Skewed Business Cycles

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Introduction

▶ During the Great Recession (2007–09)

- <u>Mean</u> wage income change for US male workers: **−6.5%**

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- <u>Median</u> wage income change for US male workers: **+0.1%**

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Business Cycles: From Aggregates to Distributions

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  ■ Further: One-in-ten workers saw

   ▶ 50+% rise in wage income
    ▶ 60+% fall in wage income

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► <u>Today:</u> Talk about Firms.

  ① Does skewness of firm growth rates fall in recessions?

 ② Does it matter for business cycle analysis?

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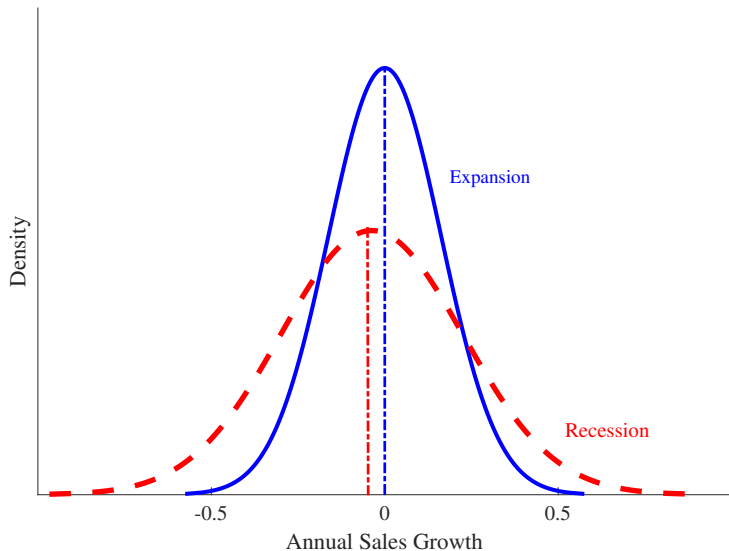
  2 Does it matter for business cycle analysis? Yes
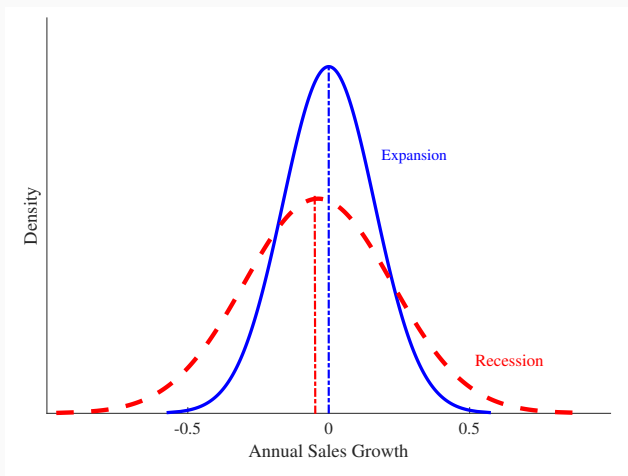
Two Perspectives on Business Cycles
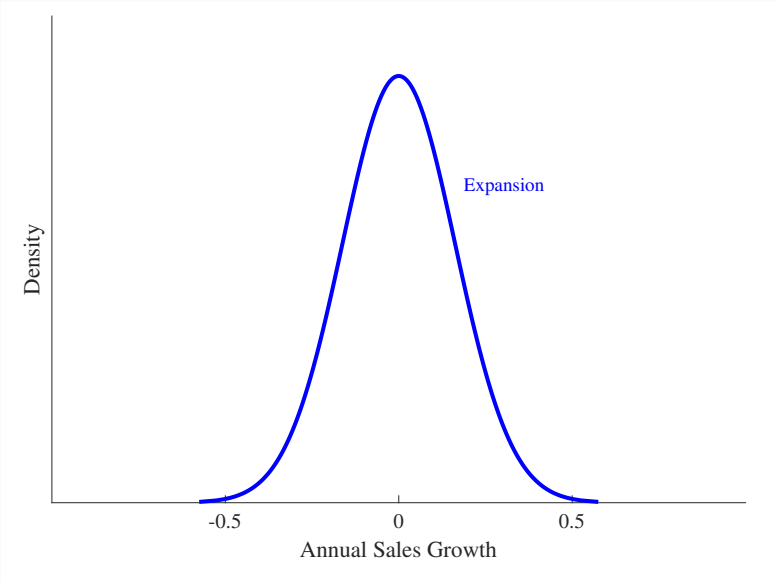
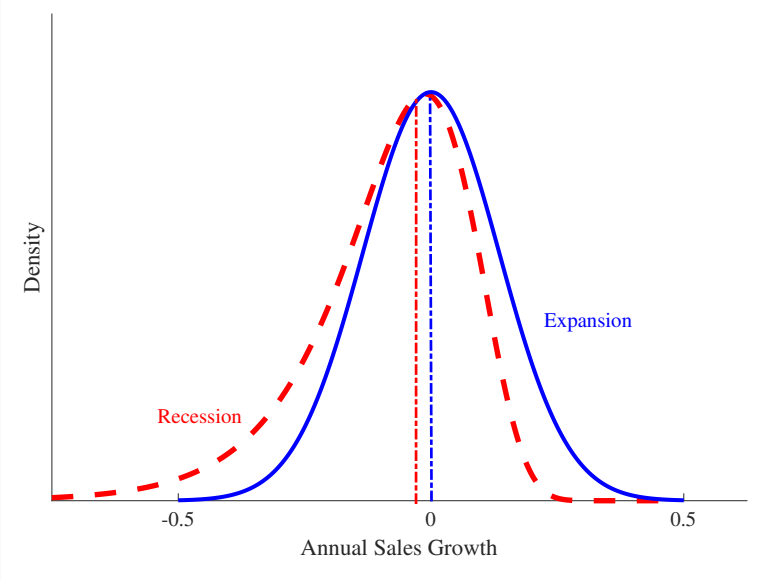# Two Perspectives on Business Cycles
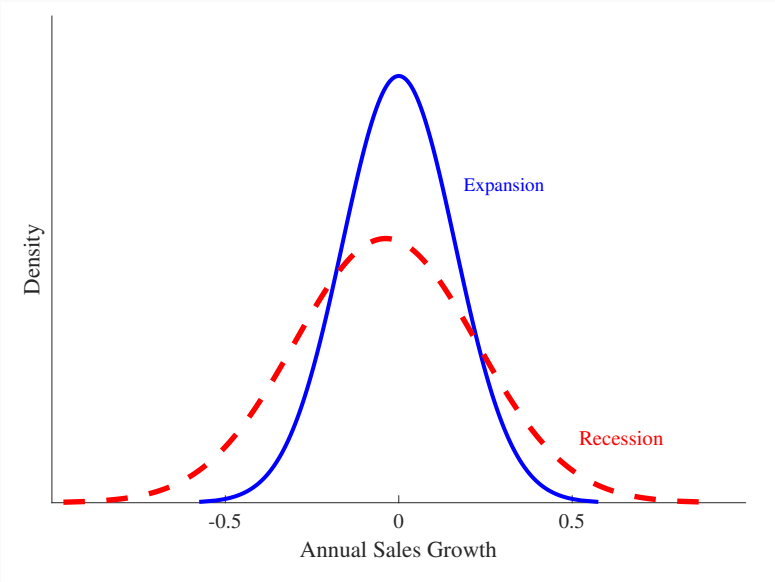
▶ Studied extensively going back 20+ years.
  ■ Both for workers (income shocks) and firms (TFP shocks)
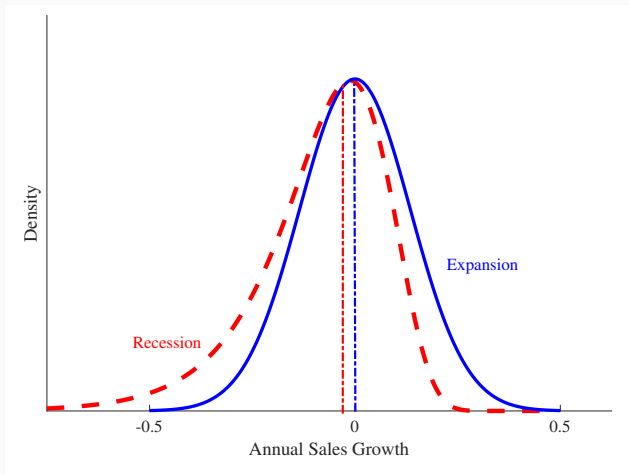
▶ Skewness strongly procyclical for workers (e.g., changes in wage income and hours)

Empirical Analysis

▶ Study the distribution of firm growth rates and productivity
Sales growth, employment growth, TFP growth, and stock returns

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Results: New Business Cycles Fact

▶ In recessions dispersion increases: left tail stretches out whereas the right tail contracts

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  Across countries, industries, and firm characteristics (size, age, etc.)

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Across countries, industries, and firm characteristics (size, age, etc.)

▶ Skewness shock correlates with persistent decline in production and employment (VAR evidence for the United States)

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Quantitative Model

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- ► Risk averse entrepreneurs

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  Borrowing constrains and adjustment costs to capital

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▶ Decline in Consumption (1.0%), Investment (15%), Hours (1.5%)

▶ A combined variance+skewness shock generates → 2.0% decline in Output

Empirical Results

Data Sources

United States

▶ Census LBD: Annual employment, age, and industry
   Panel of Entire nonfarm private sector firms for 1976-2015

▶ Census ASM/CMF: Annual employment, sales, and productivity
   Panel of manufacturing establishments for 1977-2016

▶ Compustat/CRSP: Quarterly and annual sales, employment, and stock prices
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Cross-Country

- ▶ BvD Osiris: Annual sales and employment
  Panel of publicly traded firms in 40 countries for 1989-2015
- ▶ Global Compustat: Stock prices
  Panel of publicly traded firms in 28 countries for 1970-2017
- ▶ BvD Amadeus: Annual sales, employment, and productivity
  Panel of private and publicly traded firms in 17 countries for 1989-2015

Empirical Results

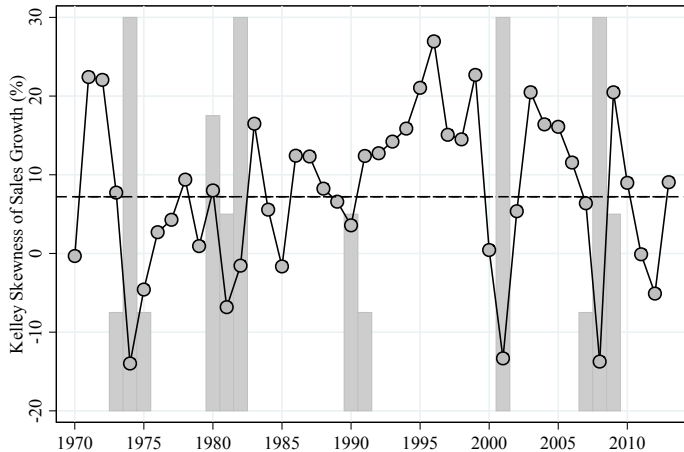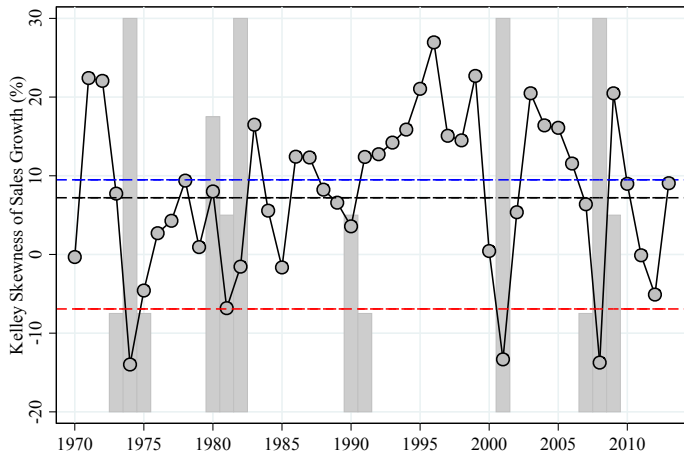# Sales Growth Becomes Left-Skewed During Recessions
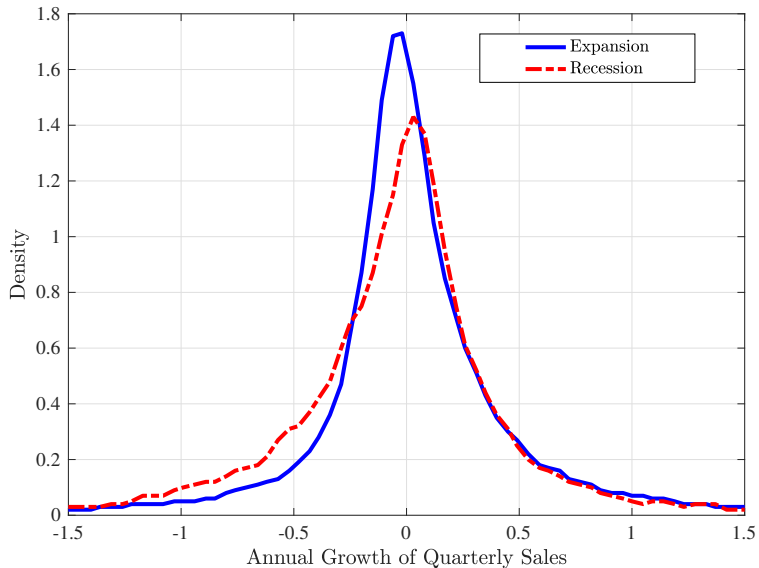
Skewness of Sales Growth (Compustat)
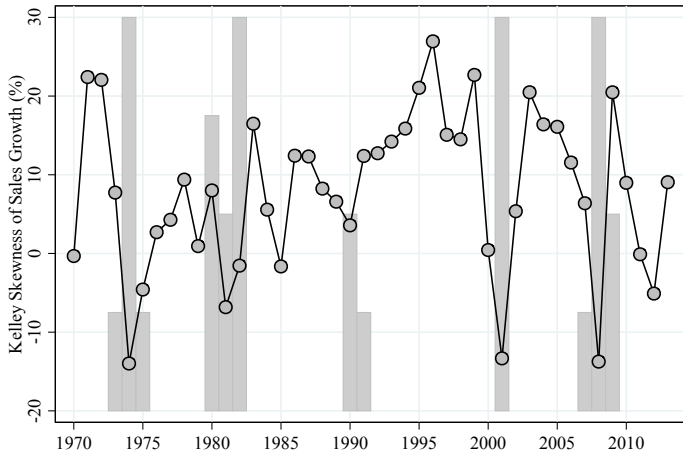
Source: Authors' calculations using sample of firms with +10 yrs of data from Compustat.
Growth rate is log-change between years t and t+1. Gray bars are fraction of recession quarters in a year.

Figure 1: SKEWNESS OF FIRM-LEVEL SALES GROWTH IS PROCYCLICAL

Skewness of Sales Growth (Compustat)

Source: Authors' calculations using sample of firms with +10 yrs of data from Compustat.
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Figure 2: SKEWNESS OF FIRM-LEVEL SALES GROWTH IS PROCYCLICAL

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Figure 3: SKEWNESS OF FIRM-LEVEL SALES GROWTH IS PROCYCLICAL
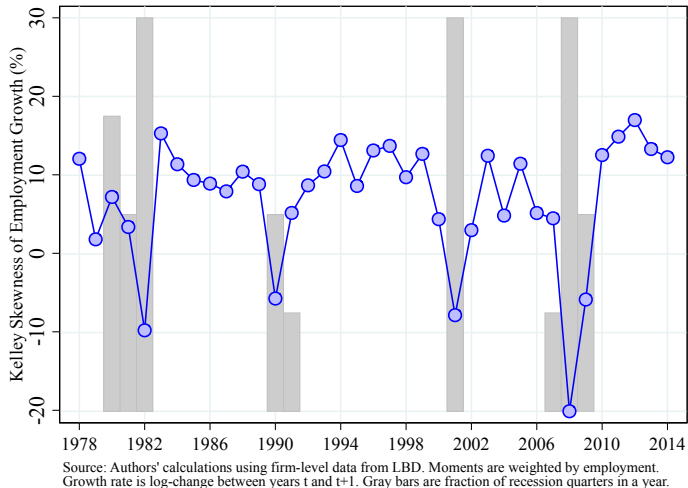
Same Pattern for Employment Growth (Census LBD)

Source: Authors' calculations using firm-level data from LBD. Moments are weighted by employment. Growth rate is log-change between years t and t+1. Gray bars are fraction of recession quarters in a year.

Figure 4: SKEWNESS OF FIRM-LEVEL EMPLOYMENT GROWTH IS PROCYCLICAL

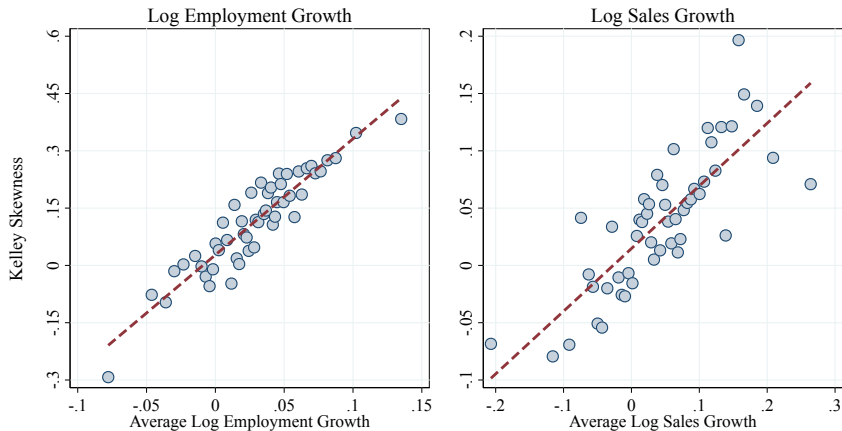# Skewness is Procyclical in a Panel of 44 Countries

Figure 5: THE SKEWNESS OF FIRMS' OUTCOMES IS LOWER IN INDUSTRY CYCLES

Skewness of Firm-Level TFP Shocks is Procyclical

Figure 6: THE SKEWNESS OF FIRMS' PRODUCTIVITY GROWTH IS PROCYCLICAL

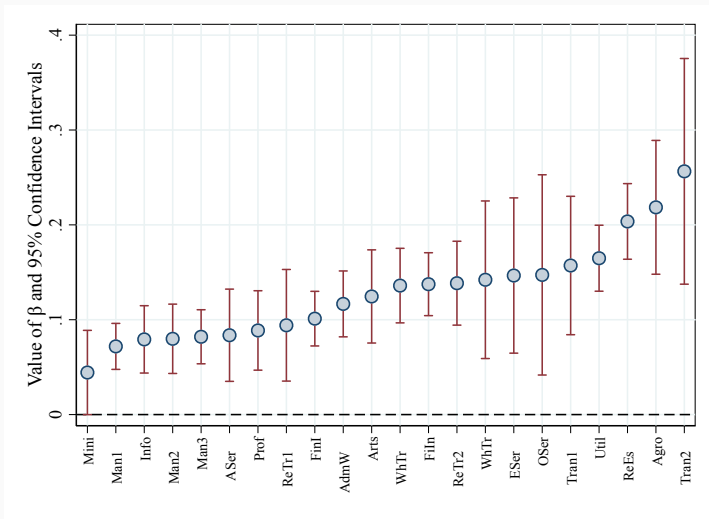# **Within-Industry** Skewness is Procyclical (Compustat)

Figure 7: WITHIN-INDUSTRY SKEWNESS β POSITIVE FOR ALL INDUSTRIES

What is the Macro Impact of a Change in Skewness?

Estimate range of VARs using monthly data for the United States

$$y_t = v + A_1 y_{t-1} + ... + A_{12} y_{t-12} + Bx_t + u_t$$

Variables and order

1. Log SP500	5. Log CPI
2. Volatility Measure	6. Hours
3. Skewness Measure	7. Log Employment
4. Fed Funds rate	8. Log Industrial Production

▶ Volatility: cross-sectional P90-P10 of stock returns in a month

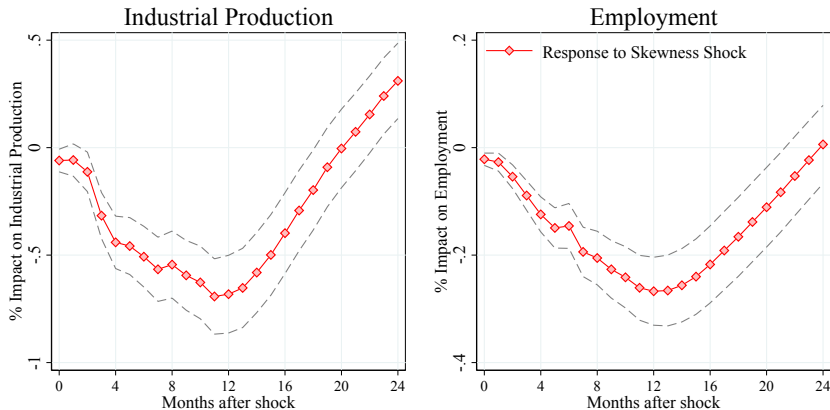▶ Skewness: cross-sectional Kelley skewness of stock returns

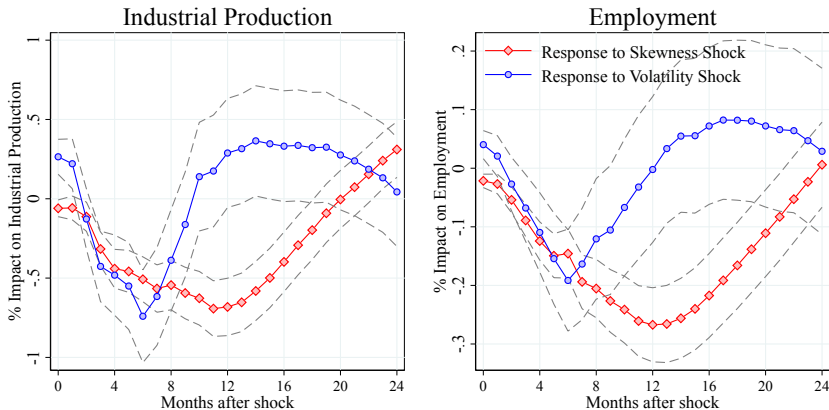▸ Details ▸ Local Projections ▸ Mean ▸ Volatility

Skewness Shock: **Persistent** Drop in Aggregates

Source: Authors' calculations using aggregate time series and firm-level stock returns from CRSP. Impact of two-std shock of skewness and volatility.

Figure 8: EFFECT OF SHOCK TO SKEWNESS ON MACRO AGGREGATES

Skewness and Volatility Shock: Persistent Drop in Aggregates

Source: Authors' calculations using aggregate time series and firm-level stock returns from CRSP. Impact of two-std shock of skewness and volatility.

Figure 9: Effect of shock to skewness and volatility on Macro Aggregates

Quantitative Model

Small Open Economy with two groups of agents

▶ Risk averse entrepreneurs: produce, own the capital, rent labor, and consume

▶ Hand-to-mouth households: supply labor and consume

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▶ Idiosyncratic TFP shocks with time-varying risk: variance and skewness

▶ Capital adjustment costs

▶ Cannot borrow: self-financing firms

▶ Portfolio choice: can save in risk-free asset

Non linearities in the response of entrepreneurs

Outline of the Model

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Figure 10: Skewness Shock: Persistent Decline on Macro Aggregates
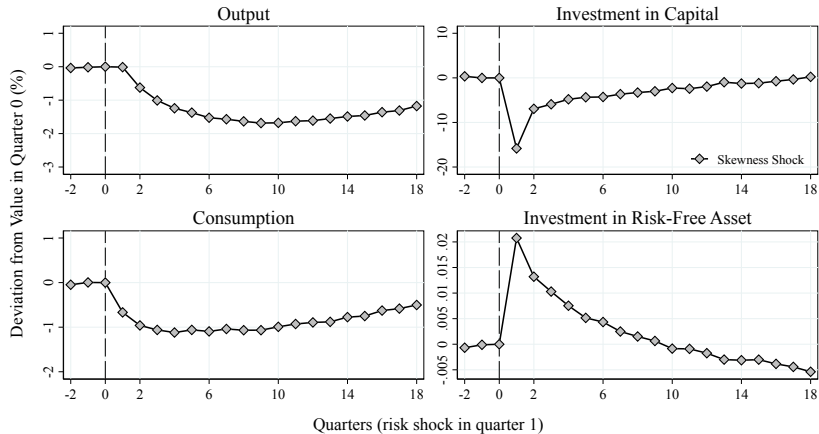
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- Entrepreneurs move resources from risk capital to risk-free asset

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  - ■ Similar to uncertainty shocks: firms freeze investment

- ▶ Precautionary savings in risky asset from risk aversion
 - ■ Entrepreneurs move resources from risk capital to risk-free asset

- ▶ Muted Oi-Hartman-Abel effect
  - ■ Uncertainty shock: same proportion of winners and losers Firms like more variance: higher variance increases value of good projects
  - ■ Skewness shocks loads increase of dispersion on big losers: micro disasters

Skewness + Variance Shock

Figure 11: SKEWNESS AND VARIANCE SHOCK REINFORCE DECLINE ON MACRO ACTIVITY
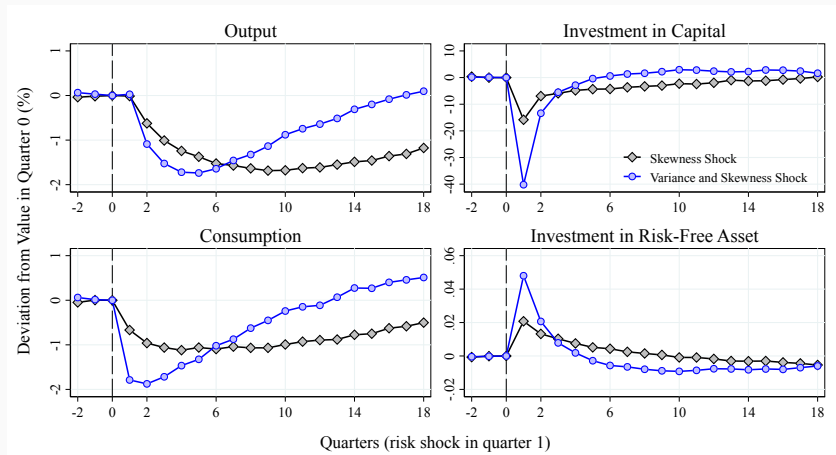
Conclusions

Empirical Evidence

► We document procyclical skewness of growth rates of firms' outcomes

► In recessions the left tail stretches out and right tail contracts

► Robust feature of business cycles: across industries, countries, firm size/age

► VAR: persistent decline in aggregate economic activity

Quantitative Model

► Skewness shock generates persistent decline in macroeconomic activity

► Skewness shock generates 1.7% decline in output

▸ More