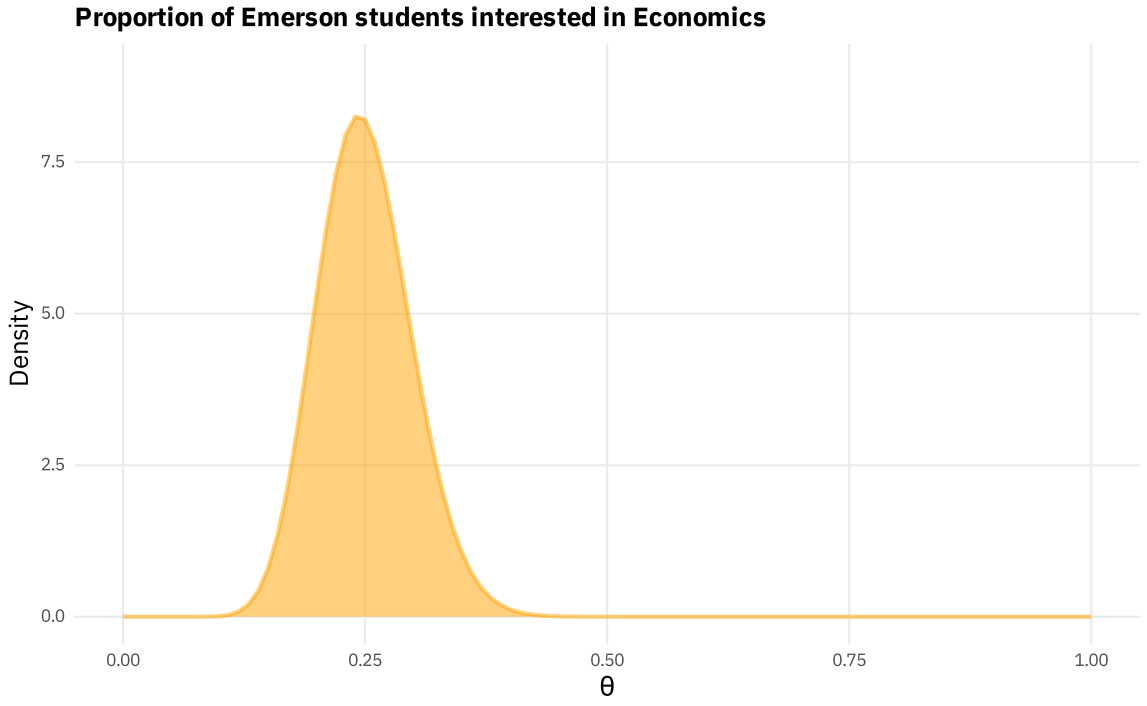
A quick example

Suppose one is curious about the **proportion** of Emerson students who are *interested in Economics*.

For whatever reason (e.g., previous research, personal beliefs, etc.), one think this proportion is around **25%**.

A quick example

This can be represented through a **probability distribution**:



A quick example

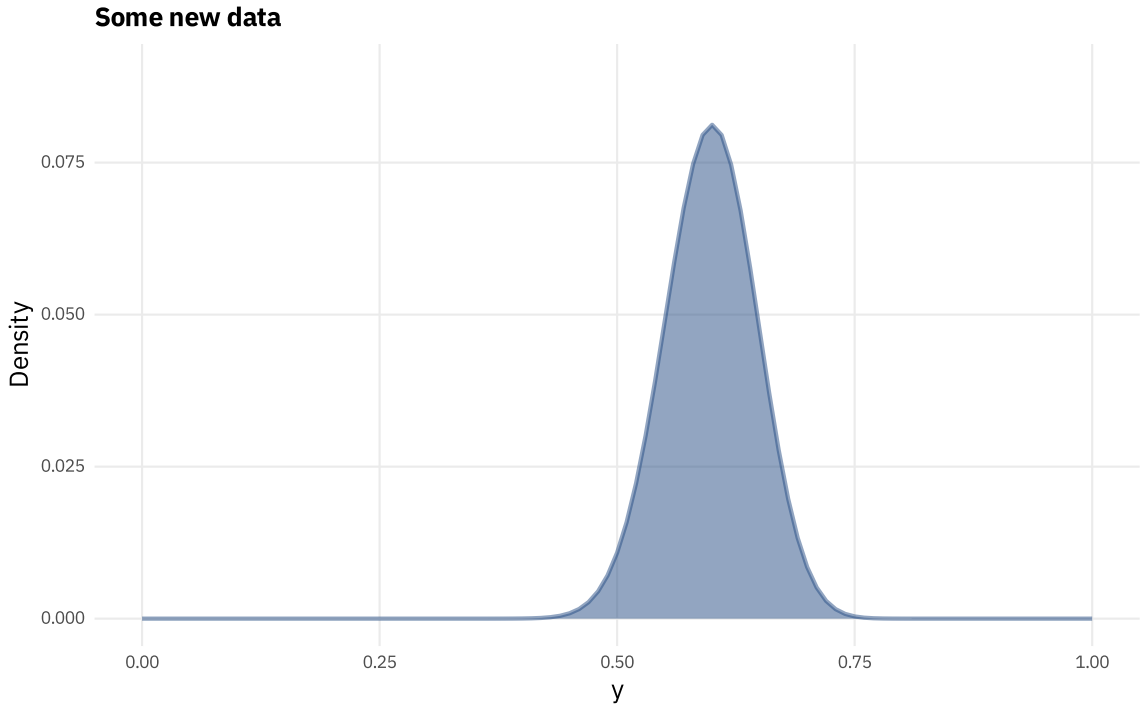
This **prior** belief can be updated in light of **new data**.

Then, suppose a **new survey** is conducted, asking a sample of **100 students** whether they are interested in Economics or not.

And **60%** of them say they *are* interested in the subject.

A quick example

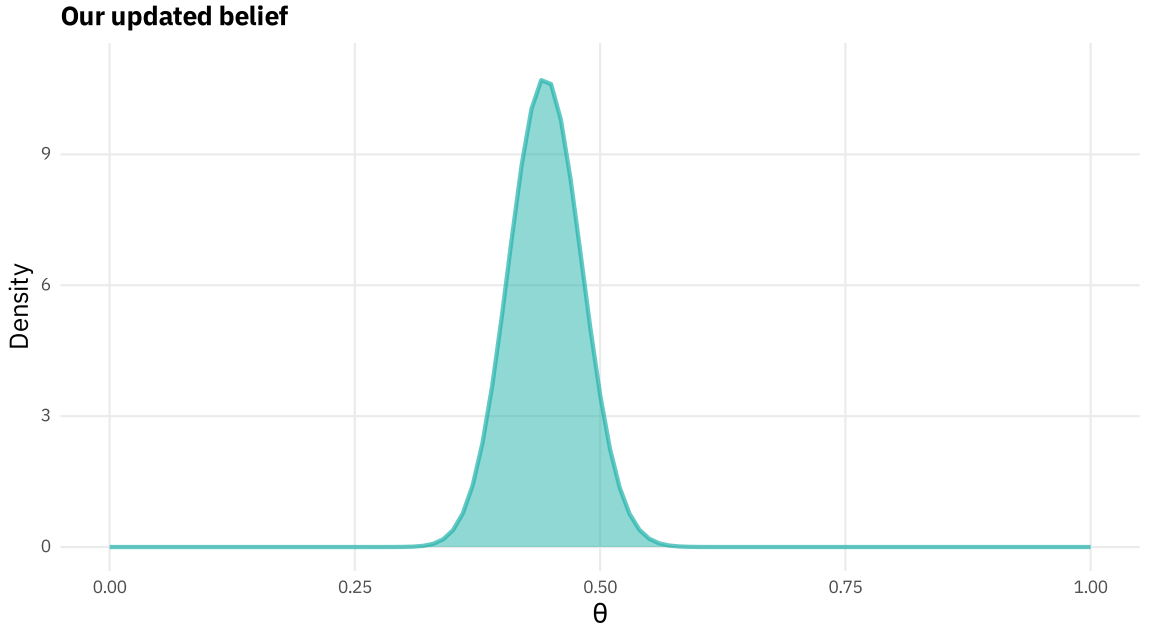
This survey's results can also be presented through a **probability distribution**:



A quick example

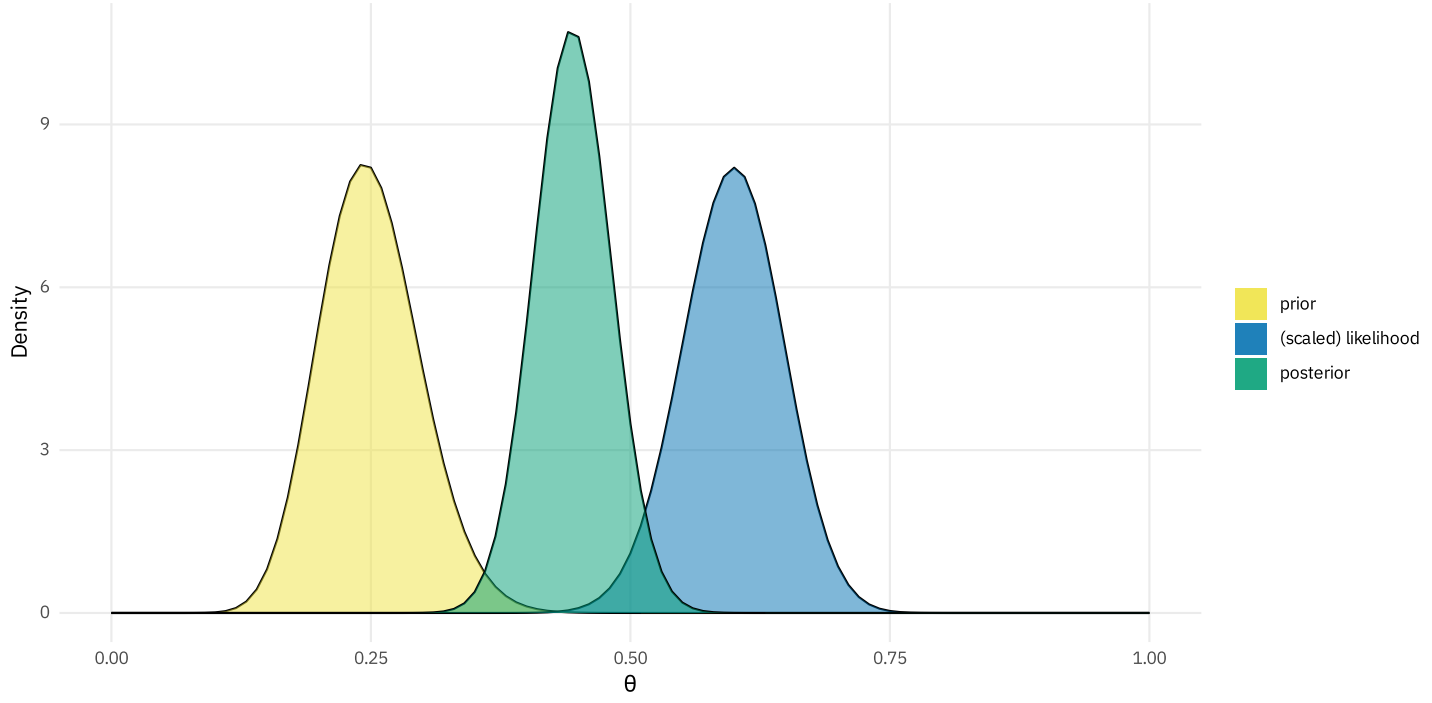
By **combining** our prior belief with these newly gathered data, we **update** our prior knowledge:

A **posterior probability**!



A quick example

All in one picture...



Data & empirics

- Procedure developed by `Primiceri (2005)`;
- Algorithm outlined in `Del Negro & Primiceri (2015)`.

Results

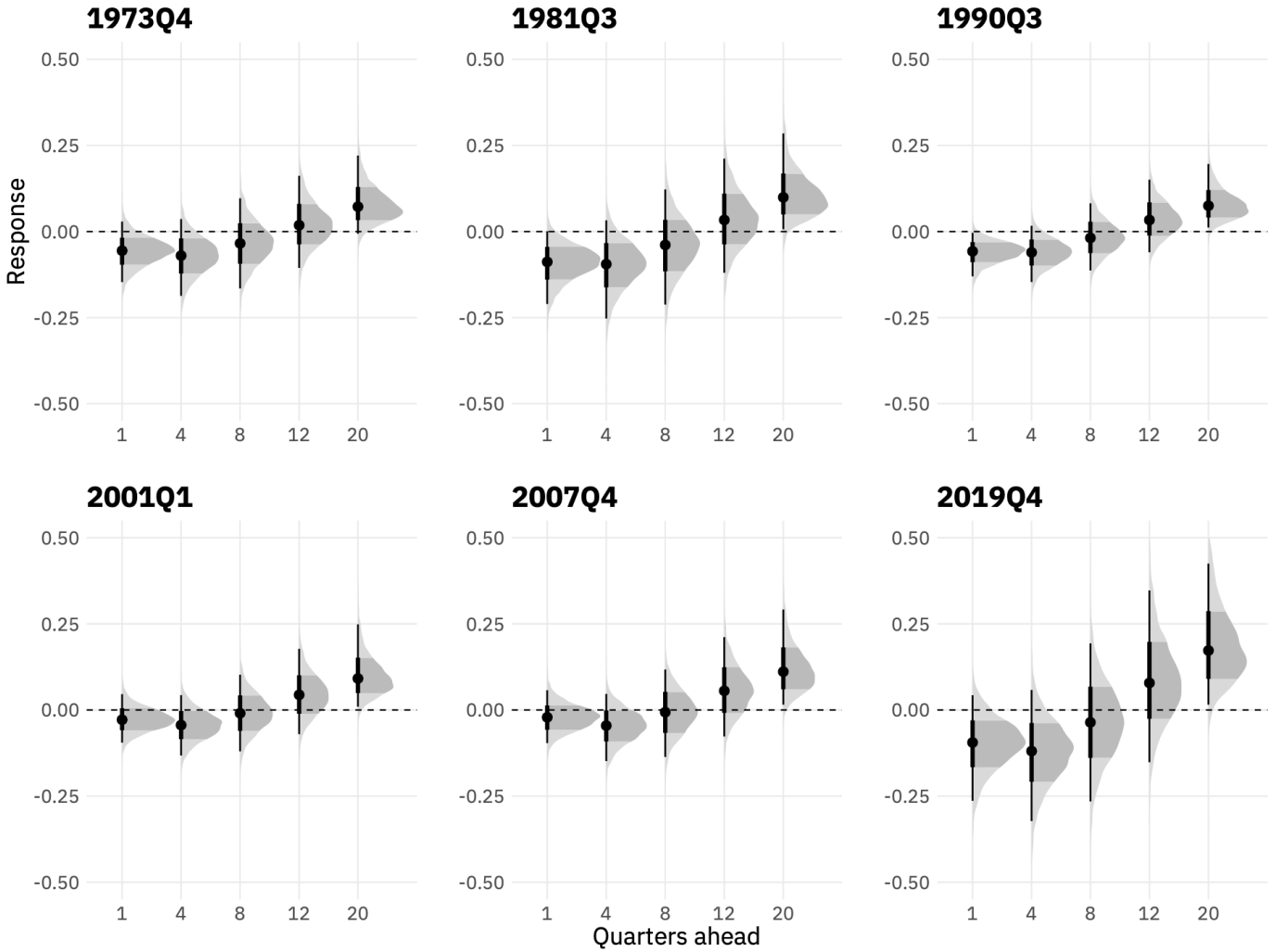
Results

The unknown parameters *(θ)* are the **responses** to macroeconomic **shocks**.

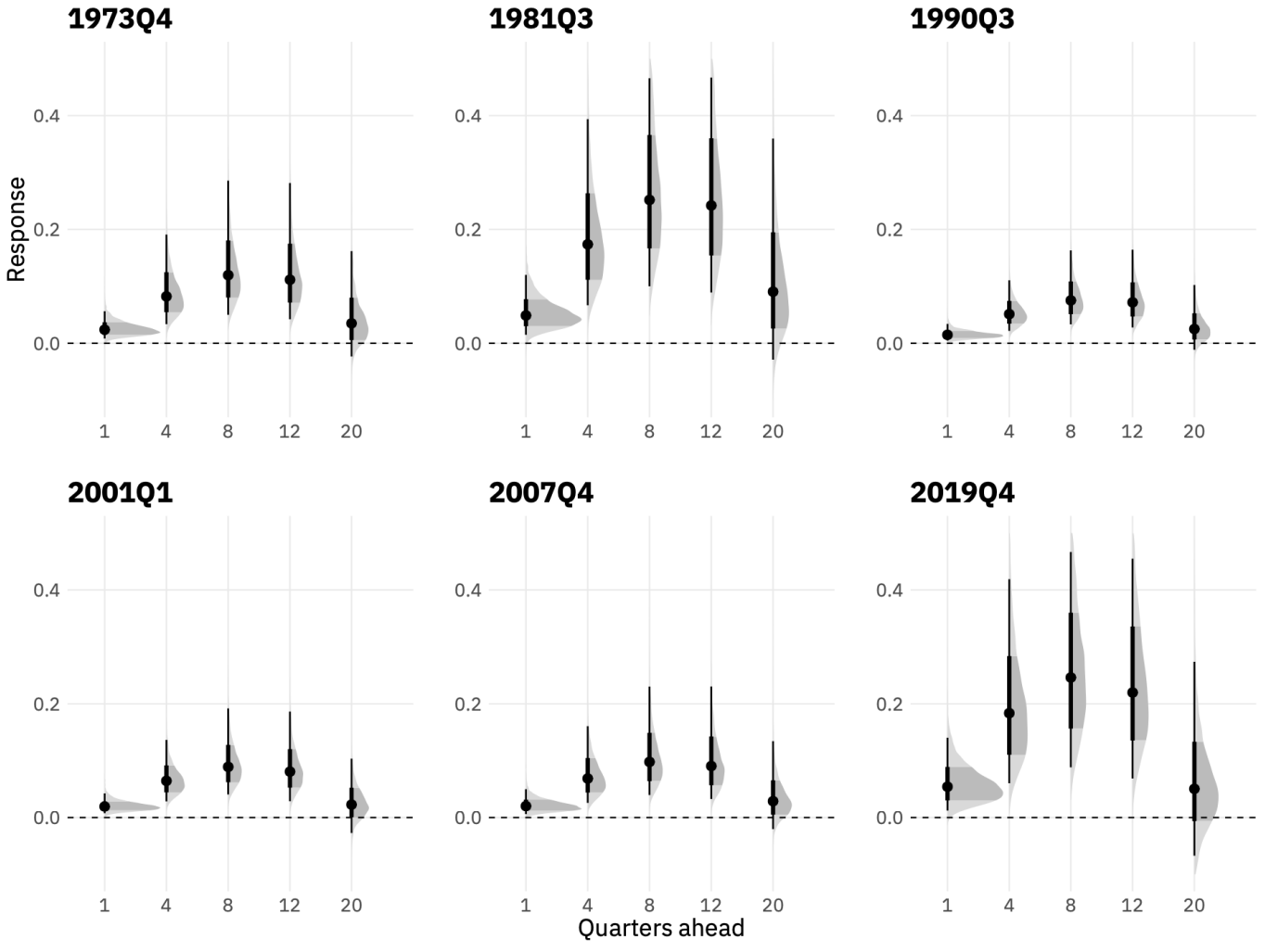
Impulse-Response Functions (IRFs) to visualize the response of each variable to different shocks over a time horizon.

- Subfigures for *six* NBER business cycle peaks: `1973Q1`, `1981Q3`, `1990Q3`, `2001Q1`, `2007Q4`, and `2019Q4`;
- Horizon divided in *five* different quarters ahead: 1, 4, 8, 12, and 20;
- Responses consisting of their entire **posterior** densities at each quarter ahead
    - Highlighting its posterior *median* and an underlying 66% shaded density region.

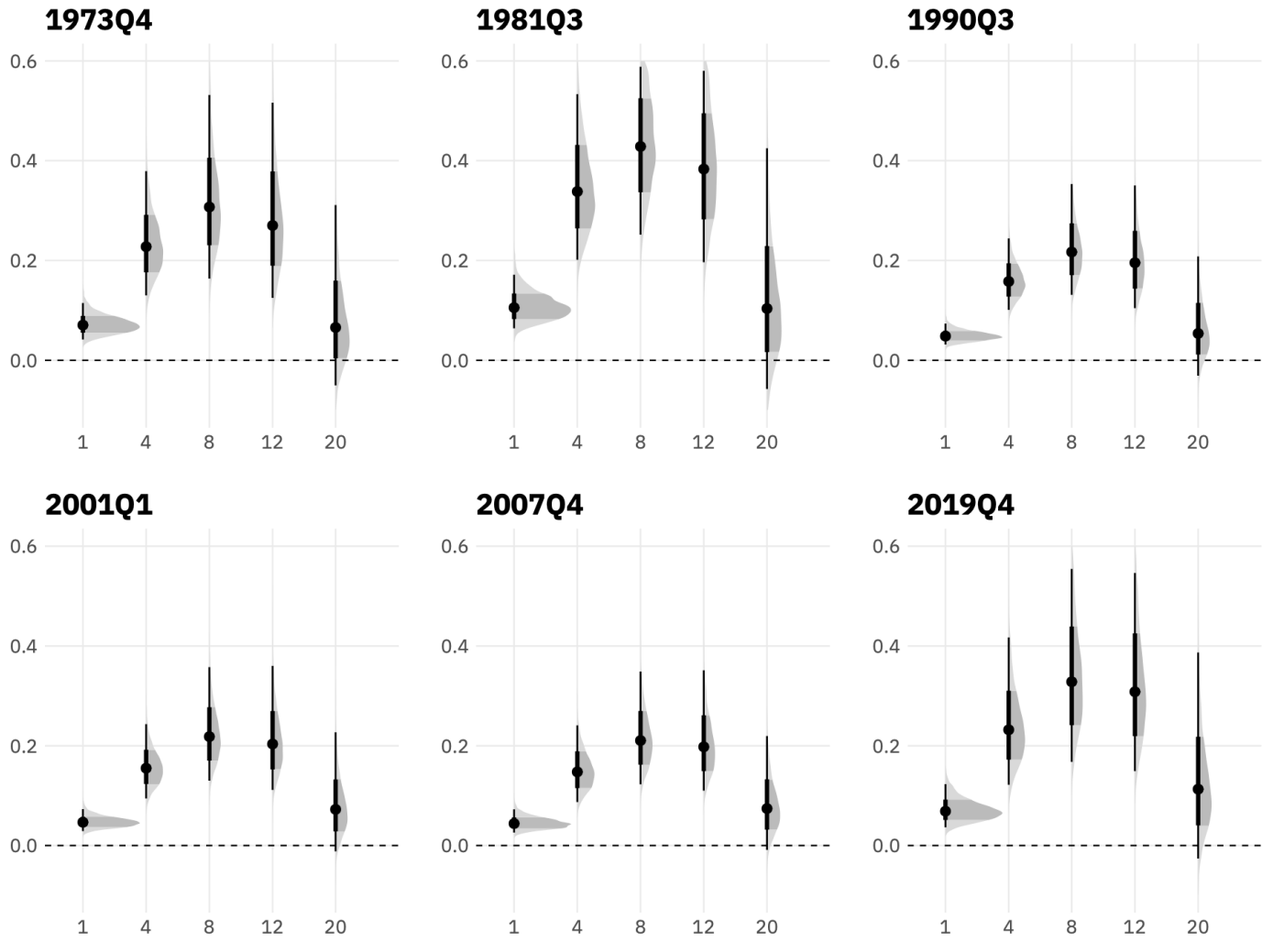
Response of employment to a labor share shock



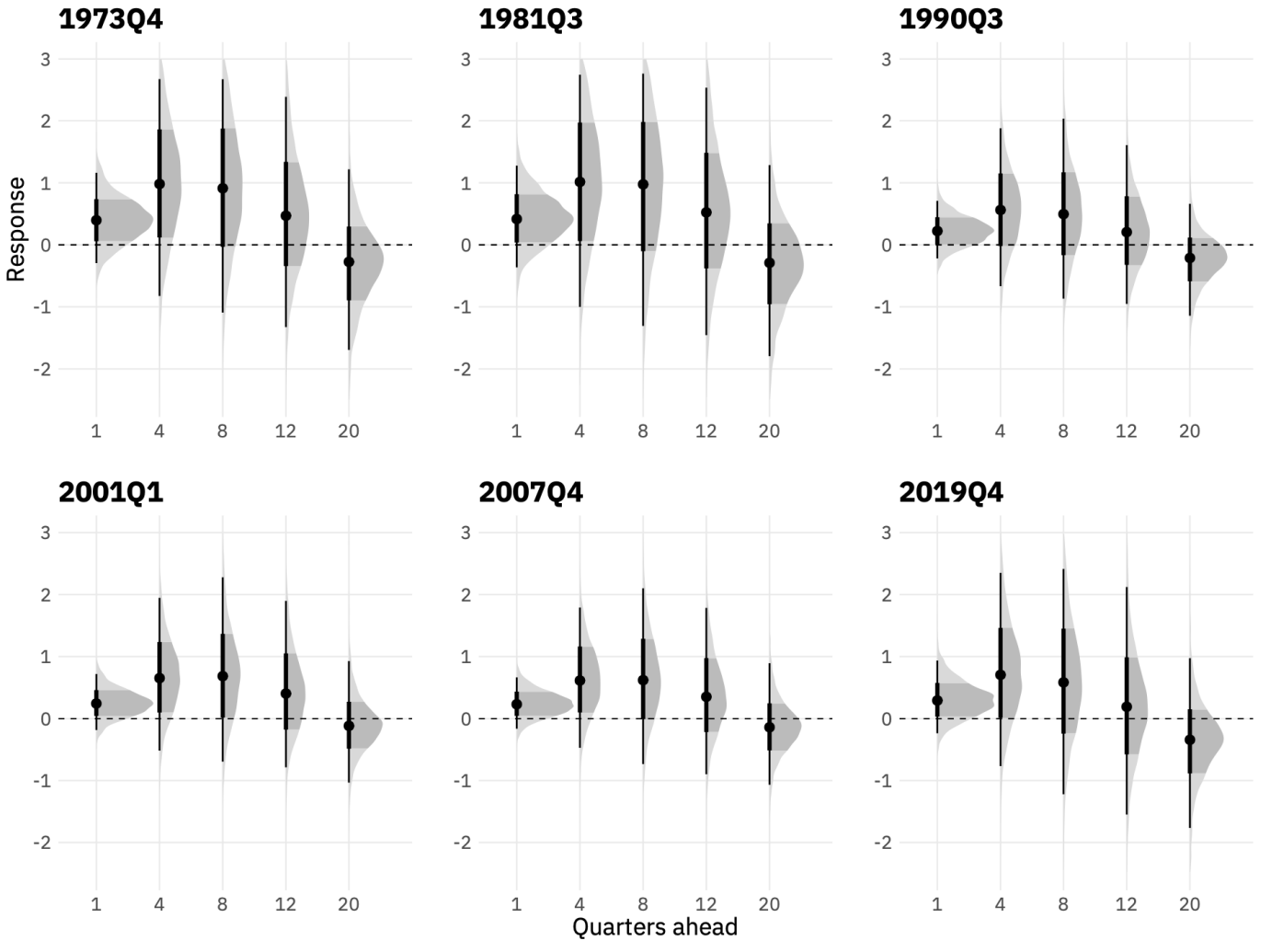
Response of labor share to employment shock



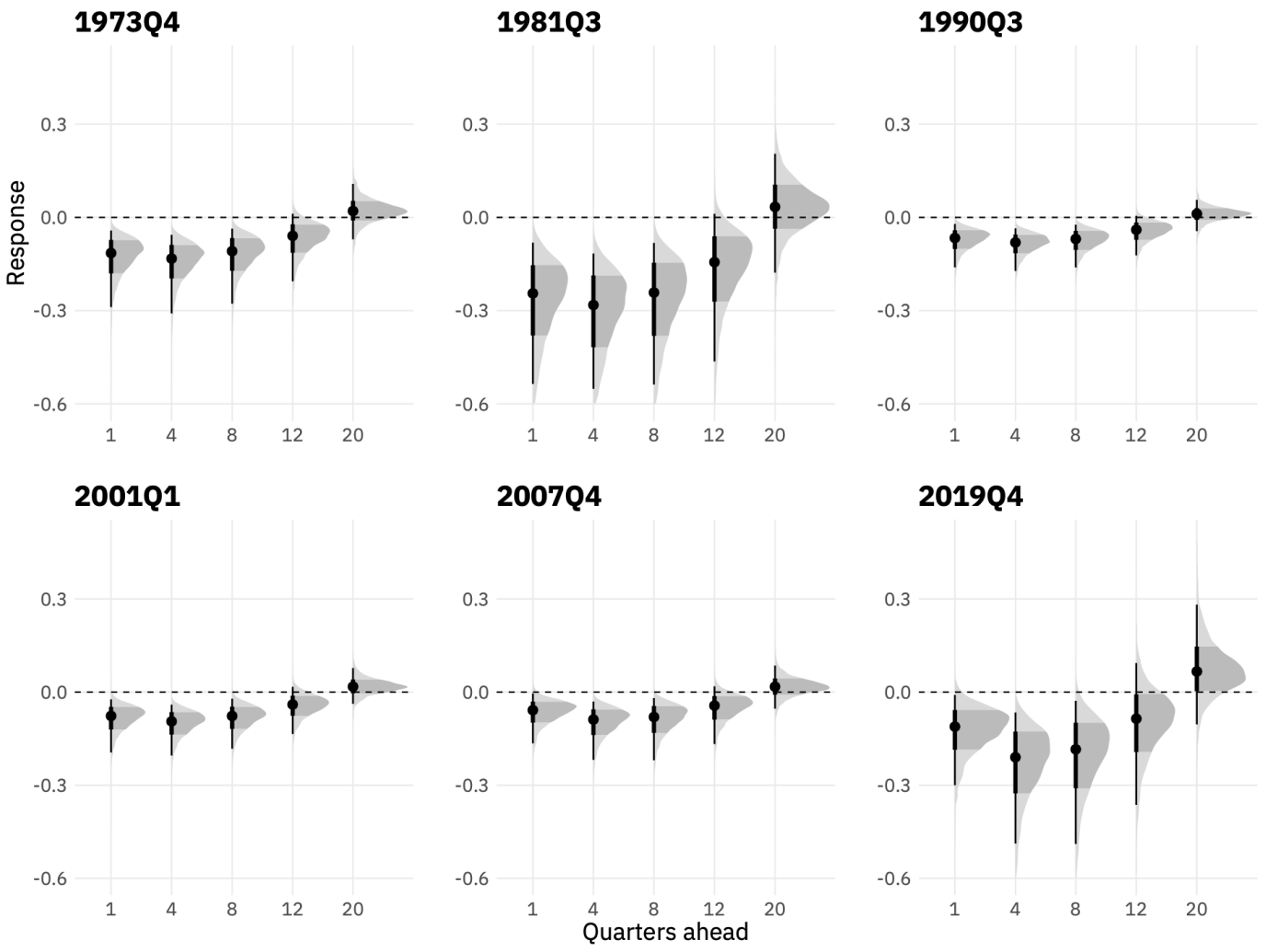
Response of employment to investment shock



Response of investment to financial shock



Response of term spread to employment shock



Conclusions

Conclusions

Key findings:

- The U.S. economy's demand regime has become **less** *profit-led* over the past cycles;
- *Profit-squeeze* distribution has **weakened** over the same period;
- The **volatility** (variance) of macroeconomic shocks has *clearly* decreased after the "Great Moderation" years.

What do these conclusions suggest about **financial** and **labor market** *institutions*?

Thank you!

Technical appendix

Technical appendix

A **Vector Autoregressive** (VAR) model with **time-varying** parameters and **stochastic volatility**:

$$\mathbf{y}_t = X_t \beta_t + A_t^{-1} \Sigma_t \varepsilon_t$$

where $\mathbf{y}_t = (\psi_t, e_t, g_t, s_t)'$ is a row vector of endogenous variables.

The key estimates are contained in ε_t, the vector of **macroeconomic shocks** (residuals).

- **Ordering** matters!

A **recursive** identification:

$$\psi_t \rightarrow e_t \rightarrow g_t \rightarrow s_t$$

In words:

- Finance (s) ***leads*** (i.e., precedes) residential investment (g);
- Residential investment (g) ***leads*** employment (e);
- Employment (e) ***leads*** the labor share (ψ).

Technical appendix