Heterogeneity in labor market response to monetary policy: small versus large firms

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Introduction

Monetary policy and the labor market

- real effects of monetary policy (mp) on the economy
- literature has focused primarily on investment, consumption, and output
- Congress' mandate for promoting "effectively the goals of maximum employment [..]"
- we study the effect of monetary policy on the labor market: employment and hiring.

Monetary policy and the labor market: what we do

- investigate empirically the impact of monetary policy on the labor market
  - margins that affect employment: hiring
  - flows have their own cyclical properties, different from employment (e.g., Krusell, Mukoyama, Rogerson, and Şahin, 2017)
  - aggregate variables show odd responses to mp shocks in recent data (e.g., Ramey, 2016)
- allow for differential effects of monetary policy across firms of different size
- differentiate sign of the shock.

Monetary policy and the labor market: what we do

- investigate empirically the impact of monetary policy on the labor market
- allow for differential effects of monetary policy across firms of different size
  - size used as proxy for financing constraints (e.g., Gertler and Gilchrist, 1994)
  - size used as proxy for productivity (e.g., Moscarini and Postel-Vinay, 2012, Moscarini and Postel-Vinay, 2013)
  - size-related policies, e.g., Small Business Administration (SBA) mandate, including the large-scale Paycheck Protection Program
- differentiate sign of the shock.

Monetary policy and the labor market: what we do

- investigate empirically the impact of monetary policy on labor market
- allow for differential effects of monetary policy across firms of different size
- differentiate sign of the shock
  - high-frequency mp shocks (Swanson, 2021): results for ffr factor shock - free from forward guidance and/or information effect
  - differentiate between positive vs. negative shocks series because:
    - different properties table scatter
    - might have asymmetric effects.

Monetary policy and the labor market: what we do

- investigate empirically the impact of monetary policy on the labor market
- allow for differential effects of monetary policy across firms of different size
- differentiate sign/type of the shock.

Main findings

Monetary policy and the labor market: main findings

- asymmetric effect of monetary policy
    - small firms increase hiring and employment growth more than large firms after mp expansion
    - large firms scale down hiring and employment growth more than small firms after mp tightening
- distributional effects of monetary policy
- aggregate effects of monetary policy
- monetary policy shock sign matters
- employment flows matter

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  - given increasing employment concentration, monetary expansion becomes less effective and tightening more effective, in influencing aggregate employment growth Concentration
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- monetary policy shock sign matters
    - if monetary policy shock sign not taken into account then conclude that small firms react more to monetary policy shocks
- employment flows matter

Monetary policy and the labor market: main findings

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- monetary policy shock sign matters
  - if monetary policy shock sign not taken into account then conclude that small firms react more
- employment flows matter
  - hiring responds more than employment; hiring responds with a lag to monetary expansions

Data and Mehods

Quarterly Workforce Indicators (QWI) dataset

- Quarterly Workforce Indicators (QWI) from Census; publicly available data by (LEHD)
  - all US private (i.e., not Federal) employers covered by UI (part/ full-time)
- seasonally adjusted using X-12 ARIMA from the US Census Bureau
- (unbalanced) panel aggregated on the dimensions of
  - firm size:
    0-19, 20-49, 50-249, 250-499, 500+
  - state
  - industry
    excluding agriculture and FIRE (Finance and Insurance, and Real Estate and Rental and Leasing).

Quarterly Workforce Indicators (QWI) dataset

- benefits
  - quarterly information on employment and flows, together with firm characteristics information
  - publicly available and easily replicable
  - good coverage, including publicly traded and non-traded firms of all industries
- shortcomings
  - unbalanced dataset: states entering at different times; sample $1998Q1 - 2019Q4$
  - firms' size changes, results might be impacted by reclassification bias (Moscarini and Postel-Vinay, 2012)
  - not firm specific but aggregate (within the category age/size-state-industry) data.

Monetary policy shocks

- extension of Gürkaynak, Sack, and Swanson (2005) (GSS) high-frequency monetary shock
- focus on federal funds rate factor series constructed by Swanson (2021) federal funds rate factor shock
  - ffr factor shock

Table Scatter plot

- high frequency ffr factor shocks, aggregated quarterly.

Methodology: size interaction

We use Jordà, Schularick, and Taylor (2015) local projections method

$$\Delta_h n_{gis,t+h} = \alpha^h_{gis} + \beta^h_{s,ffr+}\epsilon^{ffr+}_t \mathbb{I}_s + \beta^h_{s,ffr-}\epsilon^{ffr-}_t \mathbb{I}_s + \delta^h_i \epsilon^{ffr}_t \mathbb{I}_i + \Gamma^{h\prime} Z_t + u^h_{gis,t+h}$$

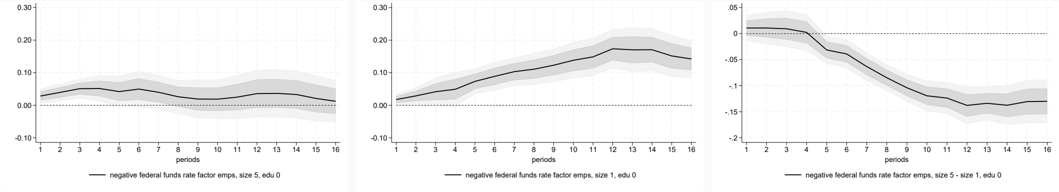
where

- $\Delta_h n_{gis,t+h} \equiv \log N_{gis,t+h} - \log N_{gis,t}$ is the cumulative difference of the log labour market variable N in state g, industry i, firm-size s, h periods after the monetary policy shock ϵ^{ffr} at t
- α^h_{gis} is state-industry-size specific fixed effects
- $\mathbb{I}_s$ is size specific indicator variable
- $\epsilon^{ffr}_t \mathbb{I}_i$ is industry-shock interactions
- Z_t includes one lag of the dependent variable; four lags of the federal funds rate and state unemployment rate; four lags of state unemployment rate interacted with firm size
- standard errors clustered two ways by state and quarter.

Empirical results

Empirical results: Size effects employment

Size effect on employment of large and small firms: mp expansion

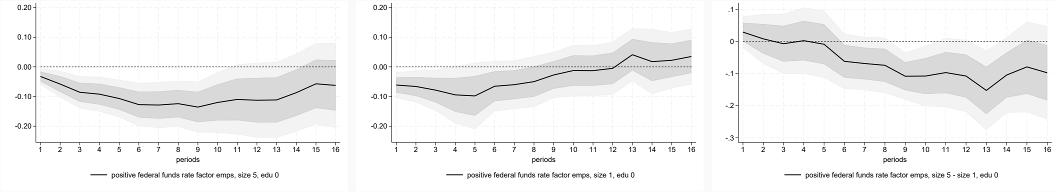


Notes: The figure plots the impulse response function for employment growth to a negative (expansionary) ffr factor shock for large (size 5—left column) and small (size 1—middle column) firms. The right panel plots the difference in the response of employment growth in large and small firms to a negative (expansionary) ffr factor shock. The horizontal axis measures time (in quarters) and the vertical axis measures the response in percent. The dark and light-shaded areas depict the 68% and 90% confidence bands, respectively.

Further results for employment: mp expansion

- expansionary (-) ffr factor shock impacts small firms more relative to large firms
- small firms respond four and half times more than large firms after monetary expansions
  - a standard deviation negative shock increases employment growth of large firms by 0.19%, and of small firms by 0.88 % over 8 quarters
- F-tests for zero impulse response at each horizon strongly rejected for small firms after expansionary ffr shocks
  - p-value for zero impulse response at each horizon for an expansionary shock is zero for small firms and 0.187 for large firms

Size effect on employment of large and small firms: mp contraction



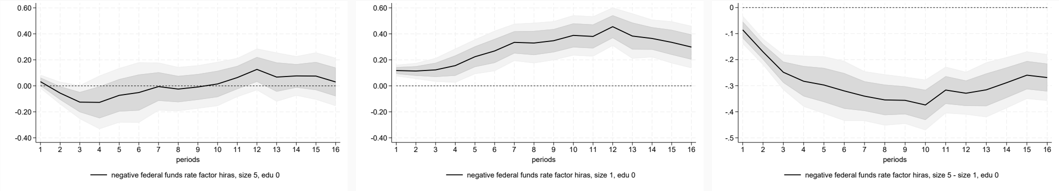
Notes: The figure plots the impulse response function for employment growth to a positive (contractionary) ffr factor shock for large (size 5—left column) and small (size 1—middle column) firms. The right panel plots the difference in the response of employment growth in large and small firms to a positive (contractionary) ffr factor shock. The horizontal axis measures time (in quarters) and the vertical axis measures the response in percent. The dark and light-shaded areas depict the 68% and 90% confidence bands, respectively.

Further results for employment: mp contraction

- tightening (+) ffr factor shock impacts large firms more relative to small firms
- large firms respond two times more than small firms after monetary contractions
  - a standard deviation positive ffr factor shock decreases employment growth of large firms by about 0.58%, and of small firms by 0.27% over 8 quarters
- F-tests for zero impulse response at each horizon strongly rejected for large firms after contractionary ffr shocks
  - p-value for zero impulse response at each horizon for a contractionary shock is 0.01 for small firms and zero for large firms.
- peak response faster vs monetary expansions.

Empirical results: Size effects hiring

Size effect on hiring of large and small firms: mp expansion



Notes: The figure plots the impulse response function for hiring growth to a negative (expansionary) ffr factor shock for large (size 5—left column) and small (size 1—middle column) firms. The right panel plots the difference in the response of hiring growth in large and small firms to a negative (expansionary) ffr factor shock. The horizontal axis measures time (in quarters) and the vertical axis measures the response in percent. The dark and light-shaded areas depict the 68% and 90% confidence bands, respectively.

Further results for hiring: mp expansion

- expansionary (-) ffr factor shock impacts small firms more relative to large firms
- small firms increase hiring growth three times more than large firms after monetary expansions
  - a standard deviation negative shock increases hiring growth of large firms by 1.35%, and of small firms by 3.86% over 12 quarters
  - (a standard deviation negative shock decreases hiring growth of large firms by 0.16%, and increases that of small firms by 2.65% over 8 quarters)
- F-tests for zero impulse response at each horizon strongly rejected for small firms after expansionary ffr shocks
  - p-value for zero impulse response at each horizon for an expansionary shock is zero for small firms and 0.885 for large firms

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- delayed response to monetary expansions.

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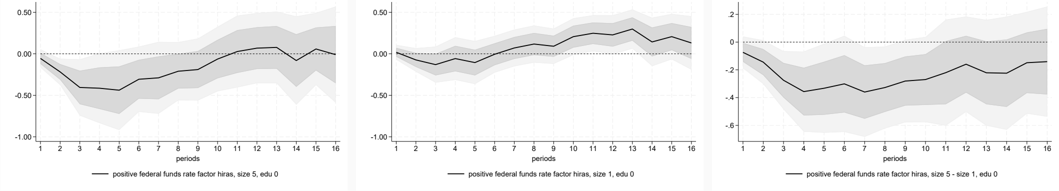
- delayed response to monetary expansions
- response of hiring growth four times larger than of employment growth.

Size effect on hiring of large and small firms: mp contraction



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Further results for hiring: mp contraction

- tightening (+) ffr factor shock impacts large firms more relative to small firms
- large firms decrease hiring growth six times more than small firms after monetary contractions
  - a standard deviation positive ffr factor shock decreases hiring growth of large firms by about 0.81%, and increases that of small firms by 0.29% over 8 quarters
- F-tests for zero impulse response at each horizon rejected for large firms after contractionary ffr shocks at the 15% level
  - p-value for zero impulse response at each horizon for a contractionary shock is 0.642 for small firms and 0.148 for large firms

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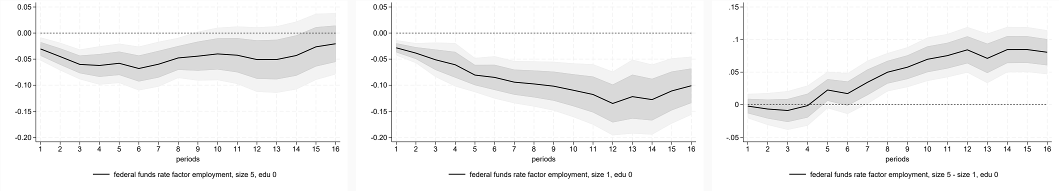
Empirical results: Response of small and large firms without sign distinction

Effect of ffr factor shocks on employment of large and small firms

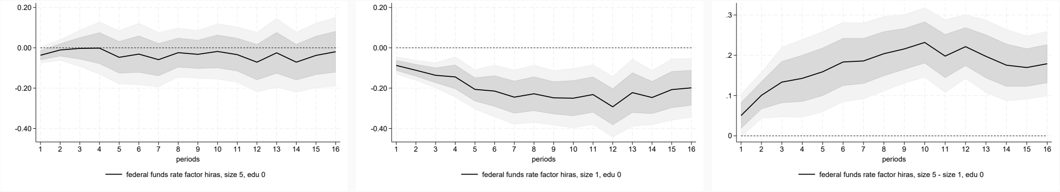


Notes: The figure plots the impulse response functions of employment growth to an increase in ffr factor shock for large (size 5—left column) and small (size 1—middle panel) firms, and the difference in the response in large and small firms (right panel). The dark and light-shaded areas depict the 68% and 90% confidence bands, respectively.

Further results for employment, without sign distinction

- ffr factor shock impacts small firms more relative to large firms
- small firms respond two times more than large firms after monetary contractions
- the gap between large and small firms peaks after 3 years, with small firms responding three times more than large firms after monetary contractions

Effect of ffr factor shocks on hiring of large and small firms



Notes: The figure plots the impulse response functions of hiring growth to an increase in ffr factor shock for large (size 5—left column) and small (size 1—middle panel) firms, and the difference in the response in large and small firms (right panel). The dark and light-shaded areas depict the 68% and 90% confidence bands, respectively.

Further results for hiring, without sign distinction

- ffr factor shock impacts small firms more relative to large firms
- small firms respond ten times more than large firms after monetary contractions
- response of hiring growth two and half times larger than of employment growth of small firms.

Summary of Results

Summary of results

- without sign asymmetry, then conclude that small firms react more than large ones after ffr factor shocks
    - distribution of +/- ffr shocks
    - delayed response to monetary expansions
- expansionary (-) ffr factor shock impacts small firms more relative to large firms and
- tightening (+) ffr factor shock impacts large firms more relative to small firms
- sign and size asymmetries relevant in the analysis of mp impact on the labor market
- employment response weaker than hiring.

Summary of results

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- sign and size asymmetries, as well as flows, relevant for uncovering mp impact on the labor market.

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Mechanisms

Monetary policy, firm size, and the labor market: mechanisms

- Size used as proxy for financing constraints (e.g., Gertler and Gilchrist, 1994)
- size used as proxy for productivity (e.g., Moscarini and Postel-Vinay, 2012, Moscarini and Postel-Vinay, 2013)
- wage effects (e.g., Singh, Suda, Zervou, 2025).

Robustness

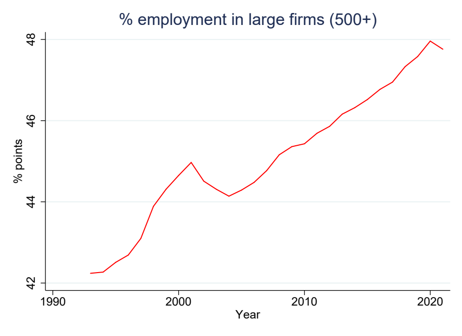
Robustness results

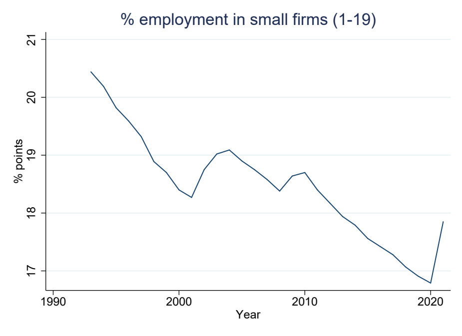
results robust to:

- excluding the GR period
- redefining small firms as 1-49 employees
- multiple variations of specification, e.g., clustering, exclusion of lagged controls.

Employment Cencetration

Employment shares by firm size





Notes: The figure plots the fraction (in % points) of employment in large firms (more than 500 employees) and small firms (1-19 employees) in the U.S. using the Bureau of Labor Statistics annual data from 1994-2021.

back

our sample

Effects of MP on aggregate employment depending on concentration

Increasing employment and hiring concentration in large firms

- 1998:1: small firms accounted for 21.12% of total employment and large firms for 46.14%
- 2019:4: small firms accounted for 18.04% of total employment and large firms for 51.97%.

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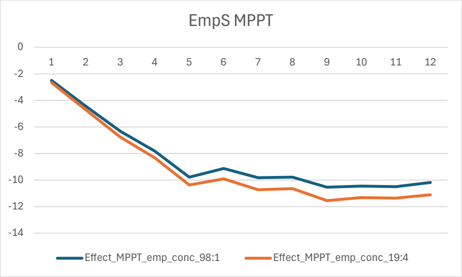
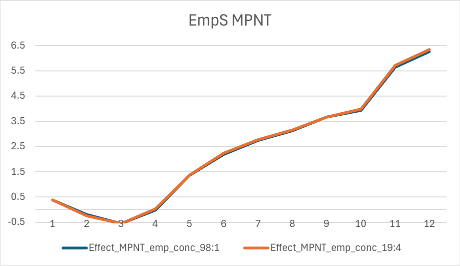
Does it affect monetary policy transmission?

- use IRFs to mp contractions and expansions to compute aggregate employment response
- use the above weights for 1998:1 and 2019:4.

Employment shares by firm size





Notes: The figure plots positive (contraction) and negative (expansion) ffrate factor monetary policy effects on employment growth, based on model irfs and changing concentration, between 1998:1 and 2019:4.

Effects of MP on aggregate employment depending on concentration

Increasing employment and hiring concentration in large firms

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Impact on MP effectiveness

- A 1-standard deviation MP contraction decreases employment growth by 0.44% after 2 years given 1998:1 concentration
- A 1-standard deviation MP contraction decreases employment growth by 0.49% after 2 years given 2019:4 concentration
- The effect on monetary expansion are almost identical between the 2 periods.

Effects of MP on aggregate hiring depending on concentration

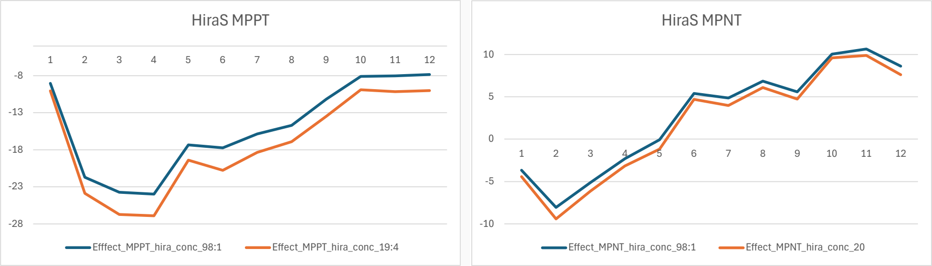
Increasing employment and hiring concentration in large firms

- 1998:1: small firms accounted for 26.22% of total hiring and large firms for 39.06%
- 2019:4: small firms accounted for 20.4% of total hiring and large firms for 47.78%

Does it affect monetary policy transmission?

- use IRFs to mp contractions and expansions to compute aggregate hiring response
- use the above weights for 1998:1 and 2019:4.

Hiring shares by firm size



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Impact on MP effectiveness

- A 1-standard deviation MP contraction decreases hiring growth by 0.67% after 2 years given 1998:1 concentration
- A 1-standard deviation MP contraction decreases hiring growth by 0.76% after 2 years given 2019:4 concentration
- A 1-standard deviation MP expansion increases hiring growth by 0.71% after 2 years given 1998:1 concentration
- A 1-standard deviation MP expansion increases hiring growth by 0.62% after 2 years given 2019:4 concentration

Effects of MP on aggregate hiring depending on concentration

Increasing employment and hiring concentration in large firms

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Effects of MP on aggregate hiring depending on concentration

Increasing employment and hiring concentration in large firms

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Impact on MP effectiveness

- 13.4% increase in MP effectiveness reducing hiring growth after MP contraction
- 14.5% decline in MP effectiveness stimulating hiring after MP expansion

purely driven by changes in concentration weights.

Conclusions

Empirical results summary and implications

Result i: Asymmetric effects of monetary policy

- small firms increase hiring and employment growth more than large firms after mp expansion
- large firms scale down hiring and employment growth more than small firms after mp tightening

Implications

- aggregate effects of monetary policy
  - given increasing employment concentration, monetary expansion becomes less effective and tightening more effective, in influencing aggregate employment growth
- distributional effects of monetary policy
  - monetary policy expansion followed by an equal tightening is non-neutral

Empirical results summary and implications

Result ii: Shock sign matters

- ignoring it leads to misleading conclusion that employment and hiring growth of small firms react more than that of large firms to mp shocks
- monetary expansions realized with a lag

Implications

- accounting for mp shock direction when evaluating mp effects on labor market
- panel variation enables identification of shock direction and firm size effects

Empirical results summary and implications

Result iii: Labor market flows matter

- response of hiring growth to monetary policy shocks two to four times stronger than employment growth

Implications

- accounting for labor market flows reveal effects of monetary policy that aggregate employment measures obscure

THANK YOU

Presentation Appendix

[Monetary policy shock statistics]

Table 1: Summary statistics of monetary policy shocks

	ffr factor shocks
Overall	
Mean	0.84
Standard deviation	12.29
Positive (rate increase)	
Mean	4.04
Standard deviation	4.46
Negative (rate decrease)	
Mean	-3.19
Standard deviation	10.26

Notes: The table reports the mean and standard deviation (in basis points) for the ffr factor shocks, positive and negative ffr factor shocks for the period 1998:1-2019:4.

[Scatter plot of positive and negative monetary policy shocks]

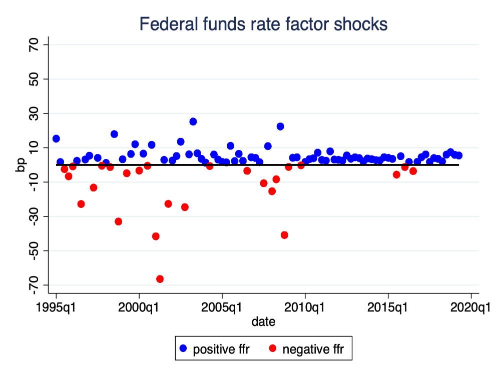


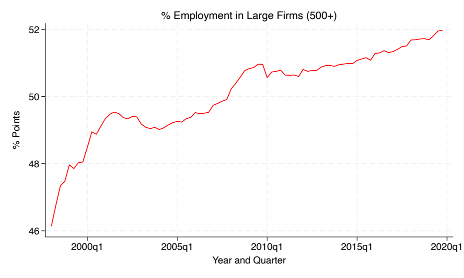
Figure 10: Positive and negative monetary policy shocks

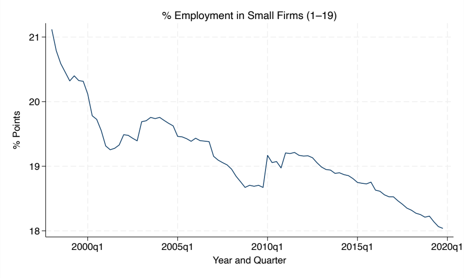
Notes: The figure plots the positive (blue) and negative (red) ffr factor shocks in basis points.

back

back mp shock

[Employment shares by firm size, our dataset]

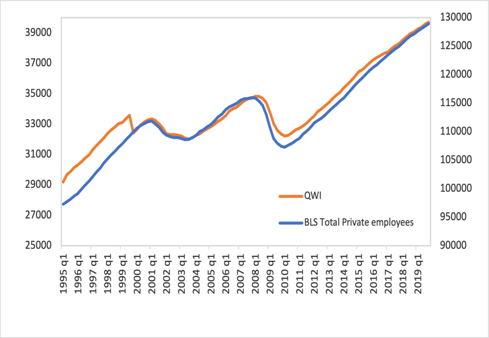




Notes: The figure plots the fraction (in % points) of employment in large firms (more than 500 employees) and small firms (1-19 employees) in the U.S. using our data sample.

back

[Our data vs aggregate]



The figure plots employment from our QWI sample on the left vertical axis (orange line) against total private employment data (USPRIV) from FRED (blue line) on the right vertical axis, source Current Employment Statistics (Establishment Survey).

back

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