Monetary Policy and Innovation

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Traditional view: monetary policy has short-run effects; neutral in long run

- **Another view: monetary policy $\Rightarrow$ innovation $\Rightarrow$ longer-term impact**
  via demand & financial conditions

This paper: empirical analyses of how monetary policy affects innovation

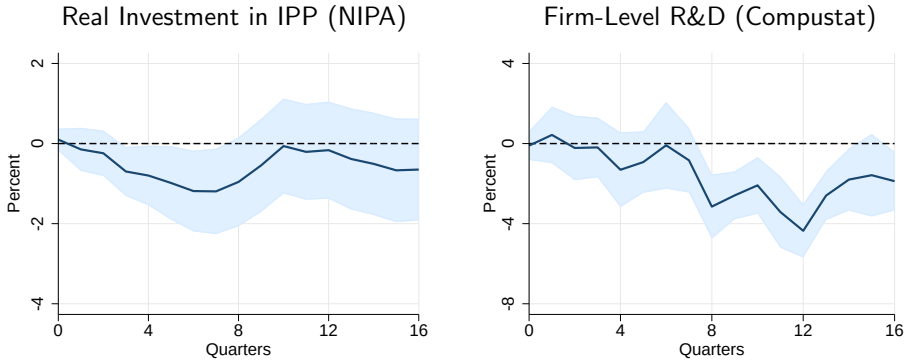
- Little systematic evidence so far
- VC investment rose 20% annually 2012 to 2021; fell 30% annually since 2022

We find: after 100 bps tightening shock à la Romer and Romer (2004)

1. Both innovation spending and patenting in important technologies decrease
2. Aggregate innovation index declines by up to 9% in next 2 to 4 years
3. Implies lower output by 1% and TFP by 0.5% after another 5 years

Result 1: R&D spending changes by 1% to 3%

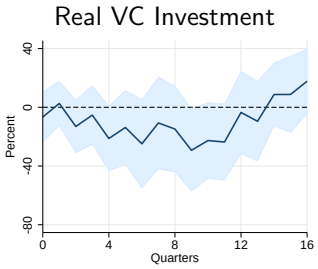
Response to 100 bps monetary policy shock

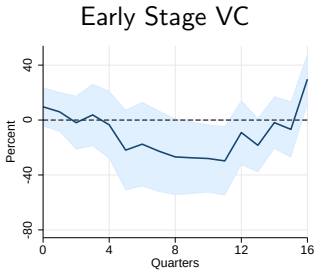


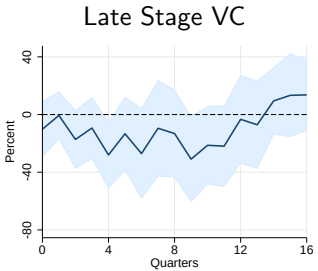
All impulse responses use local projections. Shaded areas are 90% confidence intervals.

Result 2: VC investment changes by up to 25%

Response to 100 bps monetary policy shock

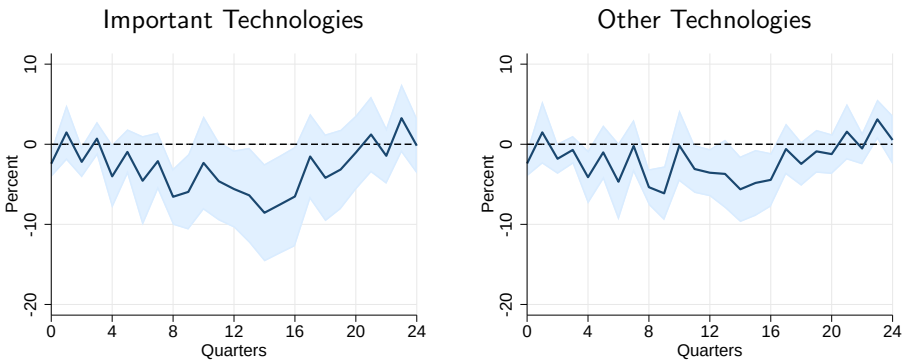






Result 3: Patenting in important tech changes by up to 9%

Response to 100 bps monetary policy shock

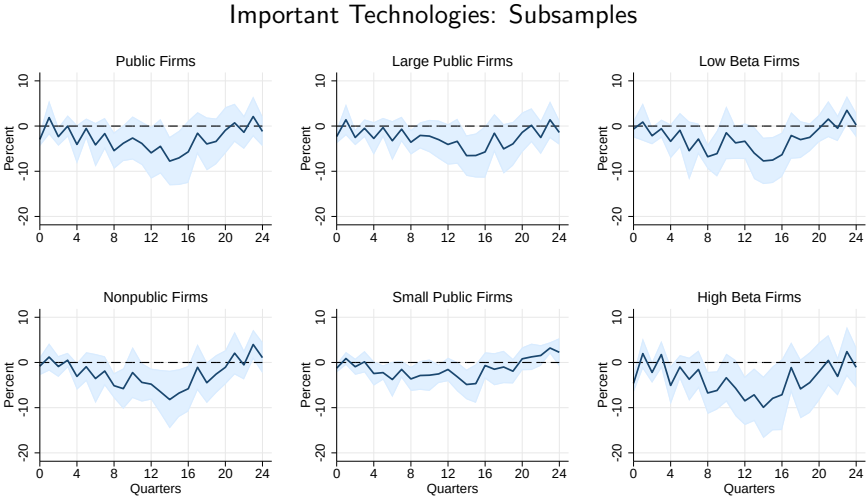


Bloom et al. (2023) classify 277 important technologies since 1976

- E.g., cloud computing, electric vehicles

Result 3: Patenting in important tech changes by up to 9%

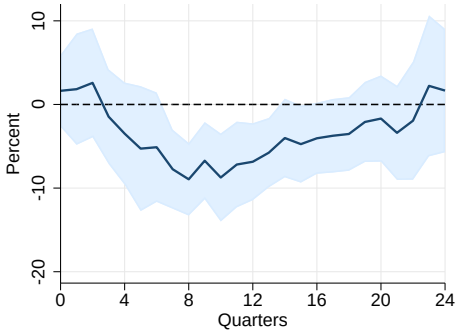
Response to 100 bps monetary policy shock



Result 4: Aggregate innovation index changes by up to 9%

Response to 100 bps monetary policy shock

- Kogan et al. (2017) constructed aggregate innovation index by estimating the economic value of patents (among public firms, normalized by total stock market capitalization)
- A 9% reduction in the innovation index $\Rightarrow$ 1% lower output and 0.5% lower TFP after another 5 years



Innovation channel: longer lasting effects than traditional investment channel

Mechanisms: Demand and financial conditions

For example, following monetary policy tightening:

1. **Lower demand ⇒ less profitable to innovate**
   - R&D and patenting decline more among high beta industries
   - R&D and patenting also decline among large public firms
2. **Tighter financial conditions ⇒ less funding and appetite for risk taking**
   - Early stage VC investment declines (immediate demand less relevant)
   - Innovation responds to financial conditions (e.g., excess bond premium)

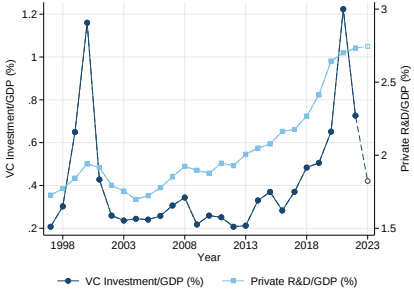
We focus on the effects of conventional monetary policy

- Impact of QE on innovation in Europe: Grimm, Laeven, and Popov (2022)
- Impact of ultra-low interest rates on productivity: Liu, Mian, and Sufi (2021)

Current conditions

VC investment grew ∼20% annually from 2012 to 2021; fell ∼30% annually since 2022

- All major sectors are affected
- Will see if recent decline is correction of overvaluation or persistent slump
- Data show monetary policy affects important technologies, not just bubbles



Historical perspective: technology revolutions survived adverse macro conditions

- Second industrial revolution hit by frequent panics and crises
- Third industrial revolution hit by oil shock, high inflation, high interest rate

Policy implications

Questions for future work:

1. Should policy be more accommodative if innovation is undersupplied?
2. Should policy be more countercyclical to stabilize innovation?
3. Monetary policy has tightening and easing; do their effects cancel out?
4. Can other policies substitute for monetary policy?

Well known that constant monetary stimulus can be counterproductive

- Friedman (1968), Lucas (1976)

Policies that stabilize innovation could be helpful

- Barlevy (2004), Aghion, Farhi, and Kharroubi (2012), Ikeda and Kurozumi (2019)