Monetary policy, labor market, and sectoral heterogeneity

Aarti Singh, Jacek Suda and Anastasia Zervou[*]

January 14, 2022

Abstract

We study the effects of monetary policy shocks on the labor market across firms in different sectors. Using the local projections method we find that the response of employment and hiring growth to monetary policy shocks is stronger for firms in the manufacturing and construction sectors relative to those in the service sector. Those sectoral differences are also present within firms of the same size. Moreover, we find that within a sector, employment and hiring growth in large firms respond more to contractionary monetary policy shocks compared to small firms; the response to expansionary monetary policy shocks is less compared to small firms. Finally, we find that the differences in the employment and hiring growth between small and large firms are greater for firms in the manufacturing and construction sectors, compared to those between small and large firms in the service sector.

JEL classification: D22, E24, E32, E52, J23, L25
Keywords: Heterogeneous firms, financing constraints, labour market frictions, Industries

1 Introduction

We study the effects of monetary policy on the labor market in different sectors. This is interesting for several reasons. First, since one of the objectives of monetary policy is to impact aggregate employment, an understanding of how employment in different sectors responds to policy will inform monetary authorities regarding which sectors drive the aggregate effect. Second, the heterogeneous employment response across sectors to a monetary policy shock suggests that there will be distributional effects of monetary policy, both for the worker and the firm. Knowing the extent of such effects is important from the

---
[*]Corresponding author: Anastasia Zervou, Department of Economics, University of Texas at Austin; zervoua@gmail.com; Singh: School of Economics, University of Sydney; aarti.singh@sydney.edu.au.; Suda: Narodowy Bank Polski and SGH, Warsaw School of Economics; jacek.suda@sgh.waw.pl

perspective of aggregate output and welfare. Finally, the results of this empirical analysis will enable us to uncover the importance of underlying frictions in order to inform structural models that study the impact of monetary policy on the labor market.

Our empirical findings reveal that the employment and hiring growth response to monetary policy shocks is stronger for firms in the manufacturing and construction sectors relative to firms in the service sector. This first result is in line with previous literature emphasizing that the investment and expenditure on durable goods is more sensitive to monetary policy relative to that on non-durable goods (e.g., Howes, 2021; Erceg and Levin, 2006; Barsky, House, and Kimball, 2003). We contribute to this literature by highlighting that similar conclusions apply for the response of the labor market variables to monetary policy shocks.

Our second set of results exploits differences in firm-size and differences across sectors that our dataset allows us to examine. First, we find that the differences across manufacturing and services, and construction and services, is present within firms of the same size. That is, large firms in manufacturing and construction respond more than large firms in services. Similarly, small firms in manufacturing and construction respond more than small firms in services.

Second, we find that within sectors, the employment and hiring growth in large firms respond more than that in small firms after monetary contractions; it does so less after monetary expansions. This is in line with the findings of Singh, Suda, and Zervou (2021) (SSZ hereafter) that consider employment and hiring growth in the aggregate U.S. economy.

Finally, we find that the differences across firm-size within sectors are more pronounced in firms in the manufacturing and construction sector, than it is for those in services. That is, there are sizable differences in the responses of large versus small firms in the manufacturing and construction sectors, while those differences are muted in the service sector.

The theoretical underpinnings of the sectoral response and firm-size responses differ. In Section 3, where we discuss our results, we argue that both the frictions behind sectoral heterogeneity (e.g. different degree of price stickiness and/or elasticity of substitution between durable and non-durable goods sectors), and frictions that usually proxy firm

2

size (e.g., financing frictions) play a role in understanding the labor market response to monetary policy shocks.

2   Data and methodology

We use labor market variables from the Quarterly Workforce Indicators (QWI) dataset of the U.S. Census Bureau. We use the extended series of monetary policy target shocks from Campbell, Evans, Fisher, Justiniano, Calomiris, and Woodford (2012), and look on size differences.[1]

The QWI data includes all private employers that are covered by unemployment insurance in the United States, aggregated by state, industry and firm size. The cross-sectional dimension of our panel is specified by the triplet "state-industry-size." Our sample consists of 17 states, including California and Texas, and covers the period 1995:1-2014:1. The QWI reports five firm size categories; we focus on the smallest firms (size 1), consisting of 0-19 employees, and on the largest firms (size five), consisting of more than 500 employees. The sectors that we consider are manufacturing (NAICS Sector codes 31-33) and services (NAICS Sector codes 31, 54-54, 61-62, 71-72, 81) and we also compare construction (NAICS Sector code 23) with services in the online appendix. The number of observations per industry ranges from 6,090 in case of construction and manufacturing to 54,678 for services. See the online appendix for summary statistics of the labor market variables for these sectors.

To measure the impact of high frequency target monetary policy shocks on the labor market we employ the local projections method. In our analysis, the dependent variable is the cumulative growth rate of employment.[2] To examine the heterogeneous response of firms that differ in size to positive and negative target policy shocks, we interact the monetary policy shock with firm size. The specification below is estimated separately for

---

[1]As noted in SSZ, the statistical properties of positive and negative target shocks are different and as a result their impact on labor market variables is also different.

[2]In the online appendix we present the results for the growth rate of hiring.

different industries i

$$\Delta_h n_{gis,t+h} = \alpha_{gis}^h + \beta_{s,Target+}^h \epsilon_t^{Target^+} \mathbb{I}_s$$
$$+ \beta_{s,Target-}^h \epsilon_t^{Target^-} \mathbb{I}_s + \Gamma^{h\prime} Z_t + u_{gis,t+h}^h \,,$$

where $\Delta_h n_{gis,t+h} \equiv \log N_{gis,t+h} - \log N_{gis,t}$ is the cumulative difference of the log 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-size specific fixed effects for each industry i, α_{gis}^h. We also include state unemployment interacted with firm size, positive and negative path shocks, federal funds rate and change in federal funds rate as the control variables in the vector Z_t. $\mathbb{I}_s$ is a size specific indicator variable. The impulse response functions presented in Figures 1 and 2 are constructed using the coefficients $\beta_{s,Target+}^h$ and $-\beta_{s,Target-}^h$ from corresponding regressions.[3] We cluster standard errors using the panel identifier.

3   Empirical results and discussion

In this section we compare the response to target shocks among the largest two sectors in the economy, manufacturing and services. In the online appendix we also compare construction to services. We then discuss our results and relate them to the existing literature.

Figures 1 and 2 depict the response of small and large firms in manufacturing and services to one standard deviation positive (tightening) and negative (expansionary) target shocks. From there we see that overall a positive target shock decreases employment growth while a negative one increases employment growth.[4] The response is strong and immediate after monetary contractions but delayed, muted or at times not significantly different from zero for monetary expansions, consistent with the results for the aggregate economy examined in SSZ.

We now emphasize the differential response across sectors, the main focus of this analysis. As we see in the top and middle panels of Figures 1 and 2, the response of firms

---

[3]In the online appendix we also present results for a simpler empirical specification, first just target shocks and then target shocks interacted with firm-size.

[4]The qualitative conclusions we make for employment growth throughout hold also for hiring growth. See the online appendix for the relevant figures.
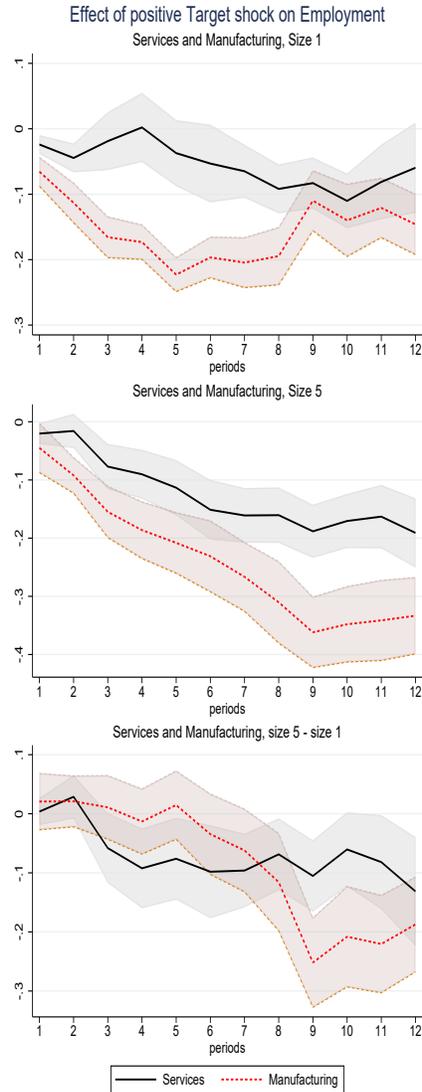
FIGURE 1: RESPONSE OF EMPLOYMENT GROWTH TO POSITIVE TARGET SHOCK

Notes: The figure plots the response of small (top panel), large (middle panel) firms, and the difference between large and small firms (bottom panel) in services (black solid line) and manufacturing (dotted red line). The horizontal axis measures time (in quarters) and the vertical axis measures the response in percent. The shaded area is the 80% confidence bands.
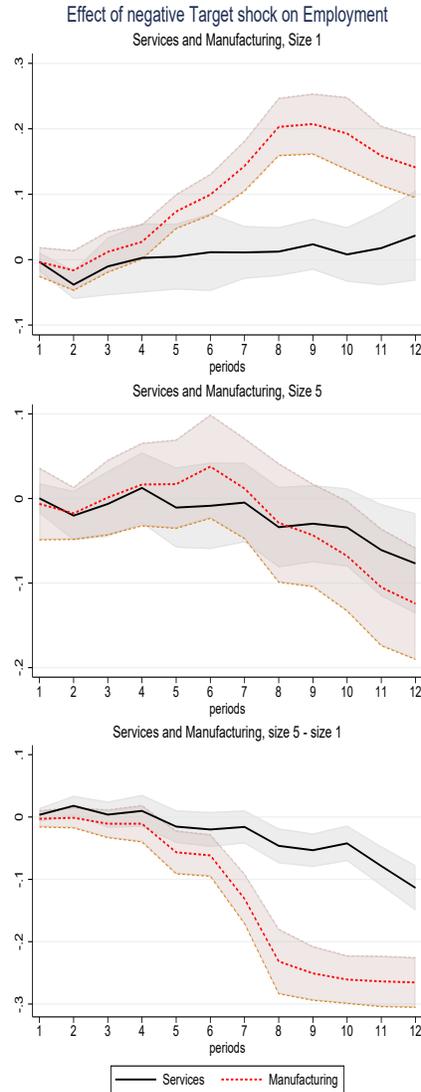
FIGURE 2: RESPONSE OF EMPLOYMENT GROWTH TO NEGATIVE TARGET SHOCK

Notes: The figure plots the response of small (top panel), large (middle panel) firms, and the difference between large and small firms (bottom panel) in services (black solid line) and manufacturing (dotted red line). The horizontal axis measures time (in quarters) and the vertical axis measures the response in percent. The shaded area is the 80% confidence bands.

in the manufacturing sector is larger (in absolute terms) compared to that of firms in the service sector. The same holds when comparing construction and services, the analysis of which can be found in the online appendix. Thus, examining the response across sectors, our first result is that the employment and hiring growth of firms in the manufacturing and construction sectors respond more to surprise target shocks compared to firms in the service sector.

Figures 1 and 2 also highlight our second set of results, exploiting differences across sectors along with differences across firm-size. First, we observe that the differences across manufacturing and services is present within firms of the same size. That is, large firms in manufacturing respond more than large firms in services; similarly, small firms in manufacturing respond more than small firms in services.

Second, comparing impulse responses in Figure 1 and Figure 2 within each sector, we find that it is large firms that respond more than small firms to a positive (tightening) target shock while they respond less to a negative (expansionary) target shock, consistent with the results of SSZ for the aggregate economy.

Third, we see that the difference in the response of large and small firms is heterogeneous across sectors. The two figures show that this differential response to monetary policy shocks based on firm-size is more pronounced for firms in manufacturing than in services. That is, large firms in manufacturing and services decrease employment growth more than the small firms in manufacturing and services, but this difference across firm-size is larger for manufacturing compared to services.

We now discuss our results. All of our results also hold when we compare firms in the construction and service sector, as shown in the online appendix. Consequently, we regard the sectoral heterogeneity in monetary policy responses as differences across the durable (manufacturing and construction) and non-durable (service) goods sectors. The theoretical underpinning of sectoral differences has been highlighted, for example, by Barsky, House, and Kimball (2007) who use a multi-sector New Keynesian model to show that durable goods investment responds more to monetary policy shocks due to durable goods having higher elasticity of substitution and lower degree of price stickiness, relative to non-durable goods. Indeed, Bils and Klenow (2004) and Nakamura and Steinsson (2008) among others,

find that prices in the service sector are stickier than in manufacturing; Barsky, House, and Kimball (2003) find that prices in the non-durable goods sectors are stickier than in the durable goods sectors.

Another line of theoretical literature (e.g. Bernanke, Gertler, and Gilchrist, 1999) highlights that through the financial accelerator effect, financing frictions play an important role in driving firms' heterogeneous response to interest rate changes. A common proxy for financing constraints is firm size. Therefore, sectors that feature many small firms (e.g. services) should respond more to monetary policy relative to those featuring relatively more large firms (e.g. manufacturing). Additional frictions that have been highlighted in the literature could result in large firms responding more than small ones after monetary policy shocks (e.g. SSZ; Ottonello and Winberry, 2020).

The theoretical predictions of these two lines of research suggest that the sectoral differences in the response to monetary policy could be attributed to various frictions. That is, observing the sectoral response to monetary policy shocks would not render conclusions for the underlying operating channels.

One way to distinguish among those channels is by looking at the response of firms that differ in firm-size and goods' durability; this is what we examine in our second set of empirical results. Demand side explanations are sector-specific, suggesting that the deviations in response among firms of the same size, across different sectors, are large; yet, those explanations are silent on the deviations among firms of different sizes, within a sector. The contrary is true for explanations that rely on financing frictions; the factors that help us understand deviations across firms of different sizes within a sector are silent on the different response of firms of the same size, across sectors.

Our second set of results sheds light on those issues by examining differences among large and small firms, within and across sectors. Our finding that within firm size, firms that operate in the manufacturing and construction sectors respond more than those in the service sectors, is in agreement with the literature that studies sectoral frictions mentioned above.

Moreover, our finding that within sectors, the employment and hiring growth in large firms respond more than that in small firms after monetary contractions but it does so

less after monetary expansions is in line with the earnings channel suggested in SSZ. The earnings channel emphasizes that if earnings change after monetary policy shocks, a working capital constraint might imply that large firms respond more to a monetary contraction, as a decrease in the earnings is more beneficial for financial constrained versus unconstrained firms. That is, the financing frictions literature helps explain the observed differences across firm size, within sectors.

Overall, our findings suggest that there are distinct differences in terms of response to monetary policy shocks among firms, both across sectors and firm-size. As such, both the frictions emphasized in the sectoral response literature, and those analyzed in the financing constraints literature, seem to play a role in affecting employment response to monetary policy.

4   Conclusions

We examine the labor market response to monetary policy, highlighting differences across sectors and firm-size. We find that both aspects of the data are important in determining firms' response to monetary policy.

Overall, in terms of policy implications, our results indicate that large firms in the manufacturing and construction sectors are hurt the most by monetary contractions, while small firms in the manufacturing and construction sectors get benefited the most by monetary expansions. Firms in the service sector have a more muted response to either monetary expansion or contraction.

References

Barsky, R., C. L. House, and M. Kimball (2003). Do flexible durable goods prices undermine sticky price models? Working Paper 9832, National Bureau of Economic Research.

Barsky, R. B., C. L. House, and M. S. Kimball (2007). Sticky-price models and durable goods. *American Economic Review 97*(3), 984–998.

Bernanke, B. S., M. L. Gertler, and S. Gilchrist (1999). *The financial accelerator in a*

quantitative business cycle framework, in J. B. Taylor & M. Woodford (Ed.), Handbook of Macroeconomics, 1341-1393, Volume 1. Elsevier.

Bils, M. and P. J. Klenow (2004). Some evidence on the importance of sticky prices. *Journal of Political Economy 112*(5), 947–985.

Campbell, J., C. Evans, J. Fisher, A. Justiniano, C. Calomiris, and M. Woodford (2012). Macroeconomic effects of federal reserve forward guidance. *Brookings Papers on Economic Activity*, 1–80.

Erceg, C. and A. Levin (2006). Optimal monetary policy with durable consumption goods. *Journal of Monetary Economics 53*(7), 1341–1359.

Howes, C. (2021). Financial constraints, sectoral heterogeneity, and the cyclicality of investment. *Federal Reserve Bank of Kansas City Working Paper* (21-06).

Nakamura, E. and J. Steinsson (2008). Five facts about prices: A reevaluation of menu cost models. *Quarterly Journal of Economics 123*(4), 1415–1464.

Ottonello, P. and T. Winberry (2020). Financial heterogeneity and the investment channel of monetary policy. *Econometrica 88*(6), 2473–2502.

Singh, A., J. Suda, and A. Zervou (2021). Heterogeneous labour market response to monetary policy: small versus large firms. Working Papers 2021-07, University of Sydney, School of Economics.