Fiscal stimulus, credit frictions and the amplification effects of small firms*

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October 3rd, 2020
Preliminary version

Abstract

How does the effectiveness of fiscal stimulus depend on the composition of firms where the stimulus takes place? Using cross sectional and time variation in national military procurement across metropolitan areas in the US, I show that the local fiscal multiplier is 1.57 and increases with the share of small firms, implying multipliers of 0.95-2.15 in the interquantile range. Using firm level data, I document that within firms that did not receive a government contract, small firms increase operating revenues, investment and financing by 5%-10% relative to large firms after an aggregate local fiscal stimulus. I find positive spillovers for small firms and neutral for large firms. I propose a heterogeneous firm credit channel based on the financial accelerator that amplifies endogenously the fiscal multiplier. Using a two-firm open economy New Keynesian model, with credit market imperfections calibrated to match cross-sectional and firm US data, the mechanism can account for 2/3 of the heterogeneous response in investment and 10-20% of the sensitivity of the local fiscal multiplier to the share of small firms. The model implies that small firms also increase the national fiscal multiplier if monetary policy does not respond aggressively to fiscal shocks.

Keywords: *Fiscal stimulus, Firm size distribution, Amplification, Financial Accelerator*
JEL classification: E62, E52

*Acknowledgments: I am indebted to my advisor Mark Huggett for his invaluable guidance, inspiration, and support. I thank Dan Cao, Toshihiko Mukoyama and Sole Martinez Peria for their continued encouragement with this project. I am also grateful with Behzad Diba, Jose Maria Fanelli, Daniel Heymann, Umberto Muratori, Jorge Puig, Rodimiro Rodrigo, Daniel Valderrama and Guillermo Vuletin for helpful comments. All errors are my own.

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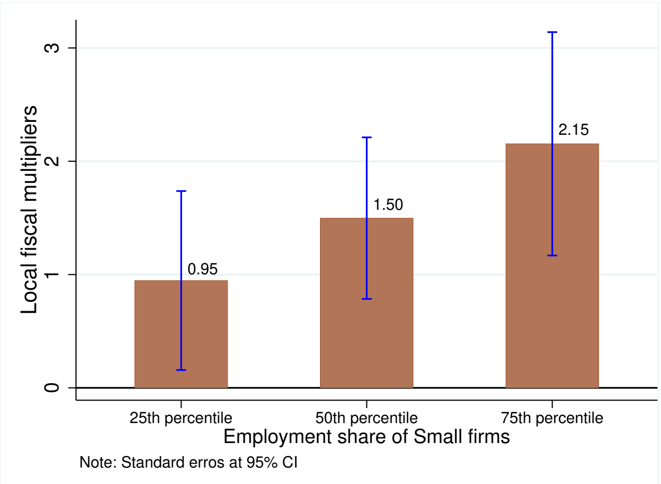
1 Introduction

How does the effectiveness of fiscal stimulus depend on the composition of firms where the stimulus takes place? A better understanding of the transmission mechanism and effectiveness of fiscal policy is needed in both academic and policy circles. This paper study the effects of government spending on output, the so-called government spending multiplier. The empirical evidence reports a wide range of multipliers, from as low as 0.5 to larger than 2 (Ramey (2011); Auerbach and Gorodnichenko (2012)). There is no such thing as a unique fiscal multiplier, it depends on the characteristics of the economy. Government spending naturally affects firms' decision to produce and invest. Little is known about the role of firm heterogeneity on the transmission mechanism of fiscal policy. The main contribution of the paper is to fill this gap.

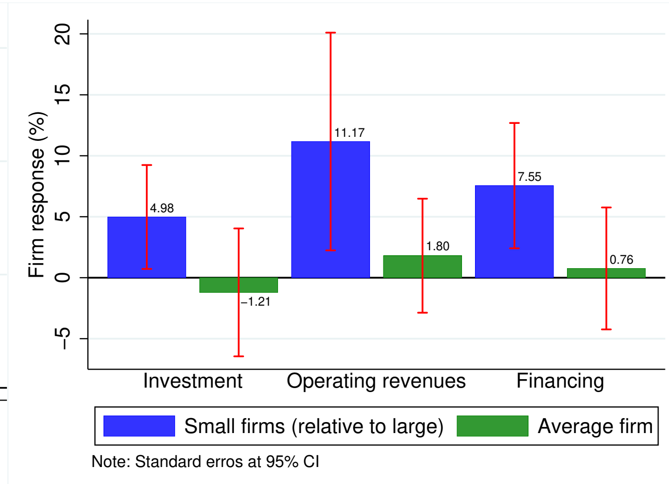
Given the enormous heterogeneity in productivity, investment and borrowing behaviour across firms, this paper asks: How does firm size heterogeneity affect the fiscal multiplier? Which firms are the most responsive to aggregate fiscal stimulus? Are spillover effects heterogeneous by firm size? The first contribution of the paper is to document a novel determinant of the fiscal multiplier, where small firms amplify local fiscal stimulus. Figure 1(a) shows that the median local fiscal multiplier is 1.50 and increases with the share of small firms, implying multipliers of 0.95-2.15 in the interquantile range. At micro level, Figure 1(b) shows that within firms that did not receive a government contract, the average firm is barely affected by an aggregate local fiscal stimulus and small firms increase investment by 5%, operating revenues by 11% and their financing by 7.5% relative to large firms. This evidence is qualitatively consistent with a financial accelerator mechanism, where the aggregate fiscal stimulus improve firm's balance sheet easing borrowing constraints of small firms.

Small firms are different from large firms in several dimensions. Conditional on surviving, small and young firms grow faster than large and more mature firms, contributing disproportionately to output growth (Decker et al., 2014). Small firms are typically more bank dependent, credit constrained, and are cyclically more sensitive than large firms to the local business cycle (Beck et al., 2005; Fort et al., 2013). In the presence of credit market imperfections, credit spreads are countercyclical, implying that during booms firms' balance sheets improve and have better growth opportunities. The latter is particularly true for small firms which respond by investing and borrowing more (Gilchrist and Zakrajšek (2012)). I present a heterogeneous firm credit channel of fiscal policy to explain the sensitivity of the local fiscal multiplier to the firm size distribution, where the stimulus increases borrower's net worth; reducing the credit spread of small firms, boosting borrowing, investment and production; and amplifies endogenously the fiscal multiplier due to a *"financial accelerator"* mechanism as in Bernanke et al. (1998).

Figure 1: The local fiscal multiplier and firm size heterogeneity



(a) The local fiscal multiplier



(b) Firm's responses

Note: Panel (a) displays the implied 1-year local fiscal multiplier along the distribution of the employment share of small firms in MSAs in US from Equation (1). Sample period is 2001-2013 and includes 344 MSAs. Data for the share of small business is from Business Dynamic Statistics. The government spending shock is identified with the cross-sectional variation of military spending across MSAs. Standard errors are clustered at MSAs level. See Section 2 for details. Panel (b) shows the response of investment, operating revenues and financing (change in total liabilities) for the average firms and small firms relative to large firms that *did not receive* a military contract to a state-level military shock. Firm data is from ORBIS (includes both private and public firms). See Equation (5).

I document a novel empirical fact: the local fiscal multiplier increases with the share of small firms. Using cross sectional and time variation in national military procurement across metropolitan areas (MSAs) in the US, and lagged employment creation by new business, I estimate the sensitivity of the local fiscal multiplier to the firm size distribution.[1] This method identifies an open economy local fiscal multiplier: it measures the effect of an increase in spending in one specific MSA within a monetary union *relative* to the response of all other MSAs (Nakamura and Steinsson (2014)).[2] For the firm size distribution across MSAs, I use panel data from Business Dynamic Statistics (BDS), the public-release sample of statistics aggregated from the Census' Longitudinal Business Database. Military spending is potentially endogenous since military contracts are notably political, and

[1]Department of Defense (DOD) spending explains more than 50% of the discretionary spending of the federal government and is the third largest component of government spending, representing 18% of total U.S. budget. See Demyanyk et al. (2019) for further details and Cox et al. (2020) for a detailed characterization of total government procurement.

[2]This spending increase is financed by taxing individuals in all U.S. MSAs.

firms politically connected can affect the allocation of spending (Choi et al. (2020)). I use an IV strategy which exploits the heterogeneous sensitivity of MSA' military procurement to an increase in (aggregate) *federal* military spending. The employment share of small firms will not be exogenous if firms in other MSAs changes their location, entry or exit decisions because of military spending. To avoid this endogeneity concern I instrument the share of small firms with a 20-year lagged in firm creation.[3] Results show that increasing the employment share of small firms by 1% above the average, increase the local fiscal multiplier by 4.3%, from 1.57 to 1.64.

The central question in this literature is whether the fiscal multiplier is greater or lower than 1, i.e. the direction and strength of fiscal spillovers. I study the spillover effects of aggregate local fiscal stimulus for different types of firms which did not receive a direct contract from the government. I show that small firms are different from large firms and government contractors. I document positive spillovers for small firms and neutral or negative for large firms. This is the second contribution of the paper. I use contract level data from *USAspending.org* to identify the contractors, match them with a firm panel data from ORBIS and exclude all firms that received any military contract during the sample period to avoid endogeneity concerns associated with the direct effects.[4] Using firm level panel data from ORBIS, with both private and public firms that did not received a DOD contract, I study the behavior of operating revenues, investment and financing of more than 7,600 non-financial firms headquartered on the state where the local fiscal stimulus takes place.[5,6] To the best of my knowledge, there are no papers studying either spillover effects at firm level nor its aggregate implications with both *private* and public firms. This distinction is key given that small private firms exhibit different investment, revenues and financing dynamics along the business cycle (Dinlersoz et al. (2019)).

In addition to excluding government contractors, my regressions include firm fixed effect to control for unobserved time-invariant heterogeneity at firm level (e.g. industry), state-year fixed effects to control for time varying omitted variables at state level and other shocks that may be occurring at the same time; and firm level controls.

[3] Gourio et al. (2016) shows that firm entry shocks at state level have persistent effects, affecting GDP growth for at least 12 years. To be cautious, I use a 20-year lag in firm entry.

[4] Ferraz et al. (2015), Lee (2017), Goldman (2020) and Choi et al. (2020) study the direct effects of government spending at firm level.

[5] I do not exploit the geographic variation of DOD contracts at MSAs level because of data availability. Appendix B.1 shows that the sensitivity of the local fiscal multiplier to the share of small firms holds at state level, i.e. is robust to this geographic aggregation.

[6] Similarly, Cohen et al. (2011) and Kim and Nguyen (2020) study the response of public corporations in Compustat to government spending shocks headquartered in the state that received the fiscal stimulus.

I build a two-firm New Keynesian open economy model with credit market imperfections to rationalize the empirical evidence and quantitatively evaluate the heterogeneous firm credit channel of fiscal stimulus. I embed the financial accelerator mechanism in a standard open economy model and allow for firms to have different access to credit markets (Bernanke et al. (1998); Nakamura and Steinsson (2014)). The model implies a countercyclical credit spread where expansionary government spending shocks lead to an increase in the price of capital and firms' net worth; and a decrease in credit spreads. Small firms face a higher credit spread in equilibrium that is more sensitive to changes in firms' balance sheets. Improvements in firms' balance sheets and collateral values ease financial constraints, allowing small firms to increase borrowing and expand (Kiyotaki and Moore (1997); Adelino et al. (2015)). In addition to the increase in operating revenues, I empirically document that local housing prices, the main collateral value of small and young firms, increase by 1.25% after a local fiscal stimulus occurs (Bahaj et al. (2019); Auerbach et al. (2019)). Calibrated to match the share of small firms, leverage and external finance premium, the mechanism can account for 2/3 of the heterogeneous response in investment and 10-20% of the sensitivity of the local fiscal multiplier to firm size heterogeneity. The model implies that the *national* fiscal multiplier increases by 1.08% when the national employment share of small firms increases by 1%. Interestingly, this relationship is non-lineal: it depends on the response of monetary policy to fiscal shocks. This is the third contribution of the paper: the larger the stabilization role, the lower the amplification effects of small firms on the national fiscal multiplier.

Related literature. Neoclassical and Keynesian theories mostly ignore the role of firm heterogeneity on the fiscal multiplier, typically, they employ a representative firm assumption (Baxter and King (1993); Burnside et al. (2004); Galí et al. (2007)). Empirically, the firm distribution where the fiscal stimulus takes place has received almost no attention in the literature that estimates the size of fiscal multipliers.[7] I contribute to this literature with a novel determinant of fiscal multipliers.

The theory predicts that fiscal stimulus increases interest rates reducing the availability of credit in the economy. Murphy and Walsh (2018) review this literature and conclude that the empirical evidence fails to support this theoretical prediction. There is a rich literature which studies the role of heterogeneity in firms' credit frictions for the transmission mechanism of monetary policy (Gertler and Gilchrist (1994); Bernanke et al. (1998); Ottonello and Winberry (2018); Cloyne et al. (2019)). Regardless of the renewed

[7] Ramey (2019) and Chodorow-Reich (2019) review the literature on the closed economy and geographical cross-sectional fiscal multipliers.

interest in fiscal policy and the focus on the interaction with the response of monetary policy and heterogeneity in households' credit constraints (Woodford (2011); Christiano et al. (2011); Hagedorn et al. (2019); Auclert et al. (2018)),[8] the literature neglects the role of credit market imperfections for firms' financing decisions and their aggregate implications for the size of the fiscal multiplier (Kaplan and Violante (2014); Farhi and Werning (2016); Demyanyk et al. (2019); Corbi et al. (2019)). I contribute to this literature showing that heterogeneity in firms' financial frictions, shapes the effectiveness of fiscal policy.

Melina and Villa (2014) and Olivero et al. (2019) document a negative relationship between credit spreads and aggregate government spending shocks that lead to an increase in banks' lending. Auerbach et al. (2020b) show that the interest rate on consumer loans decreases after a fiscal stimulus in a local economy, with a larger reduction for riskier loans. I emphasize that these effects are present at firm level and are heterogeneous by firm size. On the theory front, Canzoneri et al. (2016) uses a model of costly financial intermediation, showing that fiscal multipliers are higher in recessions due to a countercyclical credit spread. Fernández-Villaverde (2010) and Carrillo and Poilly (2013) show that financial frictions amplify the closed economy fiscal multiplier in a standard DSGE model.

I also contribute to the limited empirical evidence on firms' response to fiscal stimulus. In line with my results, Goldman (2020) finds that US listed firms that received government contracts, increased capital expenditures and had larger access to bank loans, reporting strong positive spillover among listed firms that did not receive a procurement contract through local supply chains. Ferraz et al. (2015) and Lee (2017) using quasi-natural designs in Brazil and Korea find that firms which received a procurement contract tend to grow faster and the effects persist over time. These results are stronger for small and young firms, as well as financially constrained firms. Zwick and Mahon (2017) find that small firms respond 95% more than large firms to investment tax incentives due to financial frictions in US. Notwithstanding, Kim and Nguyen (2020) and Cohen et al. (2011) document a reduction in capital expenditures and sales growth of corporations, particularly strong on smaller and financially constrained listed firms. Choi et al. (2020) documents that grants allocated to politically connected firms do not create any employment.

Road map. Section 2 presents the macro empirical evidence on how firm heterogeneity affects the size of the local fiscal multiplier. Section 3 presents the firm level evidence

[8]When monetary policy does not rise the nominal interest rate fighting back the increase in inflation due to the fiscal stimulus, real interest rate decrease, crowding-in consumption and investment increasing the size of the fiscal multiplier. The extreme case is the zero lower bound (ZLB).

on the differential response of small firms to aggregate local fiscal stimulus. Section 4 presents a quantitative model to provide a structural interpretation of the findings and evaluate the proposed mechanism. Finally, Section 5 present the conclusions.

2 Empirical evidence: fiscal stimulus and small firms

This section presents how the local fiscal multiplier depends upon the firm size distribution. The empirical strategy uses a panel data set of output, government military spending and firm size characteristics across metropolitan areas in U.S.[9]

2.1 Data

I use annual data on the geographical allocation of DOD procurement contracts for 2000-2013 from Demyanyk et al. (2019) aggregated at metropolitan area. They collect DD-350 and DD-1057 military procurement forms from USAspending.gov with information about the total amount obligated and duration of the contract, and the name and location of the prime contractors.[10] From the majority of contracts, information on the location where the majority of the work was actually performed is available. Relative to studies that exploit the cross-sectional variation of DOD contracts at state level to estimate state-level fiscal multipliers, this data allows me to reduce endogeneity concerns due to political lobby and omitted variable bias with the inclusion of MSA fixed effects, increasing the cross-sectional dimension from 50 states to 344 MSAs.[11] The data for the employment share of small firms across MSAs is from Business Dynamic Statistics (BDS). The BDS includes employment statistics by firm size operating in each MSA tabulated from micro data in the Longitudinal Business Database (LBD). The LBD covers the universe of firms and establishments in the nonfarm business sector with at least one paid employee.[12] Small firms are those with less than 250 employees. Data for real GDP is from the Bureau of Economic Analysis (BEA). Appendix A.1 presents the summary statistics.

[9] Bureau of Economic Analysis (BEA) defines an MSA as: "An area consisting of a core county or counties in which lies an urban area having a population of at least 50,000, plus adjacent counties having a high degree of social and economic integration with the core counties as measured through commuting ties."

[10] Modifications to existing contracts and de-obligation are observed. Demyanyk et al. (2019) void contracts where obligations and de-obligations are within 0.5% of each other.

[11] For a further discussion of the construction of this dataset see Demyanyk et al. (2019).

[12] Davis and Haltiwanger (2019) using BDS data study how the young-firm activity shares move with local economic conditions, local house prices and credit supply.

2.2 Econometric specification

I estimate the causal effect of firm size heterogeneity on the local fiscal multiplier using the following panel specification:

$$\frac{Y_{m,t+l}-Y_{m,t-1}}{Y_{m,t-1}} = \delta_m + \delta_t + \beta \frac{G_{m,t+l}-G_{m,t-1}}{Y_{m,t-1}} + \gamma \frac{G_{m,t+l}-G_{m,t-1}}{Y_{m,t-1}} \times (S_{m,t-1} - \bar{S}) + \eta S_{m,t-1} + \epsilon_{m,t} \quad (1)$$

$Y_{m,t}$ is real GDP for MSA m in year t, $G_{m,t}$ denotes federal military spending allocated to MSA m in year t, $S_{m,t-1}$ is the log-employment share of small firms ($\times$ 100) in MSA m a year before the fiscal stimulus and represents the firm size structure of location m and $\bar{S} = \sum_m \sum_t \frac{S_{m,t}}{n_m n_t}$ is its average across all MSA-year observations, with n_m denoting the number of MSAs and n_t the number of years in the sample.[13] I include the share of small firms itself ($S_{m,t-1}$) and therefore the interaction term captures the effect of the employment share of small firms on the local fiscal multiplier aside from the direct effect that small firms may have on output. I add MSA fixed effects to control for time-invariant unobserved heterogeneity across MSAs such as industry production structure (e.g. share of manufacturing). Lastly, time fixed effects control for aggregate shocks, such as national monetary policy and tax policy. Therefore the only possible confounding factors that may remain have to vary both across MSAs and over time. I study the sensitivity of the local fiscal multiplier to the firm size distribution at horizon $l = 0, 1, 2$. Standard errors are clustered at MSA level.

In Equation (1) the coefficient β denotes the average local fiscal multiplier: it defines the dollar increase in real output following a one dollar increase in federal government spending in a MSA with the average employment share of small firms. I de-mean the log-share of small firms only for interpretation purposes, but this does not affect the estimation of the firm-size sensitivity γ (Basso and Rachedi (2018)).[14] The coefficient of interest is γ, which captures the sensitivity of the local fiscal multiplier to the firm size distribution. The interpretation is as follows: when the employment share of small firms increase by 1% above the average, the local fiscal multiplier would be $\beta + \gamma$. If $\gamma > 0$, a higher share of small firms amplify the fiscal stimulus.

The challenge in the fiscal literature is that government spending is rarely exogenous, i.e. varies automatically along the cycle. In this case, military spending is potentially endogenous since DOD contracts are notably political. Therefore I identify government spending shocks following

[13] A similar specification is used by Basso and Rachedi (2018) to study the sensitivity of the local fiscal multiplier to the age structure across U.S. states.

[14] As $\bar{S}$ does not depend on m nor t, the specification is equivalent to $\frac{Y_{m,t+l}-Y_{m,t-1}}{Y_{m,t-1}} = \delta_m + \delta_t + \theta \frac{G_{m,t+l}-G_{m,t-1}}{Y_{m,t-1}} + \gamma \frac{G_{m,t+l}-G_{m,t-1}}{Y_{m,t-1}} \times S_{m,t-1} + \eta S_{m,t-1} + \epsilon_{m,t}$, with $\theta = \beta + \gamma \bar{S}$.

the approach of Nakamura and Steinsson (2014), which exploits the heterogeneous sensitivity of MSA' military procurement to an increase in (aggregate) *federal* military spending. The identification assumption relies on a weaker exogeneity restriction than previous studies that use military spending at national (Ramey (2011); Burnside et al. (2004)) or state level (Nakamura and Steinsson (2014); Basso and Rachedi (2018); Dupor and Guerrero (2017)): the U.S. as a country does not engage in aggregate military buildups or drawdowns (as the Iraq War) because a specific MSA (e.g. *San Francisco-Oakland-Berkeley, CA*) is experiencing or is expected to suffer from sluggish growth relative to the others (e.g. *Champaign-Urbana, IL*). To address this endogeneity problem, I use a two instruments IV approach where the first stage estimates:

$$\frac{G_{m,t+l}-G_{m,t-1}}{Y_{m,t-1}} = \alpha_m + \alpha_t + \phi\left(s_m \times \frac{G_{t+l}-G_{t-1}}{Y_{m,t-1}}\right) + \psi Z_{m,t-1} + \epsilon_{m,t} \tag{2}$$

where G_t is the aggregate federal military spending in period t, s_m is the MSA's average share of DOD contract $(G_{m,t}/G_t)$ over the relevant period and $Z_{m,t-1}$ incorporates the instruments for the share of small firms and its interaction with changes in DOD spending. The instrument for local government spending relies on the variation of aggregate (federal) DOD spending, which by construction is orthogonal to the variation in the local economic activity that can shape the allocation of federal spending across MSAs (Auerbach et al. (2020a, 2019); Demyanyk et al. (2019)).

The identification of whether an MSA's firm size structure affects the local fiscal multiplier with location and time fixed effects comes from the variation of the share of small firms across MSAs and its changes over time. For instance, the dispersion in the share of small firms across MSAs ranges from 33.4% to 73.5% in 2006 and 76% of MSAs changed their relative ranking by at least 10 positions between 2001 and 2013.[15]

I estimate the firm size sensitivity of the local fiscal multiplier using instrumental variables for both military spending and the share of small firms. The employment share of small firms in the MSA that received the fiscal stimulus will not be exogenous if firms anticipate the higher government spending.[16] To avoid these endogeneity concerns I instrument the share of small firms with lagged employment share of firm entry. Gourio et al. (2016) presents evidence at state level that shocks to firm entry can have effects on GDP for as long as 12 years, dying out for longer horizons. For this reason I use the employment share of new businesses that were born 20 years before the DOD spending shock arrives as an instrument for the employment share of small firms.

[15] And 25% of MSAs changed their relative ranking by more than 50 positions during the sample period.

[16] For example, new business may decide to enter the market in anticipation of a higher aggregate demand. Startups tend to born small increasing the employment share of small firms.

2.3 Results

Table 1 presents the first empirical fact: local fiscal stimulus get amplified in MSAs with a higher employment share of small firms. Column (1) reports a one-year local multiplier equal to 1.57 for an MSA with the average employment share of small firms, in line with the cross-sectional multiplier literature (Nakamura and Steinsson (2014); Chodorow-Reich (2019)). The coefficient of interest, γ, is positive and significant implying that a higher share of small firms increase the effectiveness of fiscal stimulus. Column (1) is interpreted as follows: the one-year local fiscal multiplier for the average MSA in the distribution of the employment share of small firms increase from 1.57 to 1.64 (= 1.573 + 0.068) when the employment share of small firms increase by 1% above the mean. Therefore the marginal effect of increasing the employment share of small firms by 1% on the fiscal multiplier is 4.32% (= 0.068/1.57). Combining the estimated coefficients with the inter-quantile range in the distribution of the employment share of small firms over the sample period imply that the local fiscal multiplier vary between 0.95 and 2.15.[17,18]. The first stage F-stat shows that instruments are relevant suggesting that the specification is well identified.

The output response at 2-years horizon indicates even a larger sensitivity. Column (2) shows that the marginal effect of increasing the share of small firms by 1% on the local multiplier is 5.34%.[19]

[17]Both multipliers are statistically significant at 5% level. The difference in multipliers across the 25^{th} and 75^{th} percentiles is 1.20 and statistically significant at 1% level.

[18]Figure 1(a) in the introduction shows the heterogeneity in the one-year local fiscal multipliers.

[19]The impact of the small firms at higher horizons are still positive but become not significant.

Table 1: The local fiscal multiplier: the role of small firms

Output response	1-year (1)	2-years (2)
Military contracts (β)	1.573***	1.442***
	(0.369)	(0.380)
Military contracts $\times$ Emp share of Small (γ)	0.068**	0.077**
	(0.028)	(0.038)
Emp share of Small (η)	0.101**	0.077
	(0.040)	(0.062)
Obs.	3,784	3,440
MSA and Time FE	Yes	Yes
Cluster SE	MSA	MSA
1st Stage F-stat	18.41	22.78

Note: This table shows estimates of Equation (1). Small firms are defined as those with less than 250 employees. Sample period is 2001-2013 and includes 344 MSAs.***: p<0.01 ;**: p<0.05;*: p<0.1.

Exclusion Restriction. The identification of the firm size sensitivity of local fiscal multipliers hinges on instrumenting the employment share of small firms with a 20-year lag in the employment share of new firms. The implicit exclusion restriction posits that, conditional on MSA and time fixed effects, whatever determines the cross-sectional variation in firm creation (i.e. startups) has no other long lasting effect on the size of fiscal multipliers 20 years later. The IV approach would not be valid if the sensitivity to federal government spending shocks - i.e., s_m in Equation (2) - is related to MSA' firm creation 20 years later. Yet, in the data this correlation is -0.005 (p-value = 0.72). Regarding the relevance of this IV, the first stage coefficient is 0.08 (p-value ¡0.05).

Robustness. Appendix A.2 presents evidence that the sensitivity of the local fiscal multiplier to the share of small firms is robust to an array of specifications and time-varying controls. Table (10) shows the OLS results with multipliers considerable lower, implied by attenuation bias and the fiscal foresight problem of government spending shocks. This table also show that results are robust to controlling for MSA specific and share of small firms specific cyclicallity. I considerar an alternative normalization that test that the exploited variation is not driven by the secular trend in the reduction of the share of small firms. Appendix A.2 Table (11) test once the IV strategy is implemented does not remain a fiscal foresight problem and that MSA's output does not react to future military shocks. The baseline specification includes MSA and time fixed fixed controls for time-invariant and aggregate shocks such as MSA production structure. If time-variant omitted variables remain, controlling for dynamic time-MSA varying factors may reduce the bias due to other confounding at play. Table (11) shows that controlling for the lagged log share of manufacturing and construction in MSA's value added, house prices and unemployment rate do not change either quantitatively nor significantly the effect of small firms on the local fiscal multiplier. Appendix A.2 Table (12) shows that results are robust to the definition of small firms and evidence that the sensitivity of the multiplier depends on the overall MSA's firm size distribution. Lastly, Appendix A.2 Table (13) show that the share of small firms also increase the response in earnings, wages, personal income.

Local fiscal stimulus and firm's constraints. A higher share of small business amplify the fiscal stimulus. Does this higher aggregate demand loose firm level constraints? Is this particularly stronger for small firms? Young firms are born small because of borrowing constraints, uncertainty about own productivity that takes time to learn, limited reputations that leads to challenges of building up a customer base. A natural conjecture is that a higher aggregate demand may help to loosen these constraints. For instance if this is the case, the survival rate of credit constraint firms should increase as the financial wedge relax due to a countercyclical credit spread. Table 2 shows that the exit rate decrease by 0.94% in MSAs hit by a fiscal stimulus relative to MSAs that did not received the stimulus. Furthermore, the exit rate of small firms decrease by 1%. Conversely the exit rate of large firms is not statistically affected.

Why does small firms that otherwise would exit the market survive when a fiscal stimulus hit a specific MSA? If the fiscal stimulus improves collateral values it may help to relax credit constraint for borrowers, amplifying the output response (Bernanke et al. (1998)). Larger values of firm's collateral reduce information asymmetries between banks and borrowers allowing for higher leverage. These constraints are particularly relevant for small firms (Gertler and Gilchrist (1994)). Adelino et al. (2015) and Bahaj et al. (2019) present evidence that housing is the main collateral value of small and young firms and therefore they are particularly sensitive to variations in house prices. As a suggestive evidence that a collateral credit channel can be behind the amplification effects of small firms, Column (4) shows that housing prices increases by 1.25% in an MSA hit by a DOD spending shock.

Table 2: Fiscal stimulus increase survival rate of Small business

Dependent variable	Exit rate All	Exit rate Small	Exit rate Large	Housing Prices
	(1)	(2)	(3)	(4)
Military contracts (β)	-0.936*	-1.006**	0.727	1.251*
	(0.495)	(0.441)	(1.720)	(0.681)
Obs.	3,784	3,784	3,784	3,652
MSA and Time FE	Yes	Yes	Yes	Yes
SD Cluster	MSA	MSA	MSA	MSA
1st Stage F-stat	6.742	6.742	6.742	7.791

Note: 1-year response. ***: p<0.01 ;**: p<0.05;*: p<0.1

3 Micro evidence: the behaviour of Small and Large firms

Which firms are the most responsive to fiscal stimulus? Are spillover effects heterogeneous by firm size? This section estimate γ at the firm level. I study the heterogeneous behavior of small and large firms that **did not receive** a DOD contract to an aggregate local fiscal stimulus to avoid endogeneity concerns of the direct effects and to shed light on the amplification effects of small firms. For this purpose I merge 3 datasets: (i) balance sheet information of non-financial private and public firms from ORBIS database; (ii) firms that were granted a DOD contracts from USAspending.gov; and (iii) local fiscal stimulus aggregate at state level. I show that the firm level evidence is consistent with the macro evidence at MSA level.

3.1 Data

I build an annual US firm level panel data from ORBIS and state military spending from 1997-2016. I use data from ORBIS, a commercial database distributed by Bureau van Dijk containing basic firm-level balance sheet information with the advantage that it includes data on small and large, unlisted and listed firms.[20] I study the behavior of operating revenues, investment, short-term, long-term and total financing of more than 7,600 non-financial firms headquartered on the

[20] I drop duplicates and double reporting for the same firm and states with less than 10 firms in the sample period and drop the top and bottom 2% of outliers for each variable.

state where the *local* fiscal stimulus takes place.[21,22] Appendix B.2 presents variables definition and descriptive statistics of each variable used in the estimation.[23] The local stimulus shock at state level is from Dupor and Guerrero (2017) that update Nakamura and Steinsson (2014) military spending until 2014[24]. I extend the military procurement spending until 2016 aggregating the DOD contract level data from USAspending.gov at state level.

The DOD buys goods and services directly from specific firms that can bias any inference from firm behavior given the endogeneity and selection concerns of whom and when received a military contract. In order to deal with it I *excluded all firms that received at least one DOD contract during the sample period*.[25] The goal here is to exclude the direct and endogeneous effects of DOD contracts on firm's behavior and focus on spillover effects of aggregate spending shocks.[26] Table (3) show that small firms are different from large firms and government contractors. This is what motivates the study of the differential impacts of fiscal stimulus on these firms. Small firms growth faster than large firms and contractors, are less leverage and face a higher borrowing costs.[27] Appendix B.4 shows that firms that received a DOD contract and I excluded from the sample were mostly large (76% were listed firms and only 19% were small firms), produced manufacturing goods (58%) and represent around 10% of total firms in the sample.

3.2 Firm level econometric specification

I study the average firm's response to local fiscal stimulus estimating the following:

$$\Delta y_{i,s,t} = \alpha_i + \alpha_t + \beta \frac{G_{s,t} - G_{s,t-2}}{Y_{s,t-2}} + \eta D_{s,t-2} + \theta X_{i,s,t-2} + \epsilon_{i,s,t} \tag{3}$$

where Δy is the two-year log change of operating revenues and fixed assets for firm i located in state s at time t. Firm's investment is defined as the log change in fixed asset and firm's operating revenues are net sales plus other operating revenues. $\frac{G_{s,t}-G_{s,t-2}}{Y_{s,t-2}}$ is the local fiscal stimulus

[21] A similar approach is followed by Cohen et al. (2011) to study the response of public corporations in Compustat to seniority-linked government spending shocks headquartered in the congressman state. Kim and Nguyen (2020) use the same approach matching corporations' headquarter in Compustat with population revision census shocks at state level.

[22] I do not exploit the geographic variation of DOD contracts at MSAs level because of data availability. Appendix B.1 shows that the sensitivity of the local fiscal multiplier to the share of small firms holds at state level, i.e. are robust to the geographic aggregation.

[23] Appendix B.3 shows the descriptive statistics of the variables used in the analysis by state.

[24] As a robustness I extended Nakamura and Steinsson (2014) data from 2006 to 2016 using USAspending.org database. Results are robust.

[25] I excluded DOD contractors for the whole sample period, no matter when the contract was granted.

[26] Ferraz et al. (2015) and Lee (2017) exploit randomness in the procurement process in Brazil and Korea to estimate the causally the *direct* effect of government spending on firm behaviour.

[27] Proxy by financial expenses over total liabilities.

Table 3: Small firms are different from large firms and military contractors

	Small	Large	Contractors
Employment	43	1,836	1,965
Log Total Assets	15.32	19.33	19.41
Growth Op. Revenues (%)	11.28	10.75	8.51
Investment	-0.02	0.08	0.07
Leverage	0.52	0.57	0.50
Financial leverage	0.20	0.28	0.22
Borrowing cost (%)	4.82	3.30	2.73

normalized by state GDP. In order to control for other shocks that can occur in the same state, $D_{s,t-2}$ include state level controls such as GDP growth and the change in state taxes. $X_{i,s,t-2}$ controls for firm level characteristics such as the log of total assets and profitability to account for changes in firm growth and creditworthiness, respectively. Nakamura and Steinsson (2014) show that the two-year change captures the dynamic effects of government spending on output in a parsimonious way.[28] Finally, I include firm and time fixed effects. Firm fixed effects controls for time invariant firm-specific trends such as their industry sector (e.g. manufacturing). Time fixed effects controls for aggregate (national) shocks common to all firms such as the stance of monetary policy or federal tax policy. Standard errors are clustered at state level, allowing the error term to be correlated across firms within a state.

Military spending is subject to endogeneity concerns as discussed in previous section given that firms politically connected can alter the allocation of DOD contracts (Choi et al. (2020)). To address this endogeneity problem I follow a standard IV approach for the identification of the shock and exclude firms that did receive a contract:

$$\frac{G_{s,t} - G_{s,t-2}}{Y_{s,t-2}} = s_s \times \frac{G_t - G_{t-2}}{Y_{t-2}}$$

where s_s is the average share of national DOD spending received by state s ($G_{s,t}/G_t$) over 1990-1996. Again the instrument relies on the heterogeneous sensitivity of states to aggregate variation of federal DOD contracts, exogenous to local economic activity.

In order to investigate the heterogeneous response of small and large firms to local fiscal stimulus I include an interaction term between firm size and the government spending shock:

$$\Delta y_{i,s,t} = \alpha_i + \alpha_t + \beta \frac{G_{s,t} - G_{s,t-2}}{Y_{s,t-2}} + \gamma \frac{G_{s,t} - G_{s,t-2}}{Y_{s,t-2}} \times Small_{i,s,t-2} + \eta D_{s,t-2} + \theta X_{i,s,t-2} + \epsilon_{i,s,t} \tag{4}$$

[28]Results that regress a one-year changes in firm level variables on one-year changes in DOD spending are robust and are available upon request.

where $Small_{i,s,t-2}$ is a dummy that takes value 1 if the firm before the fiscal stimulus have less than 250 employees (i.e. firm size is predetermined and exogenous at the moment of the shock).

While regression (3) and (4) allows me to mitigate concerns about reverse causation and unobserved firm-level factors driving firm's response to fiscal stimulus by using firm-level data and including firm fixed effects, the concern that the estimates could be biased due to time-varying omitted variables remains. I therefore focus on within state-year variation in firm's behavior across different firm groups, small vs large. I estimate the following regression with state-year ($\alpha_{s,t}$) and firm fixed effects (α_i):

$$\Delta y_{i,s,t} = \alpha_i + \alpha_{s,t} + \gamma \frac{G_{s,t} - G_{s,t-2}}{Y_{s,t-2}} \times Small_{i,s,t-2} + \theta X_{i,s,t-2} + \epsilon_{i,s,t} \tag{5}$$

Note that Equation (5) is only able to estimate the differential response of small relative to large firms to a *local* fiscal stimulus.

3.3 Results

Table 4 presents evidence that for the average firm a local fiscal stimulus increase operating turnover and decrease investment, though not statistically significant (see columns (1) and (3)).[29] However, when I take into account the heterogeneous response by firm size, small firms increase their operating turnover by 10.7% and investment by 4.8% relative to large firms in response to an aggregate local DOD shock (see columns (2) and (4)). Large firms are barely affected (negative but not significant). Therefore, within firms that did not received a DOD contract there is a differential response to local fiscal stimulus by firm size. I interpret these findings as evidence of *positive spillovers* for small firms and neutral or negative for large firms. This evidence is in line with the aggregate evidence at MSA level presented in last section which focus on the share of small-firms activity.

These results are robust to controlling for state-year fixed effects, which address concerns about time-varying omitted variable bias. Column (3) and (6) shows that small firms increase investment by 5% *relative* to large firms and operating revenues by 11.2%. The fact that small firms respond to higher government spending increasing investment reflects that easing credit constraints are worth to study as a plausible mechanism.

Robustness. Appendix B shows that these results are robust. Table 16 show that results are similar if I include the government contracts, with the exception that investment now is not statistically significant. Is it firm size or firm financial positions before the fiscal stimulus? Tables (20) and (22) in Appendix B test if there is heterogeneity across firms with above the median

[29] These results are in line with Cohen et al. (2011) and Kim and Nguyen (2020), which find a reduction of capital expenditures for large public corporations after government spending shocks.

Table 4: Heterogeneous Firms' responses to Local Fiscal stimulus

	Operating Revenues growth			Investment (Δ Fixed Assets)		
	(1)	(2)	(3)	(4)	(5)	(6)
ΔG	1.804	-0.990		-1.205	-2.519	
	(2.384)	(2.610)		(2.675)	(2.509)	
ΔG × Small (γ)		10.737**	11.168**		4.848**	4.978**
		(4.508)	(4.552)		(2.307)	(2.173)
ΔGDP	0.092	0.085		0.138	0.136	
	(0.185)	(0.181)		(0.129)	(0.129)	
$\Delta Taxes$	-0.128**	-0.129**		-0.087	-0.088	
	(0.058)	(0.059)		(0.059)	(0.058)	
Small	0.055***	0.046***	0.046***	0.019	0.015	0.016
	(0.012)	(0.012)	(0.013)	(0.025)	(0.026)	(0.025)
Total Assets	-0.177***	-0.177***	-0.173***	-0.327***	-0.327***	-0.326***
	(0.007)	(0.008)	(0.007)	(0.008)	(0.008)	(0.007)
Profitability	-0.020	-0.020	-0.021	0.097***	0.097***	0.097***
	(0.013)	(0.013)	(0.013)	(0.019)	(0.019)	(0.019)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	Yes	Yes	No
State × Year FE	No	No	Yes	No	No	Yes
Obs	59,412	59,412	59,412	61,011	61,011	61,011
Cluster SE	State	State	State	State	State	State
Kleibergen-Paap rk Wald F	9.435	4.882	45.64	9.338	4.845	41.88

Note: Data is from ORBIS. Direct contractors that received a DOD contracts during sample period were excluded. Small firms are defined as those with less than 250 employees. Sample period is 1997-2016. ***: p<0.01 ;**: p<0.05;*: p<0.1.

leverage and liquidity position before the shock arrives. Results show that there is no differential impact of fiscal stimulus across the debt or liquidity position firms. These results are confirmed when Tables (21) and (23) in Appendix B test for heterogeneous responses including both firm size an firm leverage or firm liquidity. Results show that there is a differential impact of local fiscal shocks only across firm size. Lastly, there may be concerns about sample selection of firms that entry and exit my sample. Table (19) in Appendix B keeps only those firms that remain in the sample for at least 5 years and show that the results are robust.

3.4 Fiscal stimulus and Firm's use of external finance

Credit spreads are countercyclical. During booms firms improve their balance sheet, have better growth opportunities and the value of collateral increases which leads firms to raise investment and borrowing (Bahaj et al. (2019)). Appendix B.5 shows that the investment and financial expenses of small firms are more sensible to aggregate output growth. How does the use of external finance of small firms reacts to fiscal stimulus? This subsection provides evidence that expansionary government spending loosen borrowing constraints of small firms.

I focus now on firm's financing decision after a local fiscal stimulus. I define financing as the log change in total liabilities and short-term financing as current liabilities with maturity below one year.[30] As a proxy of the interest rate that firms face I construct an implicit borrowing cost variable defined as the change in financial expenses over total liabilities. Table 5 reports the results. Relative to large firms, small business increase financing by 7.5%. Financing decisions for the average firm that did not receive a DOD contract are not statistically affected.[31]

Small firms may face borrowing constraints and a higher aggregate demand can help to relax these constraints, reducing borrower's perceived default risk due to an increase in firms' cash flows and the value of pledgable collateral. Local fiscal stimulus triggers a countercyclicall credit spread (Auerbach et al. (2020a)). This leads to an increase in small firms investments, propagating endogeneously the effects of fiscal stimulus. Column (8) and (9) shows that the implicit cost of borrowing decrease for small firms.

This evidence points to a relaxation of borrowing constraint as a mechanism behind the larger real effects of fiscal stimulus on small firms. Given that the demand for credit increase after a spending shock, I conjecture here that the equilibrium level of credit increase due to a reduction of the borrower's perceived default risk.

Taking stock of the evidence. Section 2 provides evidence that local fiscal stimulus increases with the employment share of small firms, $\gamma^{MSA} > 0$. Quantitatively, increasing the share of small firms by 1% above the average share implies a 4.32% larger one-year local fiscal multiplier. Furthermore, the survival rate of small firms and local housing prices increase. This evidence leads to conjecture that small firm constraints may loose after a government spending shock. Section 3 using firm level data shows that, within firms that did not received a direct DOD contract, the investment's response of small firms is around 5% larger than of large firms, $\gamma^{micro} > 0$. At the same time, small firms improve their balance sheet increasing earnings by more than 11% relative to large firms. This increase in investment and earnings is accompanied by an increase of 7.5% in borrowing and a reduction of borrowing costs. I document positive spillovers for small firms and neutral or negative for large firms. This evidence is qualitatively consistent with the financial

[30] There may be concerns about the focus on total liabilities and not directly on total debt or bank loans. The reason of doing this is data availability (sample size is reduced by half). Nevertheless, Appendix B.7 shows that the results for the reduced sample available that have available information for total, short-term and long-term debt. Results are robust (responses are quantitatively larger but much less precisely estimated.

[31] Appendix B.8 shows that this evidence is robust if we decompose small firms between those that have less than 100 employees and those that have between 100 and 250 employees.

Table 5: Fiscal stimulus and firm's use of external finance

	Total financing growth			Short-term financing growth			Δ Finan Exp/Liab.		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ΔG	0.758	-1.265		-0.429	-2.043		0.123	0.245	
	(2.550)	(2.062)		(2.385)	(2.709)		(0.317)	(0.318)	
$\Delta G \times$ Small (γ)		7.302**	7.550**		5.829**	6.800**		-0.619**	-0.670**
		(2.851)	(2.624)		(2.429)	(2.740)		(0.296)	(0.297)
ΔGDP	-0.011	-0.015		0.033	0.030		-0.007	-0.007	
	(0.116)	(0.116)		(0.097)	(0.096)		(0.012)	(0.012)	
$\Delta Taxes$	-0.068	-0.070		-0.034	-0.035		0.015*	0.015*	
	(0.051)	(0.050)		(0.051)	(0.050)		(0.008)	(0.008)	
Small	0.017	0.011	0.010	0.032**	0.074**	0.027**	-0.002	-0.002	-0.002
	(0.015)	(0.017)	(0.017)	(0.013)	(0.031)	(0.013)	(0.002)	(0.002)	(0.002)
Total Assets	-0.204***	-0.204***	-0.203***	-0.186***	0.006***	-0.184***	0.006***	-0.023***	0.006***
	(0.009)	(0.009)	(0.009)	(0.006)	(0.006)	(0.007)	(0.001)	(0.001)	(0.001)
Profitability	0.061***	0.061***	0.060***	0.065***	0.065***	0.065***	-0.001	-0.001	-0.001
	(0.008)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.001)	(0.001)	(0.001)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
State $\times$ Year FE	No	No	Yes	No	No	Yes	No	No	Yes
Obs	62,054	62,054	62,054	62,054	62,054	62,054	38,916	38,916	38,916
Cluster SE	State	State	State	State	State	State	State	State	State
Kleibergen-Paap rk Wald F	9.265	4.836	43.15	9.265	4.836	43.15	10.460	5.444	43.18

Note: Data is from ORBIS. Direct contractors that received a DOD contracts during sample period were excluded. Small firms are those with less than 250 employees. Sample period is 1997-2016. ***: p<0.01 ;**: p<0.05;*: p<0.1.

accelerator mechanism. Next section develops a model to quantitatively evaluate how much of the empirical evidence can be explained by this mechanism.

4 The Model

This section develops a framework to interpret the role of firm heterogeneity and financial frictions on the local fiscal multiplier. I embed the financial accelerator mechanism with endogenous countercyclical credit spread a la Bernanke et al. (1998) in a model of government spending within a monetary union and two firms, small and large, that face heterogeneous cost of external finance. (Nakamura and Steinsson (2014)).[32] The model consist in two regions that belongs to

[32] Corsetti et al. (2013) study the transmission mechanism of fiscal policy in a small open economy with fixed exchange rate in a similar spirit of Nakamura and Steinsson (2014).

a monetary and fiscal union: "home" and the "rest of the union". There are 5 types of agents: households, entrepreneurs, retailers, capital goods producers and a government with a fiscal and monetary authority.

4.1 Entrepreneurs

The key role in this model is played by firms, here relabel as entrepreneurs. There are two types of risk neutral entrepreneurs, s for small and l for large, who are perfectly competitive and produce two different intermediates output. These two types of entrepreneurs differ in the riskiness of their investment projects, leverage and credit spreads. Entrepreneurs have to borrow funds from lenders in order to finance their purchases of capital goods from capital producing firms. Entrepreneur i of type $j = s, l$ has available net worth, N^i_{jt+1} and to finance the difference between his capital expenditures and his net worth the entrepreneur needs to borrow funds B^i_{jt+1}:

$$B^i_{jt+1} = P_{jkt}K^i_{jt+1} - N^i_{jt+1} \tag{6}$$

K^i_{jt+1} is the capital stock, P_{jkt} is the price of capital expressed in terms of the home final goods and $\frac{P_{jkt}K^i_{jt+1}}{N^i_{jt+1}}$ is the leverage of entrepreneur i of type $j = s, l$. Entrepreneur's net worth is defined as the borrowers' liquid assets plus collateral value of illiquid assets less outstanding obligations. The production function of entrepreneur i in the home region h and type $j = s, l$ is constant return to scale and given by:

$$y^i_{hjt} = (L^i_{jt})^{\alpha}(K^i_{jt})^{1-\alpha} \tag{7}$$

Each type of investment project is subject in each period to a random idiosyncratic productivity shock ω^i. This shock comes from a log-normal distribution, ln $\omega_j \sim F(\frac{-\sigma^2_{\omega,j}}{2}, \sigma^2_{\omega,j})$ and have a different $\sigma^2_{\omega,j}$ for each type of firms $j = s, l$. $E(\omega) = 1$ and $F(\omega)$ is the CDF. The financial friction comes from an asymmetric information problem: its assumed that the realization of ω^i is private information to the entrepreneur. In order to learn this value, the lender has to pay a monitoring cost μ^j, which is a fraction of the entrepreneur's remaining assets. The optimal contract between lenders and an entrepreneur specifies a cutoff value for ω, denoted as $\bar{\omega}^i_t$, the value of which is contingent upon the realization of shocks at t. Entrepreneurs with $\omega^i_t \geq \bar{\omega}^i_t$ will pay back their debts $Z^i_t B^i_t$ and retain profits equal to $\omega^i_t R^{K,i}_t P_{kt} K^i_{t-1} - Z^i_t B^i_t$, where Z^i_t is the non-default contract interest rate and $R^{K,i}_t$ is the return on capital. If $\omega^i_t < \bar{\omega}^i_t$ the firm go bankrupt, is monitored and lenders keep what is left (1-μ)$\omega^i_t R^{K,i}_t P_{kt} K^i_{t-1}$. The optimal contract implies that solvent firms will not be monitored and is specified as a state-contingent rate Z^i_t which in aggregate terms is linked to $\bar{\omega}_t$ as: [33]

$$\bar{\omega}_t R^K_t P_{k,t-1} K_t = Z_t B_t \tag{8}$$

[33]The index i has been drop because the optimal contract is homogeneous and standardized for all entrepreneurs of the same type. This aggregation is possible due to constant returns to scale of the en-

The timing of events is as follows. At the end of t-1, there's a pool of entrepreneurs, whose equity is N_t on aggregate. Those firms chose the optimal value of capital K_t and hence the level of borrowing B_t. The ex-post return on capital (R_t^K) is not know yet since the government spending shock has not realized, which will affect $\bar{\omega}_t$. As the cut off value depends on the existence of aggregate uncertainty (G_t shocks), $\bar{\omega}_t$ is not known and the risky loan rate Z_t is link to macroeconomic conditions. Entrepreneurs make their decision based on $E_{t-1}\bar{\omega}_t$ and subject to the lenders participation constraint. Formally, entrepreneurs solve the following optimization problem (E1):

$$\underset{\{K_t, E_{t-1}\bar{\omega}_t\}}{Max} E_{t-1} \int_{\bar{\omega}_t}^{\infty} \Big[\omega R_t^K P_{kt} K_{t-1} - Z_t B_t\Big] dF(\omega) = E_{t-1}\Big[1 - \Gamma(\bar{\omega}_t)\Big] R_t^K P_{k,t-1} K_t \tag{9}$$

subject to,

$$R_t(P_{k,t-1}K_t - N_t) = \Big[\Gamma(\bar{\omega}_t) - \mu A(\bar{\omega}_t)\Big] R_t^K P_{k,t-1} K_t \tag{10}$$

where $\Gamma(\bar{\omega}_t) \equiv \bar{\omega}_t \int_{\bar{\omega}_t}^{\infty} f(\omega)d\omega + \int_0^{\bar{\omega}_t} \omega f(\omega)d\omega$ and $A(\bar{\omega}_t) \equiv \int_0^{\bar{\omega}_t} \omega f(\omega)d\omega$. R_t is the risk-free gross interest rate and $R_t(P_{kt-1}K_t - N_t)$ captures the opportunity cost of the lenders (riskless loan). In equilibrium this must be equal to the return on a risky loan ($\Gamma(\bar{\omega}_t)$) net of monitoring costs ($A\mu(\bar{\omega}_t)$).

The moment the G_t shock arrives, R_t^K is pinned down jointly with $\bar{\omega}_t$ and Z_t. As lenders are perfectly competitive, $\bar{\omega}_t$ solves the zero-profit condition (10). Note that lenders zero profit condition (10) can be interpreted as an economy-wide loan supply curve of the following form:

$$E_t\Big[\frac{R_{t+1}^K}{R_t}\Big] = E_t\Big[\frac{1}{\Gamma(\bar{\omega}_{t+1}) - \mu A(\bar{\omega}_{t+1})}\Big(1 - \Big(\frac{P_{kt}K_{t+1}}{N_{t+1}}\Big)^{-1}\Big)\Big] \tag{11}$$

that implies that capital expenditures are proportional to the net worth of entrepreneurs.

The behavior of the demand for capital and return of capital depends on the evolution of entrepreneur's net worth N_{t+1}, which depends on entrepreneurs' earnings, net of interest payments to lenders. In order to endow entrepreneurs with some initial capital its assumed that they also work and receive income W_t^e. Total labor input is supplied both by households and entrepreneurs, aggregated in the following form:

$$L_t = (H_t^e)^{\Omega}(H_t)^{1-\Omega} \tag{12}$$

where the working hours of entrepreneurs H_t^e are normalized to 1 and Ω is the entrepreneurs' share in total labor.[34] Entrepreneurs consumption is defined as:

$$C_t^e = (1 - \gamma_s)V_t \tag{13}$$

trepreneurial production function, i.i.d assumption of ω_t^i as well as the constant number of entrepreneurs in the economy, their risk neutrality and perfect competitiveness.

[34] Entrepreneurs supply their inelastically and I assume that $\Omega = 0.01$ in order that this modification to the standard production function does not have first order effects.

where γ_s is the entrepreneurs constant probability of surviving to the next period (and $1-\gamma$ the death rate). To keep the number of entrepreneur constant every period firms that default are replaced by new ones. V_t is the aggregate ex post profit of entrepreneurial firms, equal to the gross return on their capital less debts of the solvent firms and total monitoring costs:

$$V_t = R_t^K P_{k,t-1} K_t - \left(R_t + \frac{\mu \int_0^{\bar{\omega}_t} \omega dF(\omega) R_t^K P_{k,t-1} K_t}{P_{k,t-1} K_t - N_t} \right) (P_{k,t-1} K_t - N_t) \tag{14}$$

The net worth of the entrepreneurs for the next period is then the ex-dividend value of the remaining fraction of firms plus labor income of their own work:

$$N_{t+1} = \gamma_s V_t + W_t^e \tag{15}$$

Lastly, optimal labor decisions requires that real wages are equal for both types of firms $j = s, l$ within a region,

$$W_t X_t = \alpha(1-\Omega) \frac{y_{jt}}{H_{jt}} \qquad \text{and} \qquad W_t^e X_t = \alpha \Omega \frac{y_{jt}}{H_{jt}^e} \tag{16}$$

and X_t is the gross mark-up of retail goods over wholesale goods and $1/X_t$ is then the relative price of wholesale goods. Entrepreneurs sell their output to retailers.

There are two different intermediate goods, one produced by a small firm and the other produced by the large firm. These intermediate goods are combined in a CES aggregate to a single wholesale good as follow:

$$Y_{Ht} = [a Y_{Hl,t}^{\rho} + (1-a) Y_{Hs,t}^{\rho}]^{1/\rho} \tag{17}$$

where $Y_{Hl,t} = \int_i y_{h,l,t}^i di$ and $Y_{Hs,t} = \int_i y_{h,s,t}^i di$ and H denotes the home region. The elasticity of substitution between small and large firms goods producer is denoted by ρ and a is the output share of large firms in aggregate output.

4.2 Capital Producers

Entrepreneurs use capital from production but do not permanently own it. They purchase it from perfectly competitive capital producers firms at the end of time $t-1$, use it in production and re-sell the undepreciated part $(1-\delta)K_t$ at time t. Capital is firm-type specific, $j = s, l$. Capital producers purchase investment goods, I_t and old capital to produce new capital goods that will be sold to entrepreneurs solving the following problem (C1):

$$\underset{\{K_{jt+1}, I_{jt}\}}{Max} E_0 \sum_{t=0}^{\infty} \beta^t [P_{jkt} K_{jt} - I_{jt} - \tilde{P}_{jkt} K_{jt}] \tag{18}$$

subject to,

$$K_{jt+1} = \phi_j \Big(\frac{I_{jt}}{K_{jt}} \Big) K_{jt} + (1-\delta) K_{jt} \tag{19}$$

where the adjustment cost is an increasing and concave function ($\phi'(.) \geq 0, \phi''(.) \leq 0, \phi(0) = 0$) and $\tilde{P}_{jkt}$ is the price of capital of previously-installed capital.[35] The link between the price of capital and investment behavior is due to capital adjustment costs. Optimality conditions requires that the price of a unit of capital in terms of the home goods is given by,

$$P_{jkt} = \left[\phi_j'\Big(\frac{I_{jt}}{K_{jt}}\Big)\right]^{-1} \tag{20}$$

$$\tilde{P}_{jkt} = \Big[(1-\delta) + \phi_j\Big(\frac{I_{jt}}{K_{jt}}\Big) - \phi_j'\Big(\frac{I_{jt}}{K_{jt}}\Big)\frac{I_{jt}}{K_{jt}}\Big]P_{jkt} \tag{21}$$

The price of capital differs across firms but optimal portfolio decisions requires:

$$E_t[(R^K_{H,l,t+1} - R^K_{H,s,t+1})\beta U_{Ct}/U_{Ct+1}] = 0 \tag{22}$$

$$E_t[(R^K_{F,l,t+1} - R^K_{F,s,t+1})\beta U^*_{Ct}/U^*_{Ct+1}] = 0 \tag{23}$$

where

$$E_t(R^K_{t+1}) = E_t\left[\frac{(1-\alpha)\dfrac{Y_{Hjt+1}}{X_{t+1}K_{jt+1}}\dfrac{P_{jt}}{P_t} - (1-\delta)\tilde{P}_{jkt+1}}{P_{kt}}\right] \tag{24}$$

and $\dfrac{P_{lt}}{P_t} = a\Big(\dfrac{Y_{Ht}}{Y_{Hlt}}\Big)^{\rho-1}$ and $\dfrac{P_{st}}{P_t} = (1-a)\Big(\dfrac{Y_{Ht}}{Y_{Hst}}\Big)^{\rho-1}$.

4.3 Retailers

There is a continuum of retailers who buy output from entrepreneurs-producers in a competitive market and costlessly differentiate them. To account for nominal rigidities, I assume the existence of a monopolistically competitive retail sector subject to a price-setting decision a là Calvo. Let $Y_t(z)$ be the quantity of output sold by retailer z, measured in units of wholesale goods, and let $P_t(z)$ be the nominal price. The total final usable good, Y_t^f is the following composite: $Y_t^f = \Big[\int_0^1 Y_t(z)^{\frac{\theta-1}{\theta}}\Big]^{\frac{\theta}{\theta-1}}$. Lastly, the demand for retailer z is $Y_t(z) = \Big(\dfrac{P_t(z)}{P_t}\Big)^{-\theta} Y_t^f$. Final output can be either transformed into a single type of consumption good, invested, consumed by the government or used up in monitoring costs. As these retailers have market power and therefore make non-zero profits return these profits to households in a lump-sum form.

Retailers have a probability $1-\epsilon$ of changing their price each period. With probability ϵ keep its price unchanged, which implies that its optimal price decision involves setting its price equal to a

[35] Pancrazi et al. (2016) show that the approximation of the previously installed capital with the newly installed capital has first order equilibrium distortions in an economy with $\delta > 0$. I follow their suggested correction.

constant markup over a weighted average of current and expected future marginal cost. Appendix D.1 show that this optimization problem yields a standard home and foreign Phillips curves.

4.4 Households

The home region has a continuum of household types indexed by x. Households decide to consume home and foreign goods, to supply labor and invest its saving in a financial intermediary that pays the riskless rate of return. A household's type specify the type of labor supplied by that household. Home households of type x solves the following problem (H1),

$$\underset{\{C_{t+j},H_{t+j}(x),D_{t+j}\}}{Max} E_t \sum_{j=0}^{\infty} \beta^j U(C_{t+j}, H_{t+j}(x)) \tag{25}$$

subject to,

$$P_t C_t + D_{t+1}(x) = W_t(x) H_t(x) + R_t D_t(x) - T_t + \Pi_t \tag{26}$$

D_{t+1} are deposits at a financial intermediary[36], R_t is the risk-free interest rate, P_t is a price index that gives a consumer the minimum price of a unit of the composite consumption good C_t, W_t is the real wage rate received for working H_t hours by household type x, T_t are lump-sum taxes collected by the federal fiscal authority and lastly Π_t are profit from home intermediate producers.

The composite consumption good is an index given by,

$$C_t = \left[\phi_H^{1/\eta} C_{Ht}^{\frac{\eta-1}{\eta}} + \phi_F^{1/\eta} C_{Ft}^{\frac{\eta-1}{\eta}}\right] \tag{27}$$

ϕ_H and ϕ_F denote household's relative preference for home and foreign goods. I normalize and set these preferences as $\phi_H + \phi_F = 1$. C_{Ht} and C_{Ft} are consumption of composites home and foreign goods and $\eta > 0$ is the elasticity of substitution between home and foreign goods.

$$C_{Ht} = \left[\int_0^1 c_{ht}(z)^{\frac{\theta-1}{\theta}}\right]^{\frac{\theta}{\theta-1}} \quad \text{and} \quad C_{Ft} = \left[\int_0^1 c_{ft}(z)^{\frac{\theta-1}{\theta}}\right]^{\frac{\theta}{\theta-1}} \tag{28}$$

$\theta > 0$ is the elasticity of substitution across different varieties. $c_{ht}(z)$ and $c_{ft}(z)$ denotes the consumption variety z of home and foreign produced goods. Goods markets are completely integrated across regions and therefore home and foreign consumers face the same prices.

Households minimize the cost of buying the consumption basket C_t. These optimal decisions implies demand curves for home and foreign goods and for each of the differentiated products of the form:

[36]In equilibrium, household deposits at intermediaries equal total loanable funds supplied to entrepreneurs: $D_t = B_t$.

$$C_{Ht} = \phi_H C_t \Big(\frac{P_{Ht}}{P_t}\Big)^{-\eta} \qquad \text{and} \qquad C_{Ft} = \phi_F C_t \Big(\frac{P_{Ft}}{P_t}\Big)^{-\eta} \tag{29}$$

$$c_{ht}(z) = C_{Ht} \Big(\frac{p_{Ht}(z)}{P_{Ht}}\Big)^{-\theta} \qquad \text{and} \qquad c_{ft}(z) = C_{Ft} \Big(\frac{p_{ft}(z)}{P_{Ft}}\Big)^{-\theta} \tag{30}$$

where

$$P_{Ht} = \Big[\int_0^1 p_{ht}(z)^{1-\theta} dz\Big]^{\frac{1}{1-\theta}} \qquad \text{and} \qquad P_{Ft} = \Big[\int_0^1 p_{ft}(z)^{1-\theta} dz\Big]^{\frac{1}{1-\theta}} \tag{31}$$

and

$$P_t = \Big[\phi_H P_{Ht}^{1-\eta} + \phi_F P_{Ft}^{1-\eta}\Big]^{\frac{1}{1-\eta}} \tag{32}$$

The problem of the foreign household is defined analogously.

4.5 The Government

There is a federal government that follows a balanced budget, purchasing goods and collecting lump-sum taxes in both home and foreign regions,

$$nP_{Ht}G_{Ht} + (1-n)P_{Ft}G_{Ft} = T_t \tag{33}$$

n is the relative size of the home region, P_{Ht} is the home relative price of home goods and G_{Ht} is the per capita government purchases of home consumption goods. Lump-sum taxes are defined as $T_t = nT_{Ht} + (1-n)T_{Ft}$. I assume that government demand mimic the private demand for differentiated goods:

$$g_{ht}(z) = G_{Ht} \Big(\frac{p_{Ht}(z)}{P_{Ht}}\Big)^{-\theta} \qquad \text{and} \qquad g_{ft}(z) = G_{Ft} \Big(\frac{p_{ft}(z)}{P_{Ft}}\Big)^{-\theta} \tag{34}$$

The policy experiment explored here is an increase in government spending in the home region financed with an increase in federal lump-sum taxes (Farhi and Werning (2016)).

The Monetary authority follows a standard Taylor rule for the country nominal interest rate (in linearised form),

$$\hat{R}_t = (1-\rho_R)(\phi_\pi \hat{\pi}_t + \phi_Y \hat{Y}_t) + \rho_R \hat{R}_{t-1} \tag{35}$$

where ρ_R denotes the degree of interest rate smoothing, ϕ_π is the response to the weighted average deviation of the two regions of national inflation from target and ϕ_Y is the reaction to (weighted average) national output gap. Lastly, $\hat{\pi}_t = n\hat{\pi}_{Ht} + (1-n)\hat{\pi}_{Ft}$ and $\hat{Y}_t = n\hat{Y}_{Ht} + (1-n)\hat{Y}_{Ft}$, where a variable with a hat () is expressed as deviations of their respective steady state values.

4.6 Equilibrium

Definition Given $F_j(\omega)$, a competitive equilibrium is a sequence of allocation and price functions, $\{C_{it}, C_{it}^e, H_{ijt}, D_{it}, W_{it}, Y_{ijt}, K_{ij,t+1}, B_{ijt}, P_{kijt}, R_{ij,t+1}^K, R_{t+1}, G_{it}, T_t, \bar{\omega}_{ijt}\}_{t=0}^{\infty}$, for $i = H, F$ and $j = s, l$ such that:

1. Household solve $H1$;

2. Entrepreneur j solves $E1$;

3. Capital producers solve $C1$

4. Government budget constraint: $nP_{Ht}G_{Ht} + (1-n)P_{Ft}G_{Ft} = T_t$;

5. Goods markets clears: $Y_t = nY_{Ht} + (1-n)Y_{Ft}$; $\quad Y_{it} = C_{it} + I_{it} + G_{it}$, $C_t = [n(C_{it} + C_{it}^e) + (1-n)(C_{it}^* + C_{it}^{e*}]$; $\quad I_t = [nI_{it} + (1-n)I_{it}^*]$

6. Bond market clears: $\sum_j (Q_{ijt}K_{ij,t+1} - N_{ij,t+1}) = \sum_j B_{ij,t+1} = D_{it+1}$

4.7 Calibration

I consider a GHH preferences where consumption and labor are complements, as Nakamura and Steinsson (2014) point out helps to match the average local fiscal multiplier within this framework:

$$U(C_t, H_t) = \frac{(C_t - \chi H_t^{1+\nu^{-1}}/(1+\nu^{-1}))^{1-\sigma^{-1}}}{1-\sigma^{-1}} \tag{36}$$

Table (6) summarizes the parametrization of the model. A period in the model correspond with a quarter. I choose parameter values to match cross-sectional moments of US local economies and heterogeneity by firm size using BDS and ORBIS. For the rest of the parameters I follow Nakamura and Steinsson (2014) and Bernanke et al. (1998). I set $\sigma = 1$ and $\nu = 1$, which captures the Frisch-elasticity. The subjective discount factor, β, is set such that it match an annual nominal interest rate of 2%. The elasticity of substitution across varieties is $\theta = 7$ and between home and foreign regions is $\eta = 2$. The frequency of price change is set to $\epsilon = 0.75$, which implies that retailers change prices once a year. The labor share is equal to $\alpha = 0.65$ and then the capital share is 0.35. The quarterly depreciation rate is $\delta = 0.02$. The home bias for the average MSA is set to ϕ_H 0.66 from Dupor et al. (2018) that uses the Commodity Flow Survey (CFS) for 2012. The size of the average MSA is $n = 1\%$ calibrated from BEA. In terms of the policy parameters, the persistence of the government spending shock is from Basso and Rachedi (2018) that estimate an AR(1) process with state level data until 2015 and the conduct of the monetary policy is calibrated using the estimate Taylor rule by Nakamura and Steinsson (2014).[37]

Using Business Dynamic Statistics I set the average employment share of small firms across MSA during the sample period equal to 46% and the average exit rate (i) for small and large firms to 7% and 1% on average, respectively. From ORBIS, I calibrate the (ii) credit spread of small firms at 3% and for large firms ar 1%. Leverage (iii) is calibrated to match ORBIS the ratio of assets to liabilities for small and large firms, 2.08 and 2.32 respectively (see Table (3)). I follow BGG99 and calibrate the entrepreneurial labor share equal to 0.01 (iv). Lastly, fixing using (i)-(iv) I solve for steady state values for σ_{ω_j}, $\bar{\omega}_j$, μ_j and γ_{sj} for $j = s, l$. The heterogeneous capital adjustment cost are calibrated such that the dispersion in firm level investment is match with ORBIS: 18.69 vs 14.34 for small firms and 4.37 vs 4.27 for large firms. I choose an elasticity of substitution between small and large goods producers equal to 0.5.

Table 6: *Calibration*

		Target/Source	All	
Discount factor	β	2% i^n	0.995	
Substituibility home and foreign goods	η	NS14′	2	
Substituibility varieties	θ	NS14′	7	
Calvo parameter	ϵ	NS14′	0.78	
Labor share	α		0.65	
Depreciation	δ		0.02	
Relative size of avg. MSA	n	BEA	0.01	
Home bias	ϕ_H	Dupor et al, 19′	0.66	
Taylor rule	$(\phi_\pi, \phi_Y, \phi_R)$	NS14′	(1.5,0,0.8)	
Gov. Spending, Shock persistence	$(G/Y, \delta)$	Basso&Rachedi, 20′	(0.20,0.95)	
Financial Accelerator & Firm size		Target/Source	Small	Large
Emp. share		BDS	46%	54%
Steady-state risk spread (annual)(^{m})	R^K/R	ORBIS	3%	1%
Business failure (annual) (^{m})	$F(\bar{\omega})$	BDS	7%	1%
Leverage ratio (^{m})	B/N	ORBIS	0.52	0.57
Entrepreneurial Labor share (^{m})	Ω	BGG99′	0.01	0.01
Capital Adjustment Cost	ϕ	$(\sigma_s^I, \sigma_l^I) ORBIS$	0.10	0.50
Standard error of idiosyncratic shock*	σ_ω		0.300	0.197
Threshold value of idiosyncratic shock*	$\bar{\omega}$		0.457	0.568
Monitoring cost*	μ		0.091	0.134
Survival rate of entrepreneurs*	γ_s		0.979	0.988
Elast. of risk premium wrt leverage	ν	Deduced at SS	0.045	0.025
Elast. of substitution between small and large	ρ		0.50	

[37] I set the response of monetary policy to the output gap equal to zero, $\phi_Y = 0$, in order to make a counterfactual exercise cleared. Please see Section 4.9.

4.8 Results

This section uses the model to compare γ^{micro} and γ^{MSA} estimated in Sections 2 and 3 with the the same objects estimated using model generated data.

First, using the average calibration for the employment share of small firms (46%) between 2000 and 2013 I study the differential response in investment between small and large firms, γ^{micro}, to a federally financed increase in government spending of home goods (G_H) relative to the differential response of small and large firms in the foreign region, as estimated in Equation (5). Table (7) shows that the model generates a differential response of 3.2% versus almost 5% in the data (column (6) in Table (4). This implies that the model can account for about 2/3 of the heterogeneous response of investment between small and large firms. The financial accelerator mechanism match quantitatively well the response in investment documented in the data.

Can the model quantitatively match the effect of the employment share of small firms on the local fiscal multiplier, γ^{MSA}? To answer this question I estimate the regression Equation (1) used in the empirical part with model generated data:

$$\frac{Y_{m,t+1}-Y_{m,t-1}}{Y_{m,t-1}} = \beta\frac{G_{m,t+1}-G_{m,t-1}}{Y_{m,t-1}} + \gamma^{MSA}\frac{G_{m,t+1}-G_{m,t-1}}{Y_{m,t-1}} \times (S_{m,t-1}-\bar{S}) + \eta S_{m,t-1} + \delta_m + \delta_t + \epsilon_{m,t}$$

β is the local fiscal multiplier for the MSA that has the average employment share of small firms. Given that the model is symmetric, i.e. have the same share of small firms in both regions, I estimate β running the above equation using the average employment share of small firms. Table (7) shows that β is equal to 1.70, which overestimate but is not too far from the size of the one-year average local fiscal multiplier of 1.57 found in Section (2). The model can match quantitatively well the average local fiscal multiplier. However this is not new, this is a feature of Nakamura and Steinsson (2014) model that I follow.

As the model is symmetric and do not have heterogeneous share of small firms (S_m) and government spending (G_m) across regions, I compute γ^{MSA} as a difference in β's of two regressions that differ in the employment share of small firms by 1%. Given this limitation, I calculate the average change in β's of increasing the employment share of small firms across the range of S_m and G_m observed in the data. Table (7) shows that $\gamma^{MSA} = 0.010$ versus 0.068 in the data, implying that increasing the employment share of small firms by 1% increases the local fiscal multiplier by 0.56% versus 4.32%. The model can account for 10-20% of the sensitivity of the local fiscal multiplier to the share of small firms.

Table 7: Local fiscal multipliers: the role of small firms

		Data	Model
Difference in Investment response (γ^{micro})		4.978	3.202
Investment: Ratio of Model-Data explained		**64.3**%	
Average Local Output Fiscal Multiplier	β	1.573	1.705
Sensitivity wrt Small firms	γ^{MSA}	0.068	0.010
Δ Local Multiplier of 1% increase in Share of Small	γ/β	4.32%	0.59%
Local Fiscal Multiplier: Ratio of Model-Data explained		**13.6**%	
[Min; Max]		[10.3%; 17.1%]	

4.9 Small firms and the national fiscal multiplier

Policymakers and the fiscal literature focus on national multipliers. Even though I have not estimated the effects of the share of small firms on the national multiplier, the model accounts for general equilibrium effects. I use the model to ask the following question: Does a higher share of small firms also increase the national aggregate fiscal multiplier? In other words, is $\gamma_{nat} > 0$?

With model generated data based on the baseline calibration, I run the following regression aggregating output and the employment share of small firms. I calculate how the national output changes in response to a symmetric government spending shock in both, home and the foreign regions, with the share of small firms.

$$\frac{Y^{nat}_{t+1} - Y^{nat}_{t-1}}{Y^{nat}_{t-1}} = \beta_{nat}\frac{G^{nat}_{t+1} - G^{nat}_{t-1}}{Y^{nat}_{t-1}} + \gamma^{nat}\frac{G^{nat}_{t+1} - G^{nat}_{t-1}}{Y^{nat}_{t-1}} \times (S^{nat}_{t-1} - \bar{S}^{nat}) + \eta S^{nat}_{t-1} + \epsilon_t$$

As before, β^{nat} is the national fiscal multiplier to an economy with the average national employment share of small firms. To compute the effect of the share of small firms on the national fiscal multiplier I change the share of small firms by 1% and therefore define $\gamma^{nat} = \beta^{nat}_{\bar{S}+1} - \beta^{nat}_{\bar{S}}$. Table (8) present the results: β^{nat} is 0.277 and increasing on the share of small firms, $\gamma^{nat} = 0.005$. This implies that increasing the share of small firms by 1% rises the national fiscal multiplier by 1.68%.

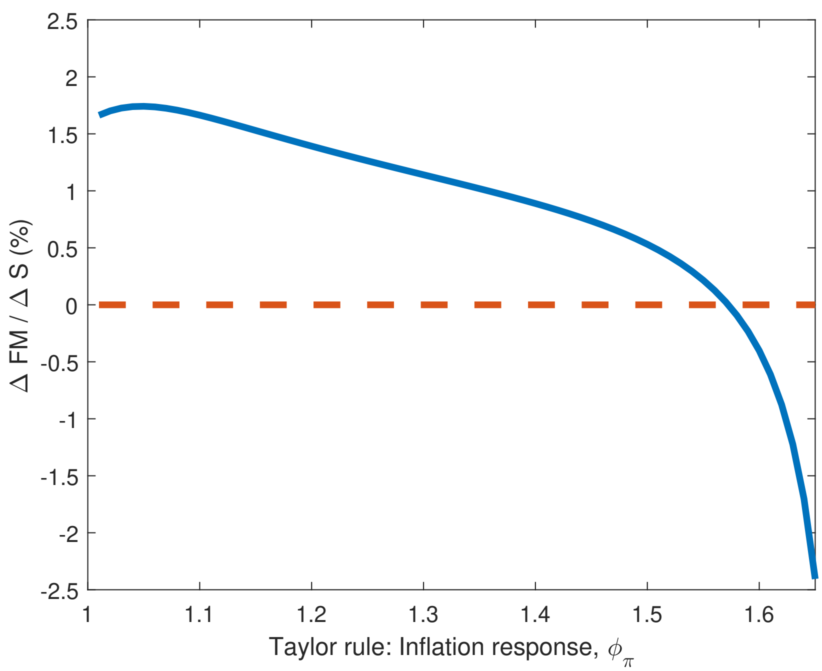
National policies such as the common monetary policy and federal tax policy affect the size of the national fiscal multiplier. The agreement in the literature is that, more accommodative monetary policies increase the national fiscal multiplier. The extreme case

Table 8: National fiscal multipliers: the role of small firms

		Model
National Fiscal Multiplier	β^{nat}	0.277
Sensitivity wrt Small firms	γ^{nat}	0.003
Δ National Multiplier of 1% increase in Share of Small	γ/β	1.08%

is the zero lower bound where the fiscal multiplier can be significantly large (Christiano et al., 2011). The reason for this result is that if the central bank does not increase the nominal interest rate after the fiscal stimulus, inflation goes up and the real interest rate goes down, crowding-in consumption and investment and increasing the size of the fiscal multiplier. Next, I ask: How does the share of small firms interact with the stance of monetary policy for the national fiscal multiplier? Figure (2) show that the relationship between the share of small firms and the national multiplier is a function of how aggressive monetary policy reacts to fiscal shocks ($\gamma^{nat} = f(\phi_\pi)$). The larger the stabilization role of monetary policy (ϕ_π), the smaller the role of the financial accelerator and therefore the role of small firms on the national fiscal multiplier (Bernanke et al. (1998)). The model predicts that the amplification effects of small firms on the *national* fiscal multiplier are larger at the ZLB.

Figure 2: National fiscal multipliers, Small firms and Monetary policy



5 Conclusions

The composition of firms where fiscal stimulus takes place is key to the design of fiscal packages aiming to stabilize the economy. This paper presents evidence of a firm size-dependent multiplier where the heterogeneous behaviour of small and large firms where the fiscal stimulus takes place shape the effectiveness of fiscal stimulus. A financial accelerator channel of fiscal stimulus is emphasized, where the aggregate effects of government spending depends on the distribution of financial constraints that firms face, which can vary over time. The propagation of government spending shocks through the interaction of firm heterogeneity and credit markets restricts the class of models able to match the empirical evidence presented here. Lastly but not least important, I show that the spillover effects of demand shocks on small firms can be sizable.

Further research is needed to improve our understanding of the links between firms and household decision in the amplification of fiscal stimulus. Is there a link between small firms owners and/or workers credit constraints? What is the role of input-output linkeages between small and large firms for the amplification? Do small firms use more intensively non-tradeable factors of production? Recent contributions brings the complex network structure between consumption and production into the transmission mechanism of fiscal policy (Patterson et al. (2019); Bouakez et al. (2020)).

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A Appendix: MSA Evidence

A.1 MSA level data - Summary Statistics

Table 9: *Summary statistics*

Variable	Mean	SD	p25	p50	p75
GDP growth (%)	1.71	4.11	-0.35	1.67	3.77
DOD spending growth (%)	0.10	1.16	-0.06	0.01	0.15
Ratio DOD spending over GDP (%)	1.36	2.71	0.15	0.45	1.42
Employment share of SMEs (Emp $<$ 250) (%)	46.27	6.56	41.85	45.35	49.87
Employment share of Small (Emp $<$ 100) (%)	37.77	6.06	33.64	36.70	41.08

Note: This table reports summary statistics for core variables of interest used in this study. The data covers 344 MSAs.

A.2 Results at MSA level - Robustness

Table 10: The local fiscal multiplier: Robustness

Output response	OLS	$(S_{m,t-1} - \bar{S}_t)$	No IV Share Small	MSA specific Cyclicality	National specific Cyclicality
	(1)	(2)	(3)	(4)	(5)
Military contracts (β)	0.213***	1.689***	1.476***	1.334***	1.640***
	(0.079)	(0.425)	(0.405)	(0.263)	(0.359)
Military contracts × Emp share of Small (γ)	0.007	0.076**	0.048**	0.046**	0.073***
	(0.004)	(0.035)	(0.024)	(0.022)	(0.025)
Emp share of Small (η)	0.123***	0.010**	0.106***	0.027	0.081
	(0.037)	(0.040)	(0.039)	(0.040)	(0.054)
Lag GDP growth				0.432**	
				(0.184)	
Lag GDP growth × Emp share of Small				0.000	0.003
				(0.001)	(0.008)
Obs.	3,748	3,748	3,748	3,440	3,440
MSA and Time FE	Yes	Yes	Yes	Yes	Yes
Cluster SE	MSA	MSA	MSA	MSA	MSA
1st Stage F-stat		15.88	20.70	17.58	17.49

Note: Sample period is 2001-2013 and includes 344 MSAs. ***: p<0.01 ;**: p<0.05;*: p<0.1.

Table 11: The local fiscal multiplier: Robustness adding MSAs' time-varying controls

Output response	Lagged GDP growth (1)	Control Unemp. rate (2)	Control Share Manuf. (3)	Control Share Constr. (4)	Control House Prices (5)
Military contracts (β)	0.002	1.463***	1.446***	1.404***	1.506***
	(0.195)	(0.333)	(0.315)	(0.321)	(0.378)
Military contracts $\times$ Emp share of Small (γ)	0.020	0.078***	0.063**	0.071***	0.070**
	(0.021)	(0.024)	(0.027)	(0.026)	(0.028)
Emp share of Small (η)	0.074***	0.108**	0.099**	0.106**	0.103**
	(0.025)	(0.042)	(0.040)	(0.043)	(0.040)
Control ($X_{m,t-1}$)		-0.001	-0.016	0.017	-0.002*
		(0.002)	(0.019)	(0.017)	(0.014)
Obs.	3,440	3,608	3,734	3,327	3,674
MSA and Time FE	Yes	Yes	Yes	Yes	Yes
Cluster SE	MSA	MSA	MSA	MSA	MSA
1st Stage F-stat	17.18	22.26	38.20	31.09	17.07

Note: Sample period is 2001-2013 and includes 344 MSAs. ***: p<0.01 ;**: p<0.05;*: p<0.1.

Table 12: The local fiscal multiplier: Robustness - Definitions of Small firms

Output response	Small <50 (1)	Small <100 (2)	Young <5 (3)	Large >1000 (4)
Military contracts (β)	1.460***	1.519***	1.201***	1.065***
	(0.379)	(0.364)	(0.257)	(0.388)
Military contracts $\times$ Emp share of Small (γ)	0.042**	0.053**	0.029***	-0.052†
	(0.019)	(0.022)	(0.009)	(0.032)
Emp share of $Small_{50}$	0.125***			
	(0.041)			
Emp share of $Small_{100}$		0.102**		
		(0.043)		
Emp share of $Young_5$			-0.017	
			(0.013)	
Emp share of $Large_{1000}$				-0.009
				(0.041)
Obs.	3,748	3,748	3,748	3,748
MSA and Time FE	Yes	Yes	Yes	Yes
Cluster SE	MSA	MSA	MSA	MSA
1st Stage F-stat	15.78	17.10	7.89	6.46

Note: Sample period is 2001-2013 and includes 344 MSAs. ***: p<0.01 ;**: p<0.05;*: p<0.1.

Table 13: The local fiscal multiplier: Impact on other outcome variables

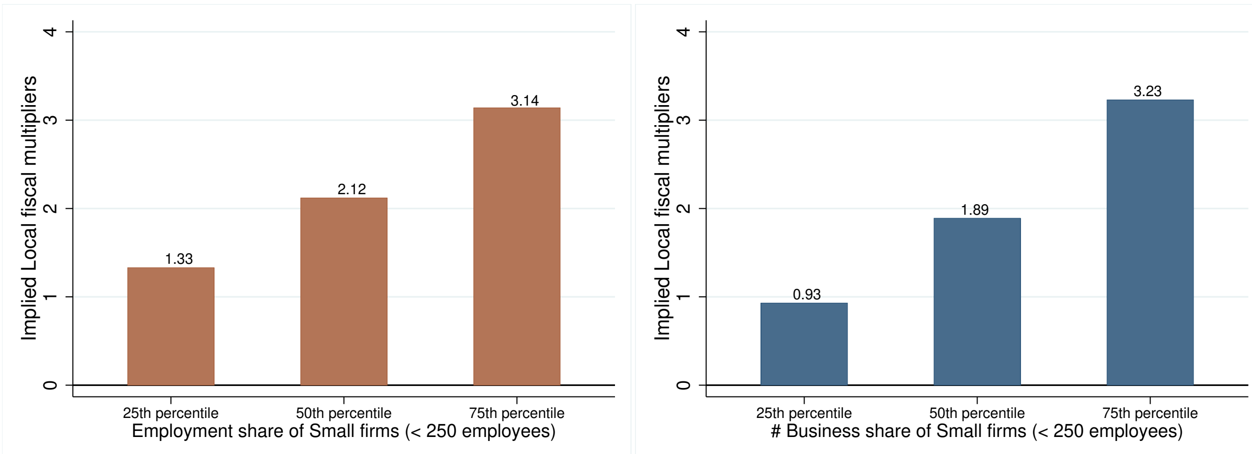
Response of	Earnings	Wages	Personal Income	Unempl rate	Dividends, Int. & rent
	(1)	(2)	(3)	(4)	(5)
Military contracts (β)	2.154***	1.934***	1.058***	-2.113**	0.691**
	(0.440)	(0.404)	(0.258)	(0.834)	(0.321)
Military contracts × Emp share of Small (γ)	0.078**	0.096***	0.036*	-0.019	0.044
	(0.033)	(0.025)	(0.020)	(0.076)	(0.033)
Emp share of Small (η)	0.105**	0.075**	0.045	0.179	-0.078
	(0.040)	(0.038)	(0.028)	(0.160)	(0.048)
Obs.	3,748	3,748	3,748	3,608	3,748
MSA and Time FE	Yes	Yes	Yes	Yes	Yes
Cluster SE	MSA	MSA	MSA	MSA	MSA
1st Stage F-stat	18.41	18.41	18.41	21.83	18.41

Note: Sample period is 2001-2013 and includes 344 MSAs. ***: $p<0.01$;**: $p<0.05$;*: $p<0.1$.

B Appendix: Robustness Micro level evidence

B.1 Results at State level

Figure 3: Aggregate effects of firm heterogeneity - State level Evidence



Note: The figure display the sensitivity of the local fiscal multiplier to the firm size distribution at state level. Sample period is 1977-2014. Data for the share of small business is from Business Dynamic Statistics. The government spending shock is identified with the cross-sectional variation of DoD spending across US states from Dupor and Guerrero (2017).

Table 14: The local fiscal multiplier: the role of small business

Dependent variable	Output		Earnings	
	(1)	(2)	(3)	(4)
Military contracts (β)	2.260***	2.126***	1.713***	1.600***
	(0.559)	(0.512)	(0.393)	(0.381)
Military contracts $\times$ Emp share of Small (γ)	0.190**		0.092**	
	(0.074)		(0.042)	
Military contracts $\times$ # Business share of Small (γ)		4.398***		1.589**
		(1.026)		(0.712)
Emp share of Small (η)	-0.153**		-0.115**	
	(0.075)		(0.056)	
#Business share of Small (η)		-3.918		-0.346
		(2.417)		(1.733)
Obs.	1,759	1,800	1,759	1,800
R2	0.285	0.258	0.526	0.522
State and Time FE	Yes	Yes	Yes	Yes

***: p<0.01 ;**: p<0.05;*: p<0.1

B.2 Firm level data - ORBIS

Table 15: Descriptive Statistics: ORBIS 1997-2016 - 7,635 firms & 60,054 obs.

Variable	Definition	Obs.	Mean	Median	SD	p25	p75
ΔSales	Log change in operating turnover	59,596	0.161	0.095	0.560	-0.088	0.343
Investment	Log change in fixed assets	61,111	0.150	0.055	0.679	-0.152	0.383
ΔWork. Capital	Growth in Net Current assets (how much capital is used by day to day activities)	55,485	-0.003	-0.042	1.087	-0.487	0.413
ΔFinancing	Log change in total financing, defined as current liabilities (Loans+Creditors+Other current liab) + long-term liabilities (Long term financial debts + other long term liab. and provisions))	62,054	0.167	0.078	0.555	-0.137	0.397
ΔST-Financing	Log change in short-term debt (with maturity less or equal than a year)	62,054	0.159	0.104	0.570	-0.154	0.421
$\Delta \frac{FinExp}{Liab}$	Change in all financial expenses such as interest charges, write-off financial assets over total liabilities	38,916	0.234	-0.011	5.505	-1.447	1.631
Total Assets$_{-2}$	Log of total assets	62,054	18.422	18.457	2.438	16.739	20.144
Profitability$_{-2}$	EBIT (Gross profit-Other operating expenses) over total assets	62,054	-0.119	0.048	0.807	-0.072	0.103
Small	Dummy equal to 1 if Employment is less than 100	62,054	0.189	0.000	0.391	0.000	0.000
Medium	Dummy equal to 1 if Employment is less than 250	62,054	0.307	0.000	0.461	0.000	1.000
ΔG	Military Procurement growth over State GDP	62,054	0.001	0.000	0.005	-0.001	0.002
ΔGDP	State GDP growth	62,054	0.050	0.046	0.049	0.021	0.083
$\Delta Taxes$	State Total Tax Collection	62,054	0.043	0.058	0.086	-0.001	0.095

B.3 ORBIS: Descriptive Statistics by State

State	Obs.	ΔSales	Investment	ΔWork. Capital	ΔFinancing	ΔST-Financing	$\frac{FinExp}{Finan_{-2}}$
AL	309	0.046	0.043	-0.156	0.060	0.048	0.050
AR	332	0.091	0.118	-0.036	0.103	0.072	0.046
AZ	902	0.216	0.157	-0.044	0.187	0.179	0.085
CA	10,277	0.201	0.186	0.051	0.195	0.190	0.090
CO	2,171	0.228	0.197	-0.091	0.249	0.233	0.099
CT	1,235	0.114	0.141	-0.015	0.131	0.145	0.074
DE	604	0.169	0.150	0.019	0.197	0.204	0.087
FL	3,193	0.166	0.146	0.001	0.184	0.182	0.091
GA	1,669	0.124	0.120	-0.042	0.138	0.137	0.076
HI	122	0.048	0.020	-0.215	0.070	0.096	0.039
IA	318	0.047	0.098	-0.022	0.102	0.095	0.052
ID	169	0.244	0.147	-0.051	0.163	0.129	0.092
IL	2,392	0.102	0.102	0.002	0.113	0.104	0.070
IN	691	0.118	0.149	0.060	0.113	0.115	0.067
KS	484	0.100	0.072	-0.095	0.124	0.101	0.072
KY	396	0.103	0.110	0.091	0.127	0.079	0.063
LA	396	0.166	0.152	-0.028	0.196	0.170	0.074
MA	2,812	0.203	0.197	0.066	0.187	0.172	0.090
MD	1,000	0.203	0.211	-0.002	0.178	0.205	0.073
MI	946	0.075	0.082	-0.025	0.098	0.110	0.056
MN	1,570	0.143	0.130	0.005	0.133	0.123	0.070
MO	912	0.106	0.133	-0.046	0.146	0.122	0.057
MS	142	0.104	0.130	-0.069	0.147	0.130	0.058
NC	1,249	0.134	0.111	-0.022	0.131	0.128	0.072
NE	155	0.120	0.186	0.180	0.228	0.185	0.077
NH	195	0.101	0.093	0.046	0.125	0.107	0.079
NJ	2,884	0.141	0.112	0.010	0.137	0.136	0.079
NV	1,127	0.235	0.210	-0.121	0.244	0.289	0.111
NY	4,861	0.140	0.128	-0.007	0.147	0.141	0.077
OH	2,140	0.072	0.072	-0.017	0.095	0.073	0.055
OK	638	0.250	0.221	-0.089	0.255	0.191	0.073
OR	587	0.102	0.083	0.053	0.096	0.095	0.071
PA	2,349	0.160	0.151	0.032	0.158	0.156	0.069
RI	208	0.128	0.100	-0.052	0.158	0.108	0.087
SC	285	0.104	0.072	-0.099	0.088	0.098	0.049
TN	927	0.159	0.168	-0.003	0.174	0.164	0.064
TX	7,051	0.181	0.168	-0.033	0.197	0.182	0.075
UT	566	0.210	0.148	0.100	0.176	0.184	0.119
VA	1,623	0.161	0.170	-0.042	0.151	0.133	0.068
VT	111	0.124	0.117	-0.225	0.150	0.115	0.066
WA	1,162	0.225	0.203	0.016	0.227	0.194	0.093
WI	894	0.105	0.092	-0.023	0.097	0.096	0.044

B.4 DOD Contractors

Table 16: *Descriptive Statistics: DOD Contractors*

Obs	13,762 (12.12%)	
Firms	847 (7.2%)	
Share of Small (< 100)	9.7%	
Share of SME (< 250)	18.9%	
Share of Listed	75.9%	
Manufacturing (20-39)	57.8%	
Services (70-89)	19.6%	
Trans., Commun., Electric, Gas, And Sanitary Ss (40-49)	10.6%	
Wholesale (50-51)	4.7%	
Retail (52-59)	3.9%	
Mining (1-9)	1.8%	
	Mean	Median
Employment	6,240.5	1,965
Profitability ($EBIT/TA_{-2}$)	-0.001	0.071
Log Total Assets	19.235	19.314
Leverage	0.56	0.50
Financial Exp/Liab$_2$ (%)	4.25	2.73

B.5 Cyclicallity of Small versus Large firms

Table 17: *Cyclicality of Firm's Investment and Financial Expenses*

Firm size	Investment	Financial Expenses
Small	0.043*** (0.002)	-0.083*** (0.024)
Large	0.019*** (0.001)	-0.070*** (0.013)
All	0.028*** (0.001)	-0.074*** (0.012)

Note: This table shows the linear combination of β_1 and β_2 coefficients of the following regression: $y_{it} - y_{i,t-1} = \alpha + \beta_1 \Delta GDP^{agg}_{t,t-1} + \beta_2 \Delta GDP^{agg}_{t,t-1} Small_{i,t-1} + Small_{i,t-1} + \theta X_{i,t-1} + \psi \Delta GDP^{agg}_{t-1,t-2} + \epsilon_{it}$, with $y =$ Investment and $(\frac{Finan.Exp}{Liab})$. Standard errors in parenthesis.***: p<0.01 ;**: p<0.05;*: p<0.1.

B.6 Robustness: Firm level results

Table 18: Robustness: Including Government Contractors

	Op. Revenues growth (1)	Investment (Δ Fixed Assets) (2)	Total Financing growth (3)
$\Delta G \times$ Small (γ)	11.230***	3.809	8.044***
	(2.924)	(2.722)	(2.615)
Small	0.047***	0.015	0.003
	(0.012)	(0.022)	(0.016)
Log Total Assets	-0.172***	-0.321***	-0.200***
	(0.007)	(0.007)	(0.010)
Profitability	-0.010	0.140***	0.074***
	(0.014)	(0.018)	(0.008)
Firm FE	Yes	Yes	Yes
State $\times$ Year FE	Yes	Yes	Yes
Obs	70,708	72,343	73,556
Cluster SE	State	State	State
Kleibergen-Paap rk Wald F	42.94	42.50	44.02

Table 19: Sample Selection - Firms that were in the sample for more than 5 years

	Op. Revenues growth (1)	Investment (Δ Fixed Assets) (2)	Total Financing growth (3)
$\Delta G \times$ Small (γ)	11.311**	6.520**	9.009**
	(4.487)	(2.525)	(3.404)
Small	0.043***	0.006	-0.005
	(0.012)	(0.031)	(0.019)
Log Total Assets	-0.162***	-0.305***	-0.194***
	(0.005)	(0.008)	(0.010)
Profitability	-0.033	0.163***	0.086***
	(0.020)	(0.023)	(0.011)
Firm FE	Yes	Yes	Yes
State $\times$ Year FE	Yes	Yes	Yes
Obs	49,270	50,185	50,687
Cluster SE	State	State	State
Kleibergen-Paap rk Wald F	38.84	38.64	39.75

Table 20: Firm's size or firm's leverage?

	Op. Revenues growth (1)	Investment (Δ Fixed Assets) (2)	Total Financing growth (3)
ΔG × High Leverage (γ)	1.703	1.322	-2.821
	(1.321)	(3.154)	(1.712)
DHigh Leverage	-0.028***	-0.085***	-0.399***
	(0.008)	(0.007)	(0.014)
Small	0.052***	0.016	0.004
	(0.012)	(0.023)	(0.011)
Log Total Assets	-0.179***	-0.340***	-0.240***
	(0.008)	(0.009)	(0.006)
Profitability	-0.045***	0.138***	0.042***
	(0.013)	(0.024)	(0.008)
Firm FE	Yes	Yes	Yes
State × Year FE	Yes	Yes	Yes
Obs	59,234	60,826	61,778
Cluster SE	State	State	State
Kleibergen-Paap rk Wald F	40.69	40.48	40.77

Table 21: Firm's size or firm's leverage?

	Op. Revenues growth (1)	Investment (Δ Fixed Assets) (2)	Total Financing growth (3)
ΔG × High Leverage	2.115	1.591	-2.596
	(1.334)	(3.106)	(1.774)
ΔG × Small (γ)	10.114**	5.729**	5.277**
	(4.578)	(2.164)	(2.561)
DHigh Leverage	-0.028***	-0.085***	-0.399***
	(0.008)	(0.007)	(0.013)
Small	0.043***	0.012	-0.000
	(0.013)	(0.024)	(0.012)
Log Total Assets	-0.180***	-0.340***	-0.240***
	(0.008)	(0.009)	(0.006)
Profitability	-0.045***	0.138***	0.042***
	(0.013)	(0.024)	(0.008)
Firm FE	Yes	Yes	Yes
State × Year FE	Yes	Yes	Yes
Obs	59,234	60,826	61,778
Cluster SE	State	State	State
Kleibergen-Paap rk Wald F	21.02	20.99	21.67

Table 22: Firm's size or firm's liquidity?

	Op. Revenues growth (1)	Investment (Δ Fixed Assets) (2)	Total Financing growth (3)
ΔG × Low Liquidity (γ)	-3.016**	0.791	-1.937
	(1.289)	(2.777)	(2.303)
DLow Liquidity	-0.048***	-0.219***	-0.144***
	(0.006)	(0.015)	(0.012)
Small	0.052***	0.014	0.014
	(0.012)	(0.025)	(0.015)
Log Total Assets	-0.172***	-0.320***	-0.200***
	(0.008)	(0.007)	(0.009)
Profitability	-0.020	0.095***	0.058***
	(0.013)	(0.020)	(0.007)
Firm FE	Yes	Yes	Yes
State × Year FE	Yes	Yes	Yes
Obs	58,598	60,164	61,167
Cluster SE	State	State	State
Kleibergen-Paap rk Wald F	41.32	41.30	41.58

Table 23: Firm's size or firm's liquidity?

	Op. Revenues growth (1)	Investment (Δ Fixed Assets) (2)	Total Financing growth (3)
ΔG × Low Liquidity	-2.086	1.236	-1.206
	(1.362)	(2.297)	(2.313)
ΔG × Small (γ)	10.691**	4.381*	7.056***
	(4.774)	(2.257)	(2.468)
DLow Liquidity	-0.048***	-0.219***	-0.144***
	(0.006)	(0.015)	(0.012)
Small	0.043***	0.011	0.008
	(0.013)	(0.025)	(0.016)
Log Total Assets	-0.172***	-0.321***	-0.200***
	(0.008)	(0.007)	(0.009)
Profitability	-0.020	0.095***	0.058***
	(0.013)	(0.020)	(0.007)
Firm FE	Yes	Yes	Yes
State × Year FE	Yes	Yes	Yes
Obs	58,598	60,164	61,167
Cluster SE	State	State	State
Kleibergen-Paap rk Wald F	21.29	21.52	22.11

B.7 Robustness from ORBIS - Loans and Long-term debt

Table 24: Fiscal stimulus and Firm's use of external finance

	Total debt growth	Long-term debt growth	Short-term debt growth	Δ Fin.Exp/Debt
	(1)	(2)	(3)	(4)
$\Delta G \times$ Small	18.848***	10.386*	8.981†	-0.677
	(6.824)	(5.923)	(5.397)	(1.403)
Small	-0.016	0.001	0.015	-0.003
	(0.036)	(0.030)	(0.043)	(0.005)
Total Assets	-0.250***	-0.263***	-0.137***	0.015***
	(0.014)	(0.016)	(0.012)	(0.003)
Profitability	0.078***	0.045***	0.062***	-0.010***
	(0.017)	(0.015)	(0.017)	(0.003)
Firm FE	Yes	Yes	Yes	Yes
State $\times$ Year FE	Yes	Yes	Yes	Yes
Obs	35,076	46,946	37,852	23,377
Cluster SE	State	State	State	State
Kleibergen-Paap rk Wald F	48.44	44.22	46.57	49.76

Note: Data is from ORBIS. Direct contractors that received a DOD contracts during sample period were excluded. Small firms are defined as those with less than 250 employees. Sample period is 1997-2016. ***: p<0.01 ;**: p<0.05;*: p<0.1;†: p<0.15

B.8 Robustness from ORBIS - Small and Medium firms

Table 25: Heterogeneous Firms' responses to Fiscal stimulus

	Operating Revenues growth		Investment (Δ Fixed Assets)		Working capital growth	
	(1)	(2)	(3)	(4)	(5)	(6)
ΔG	1.804	-1.631	-1.202	-3.275	0.594	-0.954
	(2.392)	(2.753)	(2.657)	(2.370)	(5.189)	(5.618)
$\Delta G \times$ Small		11.078**		1.195		12.702**
		(4.309)		(4.098)		(5.585)
$\Delta G \times$ Medium		13.041***		12.601***		-2.337
		(3.997)		(3.224)		(7.599)
ΔGDP	0.084	0.076	0.136	0.130	-0.126	-0.129
	(0.183)	(0.179)	(0.129)	(0.130)	(0.199)	(0.198)
$\Delta Taxes$	-0.125**	-0.127**	-0.086	-0.090	-0.190	-0.191
	(0.059)	(0.061)	(0.059)	(0.059)	(0.139)	(0.137)
Small	0.114***	0.102***	0.033	0.030	-0.007	-0.017
	(0.028)	(0.027)	(0.043)	(0.045)	(0.033)	(0.033)
Medium	0.097***	0.088***	0.036	0.027	0.014	0.016
	(0.013)	(0.014)	(0.023)	(0.024)	(0.035)	(0.033)
Total Assets	-0.169***	-0.170***	-0.325***	-0.326***	-0.217***	-0.217***
	(0.007)	(0.007)	(0.008)	(0.008)	(0.028)	(0.028)
Profitability	-0.021	-0.021	0.097***	0.097***	0.075***	0.074***
	(0.013)	(0.013)	(0.019)	(0.019)	(0.010)	(0.10)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	59,412	59,412	61,011	61,011	55,069	55,069
Cluster SE	State	State	State	State	State	State
Kleibergen-Paap rk Wald F	9.420	3.292	9.321	3.280	9.286	3.276

Note: Data from ORBIS. Small and Medium firms are defined as those with less than 100 and 250 employees. Sample period is 1997-2016. ***: p<0.01 ;**: p<0.05;*: p<0.1.

Table 26: Heterogeneous Firms' responses to Fiscal stimulus

	Operating Revenues growth	Investment	Working capital growth
	(1)	(2)	(3)
$\Delta G \times \text{Small}_{100}$	11.773**	1.727	11.494*
	(4.474)	(3.949)	(6.668)
$\Delta G \times \text{Medium}_{100-250}$	12.847***	12.461***	-1.724
	(3.883)	(3.310)	(7.753)
Small_{100}	0.104***	0.024	-0.021
	(0.027)	(0.046)	(0.032)
$\text{Medium}_{100-250}$	0.090***	0.028	0.020
	(0.014)	(0.022)	(0.033)
Total Assets	-0.166***	-0.325***	-0.216***
	(0.007)	(0.008)	(0.028)
Profitability	-0.022	0.096***	0.073***
	(0.013)	(0.019)	(0.009)
Firm FE	Yes	Yes	Yes
State $\times$ Year FE	Yes	Yes	Yes
Obs	59,412	61,011	55,069
Cluster SE	State	State	State
Kleibergen-Paap rk Wald F	22.89	23.05	24.52

Note: Data from ORBIS. Small and Medium firms are defined as those with less than 100 and 250 employees. Sample period is 1997-2016. ***: p<0.01 ;**: p<0.05;*: p<0.1.

Table 27: Fiscal stimulus and Firm's use of external finance

	Total financing growth		Short-term financing growth		Δ Finan Exp/Liab	
	(1)	(2)	(3)	(4)	(5)	(6)
ΔG	0.774	-1.860	-0.441	-2.279	0.115	0.252
	(2.545)	(2.005)	(2.383)	(2.704)	(0.312)	(0.302)
$\Delta G \times$ Small$_{100}$		8.691**		6.884***		-0.731
		(3.782)		(2.420)		(0.606)
$\Delta G \times$ Medium$_{100-250}$		8.778**		5.314**		-0.535
		(3.273)		(2.329)		(0.627)
ΔGDP	-0.011	-0.017	0.028	0.024	-0.008	-0.007
	(0.117)	(0.116)	(0.097)	(0.096)	(0.012)	(0.012)
$\Delta Taxes$	-0.068	-0.071	-0.032	-0.034	0.015*	0.015*
	(0.051)	(0.050)	(0.050)	(0.050)	(0.008)	(0.008)
Small$_{100}$	0.025	0.017	0.081**	0.074**	-0.000	0.001
	(0.033)	(0.036)	(0.031)	(0.031)	(0.002)	(0.003)
Medium$_{100-250}$	0.008	0.002	0.057***	0.054***	0.001	0.002
	(0.020)	(0.022)	(0.017)	(0.017)	(0.002)	(0.002)
Total Assets	-0.203***	-0.204***	-0.180***	-0.181***	0.006***	0.006***
	(0.011)	(0.011)	(0.007)	(0.007)	(0.001)	(0.001)
Profitability	0.061***	0.061***	0.064***	0.064***	-0.002	-0.001
	(0.008)	(0.008)	(0.007)	(0.007)	(0.001)	(0.001)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	62,054	62,054	62,054	62,054	38,916	38,916
Cluster SE	State	State	State	State	State	State
Kleibergen-Paap rk Wald F	9.248	3.279	9.248	3.279	10.460	5.444

Note: Data from ORBIS. Small and Medium firms are defined as those with less than 100 and 250 employees. Sample period is 1997-2016. ***: p<0.01 ;**: p<0.05;*: p<0.1.

Table 28: Fiscal stimulus and Firm's use of external finance

	Total financing growth (1)	Short-term financing growth (2)	Δ Finan Exp/Liab (3)
$\Delta G \times \text{Small}_{100}$	9.198**	7.938***	-0.407
	(3.694)	(2.685)	(0.679)
$\Delta G \times \text{Medium}_{100-250}$	8.721**	6.236**	-0.590
	(3.241)	(2.599)	(0.424)
Small_{100}	0.014	0.072**	0.002
	(0.036)	(0.031)	(0.003)
$\text{Medium}_{100-250}$	0.003	0.054***	0.002*
	(0.021)	(0.017)	(0.001)
Total Assets	-0.203***	-0.179***	0.005***
	(0.011)	(0.007)	(0.001)
Profitability	0.060***	0.064***	-0.001
	(0.008)	(0.007)	(0.001)
Firm FE	Yes	Yes	Yes
State $\times$ Year FE	Yes	Yes	Yes
Obs	62,054	62,054	38,220
Cluster SE	State	State	State
Kleibergen-Paap rk Wald F	23.80	23.80	20.39

Note: Data from ORBIS. Small and Medium firms are defined as those with less than 100 and 250 employees. Sample period is 1997-2016. ***: p<0.01 ;**: p<0.05;*: p<0.1.

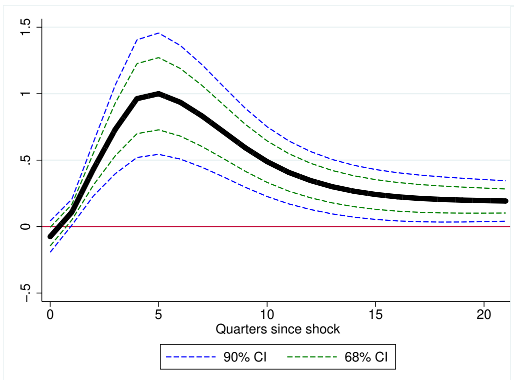
Table 29: *Interest rates* (%)*, Leverage and firm's size*

Firm size	Interest rate (FinExp/Liab)	Leverage (STD+LTD)/Ass	Liab/Ass
Small (Emp $<$ 250)	4.82	0.20	0.52
Large (Emp $\geq$ 250)	3.30	0.28	0.57
All	3.72	0.26	0.55
3-month T-Bill	1.98		

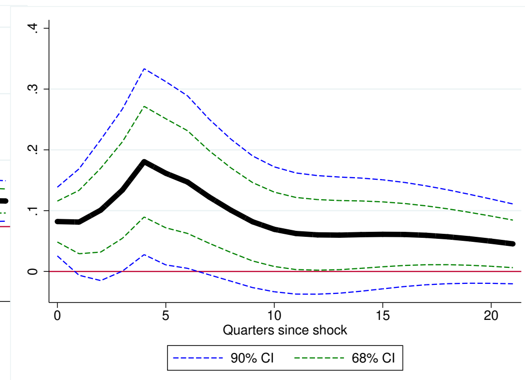
C Appendix: Aggregate Evidence - Fiscal stimulus and Credit spreads

C.1 Appendix: SVAR - Defense News shocks and Credit markets

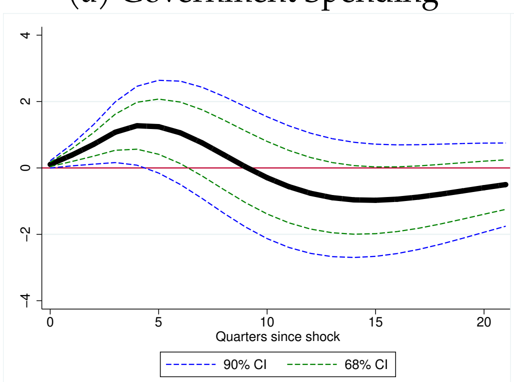
Figure 4: IRF to a (Ramey) Defense News Shock: 1948Q1 - 2008Q4



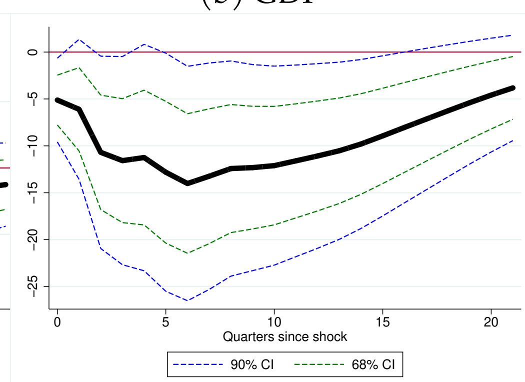
(a) Government Spending



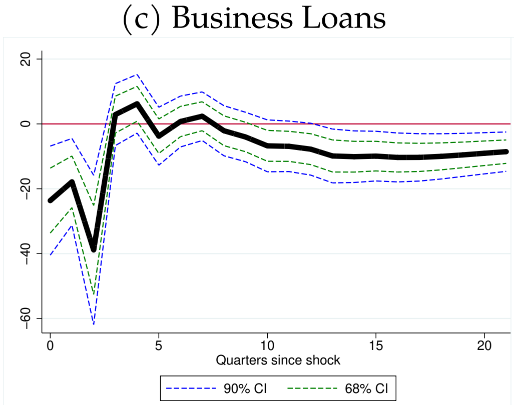
(b) GDP



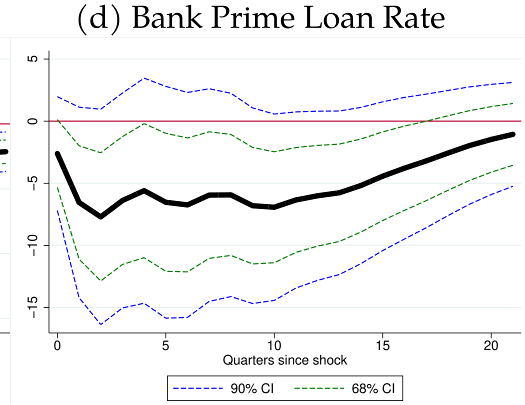
(c) Business Loans



(d) Bank Prime Loan Rate



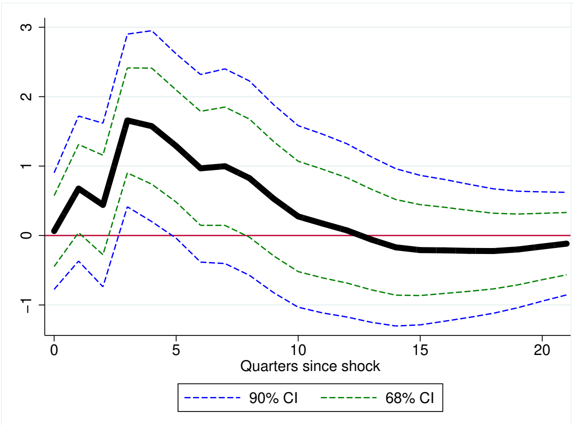
(e) Real BAA Bond rate



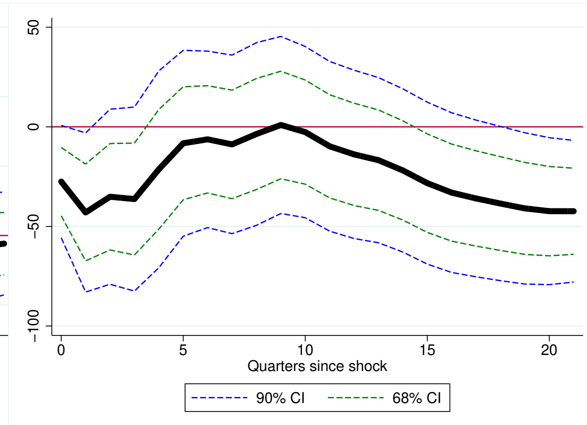
(f) 3-month T-Bill rate

C.2 Appendix: SVAR - SPF shock and Credit markets

Figure 5: IRF of a SPF errors shock: 1966Q3-2007Q4



(a) House Prices



(b) Bank loan rate

Note: SVAR includes SPF errors, log real per capita Gov. spending, Taxes, GDP, log real House prices and bank loan rate. Standard errors come from 500 Montecarlo simulations (linear and quadratic trends and 4 lags are included).

D Appendix: Model derivations

D.1 Appendix: Retailers optimization problem