Firm Size and Asymmetric Labor Market Responses to Monetary Policy Shocks*

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Abstract

We study how monetary policy affects the labor market by examining employment and hiring growth across firms of different sizes using high-frequency monetary policy surprises and the U.S. Quarterly Workforce Indicators disaggregated data. We document four main findings. First, monetary tightenings reduce employment and hiring growth more in large firms, while easings boost growth more in small firms. Second, ignoring the shock direction leads to the misleading view that small firms are more responsive; moreover, accounting for the shock direction reveals that contractionary effects are rapid, whereas expansionary effects unfold gradually. Third, hiring reacts more strongly than employment growth, highlighting the role of labor flows in monetary transmission. Finally, rising employment concentration in large firms could have changed aggregate dynamics, making contractionary policy more potent and expansionary policy less effective. These results underline that firm size, shock asymmetry, and labor flows are central to understanding monetary transmission and designing policies to achieve full employment.

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Keywords: Heterogeneous firms, labor market, monetary policy.

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1 Introduction

The Federal Reserve operates under a Congressional mandate that includes promoting "effectively the goals of maximum employment [..]". Implicit in this mandate is the belief that monetary policy has an impact on employment. Our analysis offers new empirical evidence indicating that the effects of monetary policy on the labor market depend on both the size of the firm and the direction of the monetary policy shock and that the transmission of monetary policy to the labor market has shifted.

Examining how monetary policy influences the employment dynamics of large and small firms is important for several reasons. First, recent literature has found weak evidence of monetary policy effects on aggregate variables (see Ramey, 2016). By exploring disaggregated quarterly data on employment and worker flows, we re-examine the effects of monetary policy on the labor market and find them to be significant. Second, examining the effects of monetary policy on heterogeneous firms is essential for a better understanding of the channels of monetary policy transmission. This approach has been widely adopted in the literature that focuses on the effects of monetary policy on investment (e.g., Gertler and Gilchrist, 1994; Cloyne, Ferreira, Froemel, and Surico, 2023; Ottonello and Winberry, 2020), but it has been less explored in the context of the labor market (e.g., Abo-Zaid and Zervou, 2020; Yu, 2021; Bahaj, Foulis, Pinter, and Surico, 2022; Kurt, 2024). Third, there is a noticeable trend in the United States where an increasing share of workers are employed in large firms and a decreasing share of workers are employed in small firms (see Figure B.3.1 in Appendix B.3 for firms above 500 employees versus firms with fewer than 20 employees). Our findings allow us to understand how rising employment concentration in large firms shapes monetary policy transmission. Finally, understanding the response to monetary policy by firm size is important because it is often at the forefront of policy discussions and policy enactment.[1,2]

In our empirical analysis, we use the publicly available Quarterly Workforce Indica-

[1]For example, the U.S. Small Business Administration (SBA), established in 1953, is a cabinet-level federal agency that provides counseling, capital, and contracting expertise for small businesses. Information about recent federal measures targeting small businesses, including the large-scale Paycheck Protection Program, can be found at https://home.treasury.gov/policy-issues/coronavirus/assistance-for-small-businesses.

[2]Haltiwanger, Jarmin, and Miranda (2013) highlight the importance of firm age in understanding the transmission of shocks to heterogeneous firms, and Casiraghi, McGregor, and Palazzo (2021) stress that the observed change in the fraction of old versus young firms might affect the strength of the monetary propagation mechanism. In QWI, the disaggregated data is available by firm size or firm age. We chose firm size as using firm age would require firms' initial age distribution and the use of a statistical model for the firms' evolution in various age categories.

tors (QWI) dataset from the Census (2020). The QWI provides quarterly employment and hiring data for all U.S. employers that are covered by unemployment insurance, allowing us to examine and compare both large (500+ employees) and small firms (fewer than 20). We employ the Jordà (2005) local projections method to compute impulse responses of labor market variables to the high-frequency monetary policy shocks of Swanson (2021); we account for the sign of monetary policy shocks and the size of firms affected by those shocks when examining how monetary policy impacts the U.S. labor market.

We uncover several novel findings: (i) A monetary tightening reduces employment and hiring growth, but more so for large firms relative to small firms. However, a monetary easing increases employment and hiring growth more for small firms compared to larger firms. This response heterogeneity is striking and, (ii), ignoring it leads to the misleading conclusion that the employment and hiring growth of small firms reacts more than that of large firms to monetary policy shocks. In addition, examining the sign asymmetry reveals that the effects of monetary contractions are realized fast, while the consequences of monetary expansions take time to manifest. Importantly, (iii) the response of employment growth to monetary policy shocks is weaker than that of hiring growth, highlighting the importance of studying flows to understand the effects of monetary policy on the labor market. Relating our empirical findings to the increasing trend in employment concentration in large firms allows us to uncover changes in monetary policy transmission on the aggregate labor market. Specifically, (iv) we show that contractionary monetary policy has become more effective in reducing employment and hiring growth, while expansionary policy has become less effective in stimulating it.

Our paper relates to the continuously growing literature that explores the sensitivity of heterogeneous firms to macroeconomic shocks. A strand of this literature has focused on the effects of monetary policy on the investment and sales of heterogeneous firms, e.g., Gertler and Gilchrist (1994), Chari, Christiano, and Kehoe (2013), Kudlyak and Sanchez (2017), Jeenas (2019), Crouzet and Mehrotra (2020), Ottonello and Winberry (2020), Howes (2021), Kroner (2021), Gnewuch and Zhang (2025) among others. Another strand has examined heterogeneity in employment responses to other exogenous variables, e.g., Sharpe (1994), Davis and Haltiwanger (1999), Moscarini and Postel-Vinay (2012), Fort, Haltiwanger, Jarmin, and Miranda (2013), Haltiwanger, Jarmin, and Miranda (2013), Chodorow-Reich, 2014, but not to monetary policy shocks.

Our paper stands at the intersection of these two strands of the literature and examines the effects of monetary policy on employment among heterogeneous firms.

The first strand of the literature explores the monetary transmission mechanism. Based on early evidence that small firms face tighter financing constraints (e.g., Fazzari, Hubbard, and Petersen, 1988), Gertler and Gilchrist (1994) show that after tight money episodes, sales and inventories of small (in terms of assets) firms are more responsive than those of larger firms. Their analysis highlights the credit channel and the financial accelerator mechanism of Bernanke, Gertler, and Gilchrist (1999). More recent work, including Jeenas (2019), Ottonello and Winberry (2020), and Cloyne, Ferreira, Froemel, and Surico (2023), utilizes detailed financial data to assess the investment channel, moving beyond firm size as the sole proxy for financing frictions. While our dataset lacks direct financial information, these financing channels are likely to be underlying mechanisms shaping the heterogeneous firm responses we document. In relation to this literature, we show how monetary policy shocks affect heterogeneous firms by focusing on the labor market rather than investment, and by studying asymmetric responses, demonstrating that labor flows, not just capital flows, are central to monetary transmission.

The second strand of the literature that we contribute to explores the cyclicality of employment margins of heterogeneous firms. Focusing on size heterogeneity, Moscarini and Postel-Vinay (2012) find that the net job creation of large (in terms of employment) firms, relative to small firms, is more responsive to unemployment. Their results are supported by the theoretical work of Moscarini and Postel-Vinay (2013), which models labor market frictions and treats firm size as a proxy for productivity. This channel represents another possible underlying mechanism, and in our empirical specifications we control for differential state-unemployment effects across firm sizes to capture differences in productivity and their response to local labor market conditions. Our paper contributes to this literature by examining how large and small firms' employment dynamics respond to monetary policy shocks, beyond the business cycle.

The first paper to examine empirically the effects of monetary policy shocks on the employment of heterogeneous firms is that of Bahaj, Foulis, Pinter, and Surico (2022). In their analysis they use yearly firm-level data in the United Kingdom to emphasize housing collateral constraints and to verify the existence of the financial accelerator channel that propels younger firms' employment to respond more to monetary policy shocks than older firms. Similar results are found by Yu (2021) who also emphasizes housing collateral constraints using U.S. data.[3] In a closely related paper, Kurt (2024) uses Compustat data to show that employment reacts more to monetary contractions than to expansions, where the shocks are derived using Gertler and Karadi (2015) methodology. Compustat covers only publicly traded firms, which in our classification largely fall into the large-firm category.[4] Consistent with our evidence, these large firms reduce employment growth following monetary contractions, but show little response to expansions. Moreover, we show that the asymmetry we uncover has aggregate implications for the effectiveness of monetary policy in influencing the labor market, which is a novel result.

Our sign asymmetry result (result ii) is related to a large literature that finds variation in the response of aggregate variables like output and prices, to monetary contractions versus expansions, starting with Cover (1992) and more recently in Tenreyro and Thwaites (2016) and Angrist, Jordà, and Kuersteiner (2018). Our contribution here is to distinguish the effects of monetary easing from those of tightening on large and small firms. Without that distinction, we find that we would erroneously conclude that small firms respond more than large ones to monetary policy shocks. In addition, the direction distinction uncovers differences in the timing of the response of the labor market to monetary policy shocks, being slower in monetary expansions versus contractions.[5]

A related recent literature studies employment concentration (e.g., Hopenhayn, Neira, and Singhania, 2022 and Karahan, Hobijn, and Şahin, 2022 examine start-up deficit; Hartman-Glaser, Lustig, and Xiaolan, 2019, Autor, Dorn, Katz, Patterson, and Van Reenen, 2020, and Kehrig and Vincent, 2021 study employment concentration and the declining labor share).[6] Focusing on the labor market and firms' size, our findings imply that the increased employment concentration in large firms, as shown in Figure B.3.1 in Appendix B.3, decreases monetary policy's ability to expand aggregate employment after monetary policy expansions, but increases its ability to decrease aggregate employment after monetary policy contractions.

Our paper also relates to the literature that examines the effects of monetary policy

[3]See also Madeira and Salazar (2023) for the analysis of Chile.

[4]In Kurt (2024), as noted in Table 1, the mean number of employees in a firm are 7,568, while the median is 745; our large firm category includes firms with 500 or more employees. This makes it difficult to compare our results directly to theirs. In addition, Compustat provides only annual employment data, limiting the ability to capture short-run adjustments only through interpolation.

[5]It is likely that the delayed employment response to an expansionary shock seen in our analysis reflects jobless recoveries, a feature of the aggregate data documented in a large literature (e.g. Groshen and Potter, 2003; Schreft and Singh, 2003; Berger, 2018; Jaimovich and Siu, 2020).

[6]While not related to employment, there is research on how market power affects monetary policy (e.g., Duval, Furceri, Lee, and Tavares, 2024; Ferrando, McAdam, Petroulakis, and Vives, 2021).

on labor flows, like the work of Braun, De Bock, and DiCecio (2007), White (2018) and Graves, Huckfeldt, and Swanson (2023). We show and document in result (iii) that flows provide important information about the effect of monetary policy on decisions that form labor market outcomes. We further contribute to this line of research by identifying flow responses across various firm size categories, along with the aggregate effects. Moreover, we show distinct labor market flow responses depending on the direction of the monetary policy shock, an aspect that has not been explored before in this literature.

The paper is structured as follows. Section 2 outlines the data and empirical methodology. Section 3 presents the main empirical findings, followed by robustness checks in Section 4. Section 5 explores the role of employment concentration, that together with our findings, shape monetary policy effectiveness. Section 6 discusses the policy implications and concludes.

2 Data and methodology

In this section, we describe the data and outline the methodology used in our analysis.

2.1 Data

We use the QWI panel dataset, which is publicly available and is derived from the Longitudinal Employer Household Dynamics (LEHD) program of the U.S. Census Bureau. The data includes all private, state, and local government (but not federal) employers that are covered by unemployment insurance in the U.S., aggregated by state, industry, and firm size. The QWI provides quarterly information on employment and employment dynamics, together with information on firm characteristics such as size, location, and industry classification. The source data are unique job-level data that link employers and employees. A single employer may have one or many establishments where the establishment is a physical place of work. QWI data are then aggregated from job-level to establishments. For public release, it is further aggregated, and therefore the cross-sectional dimension of our panel is specified by the triplet "state-industry-size." The state and industry information refers to the characteristics of the establishment while the firm size is defined at the national level.

In the QWI, states started reporting data at different points in time, which makes the dataset unbalanced. For example, in 1990 only four states were in the sample.

Data on additional states were gradually included and, by 2004, the dataset covers forty-nine states (all U.S. states apart from Massachusetts and Washington, D.C.). Our sample includes all states and covers the period 1998:1-2019:2, given that the monetary policy shock we are using ends at that time. We exclude Agriculture, Forestry, Fishing and Hunting, and Public Administration, as is usual in employment studies, as well as Finance and Insurance, and Real Estate, Rental and Leasing (FIRE), as is usual in monetary policy studies. The QWI reports five firm size categories; size one has 0-19 employees, size two has 20-49, size three has 50-249, size four has 250-499, and size five has more than 500 employees. Our sample consists of a total of $425,984$ observations with $5,300$ unique state-industry-size observations.

In our analysis, we focus on the behavior of stable employment and stable hiring. In the QWI dataset, these variables are *EmpS* and *HirAS*. Their exact definitions are available in Appendix A. We consider hiring in our analysis, as it measures inflows to employment and it implies a mutual agreement between firms and employees for the match to occur. It also allows us to understand the role of monetary policy in creating new labor market matches. Separations, on the other hand, which are also recorded, can be voluntary (retirement, quits, new job) and involuntary (layoffs, firing), and since the two types of separations cannot be separately identified in the data, we do not consider separations in our analysis. The data are seasonally adjusted using X-12-ARIMA method by the U.S. Census Bureau.

Table 1 presents summary statistics of the labor market variables. As seen from the table, large and small firms have distinctly different growth rates (median) for all the variables considered in our empirical analysis, and these differences are statistically significant.[7] Moreover, in the case of hiring, it is striking that while hiring growth has increased in large firms, it has decreased in small firms.

Comparing the aggregate employment in our sample with the total private employment from the Federal Reserve Economic Data (FRED) in Figure 1, we see that the trends in our sample are closely related to the trends in the aggregate. This is despite the smaller coverage of our data as we exclude some states and industries.

For the monetary policy shocks, we use the federal funds rate factor series constructed by Swanson (2021), based on the high-frequency futures market identification approach first developed by Kuttner (2001) and relevantly decomposed to capture different aspects of monetary policy.[8] Those decompositions are important. For example,

[7] These differences are statistically significant at the 1% level.

[8] The monetary policy shocks are constructed using the three principal components of the asset price

Table 1: Summary statistics of labor market variables

Variables (growth rates, in percent)		All firms	Small firms		Large firms
			size 1	size 1&2	size 5
Employment	mean	1.11	0.73	0.69	1.91
	median	1.51	0.74	0.86	1.87
	st. dev.	6.52	11.05	12.21	13.68
Hiring	mean	−0.01	−0.98	−0.88	1.00
	median	1.36	−0.46	−0.09	2.36
	st. dev.	19.08	19.66	22.14	27.61

Source: QWI.
Notes: The table reports the mean, median, and standard deviation (st. dev.) of the annual growth rates of employment and hiring in all firms, small (size 1 as well as size 1 and 2 combined) firms, and large firms in our sample.

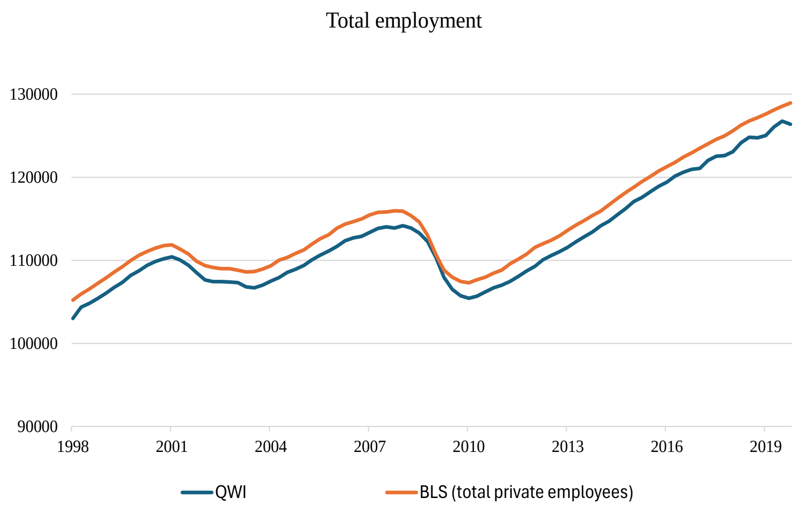


Figure 1: Total Employment

Notes: The figure plots employment from our QWI sample (blue line) against total private employment data (USPRIV) from FRED (orange line), source Current Employment Statistics (Establishment Survey) in thousands of persons.

Gürkaynak, Sack, and Swanson (2005) decompose monetary policy shocks into two factors, pointing out that at the time of an FOMC announcement, the public receives information not only about the current federal funds rate target but also, through the statement that follows such announcements, about the expected path of the economy; this component is present in the central bank communication even before the introduction of formal forward guidance. Swanson (2021) identifies three factors of monetary policy, adding to the short-run federal funds rate and forward guidance factors, the large-scale asset purchases factor present after the Great Recession, and finds that all three factors have very persistent effects. The latter factor is relevant only in the period after 2008, and therefore, we do not focus on it given our larger sample. The second factor has an unclear interpretation, given that it also includes, besides the forward guidance effect, a possible information effect, as pointed out by Campbell, Evans, Fisher, and Justiniano (2012).[9] We focus on the short-run effect of changes on the federal funds target rate surprises, using Swanson (2021)'s federal funds rate (ffr) factor series, isolating the effect of the short-term movements in asset prices and producing results that are not impacted by forward guidance and information effects of monetary policy, which can affect the interpretation of our conclusions.[10] Moreover, we aggregate the series to construct quarterly measures, as is common in the literature. Table 2 reports the summary statistics of the ffr factor shocks. We find that these ffr factor shocks have the expected effects on aggregate macroeconomic variables, that is, an increase in the ffr factor shock decreases real GDP and employment growth, as seen in Figure B.1.1 in Appendix B.1.

There is a large empirical literature, e.g. Cover (1992), DeLong and Summers (1988), Lo and Piger (2005), which argues that the impact of monetary policy on the economy is not symmetric. The asymmetry analyzed in this literature is either based on sign (positive or negative) or size (large or small) of monetary policy shocks. We focus on

responses to each announcement of the Federal Reserve's Federal Open Market Committee (FOMC) within the 30-minute window. See Swanson (2021) for more details.

[9]The Fed information arises when economic participants believe that the Federal Reserve has superior information, and act on that information. Its effect has been analyzed by Romer and Romer (2000) and Nakamura and Steinsson (2018) among others. A recent and thorough investigation is conducted by Hoesch, Rossi, and Sekhposyan (2023).

[10]We have conducted robustness tests using the standard contractionary monetary policy shock (u_1) from Jarociński (2024) (see B.2.3) as well as "target" factor of an extended series we construct based on Gürkaynak, Sack, and Swanson (2005)'s series. We have also done robustness using the Campbell, Evans, Fisher, and Justiniano (2012) data; we thank Alejandro Justiniano for providing his event-study shock series for that paper and the extended version of it. Given the close correlation of those shocks with ours, and the similarity in their construction, we do not present those robustness exercises, though they are available upon request. Lastly, we have done robustness controlling for the second and third factors of Swanson (2021)'s shocks, and the results are qualitatively similar.

Table 2: 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 1998:1-2019:2.

the sign asymmetry of the ffr shocks and we do a robustnessss exercise regarding the shock sign in Section 4.1. Furthermore, the literature that studies labor flows, such as Elsby, Hobijn, Karahan, Koşar, and Şahin (2019), uncovers flow movements that could result in cyclical asymmetries of labor market stocks, further motivating our analysis of the asymmetric response of labor market variables to monetary policy shocks.

Table 2 reports the summary statistics of the ffr factor shocks, as well as the positive and negative ffr factor shocks. What is striking is that the standard deviation of the negative monetary policy shock is more than twice that of the positive one. This can also be seen in Figure 2, which plots these shocks. Since positive and negative shocks have distinct characteristics, they are likely to impact the labor market variables differently. We address this in our empirical analysis by studying the effects of positive and negative shocks separately. Moreover, since the shocks have different standard deviations depending on their direction, we convert the units of the federal funds rate shocks of Swanson (2021) from standard deviation to basis points.[11] We then use the information of the standard deviation of the positive and negative ffr shocks to interpret our results.

Appendix A provides additional details about the data used in our analysis.

[11]Since Swanson (2021) was examining the overall effects of the three factors, this conversion was not necessary in his analysis. To convert the federal funds rate factor of Swanson (2021) to basis points, we multiply those shocks by 11.92.

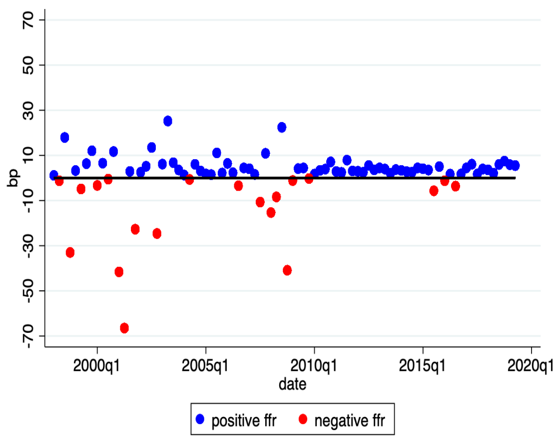


Figure 2: Positive and negative monetary policy shocks

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

2.2 Empirical framework

To measure the impact of ffr shocks on the labor market we employ the local projection method of Jordà, Schularick, and Taylor (2015) who extend Jordà (2005)'s approach, to a panel data setting.[12]

Equation (1) below is our baseline empirical specification that considers sign asymmetry and size heterogeneity. In our analysis, the dependent variables are cumulative growth rates of employment and hiring, that is, $\Delta_h n_{gis,t+h} \equiv \log N_{gis,t+h} - \log N_{gis,t}$, which is the cumulative difference of the log labor market variable N in state g, industry i, firm-size s, h periods after the monetary policy shock in period t. We control for state-industry-size specific fixed effects, α^h_{gis}. The coefficients of interest are $\beta^h_{s,ffr+}$ and $\beta^h_{s,ffr-}$ interacted with firm size, where $\mathbb{I}_s$ is the indicator for size. The impulse response functions presented in Section 3 are constructed using these coefficients.

$$\Delta_h n_{gis,t+h} = \alpha^h_{gis} + \beta^h_{s,ffr+}\epsilon^{ffr+}_t \mathbb{I}_s + \beta^h_{s,ffr-}\epsilon^{ffr-}_t \mathbb{I}_s + \Gamma^h Z_t + u^h_{gis,t+h} \tag{1}$$

The control variables in Z_t are one lag of the dependent variable, four lags of the federal funds rate, four lags of the state unemployment rate, and interactions of federal funds rate factor with industry. We also include the state unemployment rate interacted with firm size as control variables. We add state unemployment interacted with firm size in our set of controls as the existing literature on firms' cyclical sensi-

[12]See Plagborg-Møller and Wolf (2021) for a comparison of the impulse response functions generated using local projections and Vector Autoregressions (VARs).

tivity (Moscarini and Postel-Vinay, 2012) emphasize that large firms increase net job creation more than small firms at times when the unemployment rate is low, yet decrease the net job creation more than small firms when the unemployment rate is high. By including the interaction of state unemployment with firms' size as an explanatory variable, we capture the effect of monetary policy on the labor market variables after controlling for their fluctuations due to changes in state unemployment.[13] In fact, we find that state unemployment's effect on employment growth is consistent with the response of large firms being stronger than that of smaller firms.

Since we are using a panel dataset, observations might be cross-sectionally correlated (e.g., within a state) and serially correlated (across time). We use time-clustered robust standard errors. Such clustering produces standard errors that are known to have wider bands compared with Driscoll and Kraay (1998) standard errors.

3 Empirical results

In this section, we present our empirical results where we examine the effects of monetary policy, using the ffr factor monetary policy shocks constructed by Swanson (2021), on labor market variables of large and small firms. Note that while these shocks have a sharp interpretation and are not influenced by forward guidance or information effects, they are rather small. As a result, we analyze and interpret our findings using one standard deviation (68%) confidence bands following Coibion, Gorodnichenko, Kueng, and Silvia (2017), and Graves, Huckfeldt, and Swanson (2023), among others; we also report 1.68 standard deviation (90%) confidence intervals.Moreover, we present F-test results for the null hypothesis that the impulse response is zero for each horizon, as in Coibion, Gorodnichenko, Kueng, and Silvia (2017).

Given the evidence presented in Table 2 on the differences across the negative and positive ffr factor shocks, we first examine in Sections 3.1 and 3.2 separately the response of labor market variables to contractionary and expansionary ffr factor shocks of large and small firms. Having substantial panel variation allows us to do so with confidence. In Section 3.3, we present results without taking into account the sign distinction and show how those results could be misleading for policy evaluation.

[13]We thank Giuseppe Moscarini for this suggestion.

3.1 Response of employment

We study the response of employment in large and small firms, to positive and negative ffr factor monetary policy shocks, using the empirical specification of equation (1). Figure 3 depicts the response of employment growth to contractionary (top panel) and expansionary (bottom panel) ffr factor shocks. The left panels present results for large firms, the middle for small firms, and the right ones depict the difference in response between large and small firms.

Figure 3 shows that contractionary ffr factor shocks (top row) impact employment growth in small firms less relative to large firms, and expansionary ffr factor shocks (bottom row) impact small firms more relative to large firms. That is, small firms decrease employment growth less in response to a contractionary monetary policy shock and increase employment growth more in response to an expansionary monetary policy shock, relative to large firms. We observe that the peak response after monetary expansions is delayed compared to the trough after contractions, with employment growth of small firms increasing for a long time after a monetary expansion. The difference in the timing of the responses to monetary expansions versus contractions will be a finding that sustains various specifications in our analysis and provides an additional reason for examining asymmetric responses of the labor market to monetary policy shocks. The literature in jobless recoveries (e.g. Groshen and Potter, 2003; Schreft and Singh, 2003; Berger, 2018; Jaimovich and Siu, 2020) discusses relevant causes.

Table 3 presents all p-values for the F-tests for the null hypothesis that the impulse responses are zero for each horizon, after positive/contractionary (ffr^{+}) and negative/expansionary (ffr^{-}) ffr factor shocks on the growth rate of employment and hires. The p-value for the null hypothesis that the employment impulse response is zero at each horizon for a contractionary shock is 0.01 for small firms and zero for large firms. The p-value for the null hypothesis that the employment impulse response is zero at each horizon for an expansionary shock is zero for small firms and 0.187 for large firms. As such, the F-tests for the null hypothesis that the impulse responses are zero for each horizon show that the hypothesis is strongly rejected for large firms after contractionary monetary policy shocks, and for small firms after expansionary shocks.

The differences across large and small firms are calculated and depicted on the right panel of Figure 3. Note that on the graphs that depict differences in responses between large and small firms, the line below zero after a positive/contractionary ffr factor shock means that large firms tighten more than small firms; similarly, for a neg-

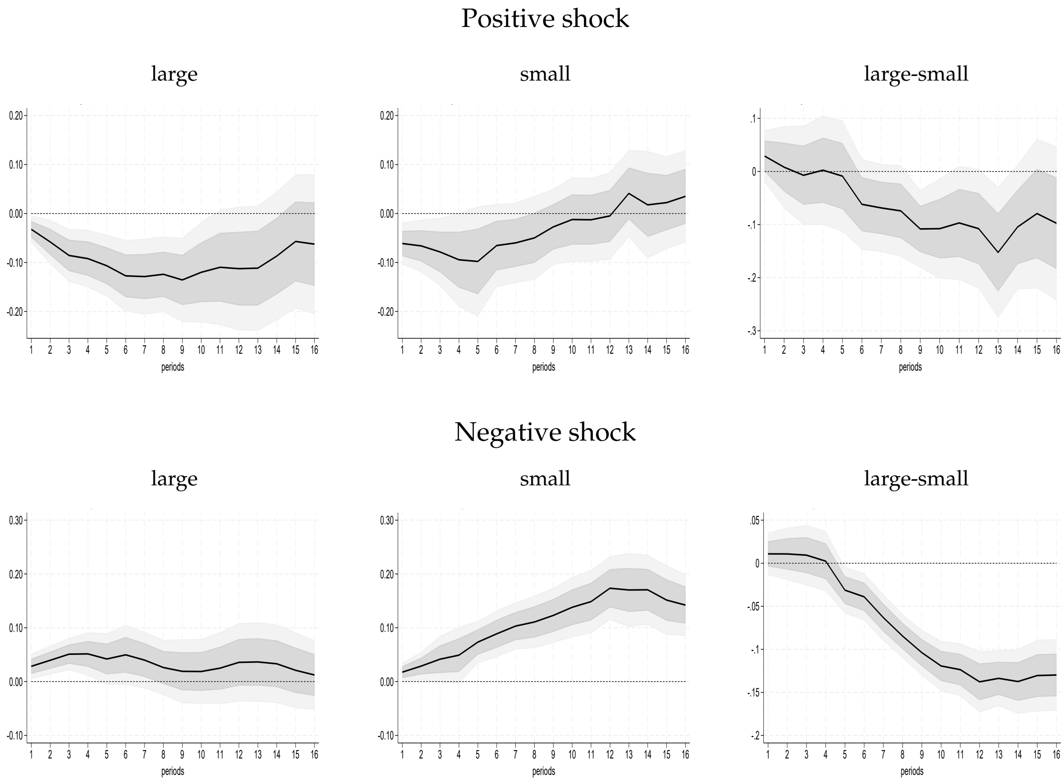


Figure 3: Response of employment growth in large and small firms to a positive and negative ffr factor shock

Notes: The top row plots impulse responses of employment growth to a positive (tightening) ffr factor shock for large (size 5, left panel) and small (size 1, middle panel) firms; the bottom row plots responses to a negative (easing) shock. Right panels plot the differences between large and small firm responses. The horizontal axis shows quarters, the vertical axis the percent response to a one bp shock; shaded areas are 68% and 90% confidence bands.

Table 3: p-values for F-tests

	ffr^+		ffr^-	
	small	large	small	large
Employment	0.01	0.000	0.000	0.187
Hires	0.642	0.148	0.000	0.885

Notes: The table reports the p-values for the F-tests for the null hypothesis that the impulse responses are zero for a 3-year horizon after positive (ffr^+) and negative (ffr^-) ffr shocks on the growth rate of hires and employment, for our sample.

ative/expansionary ffr factor shock, having the line below zero means that large firms expand less than small firms. The top right panel of Figure 3 depicts the strong and significant difference in the response of large versus small firms after monetary contractions. The bottom right panel shows that a monetary policy loosening increases employment growth in small firms more than in large ones.

Apart from the direction, it is also interesting to understand the magnitude of the differences in the responses of large and small firms. Given that the standard deviation of the positive ffr factor shock differs from that of a negative ffr factor shock, we adjust the responses appropriately to interpret the magnitude of the impulse response functions. With such adjustment, our results imply that a one standard deviation positive ffr factor shock decreases the employment growth of large firms by about 0.58% (0.13×4.46), and of small firms by 0.27% (0.06×4.46) over 8 quarters, two years after the shock; that is, large firms respond two times more than small firms after monetary contractions. Note that in this calculation and the ones that follow, the first number (here 0.13 and 0.06) are the cumulative changes in the eighth quarter in the relevant labor market variable, while the second number (here 4.46) is the standard deviation of the ffr shocks in basis points as reported in Table 2. A standard deviation negative shock increases employment growth of large firms by 0.19% (0.0185×10.26), and of small firms by 0.88% (0.086×10.26) in the eighth quarter; that is, small firms respond four and a half times more than large firms after monetary expansions.[14] Our results suggest that after taking into account the ffr factor shock sign and firm size asymmetries, small firms drop employment growth less compared to large firms in response to a monetary contraction; they increase employment growth more than large firms after a monetary expansion.

3.2 Response of hiring

We analyze the response of hiring growth and find that our conclusions of impulse (contractionary versus expansionary shock) and response (small versus large firms) asymmetry for employment also hold for hiring. The response of hiring growth is stronger than employment growth, and as such important to consider.

Figure 4 presents the response of large (left column) and small firms (middle column), and the difference in the responses of the two (right column), considering the

[14] The magnitude of the effects of monetary policy shocks on employment is economically important and in line with the results presented in the literature, e.g., Bahaj, Foulis, Pinter, and Surico (2022), Kurt (2024), even though they use different employment datasets and monetary policy shocks.

direction of the shock. A monetary policy tightening (top row) decreases hiring growth more in large firms relative to small ones, and a monetary expansion (bottom row) increases hiring growth in small firms more than in large ones. The difference in responses of large and small firms, shown in the right columns, is strong and significant for both shock directions.

As we see in Table 3, the p-value for the null hypothesis that the impulse response is zero at each horizon after a contractionary shock equals 0.642 for small firms, and 0.148 for large firms. In addition, the p-value for the null hypothesis that the impulse response equals zero at each horizon after an expansionary shock is zero for small firms and 0.885 for large firms, showing that small firms are the ones that benefit most during monetary expansions. As also for employment, we find for hiring growth too, that the F-tests for the null hypothesis that the impulse responses are zero for each horizon show that the hypothesis is rejected at the 15% level for large firms after contractionary monetary policy shocks and for small firms at any level, after expansionary ones.

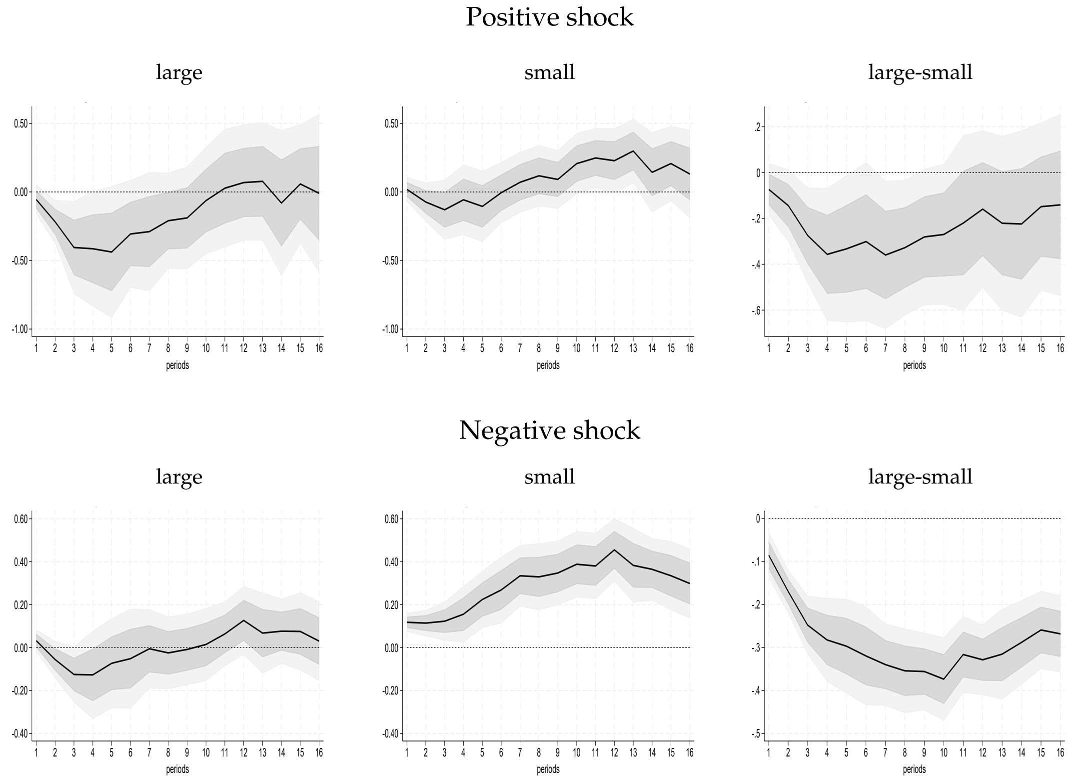


Figure 4: Response of hiring growth in large and small firms to a positive and negative ffr factor shock

Notes: The top row plots impulse responses of hiring growth to a positive (tightening) ffr factor shock for large (size 5, left panel) and small (size 1, middle panel) firms; the bottom row plots responses to a negative (easing) shock. Right panels plot the differences between large and small firm responses. The horizontal axis shows quarters, the vertical axis the percent response to a one bp shock; shaded areas are 68% and 90% confidence bands.

As before, taking into account the differences in standard deviations of positive and negative shocks as seen in Table 2, we find that a standard deviation positive shock decreases the hiring growth of large firms by 0.81% (0.182×4.46) and of small firms by 0.29% (0.066×4.46) after eight quarters. Hence, the fall in hiring growth in large firms is almost three times larger than that of small firms. For a standard deviation negative shock, hiring growth in small firms increases by 3.86% (0.37625×10.26), which is almost three times more that of the large firms, which increases by 1.35% (0.1317×10.26) after twelve quarters.[15]

In addition, comparing the responses of hiring and employment growth, we find that hiring is more responsive. For example, during monetary tightenings, the hiring growth of large firms declines 1.5 times more than employment growth, 2 years after the shock; following monetary easings, the hiring growth of small firms increases more than four times the corresponding employment growth.

Taken together, our empirical results suggest that in fact, large firms are more responsive to a contractionary ffr factor shock while small firms are more responsive to an expansionary shock. Our results also show that compared to employment, hiring growth responds stronger to monetary policy ffr factor shocks. Therefore, looking at the effect of monetary policy on employment growth alone is not fully informative of the effect of monetary policy on the labor market; this is uncovered through the effects of monetary policy shocks on employment flows like hiring growth.

3.3 Responses of firms without sign distinction

In this subsection, we study the response of large and small firms to a ffr factor monetary policy shock, estimating a specification similar to equation (1) but without taking into account the sign distinction of the ffr shocks. The objective of this analysis is to highlight the importance of the direction of monetary policy shocks in understanding their effects on the labor market of large and small firms.

Figure 5 presents the results. Without considering direction asymmetries, the top row of Figure 5 indicates that small firms are more responsive to an increase in the ffr shock compared to large firms, in terms of employment growth. After eight quarters,

[15] 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. We reported in the main text the response after 12 quarters given that the delayed response after monetary expansion caused in this case the response of large firms to be negative after 2 years and only becoming positive later on.

small firms decrease employment growth by 1.229% following a one-standard deviation ffr factor shock (this is 0.1×12.29, where 0.1 is the change in response and 12.29 is the standard deviation of the ffr factor shock, as shown in Table 2). For large firms the decrease in employment growth is half that of small firms. The difference, as seen in the last column, is significant after the 5th quarter.

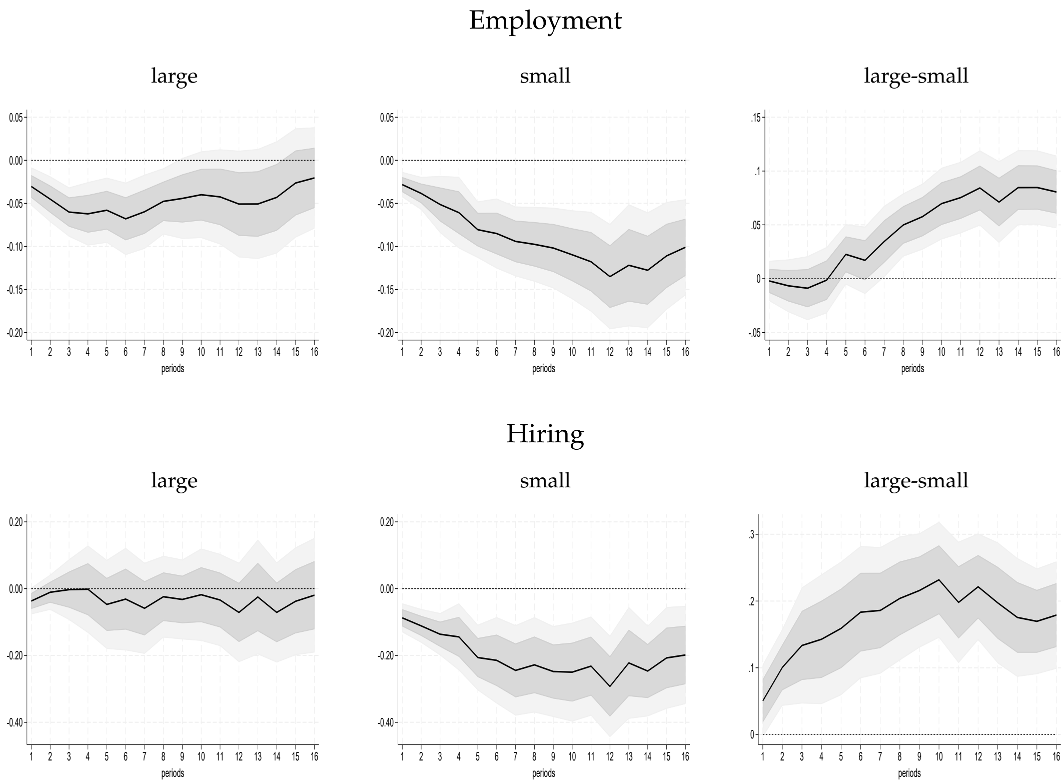


Figure 5: Response of employment and hiring growth of large and small firms to a ffr factor shock

Notes: The top row 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 bottom row shows the equivalent effects for hiring growth. The horizontal axis shows quarters, the vertical axis the percent response to a one bp shock; shaded areas are 68% and 90% confidence bands.

Similarly, the bottom row of Figure 5 shows that after eight quarters, the hiring growth of small firms drops by 2.7% (0.22×12.29) after an increase in ffr factor shock, while that of large firms does not respond much. The cumulative difference across firm size, shown in the right panel, is always significant. We note again that the change in hiring growth is double that of employment growth.

Ignoring the monetary policy shocks' sign distinction, one would conclude that small firms respond more strongly than large firms to such shocks. This general conclusion aligns with earlier findings in the literature, including the seminal work of Gertler and Gilchrist (1994), who examined the effects of monetary policy on firm-level sales and inventories. Their findings laid the foundation for the financial accelerator mechanism of Bernanke, Gertler, and Gilchrist (1999), which has been extensively documented in the investment literature. However, our results in Sections 3.1 and 3.2 challenge the sign-agnostic approach when applied to the labor market. Specifically, we find that ignoring the direction of the monetary shock obscures important asymmetries in employment responses of large and small firms. While small firms exhibit a stronger response than large firms to expansionary shocks, the opposite is true in the case of contractionary shocks, where large firms exert a more pronounced reaction. These findings suggest that insights from the investment literature do not fully carry over to labor market dynamics, when the sign of monetary policy shocks is considered.

4 Robustness

In this section, we conduct several robustness tests. In Section 4.1, we perform a robustness exercise to ensure that our findings are driven by the shock sign, instead of the shock size asymmetry. Second, in Section 4.2, we perform robustness checks related to the sample we use in our benchmark results, including the Great Recession period.

Moreover, in Appendix B.2.1 we present results obtained after redefining small firms to include those with fewer than 49 employees (instead of 19, as in the main text). This broader cutoff captures a wider extensive margin, which may be particularly relevant for the dynamics of very small firms; our results are robust to such a redefinition of small firms. In Appendix B.2.3 we show robustness to alternative monetary policy shocks. Finally, our empirical results are also robust to multiple variations of the empirical specification, like clustering variations, and the exclusion/inclusion of lagged controls.[16]

4.1 Size of the monetary policy shock

Based on the patterns observed in Table 2 and Figure 2, we note that negative monetary shocks in the sample are larger than positive ones. This observation suggests that even if the responses to positive and negative shocks were symmetrical, the non-linearities in the economy's reaction to large versus small shocks could still produce the results

[16]These additional results are available upon request.

observed in our empirical analysis. In other words, the differences in the estimated effects of negative and positive shocks might instead be capturing the differential effects of large and small shocks.

To ensure that our findings are not a result of this size asymmetry, we conduct a robustness test where we exclude ffr factor shocks greater than 30 basis points in absolute value. The results for employment and hiring growth are seen in Figures 6 and 7, respectively. Both figures show that our main messages remain, and at times, become stronger.

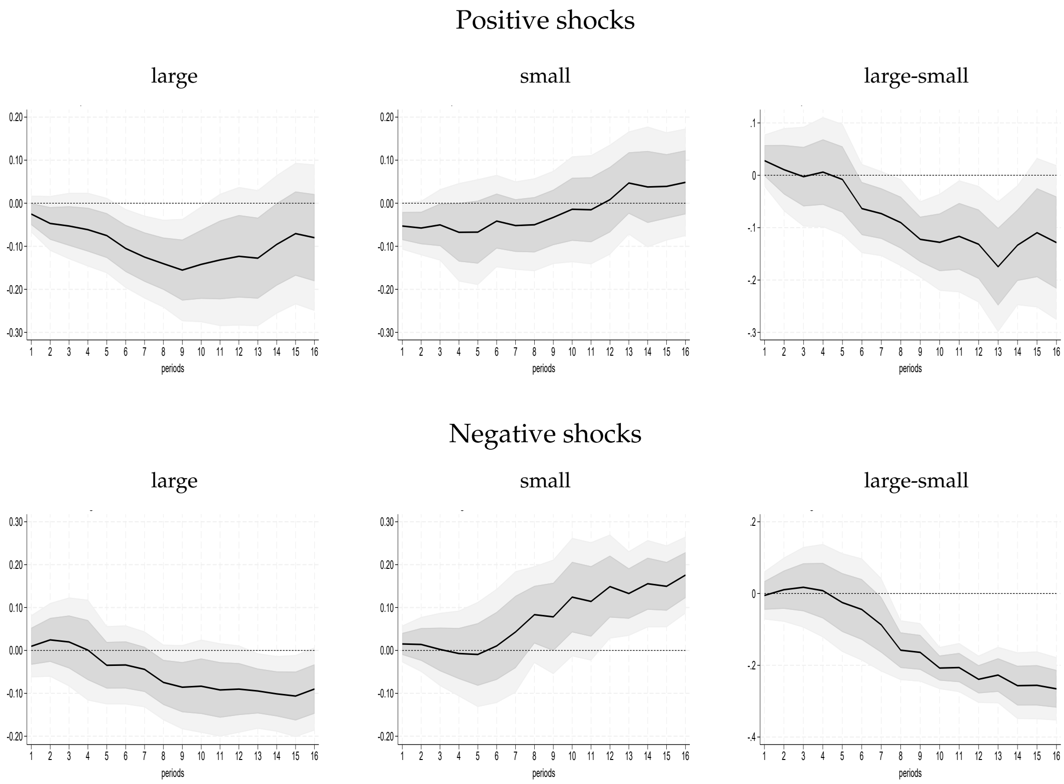


Figure 6: Response of stable employment growth in large and small firms to a positive and negative ffr factor shock, excluding outliers.

Notes: The top row plots impulse responses of employment growth to a positive (tightening) ffr factor shock smaller than 30 basis points in absolute value, for large (size 5, left panel) and small (size 1, middle panel) firms; the bottom row plots responses to a negative (easing) shock. Right panels plot the differences between large and small firm responses. The horizontal axis shows quarters, the vertical axis the percent response to a one bp shock; shaded areas are 68% and 90% confidence bands.

4.2 Excluding the Great Recession

This second robustness exercise addresses the issue that our benchmark sample results include the Great Recession period. To ensure that our results are not driven by that

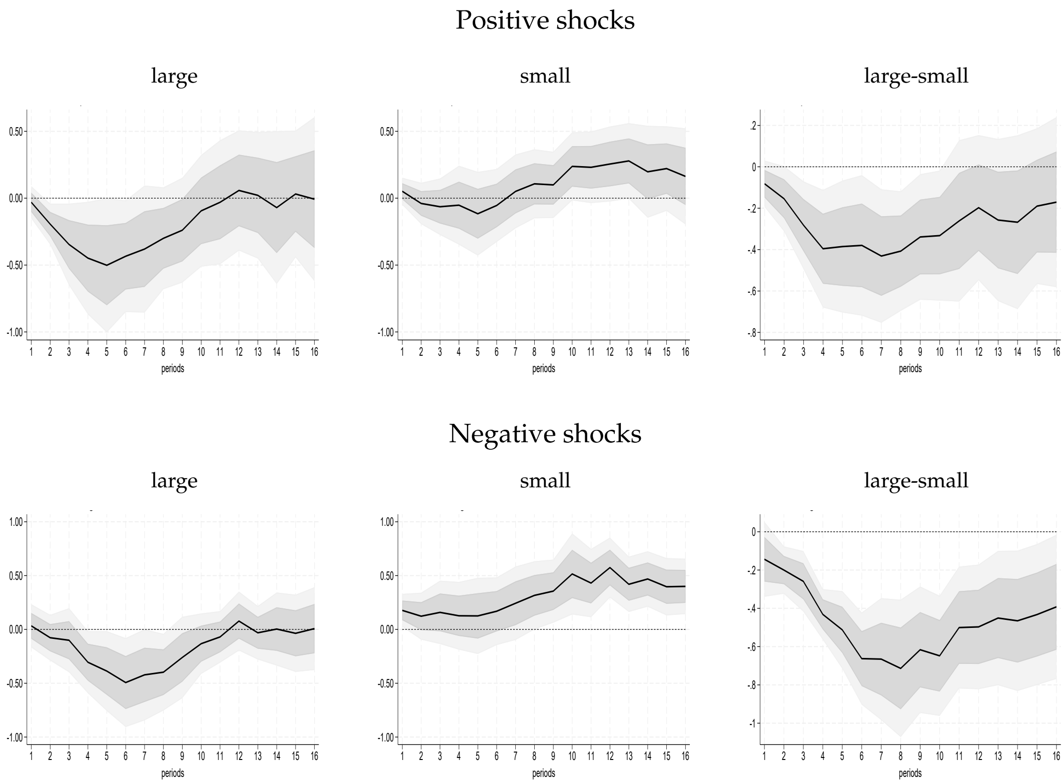


Figure 7: Response of hiring growth in large and small firms to a positive and negative ffr factor shock, excluding outliers.

Notes: The top row plots impulse responses of hiring growth to a positive (tightening) ffr factor shock smaller than 30 basis points in absolute value, for large (size 5, left panel) and small (size 1, middle panel) firms; the bottom row plots responses to a negative (easing) shock. Right panels plot the differences between large and small firm responses. The horizontal axis shows quarters, the vertical axis the percent response to a one bp shock; shaded areas are 68% and 90% confidence bands.

particular period, we do the following. First, we plot figures where the sample period excludes the Great Recession; that is, we exclude the period 2008:1-2009:4 and we use in our regressions the sample periods 1998:1- 2007:4 and 2010:1-2019:2. Figures 8 and 9 show that, like Figures 3 and 4 in the main results Section 3, large firms respond more to a monetary contraction and small firms respond more to a monetary expansion for both employment and hiring growth.

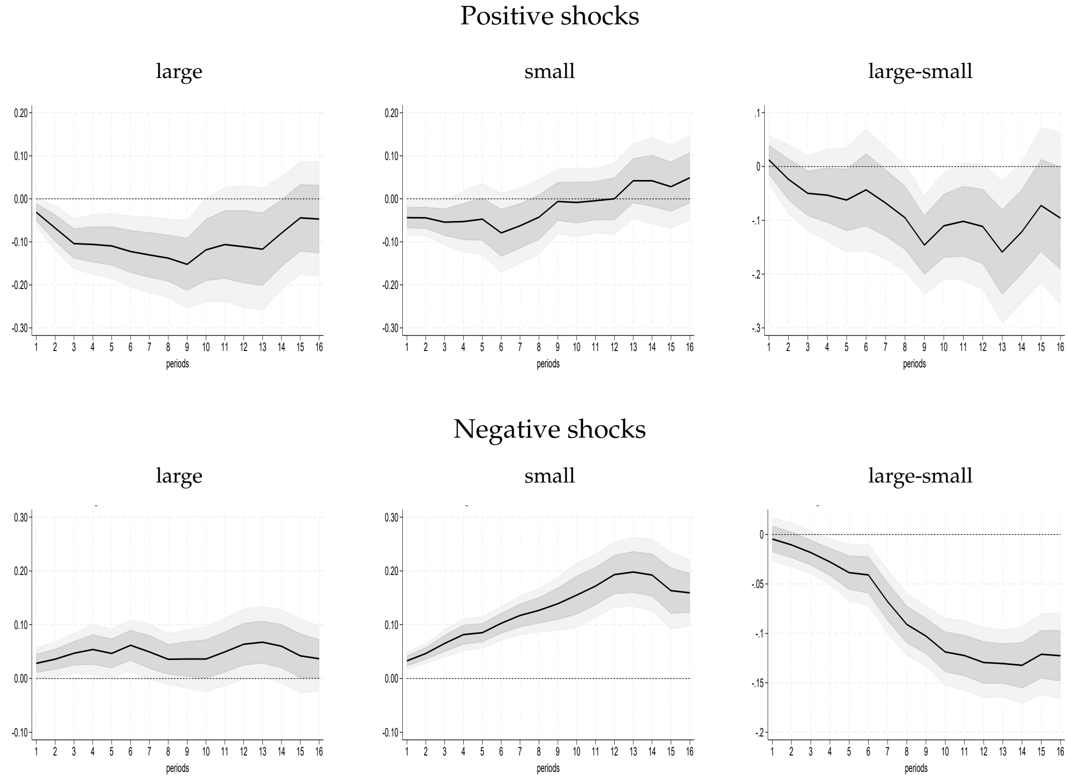


Figure 8: Response of employment growth in large and small firms to a positive and negative ffr factor shock, without GR sample

Notes: The top row plots impulse responses of employment growth to a positive (tightening) ffr factor shock for large (size 5, left panel) and small (size 1, middle panel) firms; the bottom row plots responses to a negative (easing) shock. Right panels plot the differences between large and small firm responses. The sample does not include the Great Recession. The horizontal axis shows quarters, the vertical axis the percent response to a one bp shock; shaded areas are 68% and 90% confidence bands.

In an alternative exercise, we cut the sample before the Great Recession and we show those results for employment and hiring growth in Figures B.2.3 and B.2.4 in the Appendix B.2.2. Our conclusions remain unchanged.

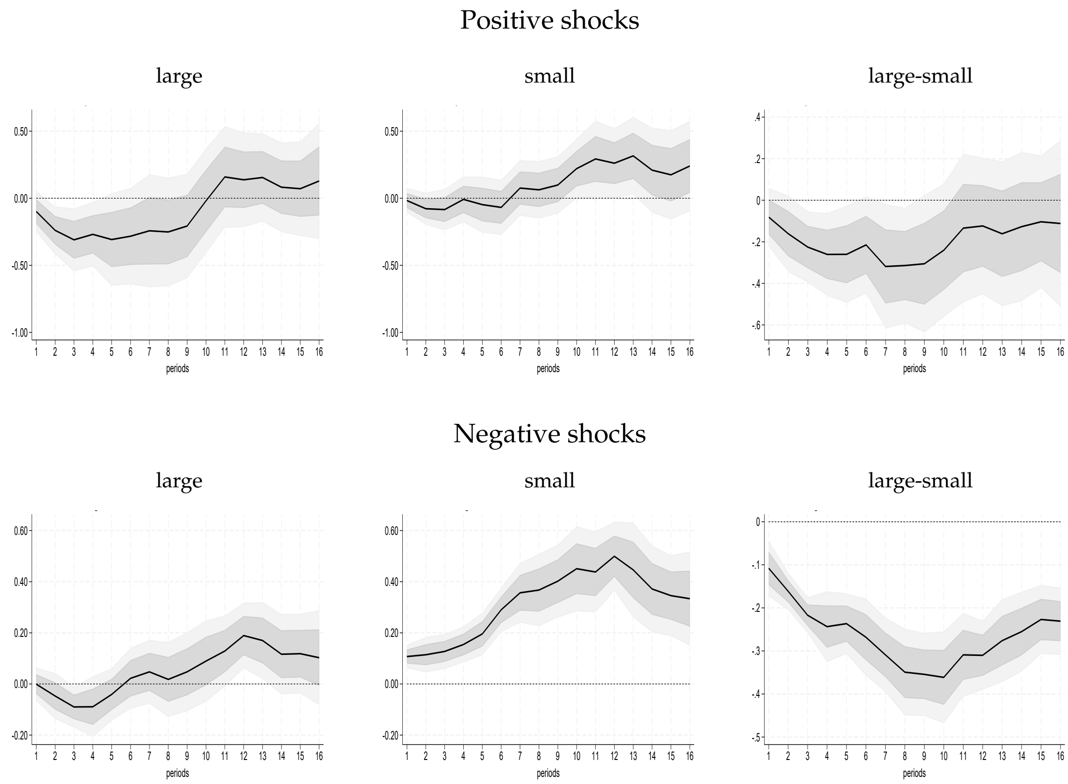


Figure 9: Response of hiring growth in large and small firms to a positive and negative ffr factor shock, without GR sample.

Notes: The top row plots impulse responses of employment growth to a positive (tightening) ffr factor shock for large (size 5, left panel) and small (size 1, middle panel) firms; the bottom row plots responses to a negative (easing) shock. Right panels plot the differences between large and small firm responses. The sample does not include the Great Recession. The horizontal axis shows quarters, the vertical axis the percent response to a one bp shock; shaded areas are 68% and 90% confidence bands.

5 Employment concentration

In this section, we investigate whether the increasing concentration of employment in large firms represents a shift in how monetary policy is transmitted through the economy.

Recent studies have highlighted the growing dominance of large firms in employment and output. Autor, Dorn, Katz, Patterson, and Van Reenen (2020) document the rise of "superstar firms", i.e., highly productive, large firms that increasingly account for industry-level employment and output shares. De Loecker, Eeckhout, and Unger (2020) show that firm markups and market power have risen significantly, correlating with increased employment concentration. These results suggest that large firms operate under different labor market dynamics and, as we show in Sections 3.1 and 3.2, they are affected by monetary policy differently compared to small firms. Further, Bigio and La'O (2020) examines the macroeconomic impact of firm size distributions and find that large firms play a disproportionate role in amplifying economic fluctuations due to their centrality in production networks.

Figure 10 presents changes in the employment shares of both small (right panel) and large (left panel) firms in the QWI dataset. The share of employment in large firms has been increasing and that of small firms have been declining over time and this corresponds closely with the BLS data plotted in Figure B.3.1 in the appendix.

Figure 10: Employment concentration in large and small firms.

Source: QWI.
Notes: The top panel of the figure plots the fraction of employment in large firms (more than 500 employees: left panel) versus small firms (1-19 employees: right panel) in the U.S., using our QWI sample from 1998-2019.

5.1 Employment concentration across states and industries

We can also check whether these change of the distribution of employment in large and small firms is influenced by the industry or the state in which it operates.

Figure 11 plots the distribution of employment across states in small (panel A) and large firms (panel B), in our sample. For each state and firm size category, the numbers are constructed by first summing employment across all industries and then averaging these totals across quarters for the years 1998 and 2019. The percentage change statistic in Figure B.3.2 in Appendix B.3 is computed by taking the percentage change in the average quarterly employment (depicted in Figure 11) between 1998 and 2019. This measure captures the relative growth or decline in employment over the two-decade period, allowing for a comparison of long-term employment trends across firm sizes and states. From the figures we see that employment in large firms increased in all states between 1998 and 2019; there are some states, however, that show a slight decrease in employment in small firms. Overall, we observe that the increase of employment in large firms and the decrease in small firms are not driven by a particular state.

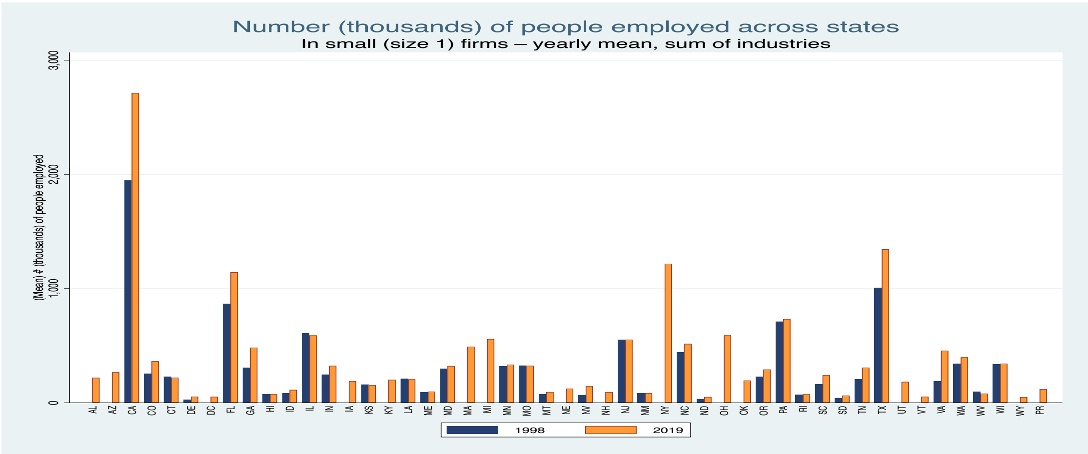
Figure 12 displays the distribution of employment across industries for small firms (left panel) and large firms (right panel) in our sample. For each industry-size category, employment is first aggregated across all states and then averaged across quarters for 1998 and 2019.[17] Figure B.3.3 in Appendix B.3 reports the percentage change in employment between 1998 and 2019 across industries and firm size groups, capturing the long-term dynamics in employment across industries.

While employment in large firms grew more rapidly than in small firms in most industries, several exceptions exist. Employment in small firms expanded more than in large firms in Mining, Quarrying, and Oil and Gas Extraction (21), Utilities (22), Management of Companies and Enterprises (55), and, though only marginally, in Arts, Entertainment, and Recreation (71). The largest divergences are observed in Utilities (22) and Professional, Scientific, and Technical Services (54). Industry-specific studies document industry-specific reasons for increases in small firms in those sectors.[18]

[17] In related work, Singh, Suda, and Zervou (2022) examine whether the effects of monetary policy shocks on labor market outcomes vary across sectors, and find large differences across the manufacturing and construction sectors relative to services.

[18] For example, Davis and Sims (2019) argue that technological innovations in horizontal drilling and fracking increased the profitability of shale gas production, enabling small firms to enter the industry after 2000. Likewise, Muttaqee, Furqan, and Boudet (2023) highlight how the development of microgrids created opportunities for small firms to participate in the utilities sector. Finally, Faulconbridge and Jones (2012) describes the emergence of decentralized networks and boutique firms in the management

Panel A: Distribution of employment across states in small (size 1) firms



Panel B: Distribution of employment across states in large (size 5) firms

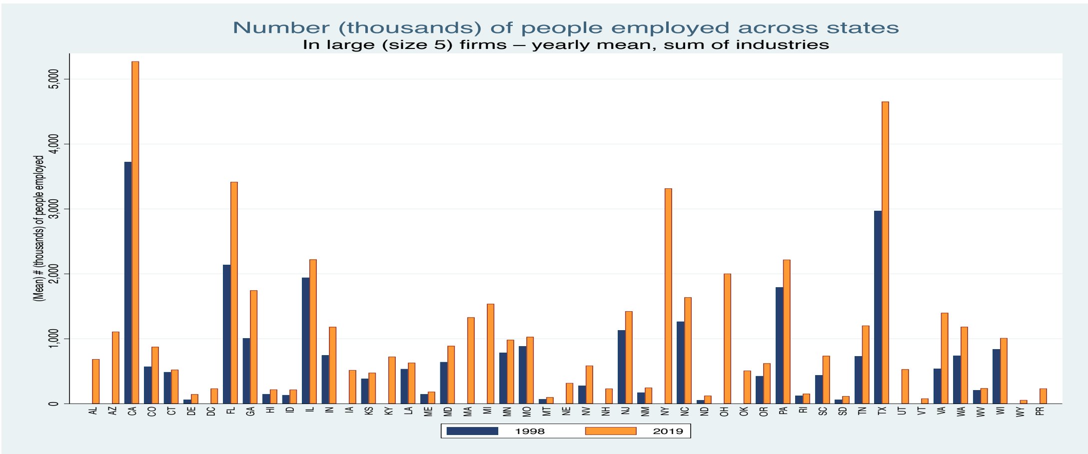


Figure 11: Distribution of employment across states for large and small firms

Source: QWI.
Notes: Each panel shows the average number of people employed across U.S. states for a given firm size. Employment figures are calculated by summing across all industries and averaging across quarters for the years 1998 and 2019. Industries with their QWI-assigned codes: 21 Mining, Quarrying, and Oil and Gas Extraction; 22 Utilities; 23 Construction; 31-33 Manufacturing; 42 Wholesale Trade; 44-45 Retail Trade; 48-49 Transportation and Warehousing; 51 Information; 54 Professional, Scientific, and Technical Services; 55 Management of Companies and Enterprises; 56 Administrative and Support and Waste Management and Remediation Services; 61 Educational Services; 62 Health Care and Social Assistance; 71 Arts, Entertainment, and Recreation; 72 Accommodation and Food Services; 81 Other Services (except Public Administration).

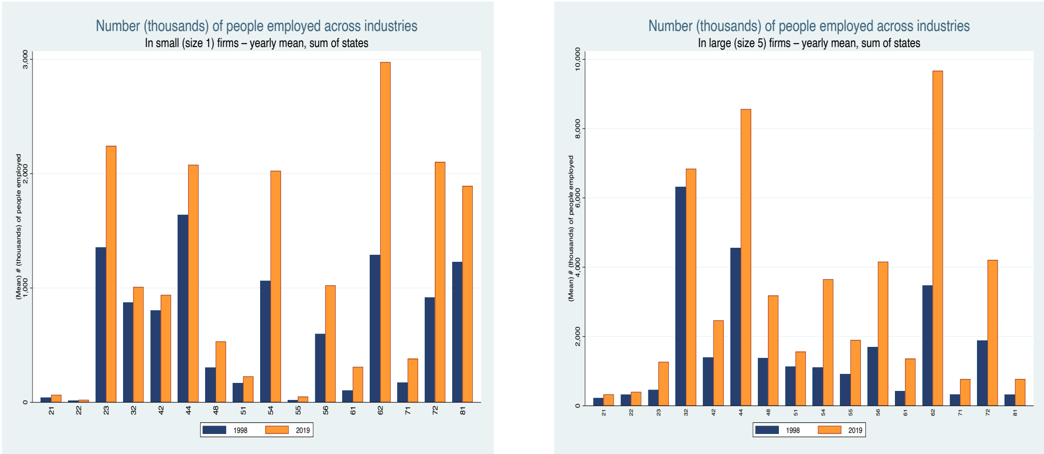


Figure 12: Distribution of employment across industries in large and small firms

Source: QWI.
Notes: Each panel displays the average number of people employed across industries for the given firm size. Employment figures are calculated by summing across all states and averaging over quarters for the years 1998 and 2019.

Overall, although there are industry and state-specific effects, the observed increased employment concentration in large firms depicted in Figure 10 is not driven by any single state or industry but reflects a broader pattern across the economy.

5.2 Employment concentration and monetary policy transmission

We now investigate the potential influence of firm size on the monetary transmission mechanism by examining how the impact of monetary policy on the labor market is shaped by shifts in employment concentration. Our methodology involves calculating a weighted sum of the coefficients for each of the employment size categories, with weights corresponding to the percentage of employment share in each category. This statistic is computed across two different periods, 1998:1 and 2019:4, to evaluate its evolution as employment concentration increases. To emphasize the changes at the extremes of the firm size distribution, specifically, small versus large firms, which is the focus of this work, we perform this calculation while holding the weights for medium-sized firms constant at zero.

As summarized in Table 4, in 1998 in our sample small firms represented 21.12% of total employment, while large firms 46.14%. By 2019, the share of small firms had decreased to 18.04%, while that of large firms increased to 51.97%. Similarly, in 1998,

consulting industry as a strategic response to global client needs and regional market shifts.

Table 4: Share of total employment and hiring (in %)

	1998	2019
Employment		
Small firms	21.12	18.04
Large firms	46.14	51.97
Hiring		
Small firms	26.22	20.04
Large firms	39.06	47.78

Notes: The table reports the shares in % of total employment and hiring accounted for by small and large firms in 1998:1 and 2019:4.

small firms accounted for 26.22% of total hires, while large firms accounted for 39.06%. By the end of 2019, the share of small firms had decreased to 20.4%, while that of large firms increased to 47.78%. Using the estimated in Sections 3.1 and 3.2 IRFs of employment and hiring growths of large and small firms to monetary policy shocks we compute the quasi-aggregate employment responses under alternative labor market composition corresponding to these shares.

Figure 13 shows the change in monetary policy effectiveness in influencing aggregate employment, given the changing concentration weights between 1998 and 2019. Specifically, a one-standard-deviation monetary policy contraction reduces employment growth by 0.30% after two years, given the employment concentration in 1998:1 ($-0.068\% \times 4.46 = -0.30\%$, where the first number is the cumulative changes in the eighth quarter in the relevant labor market variable calculated with the weights of the relevant year, while the second number is the standard deviation of the ffr shocks in basis points as reported in Table 2). In contrast, the same monetary policy contraction decreases employment growth by 0.33% after two years, considering the employment concentration in 2019:4 ($0.073\% \times 4.46 = -0.33\%$); this is a 10% increase in monetary policy effectiveness due to the change of employment shares. The effect on monetary expansion is more modest during the 8th quarter, being almost identical between the two periods, as we also see in the right panel of Figure 13; it becomes larger though, further on. Those results are summarized in Table 5.

More striking are the differences in the hiring growth response implied by the changes in hiring concentration weights between the two periods, as shown in Figure 14 and summarized in Table 5. Specifically, a one-standard-deviation monetary policy contraction reduces hiring growth by 0.21% after two years when evaluated using the earlier concentration weights ($-0.048\% \times 4.46 = -0.21\%$). In contrast, the same

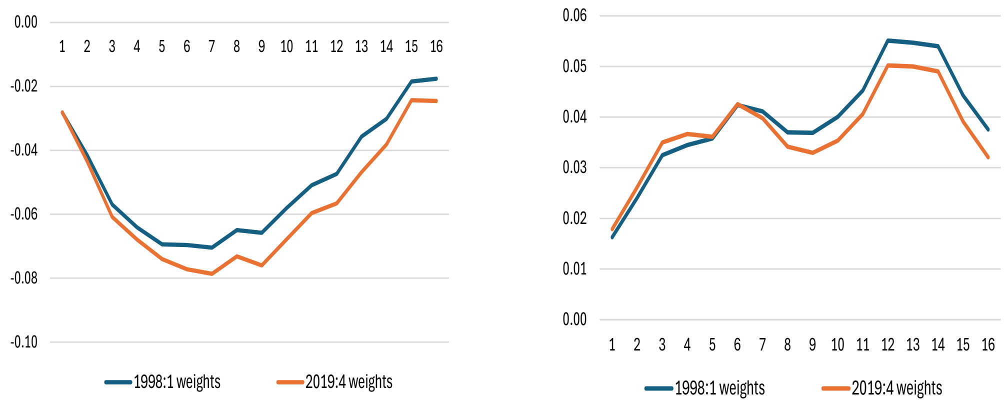


Figure 13: Changing employment concentration and monetary policy effectiveness

Notes: The figure plots effect of positive (contraction) and negative (expansion) monetary policy shock on employment growth, based on the impulse response functions and changing concentration weights, in 1998:1 (blue lines) and 2019:4 (orange lines).

Table 5: Effectiveness of monetary policy shocks on shaping employment and hiring growth (after 2 years)

	Employment Growth		Hiring Growth	
	Tightening	Easing	Tightening	Easing
1998 weights	−0.30%	0.37%	−0.21%	0.80%
2019 weights	−0.33%	0.35%	−0.33%	0.58%
2019-1998 % change	10.0%	−5.4%	57.1%	−27.5%

Notes: The table reports the effects of monetary policy tightening and easing on employment and hiring growth two years after the shock, for the 1998:1 and 2019:4 weights. The last row shows the absolute percentage change in monetary policy effectiveness due to the shift in employment and hiring weights between the two periods.

Figure 14: Changing hiring concentration and monetary policy effectiveness

Notes: The figure plots effects of positive (contraction) and negative (expansion) monetary policy shock on hiring growth, based on the impulse response functions and changing concentration weights, in 1998:1 (blue lines) and 2019:4 (orange lines).

monetary contraction reduces hiring growth by 0.33% using the 2019:4 concentration weights ($-0.073\% \times 4.46 = -0.33\%$). This reflects a 57.1% increase in the effectiveness of monetary policy in reducing hiring after a monetary contraction, driven purely by changes in concentration weights. Conversely, a one-standard-deviation monetary policy expansion increases hiring growth by 0.80% after two years under the earlier concentration weights ($0.078\% \times 10.26 = 0.82\%$). However, using the 2019:4 concentration weights, the same monetary expansion increases hiring growth by only 0.58% ($0.057\% \times 10.26 = 0.58\%$). This corresponds to a 27.5% decline in monetary policy effectiveness in stimulating hiring growth after a monetary policy expansion, caused solely by the change in concentration weights. These findings indicate that the U.S. economy, now dominated by large firms, exhibits stronger effectiveness after monetary tightenings and weaker effectiveness after monetary easings, relative to earlier periods when employment was less concentrated on large firms, in shaping the labor market.

6 Implications and conclusions

We now summarize our four main empirical results and discuss the implications for the policy mandate of maximum employment. Our first empirical result suggests that the aggregate employment response to monetary policy depends on the size of employers. Specifically, result (i) establishes that after a monetary tightening, large firms reduce employment and hiring growth more than small firms, while small firms expand more after a monetary easing. As a result, a monetary expansion followed by an equally strong monetary tightening is non-neutral for the distribution of employees across firms.

Furthermore, given that employment is directed towards larger firms over time our result (i) then suggests that monetary tightening is likely to have a greater impact over time, as it affects larger firms, while monetary easing becomes less effective over time, as it affects smaller firms. Indeed, in Section 5 we established that this is the case, using the employment concentration measures of 1998 versus 2019. For this reason, the size composition, or otherwise, employment concentration, is an important metric for policy to track when assessing its effectiveness in achieving full employment (result iv).

Our second result suggests that the direction of the shock is important in understanding the effects of monetary policy on the labor market. Specifically, result (ii) establishes that without taking the shock sign asymmetry into account, we would conclude that small firms react more than large ones to monetary policy shocks. We uncover that small firms do not, in general, react more to monetary policy shocks relative to large ones, yet they do so after monetary expansions; large firms react more after monetary contractions. These findings suggest that policies aiming to boost employment in small firms during times of monetary contractions might be less essential.

Our result (ii) suggests that taking into account the direction of the shock is important for an additional reason. We find that monetary expansions are realized in the labor market with a lag, a finding that becomes apparent only when we examine separately the impact of positive and negative shocks. In turn, the difference in the timing of the responses after loosening versus tightening blurs the effect of monetary policy shocks on labor market variables when averaged out. We also note that exploiting the variation across firm size allows us, beyond the exploration of interesting questions, to estimate with confidence the sign asymmetries. The length of the sample of monetary announcements alone might not be adequate for making conclusions when using only time variation and splitting the data into positive and negative shocks. The information we unveil is important for policy design aiming to affect the labor market in a timely manner; our results suggest that this is more easily done when attempting to cool down employment rather than when trying to boost it.

Finally, our result (iii) demonstrates that the effects of monetary policy are less pronounced for employment, while they are more apparent for hiring. This result establishes the importance of labor market flows in evaluating and designing monetary policies that aim to impact employment; flows offer a more accurate account of the effects of monetary policy on the labor market than aggregate employment alone.

In our analysis, we rely on the QWI dataset, which reports employment flow margins aggregated at the state-industry-firm size level and covers a wide range of large and small firms across the United States. This publicly available quarterly panel provides rich variation for examining the effects of monetary policy on the labor market and its asymmetries by shock sign and firm size. At the same time, the dataset has important limitations: it does not contain firms' financial information, preventing us from directly studying the mechanisms behind our results. Nevertheless, our evidence suggests that neither the well-cited financial accelerator mechanism nor the steeper upward-sloping marginal cost curve for constrained firms emphasized by Ottonello and Winberry (2020) and Bahaj, Foulis, Pinter, and Surico (2022), dominates in both directions of monetary shocks when firm size is used as a proxy for financing constraints.[19] These remain important questions for future research. Despite its limitations, our study takes a significant step toward clarifying how monetary policy shapes labor market dynamics in the pursuit of Congress's mandate of maximum employment and effective stabilization.

[19] Additional mechanisms focusing on input costs are studied in Zervou (2014), Manea (2020) and Singh, Suda, and Zervou (2024).

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A Data appendix

A.1 Further details on QWI

The QWI dataset includes quarterly, state-level information on total employment and employment dynamics including also employer or establishment information, like firm size and NAICS Sectors.[20] All private (i.e., not Federal) employers that are covered by unemployment insurance in the U.S. are included.[21]

The QWI links together the following datasets: 1) Unemployment Insurance earnings data (UI) from where the employment and earnings data at the job level (a worker at an establishment) is taken. All employers that are covered by unemployment insurance submit quarterly earnings reports for all employees (around 96% of wage and salary civilian jobs in the U.S.) 2) Quarterly Census of Employment and Wages (QCEW) from where employer information such as industry, is taken. 3) Business Dynamics Statistics (BDS) from where firm age or size is obtained. This is reported on the employer/firm level (not on establishment). 4) Various sources provide information about the demographic characteristics of the worker, such as age, sex, race, ethnicity, education, and place of residence (e.g., the 2000 Census Social Security Administrative records, individual tax returns, etc).

The main definitions used to describe a job are as follows. An employer is a single account in a given state's unemployment reporting system, referred to as State Employer Identification Number (SEIN). State-based Employers may be linked across states to a national firm, via the Federal Employer Identification Number (EIN). An establishment is a physical place of work within an employer (SEINUNIT). A single employer may have one or many establishments. An employee is a single worker, identified by Social Security Number (SSN), encoded to the Protected Identification Key (PIK). Job is the association of an individual PIK with an establishment (SEINUNIT) in a given year and quarter.

Our dependent variables from the QWI are stable employment-*EmpS* and hires-*HirAS*. The definitions of those variables are as follows. *EmpS*: count of employees with positive earnings at $t-1$, t and $t+1$. This is an estimate of stable jobs, i.e., the number of jobs that are held on both the first and last day of the quarter with the same

[20] An alternative data set that we could have used is the Quarterly Census of Employment and Wages. However, this data set does not include job creation/destruction, which is important in identifying the sources of employment changes.

[21] Examples of jobs that are not covered include federal employment, some agricultural jobs, railroad employment, self-employment, and other exceptions that vary from state to state.

employer. *HirAS*: count of workers having positive earnings at a specific employer in $t-1$, t, $t+1$ but no earnings from that employer in $t-2$. This is an estimate of stable hires, i.e, the number of workers who started a job that they had not held within the past year and the job turned into a job that lasted at least a full quarter with a given employer.

We use the information on the employer size, which is defined at the national level (not at the state level). A national firm may be larger or older than the part of that firm found in a state. Firm size refers to the national employment size of the firm on March 12th (Q1) of the previous year. For new firms, firm size is measured as the current year's March employment (or the employment in the first month of positive employment if born after March). There are five category bins of firm size (0 – 19, 20 – 49, 50 – 249, 250 – 499 and 500+ Employees). We also use the information on the state of work, i.e., this characteristic is based on the job geography. Finally, we use the 2-digit industry code.

As mentioned in the main text, following standard practice in employment and monetary policy research, we restrict our analysis to private non-FIRE, non-agricultural sectors. Specifically, we exclude Agriculture, Forestry, Fishing and Hunting, and Public Administration, which are typically omitted in labor market studies due to their distinct employment patterns. We also exclude the Finance, Insurance, and Real Estate (FIRE) sectors. The industries included with their QWI assigned code are: 21 Mining, Quarrying, and Oil and Gas Extraction; 22 Utilities; 23 Construction; 31-33 Manufacturing; 42 Wholesale Trade; 44-45 Retail Trade; 48-49 Transportation and Warehousing; 51 Information; 54 Professional, Scientific, and Technical Services; 55 Management of Companies and Enterprises; 56 Administrative and Support and Waste Management and Remediation Services; 61 Educational Services; 62 Health Care and Social Assistance; 71 Arts, Entertainment, and Recreation; 72 Accommodation and Food Services; 81 Other Services (except Public Administration).

One of the drawbacks of the QWI dataset is that as a panel, is unbalanced across states. In 1990, when it was first introduced, only four states participated. Additional states joined through 2004, when forty-nine states are included (all U.S. states apart from Massachusetts and Washington, D.C.). The states used, with their QWI assigned numbers are: 1 AL; 2 AK; 4 AZ; 5 AR; 6 CA; 8 CO; 9 CT; 10 DE; 11 DC; 12 FL; 13 GA; 15 HI; 16 ID; 17 IL; 18 IN; 19 IA; 20 KS; 21 KY; 22 LA; 23 ME; 24 MD; 25 MA; 26 MI; 27 MN; 28 MS; 29 MO; 30 MT; 31 NE; 32 NV; 33 NH; 34 NJ; 35 NM; 36 NY; 37 NC; 38 ND;

39 OH; 40 OK; 41 OR; 42 PA; 44 RI; 45 SC; 46 SD; 47 TN; 48 TX; 49 UT; 50 VT; 51 VA; 53 WA; 54 WV; 55 WI; 56 WY.

B Results appendix

B.1 Aggregate data

We examine the effect of the ffr factor shocks on key aggregate variables such as real GDP (GDPC1, Real Gross Domestic Product, Billions of Chained 2012 Dollars, Quarterly, Seasonally Adjusted Annual Rate), employment (USPRIV, All Employees, Total Private, Thousands of Persons, Quarterly, Seasonally Adjusted), and the price level (CPIAUCSL, Consumer Price Index for All Urban Consumers, Quarterly, Seasonally Adjusted). The data are from the St. Louis FRED database, for the period 1995:1-2019:2. We estimate the following equation

$$\Delta_h n_{t+h} = \beta^h_{ffr} \epsilon^{ffr}_t + \Gamma^{h\prime} Z_t + u^h_{t+h} \tag{B.1}$$

where Z includes the other two components of monetary policy, forward guidance and large-scale asset purchases (LSAPs), and current and three lags of the federal funds rate, and capacity utilization.

Figure B.1.1 shows that an increase in the ffr factor shock decreases real GDP and employment growth, and lowers the price level (although with an initial price-puzzle period). As such, the ffr factor shocks that we use in this paper, generate the expected effects on the aggregate variables.

B.2 Further robustness

B.2.1 Redefining small firms

In this section, we present results when we consider a broader definition of small firms than in the main text. We do so as the extensive margin might be more active on very small firms, and we want to verify that our conclusions are not driven purely by that margin. In the figures B.2.1-B.2.2, small firms are defined as firms with a total number of employees of 1-49, instead of 1-19. Our conclusions are unchanged, i.e., employment and hiring growth falls more for large firms compared to small firms during monetary contractions, while employment and hiring growth expands more

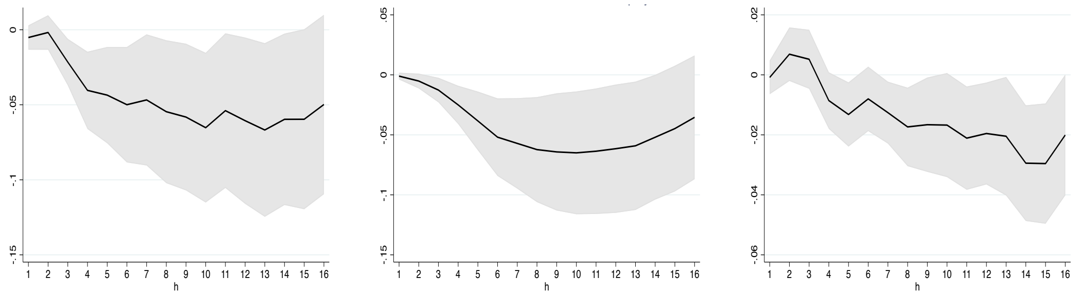

Figure B.1.1: Response of the growth rate of real GDP, aggregate employment and the price level to a ffr factor shock

Notes: The figure plots the response of the growth rate of real GDP (left column), aggregate employment (middle column) and the price level (right column), to an increase in the ffr factor shock. The horizontal axis measures time (in quarters) and the vertical axis measures the response in percent to a one basis point shock. The shaded area depicts 68% confidence bands.

for small firms compared to large firms during monetary expansions. That is, our conclusions are robust to redefining small firms as larger as in the main text.

B.2.2 Sample Prior to GR

In this exercise, we end the sample before the Great Recession. The results for employment and hiring growth are shown in Figures B.2.3 and B.2.4, respectively. Our conclusions are unchanged.

B.2.3 Alternative shocks

In this section, we follow Jarociński (2024), who propose an alternative decomposition of high-frequency asset price movements around FOMC announcements into three distinct shocks: a monetary policy shock, capturing unexpected changes in the policy stance; a central bank information shock, reflecting news about the Fed's assessment of the economy; and a Fed response-to-news shock, which accounts for the central bank's reaction to incoming economic data. We use the monetary policy shock. Figures B.2.5 and B.2.6 depict the results, which are in line with the results in the main text.

We have also performed robustness using the Gürkaynak, Sack, and Swanson (2005) target monetary policy shock and the extended Campbell, Evans, Fisher, and Justiniano (2012) shock series. The results are similar to those obtained in the main text and are available upon request.

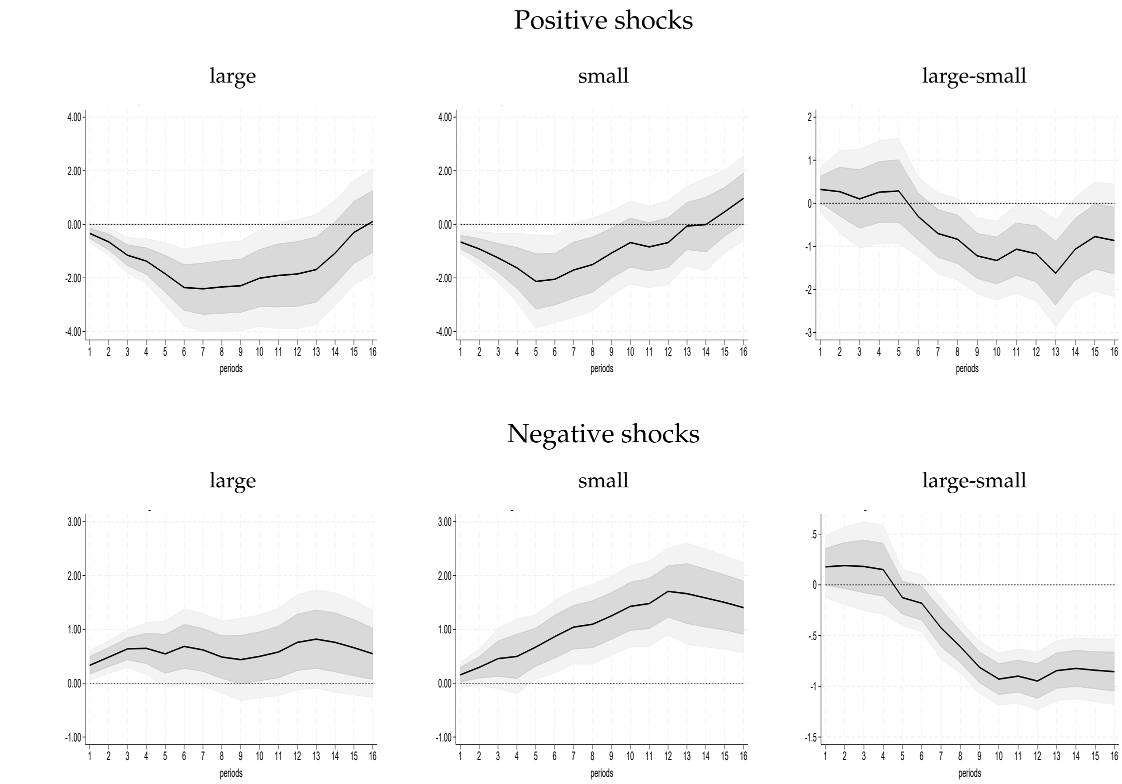

Figure B.2.1: Response of employment growth in small (size 1 and 2 combined) and large firms to a positive and negative ffr factor shock

Notes: The top row plots impulse responses of employment growth to a positive (tightening) ffr factor shock for large (size 5, left panel) and small (sizes 1 and 2 combined, middle panel) firms; the bottom row plots responses to a negative (easing) shock. Right panels plot the differences between large and small firm responses. The horizontal axis shows quarters, the vertical axis the percent response to a one bp shock; shaded areas are 68% and 90% confidence bands.

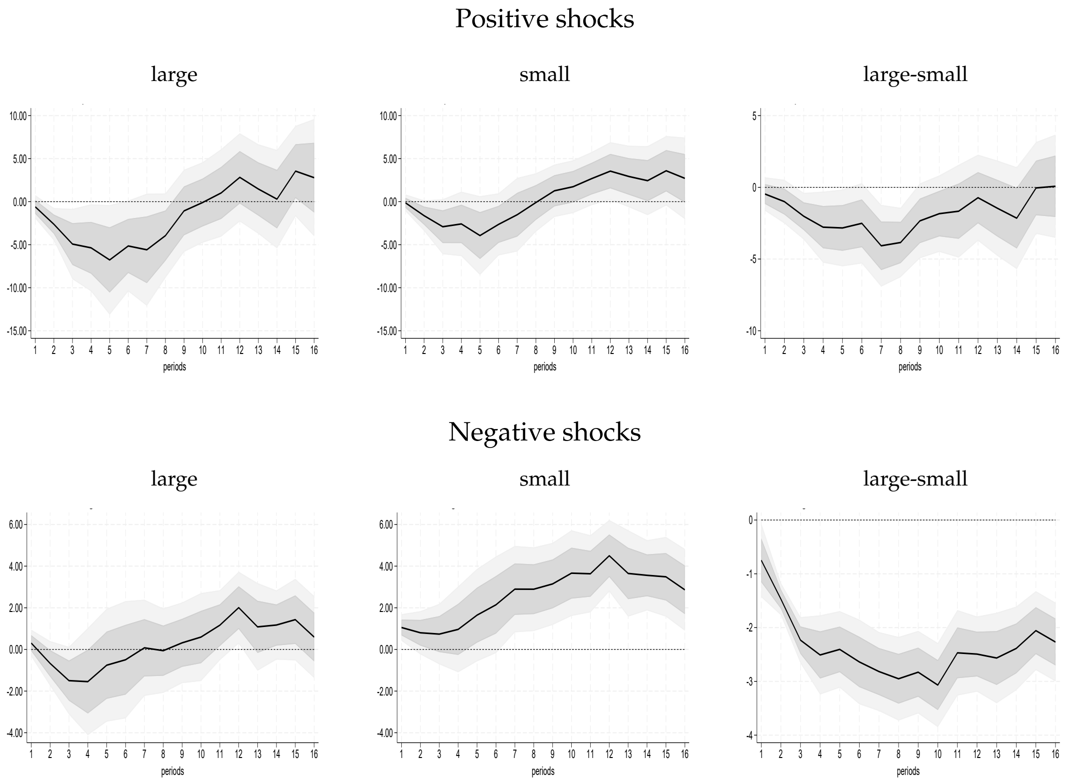

Figure B.2.2: Response of hiring growth in small (size 1 and 2 combined) and large firms to a positive and negative ffr factor shock

Notes: The top row plots impulse responses of hiring growth to a positive (tightening) ffr factor shock for large (size 5, left panel) and small (sizes 1 and 2 combined, middle panel) firms; the bottom row plots responses to a negative (easing) shock. Right panels plot the differences between large and small firm responses. The horizontal axis shows quarters, the vertical axis the percent response to a one bp shock; shaded areas are 68% and 90% confidence bands.

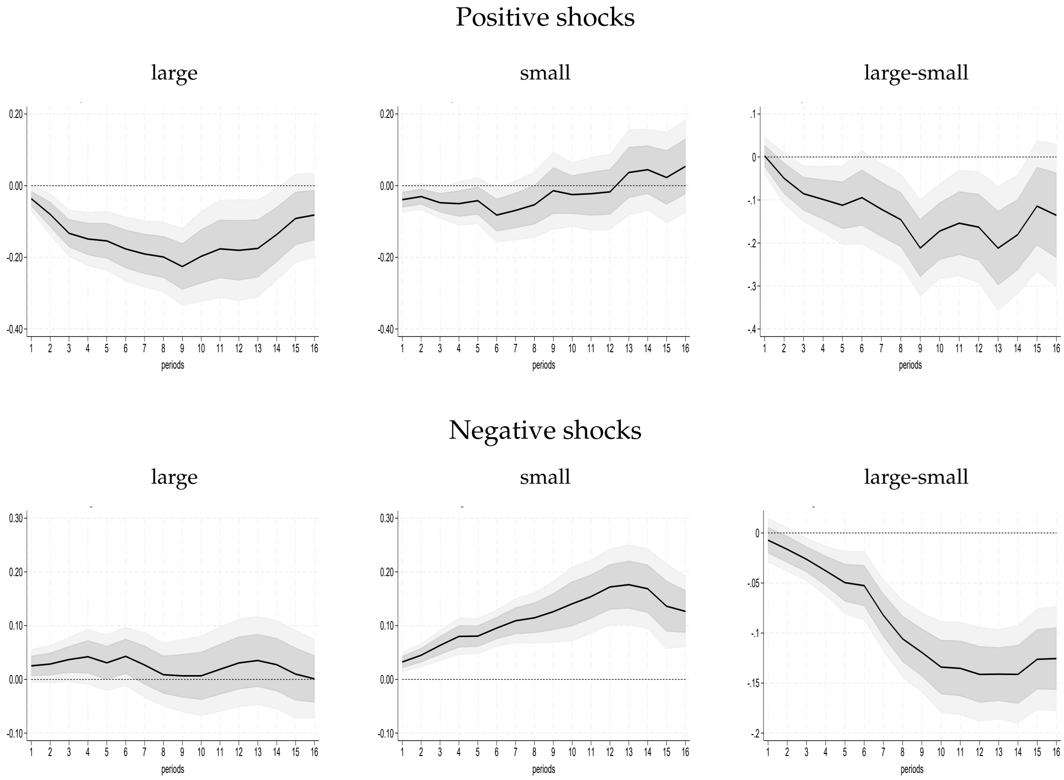

Figure B.2.3: Response of (stable) employment growth in large and small firms to a positive and negative ffr factor shock, before GR

Notes: The top row plots impulse responses of employment growth to a positive (tightening) ffr factor shock for large (size 5, left panel) and small (sizes 1 and 2 combined, middle panel) firms; the bottom row plots responses to a negative (easing) shock. Right panels plot the differences between large and small firm responses. The sample ends before the Great Recession. The horizontal axis shows quarters, the vertical axis the percent response to a one bp shock; shaded areas are 68% and 90% confidence bands.

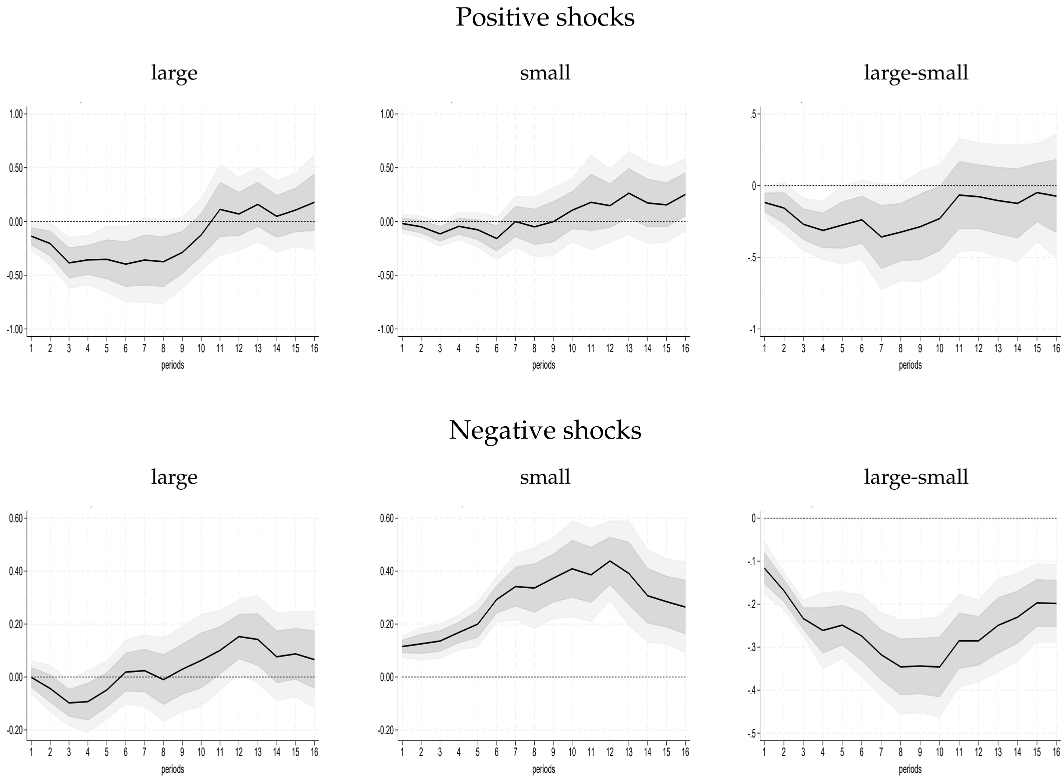

Figure B.2.4: Response of (stable) hiring growth in large and small firms to a positive and negative ffr factor shock, before GR.

Notes: The top row plots impulse responses of hiring growth to a positive (tightening) ffr factor shock for large (size 5, left panel) and small (sizes 1 and 2 combined, middle panel) firms; the bottom row plots responses to a negative (easing) shock. Right panels plot the differences between large and small firm responses. The sample ends before the Great Recession. The horizontal axis shows quarters, the vertical axis the percent response to a one bp shock; shaded areas are 68% and 90% confidence bands.

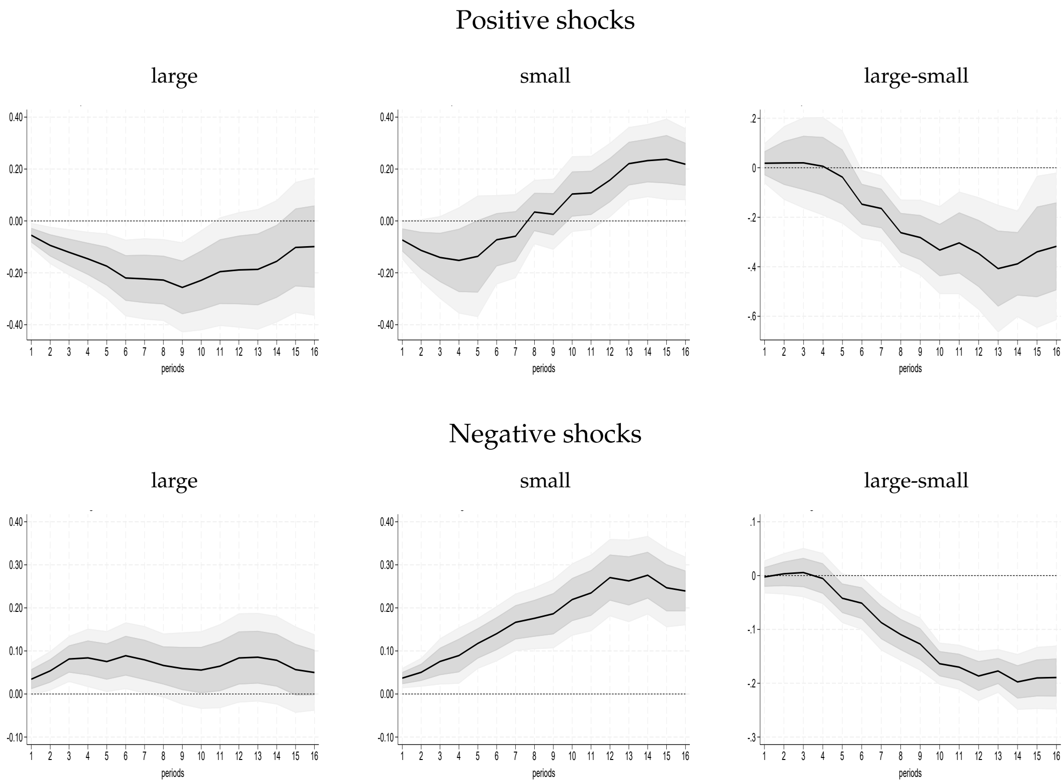

Figure B.2.5: Response of stable employment growth in large and small firms to a positive and negative Jarociński (2024) shock

Notes: The top row plots impulse responses of employment growth to a positive (tightening) Jarociński (2024) shock for large (size 5, left panel) and small (sizes 1 and 2 combined, middle panel) firms; the bottom row plots responses to a negative (easing) shock. Right panels plot the differences between large and small firm responses. The horizontal axis shows quarters, the vertical axis the percent response to a one bp shock; shaded areas are 68% and 90% confidence bands.

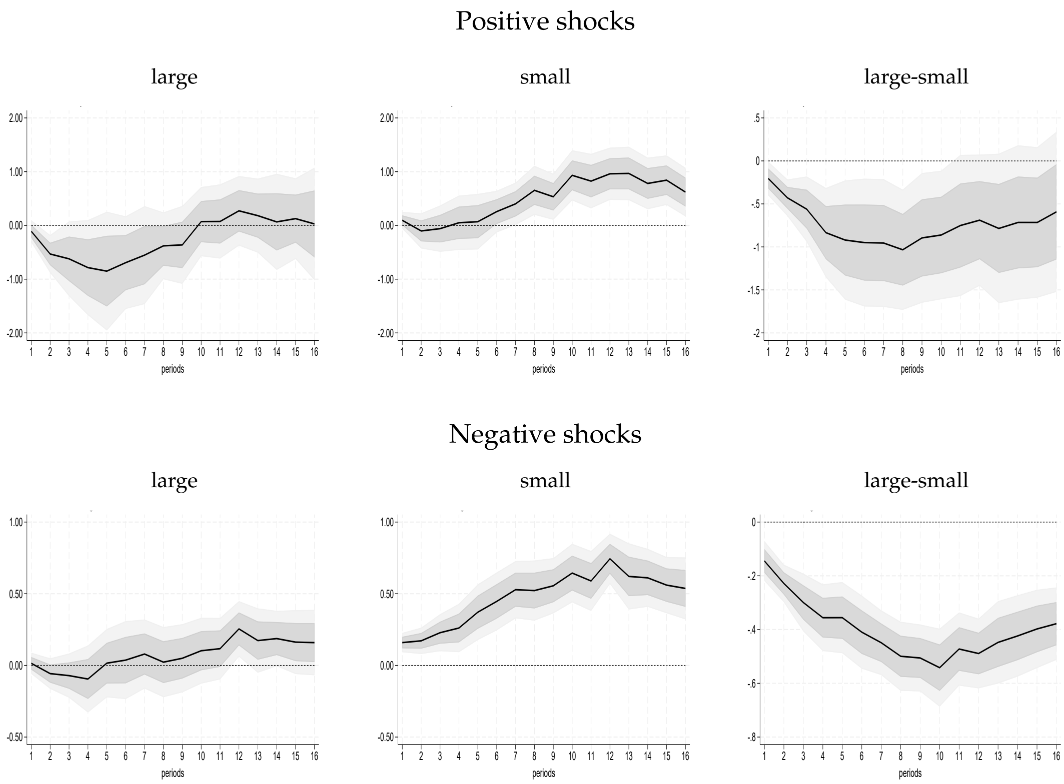

Figure B.2.6: Response of hiring growth in large and small firms to a Jarociński (2024) shock

Notes: The top row plots impulse responses of hiring growth to a positive (tightening) Jarociński (2024) shock for large (size 5, left panel) and small (sizes 1 and 2 combined, middle panel) firms; the bottom row plots responses to a negative (easing) shock. Right panels plot the differences between large and small firm responses. The horizontal axis shows quarters, the vertical axis the percent response to a one bp shock; shaded areas are 68% and 90% confidence bands.

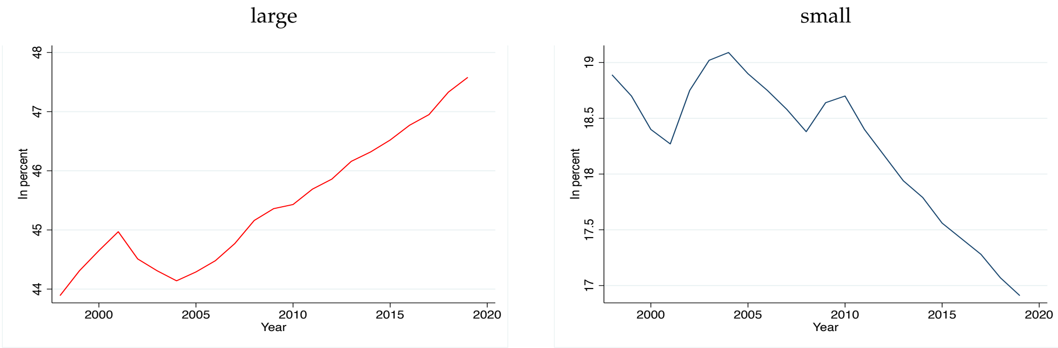

Figure B.3.1: Employment concentration in large and small firms: BLS

Notes: The top panel of the figure plots the fraction of employment in large firms (more than 500 employees: left panel) versus small firms (1-19 employees: right panel) in the U.S., using the Bureau of Labor Statistics annual data from 1998-2019.

B.3 Further concentration statistics

Figure B.3.1 plots the trend in concentration using the data from the Bureau of Labor Statistics which closely matches the trend in QWI presented in Figure 10 in the main text.

In Figure B.3.2, we show the percentage change for large and small firms from 1998 to 2019, for each state. The percentage change statistic in Figure B.3.2 is computed by taking the percentage change in the average quarterly employment (depicted in Figure 11) between 1998 and 2019. This measure captures the relative growth or decline in employment over the two-decade period. We see that employment in large firms increased in all states between 1998 and 2019; it decreased in small firms in some states.[22] Overall, the increase in employment in large firms, versus small firms, is not driven by a specific state.

Figure B.3.3 reports the percentage change in employment between 1998 and 2019 across industries and firm size groups. The percentage change in Figure B.3.2 is calculated based on the average quarterly employment (shown in Figure 12).

Overall, as also pointed out in the main text, although there are industry and state-specific effects, the observed increase in employment concentration is not driven by any single state or industry.

[22] Because the QWI dataset is unbalanced across states, with fewer states reporting data in 1998 than in 2019, some states are missing from the percentage change graph. See Appendix A.1 for additional details on the QWI dataset.

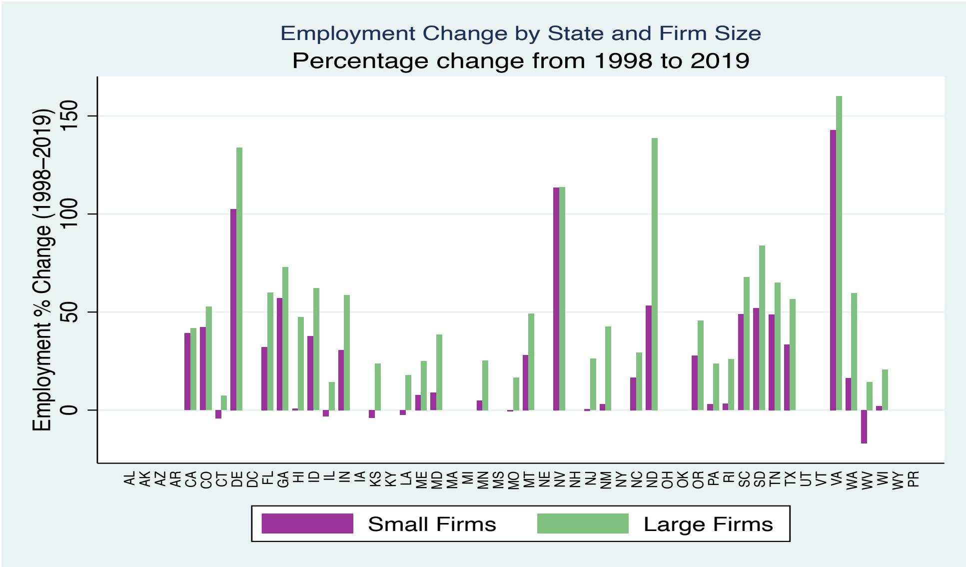

Figure B.3.2: Percentage change in distribution of employment from 1998 to 2019, across states.

Notes: The figure plots the percentage change in the number of people employed across states for small (size 1) and large (size 5) firms from 1998 to 2019.

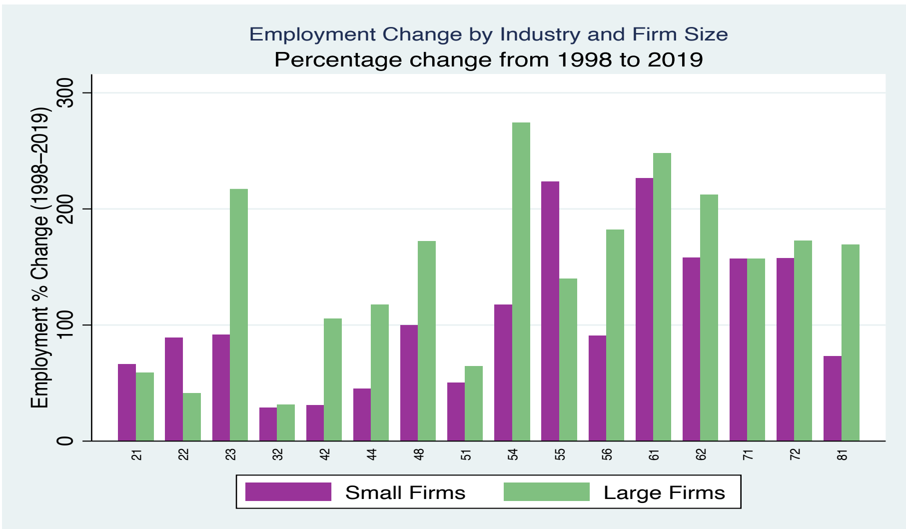

Figure B.3.3: Percentage change in distribution of employment from 1998 to 2019, across industries.

Notes: The figure plots the percentage change in the number of people employed across industries for small (size 1) and large (size 5) firms from 1998 to 2019. The figure plots the percentage change in employment between 1998 and 2019 for each industry, for small (size 1) and large (size 5) firms.