

# Heterogeneity and Monetary Policy Transmission: Empirical Exercises Using Local Projection

Wentao (Eric) Zhou

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# Introduction

- ▶ Traditionally, we estimate the effect of monetary policy shock in a multivariate VAR system
  - ▶ Aggregate data on I, C, Y, CPI and so on, from FRED or FoF.
  - ▶ Identifying monetary policy shocks by SVAR.
  - ▶ See Christiano et al. (1999).

SVAR restricts us to aggregate data, however, households /firms/sectoral heterogeneity might be very important for the transmission of monetary policy  $\Rightarrow$  You might want to work with micro-level panel data

- ▶ A recent trend:
  - ▶ Micro-level panel data (COMPUSTAT or CEX)
  - ▶ Externally identified monetary policy shocks (eg. HFI shocks)
  - ▶ Estimating IRFs using local projection

# Today

- ▶ Briefly introducing some recent papers that emphasizing heterogeneity in monetary policy transmission.
- ▶ Discussing two specifications in details.
- ▶ How I use them in my field paper.
- ▶ Tips: how to get a quick start

# Heterogeneity and Monetary Policy Transmission

## The effect on consumption:

- ▶ Mainly driven by households with mortgages (and outright home-owners do not adjust expenditure at all)  $\implies$  Cloyne et al. (RES, 2019)
- ▶ Young people who refinance their mortgages  $\implies$  Wong (R&R AER, 2019)

## The effect on fixed capital investment:

smaller fixed capital accumulation/capital expenditure for

- ▶ Firms with more existing bank loans  $\implies$  Ippolito et al. (JME, 2018)
- ▶ Firms with higher default probability  $\implies$  Ottonello and Winberry (R&R ECMA, 2019)
- ▶ Young firms that do not pay dividends  $\implies$  Cloyne et al. (NBER WP, 2018)
- ▶ Firms with lower liquidity  $\implies$  Jeenas (2019)

# Empirical Specification 1:

- ▶ Estimating the differences in how firms respond to monetary policy shocks conditional on their firm characteristics before the shock.
- ▶ Ottonello and Winberry(2019): looking at heterogeneous responses of capital accumulation across firms with default probability before the shock.

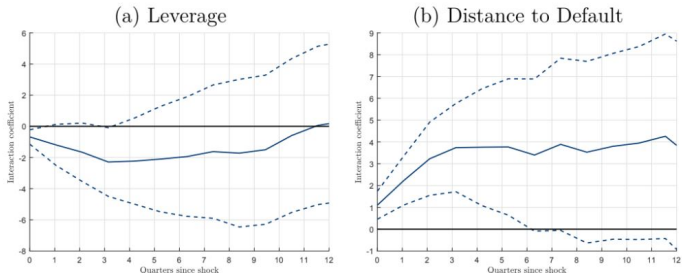
$$\log k_{jt+h} - \log k_{jt} = \alpha_{jh} + \alpha_{sth} + \beta_h x_{jt-1} \epsilon_t^m + \Gamma'_h Z_{jt-1} + e_{jt}$$

- ▶ j for firms, t for quarters, h for horizons
- ▶  $\alpha_{jh}$ : firm fixed effect
- ▶  $\alpha_{sth}$ : sector-by-quarters firm fixed effect
- ▶  $\epsilon_t^m$ : HFI monetary policy shock
- ▶  $x_{jt-1}$ : firm characteristics before the shock
- ▶  $Z_{jt-1}$ :  $x_{jt-1}$  and other firm-level controls
- ▶ Two-way clustered standard errors (by firm and time)
- ▶  $\beta_h$ : heterogeneous effect over h horizons

# Ottonello and Winberry (2019)

- ▶ Considering expansionary monetary policy shocks (interest rate goes down)
- ▶ Default probability: two proxies, leverage ratio and Distance to Default
- ▶ High leverage or low Distance-to-Default  $\implies$  high default probability

FIGURE 1: Dynamics of Differential Response to Monetary Shocks



- ▶ High leveraged firms experience lower capital accumulation.
- ▶ High Distance-to-Default firms experience higher capital accumulation.

## Empirical Specification 2:

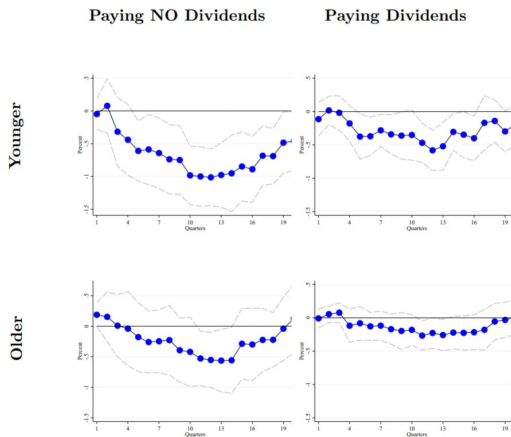
- ▶ Estimating IRFs of different types of firms
- ▶ Cloyne et al. (2018): young firms paying No dividends are driving the aggregate effect of monetary policy on capital expenditure (I)

$$\log I_{jt+h} - \log I_{jt} = \alpha_{i,h} + \sum_{g=1}^G \beta_h^g \cdot I[x_{i,t-1} \in g] \cdot \epsilon_t^M + \sum_{g=1}^G \gamma_h^g \cdot I[x_{i,t-1} \in g] + \mu_{i,t+h}$$

- ▶  $\alpha_{i,h}$  : firm fixed effect
- ▶  $\epsilon_t^m$ : HFI monetary policy shock
- ▶ Sorting firms into different groups  $g$  based on their types  $x_{i,t-1}$ .
- ▶ Running local projection separately.

## Cloyne et al. (2018)

- ▶ Considering contractionary monetary policy (interest rate goes up)
- ▶ Sorting firms into four different groups



- ▶ Pretty easy to see that decrease in capital expenditure mainly happens among young firms that do not pay dividends.



# My field paper

- ▶ Interested in how product market frictions affect monetary policy transmission.
- ▶ Focusing on a particular type of frictions:  $\frac{SG\&A}{SALES}$ 
  - ▶  $SG\&A$  is considered as fixed cost of production.(relative to variable costs)
  - ▶ High  $\frac{SG\&A}{SALE}$  ratio means it is much more expensive for a firm to sell one dollar good.
  - ▶ High  $\frac{SG\&A}{SALE}$  ratio  $\implies$  low operating efficiency, as in Gilchrist et al.(AER, 2017)
- ▶ Focusing on the effect of finished-goods inventories (a part of output).

# Equation 1

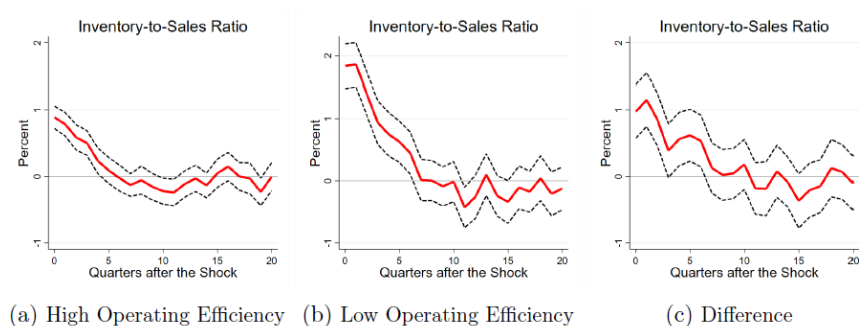
- ▶ One-period ahead version of equation 1
- ▶ After contractionary MP shock, firms with high *SG&A* ratio adopt a higher inventory-to-sales ratio than firms with low *SG&A* ratio.
- ▶ Robust to a variety of firm-level heterogeneity.

Heterogeneous Responses to a Contractionary MP Shock (Retail and Wholesale)								
Dep. Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IS ratio								
$\frac{XSGA}{SALE} \times \epsilon_t^M$	0.011** (2.071)	0.011** (2.070)	0.011** (2.037)	0.011** (2.078)	0.012** (1.984)	0.011** (2.061)	0.011** (1.986)	0.011** (1.984)
Leverage $\times \epsilon_t^M$		-0.001 (-0.292)						-0.001 (-0.293)
Log Size $\times \epsilon_t^M$			0.000 (0.115)					
Liquidity $\times \epsilon_t^M$				0.008 (0.509)				
Cash Flow $\times \epsilon_t^M$					0.027 (0.707)			
Asset Growth $\times \epsilon_t^M$						-0.004 (-0.272)		
Sales Growth $\times \epsilon_t^M$							-0.009 (-1.063)	-0.009 (-1.061)

## Equation 2

- ▶ Still, high  $SG\&A$  ratio firms adopt a higher IS ratio.
- ▶ Sorting firms into efficient firms (below median  $SG\&A$  ratio) and inefficient firms (above median  $SG\&A$  ratio).

Figure 1: Heterogeneous Responses to Monetary Policy by Operating Efficiency



## Tips: how to get started quickly if you are interested

- ▶ Replication files of Ramey(2016): on her websites
- ▶ Monetary policy shocks : Romer and Romer (2004) and HFI monetary policy
- ▶ Transforming her STATA codes for location projection (OLS) into panel regression version.
- ▶ Jorda's website also provides codes for different versions of LP.