Firm Leverage and Regional Business Cycles*

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October 2018

Abstract

This paper shows that buildups in *firm* leverage predict subsequent declines in aggregate regional employment. Using confidential establishment-level data from the U.S. Census Bureau, we exploit regional heterogeneity in leverage buildups by large U.S. publicly listed firms, which are widely spread across U.S. regions. For a given region, our results show that increases in firms' borrowing are associated with "boom-bust" cycles: employment grows in the short run but declines in the medium run. Across regions, our results imply that regions with larger buildups in firm leverage exhibit stronger short-run growth, but also stronger medium-run declines, in aggregate regional employment. We obtain similar results if we condition on national recessions: regions with larger buildups in firm leverage prior to a recession experience larger employment losses during the recession. When comparing regional firm and household leverage growth, we find qualitatively similar patterns for both. Lastly, we find that regions whose firm leverage growth comoves more strongly also exhibit stronger comovement in their regional business cycles.

*We thank Eduardo Dávila, Shan Ge, Mark Gertler, Adam Guren, Theresa Kuchler, Simone Lenzu, Andres Liberman, Max Maksimovic, Thomas Philippon, Alexi Savov, Jeremy Stein, Johannes Stroebel, Amir Sufi, Emil Verner, and seminar participants at NYU and Maryland for helpful comments. Any opinions and conclusions expressed herein are those of the authors and do not necessarily represent the views of the U.S. Census Bureau. All results have been reviewed to ensure that no confidential information is disclosed.

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1 Introduction

Large U.S. firms are widely spread across regions. During the 1976–2011 period, the average U.S. publicly listed firm owned establishments in 32.3 counties, 19.9 MSAs, and 8.1 states. When these large firms increase their borrowing, regions are differentially impacted. As this paper shows, regions with larger buildups in leverage by U.S. publicly listed firms exhibit stronger aggregate regional employment growth in the short run. However, this employment growth is only temporary. In the medium run, regions with larger buildups in leverage by U.S. publicly listed firms experience stronger *declines* in aggregate regional employment. For a given region, this implies that increases in firms' borrowing are associated with "boom-bust" cycles: employment grows in the short run but declines in the medium run. Across regions, our results imply that regions with larger buildups in firm leverage experience stronger short-run growth, but also stronger medium-run declines, in aggregate regional employment.

Our study informs the debate about the role of credit growth. A key finding in that literature is that leverage buildups predict subsequent downturns in economic activity.[1] For instance, Schularick and Taylor (2012), in a seminal paper, find that credit growth is a powerful predictor of financial crises, Jordà, Schularick, and Taylor (2013) find that more credit-intensive booms are followed by deeper (financial and normal) recessions, and Jordà, Schularick, and Taylor (2016) find that both mortage and non-mortgage credit booms predict financial crises—but mortgage credit booms lead to deeper recessions and slower recoveries. Gourinchas and Obstfeldt (2012) find that increases in the ratio of credit to GDP predict future banking crises, while Baron and Xiong (2017) find that increases in the credit-to-GDP ratio predict bank equity crashes. Finally, Mian, Sufi, and Verner (2017) find that increases in the ratio of household debt to GDP generate "boom-bust" cycles: GDP grows in the short run but declines in the medium run. By contrast, increases in the ratio of firm debt to GDP do not generate "boom-bust" cycles, and they have only weak predictive power for GDP growth in the medium run.

[1] Other empirical studies use credit *spreads*—as opposed to credit growth—to predict future economic activity (e.g., Gilchrist and Zakrajšek 2012; López-Salido, Stein, and Zakrajšek 2017).

Why do increases in household debt predict future GDP declines but increases in firm debt do not? One possibility is that both firms and households respond to credit booms, which may eventually "go bust." However, firms may additionally respond to future growth opportunities—by borrowing and making investments. Thus, increases in firm debt may predict either bad times or good times. This raises the question as to why households do not (also) borrow in response to future growth opportunities. We can think of at least two possibilities. One is that households are simply not as good at forecasting growth opportunities. The other is that firms and households are both good at forecasting, but households face tighter collateral constraints, preventing them from borrowing against future growth opportunities. For example, households may only be able to borrow against realized home value appreciations but not against (expected) future home value appreciations.

In this paper, we explore a U.S. *regional* setting in which regional variation in firm leverage growth is plausibly uncorrelated with regional growth opportunities. Once the growth opportunity channel is accounted for, we obtain the same qualitative pattern for firm leverage growth that prior (country-level) studies have obtained for household leverage growth: buildups in regional firm leverage are associated with short-run increases but medium-run declines in aggregate regional employment. In fact, we obtain the same qualitative pattern for both firm and household leverage growth, suggesting that the predictability of downturns after leverage buildups is a broad phenomenon.

To isolate regional variation in firm leverage growth that is plausibly uncorrelated with regional growth opportunities, we exploit variation in regional exposure to leverage buildups by large U.S. publicly traded firms, which are widely spread across U.S. regions. We measure regional exposure to leverage buildups by U.S. publicly listed firms by computing the weighted average leverage ratio of U.S. publicly listed firms operating in a given region ("regional firm leverage"). Weights are based on firms' shares of regional employment. We construct regional employment shares for all U.S. publicly listed firms using confidential data from the U.S. Census Bureau's Longitudinal Business Database (LBD), which provides information on employment, payroll, location, and firm affiliation for all business establishments. Our main regional analysis is at the county level. The sample period is from 1976 to 2011.

Our main identifying assumption is that *non-listed* firms are sensitive to regional shocks. We believe this is a plausible assumption. The typical non-listed firm in the LBD sample is a small local firm with 17 employees operating in a single county. As prior research has shown, these firms are highly sensitive to local shocks (e.g., Giroud and Mueller 2017). Accordingly, if variation in regional firm leverage growth—based on heterogeneity in regional exposure to leverage buildups by U.S. publicly listed firms—was driven by regional shocks, non-listed firms in the same region should also "respond." However, changes in regional firm leverage are uncorrelated with either employment or wage changes at non-listed firms in the same region. We thus conclude that variation in regional firm leverage growth in our setting is not driven by regional shocks.[2] For the same reason, we also find that changes in regional firm leverage are uncorrelated with changes in regional household leverage ($\rho = 0.015$). While the former capture the effects of leverage buildups by large U.S. publicly listed firms—which are widely spread across U.S. regions—the latter reflect changes in leverage by regional households, which are driven by regional factors (e.g., regional house prices).

We find that a one standard deviation increase in regional firm leverage over a three-year period is associated with a 3.8 percent increase in regional employment by U.S. publicly listed firms as well as a 0.5 percent increase in aggregate regional employment (by listed and non-listed firms). In the medium run, however, an increase in regional firm leverage predicts a *decline* in regional employment. Precisely, a one standard deviation increase in regional firm leverage from $t-3$ to t predicts a 3.0 percent decline in regional employment by U.S. publicly listed firms and a 0.4 percent decline in aggregate regional employment, both from $t+1$ to $t+4$. A comparison of these magnitudes shows that employment changes at U.S. publicly listed firms are passed through to the aggregate regional level at a ratio of approximately 12.8 percent, corresponding to the average regional employment share of U.S. publicly listed firms (note: $3.8 \times 0.128 = 0.5$ and

[2]The "non-listed firm placebo" is similar to the "pass-through entity placebo" in empirical studies of corporate tax changes (e.g., Yagan 2015; Giroud and Rauh 2018). In those studies, pass-through entities (S-corporations, sole proprietorshps, partnerships) do not "respond" to corporate (income or dividend) tax changes, suggesting that variation in these tax changes is not driven by regional shocks.

$3.0 \times 0.128 = 0.4$). This is precisely what one would expect given that changes in regional firm leverage are uncorrelated with employment changes at non-listed firms.

We note that this (near perfect) pass through from changes in regional employment at U.S. publicly listed firms to changes in aggregate regional employment is not at odds with the agglomeration literature, which documents significant regional spillover effects (e.g., Greenstone, Hornbeck, and Moretti 2010; Bernstein et al. 2018; Huber 2018).[3] In those empirical studies, regional spillovers arise from plant openings, firm bankruptcies, or other large shocks to individual firms. In contrast, in our empirical setting, changes in regional employment by U.S. publicly listed firms are based on a weighted average across a large number of firms, smoothing out variation at the individual firm level.

While our main regional analysis is at the county level, we obtain similar results if we use broader regions based on MSAs or states. Likewise, our results are similar if we conduct separate analyses for tradable, non-tradable, and other industries. In all of these industries, increases in leverage by large U.S. publicly listed firms operating in a region predict subsequent declines in aggregate regional (sectoral) employment. Moreover, our results are similar if we focus on firms with headquarters located at least 1,000 miles away or in a different state. Lastly, our results are similar if we consider changes in establishment-level employment using highly granular county $\times$ industry $\times$ year fixed effects. Accordingly, we compare establishments in the same county, industry, and year—which are likely exposed to the same regional shocks—belonging to U.S. publicly listed firms with different changes in firm leverage from $t-3$ to t. We again find that increases in firm leverage predict subsequent declines in employment.

A large body of theory literature links increases in leverage to downturns in economic activity. In these models, buildups in leverage bring about fragility and vulnerability to shocks, operating either through balance-sheet constraints (e.g., Bernanke and Gertler 1989, Kiyotaki and Moore 1997, Bernanke, Gertler, and Gilchrist 1999, Brunnermeier and Sannikov 2014) or reversals in beliefs (e.g., Minsky 1977, Kindleberger 1978, Fostel and Geanakoplos 2008, Gennaioli, Shleifer, and Vishny 2015, Bordalo, Gennaioli, and Shleifer

[3] See Glaeser and Gottlieb (2009) and Kline and Moretti (2014) for literature reviews.

2018). Alternatively, firms may be facing temporary demand or productivity shocks generating mean-reversion in employment growth. We present two pieces of evidence that are inconsistent with this alternative story. First, while increases in regional firm leverage predict subsequent declines in aggregate regional employment, decreases in regional firm leverage do not predict subsequent growth in aggregate regional employment. Thus, the story is very much one of *buildups* in regional firm leverage predicting *downturns* in regional economic activity. Second, in the case of temporay employment shocks, the subsequent drop in employment is a reversal of, and thus explained by, the initial growth in employment. However, our results are only slightly weaker—and all coefficients remain similar—when we control for the initial employment growth. Accordingly, buildups in regional firm leverage have *separate* predictive power for medium-run drops in aggregate regional employment over and above their possible short-run effects.

All our results are unconditional, in the sense that they do not condition on economic downturns. However, our results also hold if we condition on national recessions during our sample period (1980–82, 1990–91, 2001, 2007–09). In each of these recessions, we find that regions with larger buildups in firm leverage before the recession experience larger employment losses during the recession. Interestingly, the magnitude of this effect varies significantly across recessions. For example, a one standard deviation increase in regional firm leverage before the recession is associated with 0.4 percent decline in aggregate regional employment during the 1980–82 recession but a 1.5 percent decline in aggregate regional employment during the 2007–09 ("Great") recession.[4]

Moreover, we examine whether comovement in regional firm leverage growth induces comovement in regional business cycles. We find that it does. A one standard deviation increase in the pairwise correlation of regional firm leverage growth is associated with a 1.6 percentage point increase in the pairwise correlation of medium-run regional employment growth. Accordingly, regions whose firm leverage growth comoves more strongly also exhibit stronger comovement in their regional business cycles.

[4]The Great Recession witnessed a significant drop in consumer demand due to falling house prices. Consistent with buildups in firm leverage creating fragility and vulnerability to shocks, Giroud and Mueller (2017) find that establishments of firms with higher leverage in 2006, at the onset of the Great Recession, were more sensitive to drops in consumer demand during the Great Recession.

Lastly, we address potential concerns that our results could be picking up the effects of *household* leverage growth. As mentioned previously, changes in regional firm and household leverage are practically uncorrelated in our setting. Not surprisingly, therefore, our estimates remain similar if we control for changes in regional household leverage. More importantly, we obtain qualitatively similar results for firm and household leverage growth, suggesting that the predictability of downturns after buildups in leverage is a broad phenomenon that holds for various types of leverage.

Our research is part of a broader literature in macroeconomics using regional analysis. As Nakamura and Steinsson (2018) point out, the use of regional analysis entails two advantages. First, the number of observations is multiplied by an order of magnitude. Our U.S. regional setting is based on nearly 100,000 county-year observations. Thus, all coefficients are precisely estimated. Second, identification is cross-sectional, based on heterogeneity in regional exposure to a given shock. For example, Autor, Dorn, and Hanson (2013) exploit variation in regional exposure to import competition from China, Nakamura and Steinsson (2014) exploit regional differences in the sensitivity to national military buildups, and Beraja et al. (2018) exploit regional heterogeneity in home equity refinancing and spending responses to interest rate cuts. Our paper exploits variation in regional exposure to leverage buildups by large U.S. publicly listed firms to study the effects of firm leverage growth on aggregate regional employment growth. Importantly, variation in regional firm leverage growth in our setting is uncorrelated with regional growth opportunities, or regional shocks more generally. Furthemore, it is uncorrelated with variation in regional household leverage growth, allowing us to separate the effects of regional firm and household leverage growth.

The rest of this paper is organized as follows. Section 2 describes the data, variables, methodology, and summary statistics. Section 3 studies the relationship between regional firm leverage growth and regional employment growth. Section 4 contains extensions and robustness tests. Section 5 examines whether our results are driven by mean-reverting employment growth. Section 6 considers leverage buildups prior to national recessions. Section 7 studies regional business cycle comovement. Section 8 compares changes in regional firm and household leverage. Section 9 concludes.

2 Data, Methodology, and Summary Statistics

2.1 Data and Variables

Our main data source is the Longitudinal Business Database (LBD) provided by the U.S. Census Bureau. The LBD contains information on employment, payroll, location, industry, and firm affiliation for all business establishments in the U.S. with at least one paid employee. An establishment is a "single physical location where business is conducted" (Jarmin and Miranda 2002; p. 5), e.g., a restaurant, department store, or manufacturing plant. Our sample period is from 1976 to 2011.[5]

We match individual establishments in the LBD to firms in Compustat using the Compustat-SSEL bridge maintained by the U.S. Census Bureau. Given that this bridge ends in 2005, we extend the match to 2011 using employer name and ID number (EIN) by applying the methodology described in McCue (2003). Following standard practice in the literature, we exclude regulated industries (utilities, financial firms) and firms with missing financial data.

Our main regional analysis is at the county level, though we also conduct analyses at the MSA and state level. We obtain county-level employment separately for publicly listed and non-listed firms in a county by adding up their employment from individual establishments. To obtain a measure of firm leverage at the county level, we compute the weighted average leverage ratio across all publicly listed firms with establishments in a county. Weights are based on the firms' shares of county-level employment:

$$\mathrm{Lev}_{k,t} = \sum_j \frac{w_{j,k,t}}{\sum_j w_{j,k,t}} \, \mathrm{Lev}_{j,t}, \tag{1}$$

where $\mathrm{Lev}_{k,t}$ is firm leverage in county k and year t, $w_{j,k,t}$ is firm j's employment share in county k and year t, and $\mathrm{Lev}_{j,t}$ is the leverage ratio of firm j in year t.[6] Firm leverage is the ratio of the sum of debt in current liabilities (Compustat item DLC) and long-term

[5] 1976 is the first available year in the LBD. 2011 is the last available year in our Census data project.

[6] The weight $w_{j,k,t}$ represents firm j's share of total employment in county k—not county k's share of total employment by firm j. Hence, the sum $\sum_j w_{j,k,t}$ represents the total employment share of publicly listed firms in county k.

debt (item DLTT) to assets (item AT) and is winsorized between zero and one.[7] We proceed analogously when computing firm leverage at the MSA and state level.

We also use data on household debt at the county level from the Consumer Credit Panel provided by the Federal Reserve Bank of New York. Household debt is mortgage, credit card, and auto loan debt normalized by adjusted gross income (from IRS data).

2.2 Empirical Methodology

We study the dynamic relation between changes in regional firm leverage—the weighted average leverage ratio across all U.S. publicly listed firms with establishments in a given region—and regional employment growth. We estimate the following equation:

$$\Delta \log(\text{Emp})_{k,t}(t+\tau, t+\tau+3) = \alpha_k + \alpha_t + \beta \, \Delta \, \text{Lev}_{k,t}(t-3, t) + \varepsilon_{k,t}, \tag{2}$$

where $\tau = -3, \ldots, 2$; $\Delta \log(\text{Emp})_{k,t}(t+\tau, t+\tau+3)$ is employment growth in county k from $t+\tau$ to $t+\tau+3$; Δ $\text{Lev}_{k,t}(t-3,t)$ is the change in firm leverage in county k from $t-3$ to t; and α_k and α_t are county and year fixed effects. We estimate equation (2) for all $\tau = -3, \ldots, 2$, resulting in six regressions. For example, when $\tau = -3$, the coefficient β captures the short-run effects of changes in regional firm leverage from $t-3$ to t on regional employment growth from $t-3$ to t. As τ increases, we move towards medium-run effects. For example, when $\tau = 1$, the coefficient β captures the effects of changes in regional firm leverage from $t-3$ to t on regional employment growth from $t+1$ to $t+4$. For simplicity, we write $\Delta \log(\text{Emp})(-3,0)$ in lieu of $\Delta \log(\text{Emp})_{k,t}(t-3,t)$, etc., in our tables and figures. Observations are weighted by county-level employment. Standard errors are double clustered at the county and year level.

In one particular case, we examine the dynamic relation between changes in firm leverage and employment growth at the individual establishment level. We estimate the

[7] This definition of firm leverage is standard in the corporate finance literature. Frank and Goyal (2009) provide an empirical assessment of the determinants of firms' capital structure choices. Graham and Harvey (2002) present related evidence from CFO surveys. Graham and Leary (2011) review the empirical literature on capital structure research.

following equation:

$$\Delta \log(\text{Emp})_{i,j,k,l,t}(t+\tau, t+\tau+3) = \alpha_k \times \alpha_l \times \alpha_t + \beta \ \Delta \ \text{Lev}_{j,t}(t-3,t) + \varepsilon_{i,j,k,l,t}, \quad (3)$$

where $\Delta \log(\text{Emp})_{i,j,k,l,t}(t+\tau, t+\tau+3)$ is the growth in employment of establishment i of firm j in county k and industry l from $t+\tau$ to $t+\tau+3$, Δ Lev$_{j,t}(t-3,t)$ is the change in leverage of firm j from $t-3$ to t, and $\alpha_k \times \alpha_l \times \alpha_t$ are county $\times$ industry $\times$ year fixed effects. Accordingly, equation (3) compares the employment growth of establishments in the same county, industry, and year that belong to firms with different leverage changes from $t-3$ to t. Industries are measured at the 4-digit NAICS code level. Observations are weighted by establishment-level employment. Standard errors are double clustered at the county and year level.

Our main identifying assumption is that *non-listed* firms are sensitive to regional shocks. We believe this is a plausible assumption. The typical non-listed firm in the LBD sample is a small local firm operating in a single region (see Table 2). As prior research shows, these firms are highly sensitive to local shocks—in fact, they are *more* sensitive than establishments of publicly listed firms (Giroud and Mueller 2017). By implication, if variation in regional firm leverage growth was driven by regional growth opportunities, or regional shocks more generally, non-listed firms in the same region should also "respond." To examine whether non-listed firms "respond" to changes in regional firm leverage, we estimate equation (2) using employment growth of non-listed firms as the dependent variable. The results are provided in Table 1. As Panel (A) shows, changes in regional firm leverage are uncorrelated with employment changes at non-listed firms in the same region, both in the short and medium run. Arguably, employment may not be responsive to growth opportunities if labor supply is relatively inelastic. However, Panel (B) shows that changes in regional firm leverage are also uncorrelated with *wage* changes at non-listed firms in the same region, again both in the short and medium run. We may thus conclude that variation in regional firm leverage growth—based on leverage buildups by large U.S. publicly listed firms, which are widely spread across regions—is not driven by regional growth opportunities, or regional shocks more generally.

2.3 Summary Statistics

Table 2 provides summary statistics. Panel (A) provides firm-level summary statistics for all firms, publicly listed firms, and non-listed firms. As one would expect, publicly listed firms are much larger than non-listed firms—they have more employees and more establishments. Indeed, the typical non-listed firm is a small local firm with a single establishment operating in a single ZIP code. In contrast, the typical publicly listed firm owns 85.5 establishments in 63.6 ZIP codes, 32.3 counties, 19.9 MSAs, and 8.1 states. The average leverage ratio of publicly listed firms is 0.261. And while there are many ups and downs in firm leverage ratios during the sample period, the average three-year change in firm leverage is close to zero.

Panel (B) provides summary statistics at the county level. The average three-year employment growth at the county level, Δ log(Emp)$(-3, 0)$, is 5.4 percent for all firms, 4.1 percent for publicly listed firms, and 6.2 percent for non-listed firms. Publicly listed firms account for 12.8 percent of total county-level employment. However, the county-level employment share of publicly listed firms varies across industry sectors. It is 13.2 percent in the non-tradable sector, 26.9 percent in the tradable sector, and 7.1 percent in the "other" sector (industries that are neither non-tradable nor tradable). In robustness tests, we perform separate analyses for each industry sector. The average firm leverage ratio at the county level is 0.288, which differs slightly from the corresponding ratio at the firm level due to the uneven geographical distribution of publicly listed firms. The average three-year change in firm leverage at the county level ("regional firm leverage"), Δ Lev$(-3, 0)$, is (again) close to zero, and its standard deviation is 0.08.

3 Firm Leverage and Regional Employment Growth

3.1 Bin Scatterplots

Figure 1 shows bin scatterplots depicting the relation between changes in regional firm leverage and regional employment growth. Panel (A) shows the growth in total regional employment by all U.S. publicly listed firms with operations in a given region. Panel (B) shows the growth in aggregate regional employment by all (listed and non-listed) firms in a given region. In both panels, the left plots show the short-run effects of changes in regional firm leverage—the relation between Δ Lev$(-3,0)$ and Δ log(Emp)$(-3,0)$—based on 99,300 county-year observations, whereas the right plots show the medium-run effects of changes in regional firm leverage—the relation between Δ Lev$(-3,0)$ and Δ log(Emp)$(1,4)$—based on 86,500 county-year observations. For any given percentile bin, the plots show the mean values of Δ Lev$(-3,0)$ and either Δ log(Emp)$(-3,0)$ (left plots) or Δ log(Emp)$(1,4)$ (right plots).[8]

As the left plot in Panel (A) shows, there is a positive short-run association between changes in regional firm leverage and regional employment growth at U.S. publicly listed firms. The magnitude of this effect is quite large: a one standard deviation increase in regional firm leverage (0.08) is associated with a 3.5 percent short-run increase in regional employment at U.S. publicly listed firms (note: $0.08 \times 0.440 = 0.035$). In the medium run, however, this positive association turns negative. As the right plot shows, a one standard deviation increase in regional firm leverage predicts a 4.3 percent medium-run *decline* in regional employment at U.S. publicly listed firms. The plots in Panel (B)—which are based on aggregate regional employment by all firms—look similar, except that the magnitudes are much smaller. In the left plot in Panel (B), a one standard deviation increase in regional firm leverage is associated with a 0.8 percent short-run increase in aggregate regional employment, whereas in the right plot, it is associated with a 0.5 percent medium-run decline in aggregate regional employment. In Section 3.2, we shall see that the pass-through from changes in regional employment at U.S. publicly listed firms to changes in aggregate regional employment is roughly proportionate to the average regional employment share of U.S. publicly listed firms.

Table 3 presents the regressions that correspond to the bin scatterplots. While these regressions do not include county or year fixed effects—in accord with Figure 1—they are based on the full sample of 99,300 or 86,500 observations rather than percentile bins. As can be seen, the regression coefficients associated with Δ Lev$(-3,0)$ are remarkably

[8] All sample sizes are rounded to the nearest hundred following Census Bureau disclosure guidelines.

similar to the slope coefficients in Figure 1: 0.481 versus 0.440, -0.526 versus -0.541, 0.097 versus 0.096, and -0.069 versus -0.064. Three of the four regression coefficients are significant at the one percent level; one is significant at the five percent level. Thus, the bin scatterplots in Figure 1 provide an adequate representation of the raw data.

3.2 Main Results

Table 4 presents our main results based on estimating equation (2) for $\tau = -3, ..., 2$. This yields six regressions with dependent variables ranging from short-run ($t - 3$ to t) to medium-run (t to $t + 3, ..., t + 2$ to $t + 5$) regional employment growth. Panel (A) examines the relationship between changes in regional firm leverage and regional employment growth at U.S. publicly listed firms. Inspection of all six columns shows that the effects are positive in the short run but negative in the medium run. The sign switches around ($t - 2$ to $t + 1$), which is why the coefficient in column (2) is small and insignificant. All other coefficients are significant. In particular, the short-run coefficient in column (1) and the medium-run coefficient in column (5) are both significant at the one percent level. As in the bin scatterplots in Figure 1, the magnitudes of the effects are quite large. In column (1), for example, a one standard deviation increase in regional firm leverage is associated with a 3.8 percent short-run increase in regional employment at U.S. publicly listed firms, whereas in column (5), it predicts a 3.0 percent medium-run *decline* in regional employment at U.S. publicly listed firms.

Employment losses at U.S. publicly listed firms may trigger a drop in regional wages and offsetting hiring by non-listed firms in the same region, with the implication that aggregate regional employment remains unchanged. That being said, we have seen in Table 1 that changes in regional firm leverage are uncorrelated with both employment and wage changes at non-listed firms in the same region. Consequently, we would expect that employment changes at U.S. publicly listed firms are passed through to the aggregate regional level without any significant offsetting effects.

Panel (B) examines the relationship between changes in regional firm leverage and aggregate regional employment growth—the growth in employment by all (listed and non-listed) firms in a given region. As can be seen, the results are qualitatively similar to those in Panel (A). The short-run effects are again positive, the sign switches again around ($t-2$ to $t+1$), and the medium-run effects are again negative. Also, the short-run coefficient in column (1) and the medium-run coefficient in column (5) are again both significant at the one percent level. However, the magnitudes are much smaller than those in Panel (A). In column (1), for example, a one standard deviation increase in regional firm leverage is associated with a 0.5 percent short-run increase in aggregate regional employment, while in column (5), it predicts a 0.4 percent medium-run decline in aggregate regional employment. A comparison of these magnitudes with those in Panel (A) indicates that, in both cases, employment changes at U.S. publicly listed firms are passed through to the aggregate regional level at a ratio of approximately 12.8 percent, corresponding to the average regional employment share of U.S. publicly listed firms (note: $3.8 \times 0.128 = 0.5$ and $3.0 \times 0.128 = 0.4$). This is exactly what one would expect given that changes in regional firm leverage are uncorrelated with changes in employment at non-listed firms in the same region.

Let us summarize. Our results show that within a given region, increases in U.S. publicly listed firms' borrowing are associated with "boom-bust" cycles: employment grows in the short run but declines in the medium run. Across regions, our results imply that regions with larger buildups in firm leverage exhibit stronger short-run growth, but also stronger medium-run declines, in aggregate regional employment.

4 Extensions and Robustness

4.1 Industry Sectors

Table 5 breaks down our main results by industry sector. Panel (A) considers tradable industries. Panel (B) considers non-tradable industries. Panel (C) considers all other industries.[9] All variables are industry-specific. For example, in Panel (A), regional firm

[9] Our classification of tradable and non-tradable industries follows Mian and Sufi (2014). Tradable industries are essentially manufacturing industries. Non-tradable industries are restaurant and retail industries. "Other" industries are those that are neither tradable nor non-tradable.

leverage is the weighted average leverage ratio across publicly listed firms with tradable establishments in a county, and the employment weights are based on firms' shares of tradable county-level employment. Likewise, employment growth is the growth rate of tradable employment in a county. In this and all remaining tables, we focus on the predictability of medium-run employment growth.

Inspection of all three panels shows that the results are qualitatively similar across industry sectors. To interpret the coefficients, note that the standard deviation associated with Δ Lev$(-3, 0)$ is 0.108 for tradable industries, 0.086 for non-tradable industries, and 0.091 for other industries. In column (2), for example, where the dependent variable is Δ log(Emp)$(1, 4)$, a one standard deviation increase in regional firm leverage predicts a subsequent decline in aggregate regional employment of 0.4 percent both in the tradable and non-tradable sector and 0.6 percent in the "other" sector. We thus conclude that the medium-run effects of changes in regional firm leverage on aggregate regional (sectoral) employment are fairly similar across industry sectors.

4.2 MSAs and States

Using counties as our unit of analysis entails two main advantages. First, our sample consists of nearly 100,000 county-year observations, allowing us to precisely estimate all coefficients. Second, with over 3,000 counties, there is ample regional variation in both regional firm leverage and aggregate regional employment growth.

In Table 6, we estimate equation (2) using broader definitions of regions. Panel (A) considers MSAs, while Panel (B) considers states. As can be seen, the results are similar to our county-level results. To interpret the coefficients, note that the standard deviation associated with Δ Lev$(-3, 0)$ is 0.043 at the MSA level and 0.044 at the state level. In column (2), for example, where the dependent variable is Δ log(Emp)$(1, 4)$, a one standard deviation increase in regional firm leverage predicts a subsequent decline in aggregate regional employment of 0.4 percent at the MSA level and 0.8 percent at the state level, which is of the same order of magnitude as the corresponding drop at the county level. Hence, our results are robust to using broader regions.

4.3 Firms with Distant Headquarters

Regional shocks may disproportionately affect firms that are headquartered in a given region.[10] In Table 7, we therefore exclusively focus on firms with distant headquarters. Specifically, when computing our measure of regional firm leverage in (1), we drop all firms which are either headquartered in the given region or nearby. In Panel (A), we require that firms' headquarters be located at least 1,000 miles away from the given region. In Panel (B), we require that firms' headquarters be located in a different state. As can be seen, our results are similar to our baseline results.

4.4 Establishment-Level Evidence

The predictability of employment drops after buildups in firm leverage does not hinge on how we aggregate firm leverage at the regional level. Indeed, we have just seen that our results are similar if we consider MSAs or states. Rather, the predictability comes directly from the underlying firms.

To illustrate, we consider employment growth at the individual establishment level. An added benefit of using establishments as our unit of analysis is that we can directly control for regional shocks by saturating our empirical model with highly granular fixed effects. Precisely, we estimate equation (3), which is similar to equation (2), except that employment and leverage growth are disaggregated at the establishment and firm level, respectively. Importantly, equation (3) includes county $\times$ industry $\times$ year fixed effects, where industries are measured at the 4-digit NAICS code level. Thus, we compare establishments in the same county, industry, and year—which are likely exposed to the same regional shocks—that belong to U.S. publicly listed firms with different changes in leverage from $t-3$ to t. The results are shown in Table 8. As can be seen, buildups in firm leverage again predict subsequent declines in employment, consistent with what we have found at the aggregate regional level.

[10] Gao, Ng, and Wang (2011) find that firm leverage is correlated with headquarter-MSA fixed effects after controlling for time-varying firm-level characteristics as well as year and industry fixed effects.

5 Mean-Reverting Employment Growth

A large body of theory literature associates leverage buildups with subsequent downturns in economic activity. In models based on financial frictions, increases in leverage bring about fragility and vulnerability to shocks operating through balance-sheet constraints (e.g., Bernanke and Gertler 1989, Kiyotaki and Moore 1997, Bernanke, Gertler, and Gilchrist 1999, Brunnermeier and Sannikov 2014). In behavioral models, optimism leads to credit expansions, financial fragility, and belief reversals, resulting in slowdowns in economic growth (e.g., Minsky 1977, Kindleberger 1978, Fostel and Geanakoplos 2008, Gennaioli, Shleifer, and Vishny 2015, Bordalo, Gennaioli, and Shleifer 2018).

An alternative hypothesis is that firms may face temporary demand or productivity shocks generating mean-reversion in employment growth. For example, firms facing an increase in demand may hire more workers. When the demand subsides, the workers are laid off. If the expansion is financed with debt, we might see an initial increase and a subsequent drop in employment, where the increase in employment goes hand in hand with an increase in leverage. And yet, the employment drop is fully explained by the initial increase—the increase in leverage is only a "side show." In Table 9, we provide two pieces of evidence that are inconsistent with this story.

The employment mean-reversion story is inherently symmetric: temporary demand or productivity shocks can be positive or negative. Our main results, however, are not symmetric. In Panel (A), we interact changes in regional firm leverage with a dummy indicating whether these changes are positive or negative.[11] As is shown, increases in regional firm leverage predict subsequent declines in aggregate regional employment, but decreases in regional firm leverage do not predict subsequent growth in aggregate regional employment. Thus, the story is very much one of *buildups* in regional firm leverage predicting subsequent *downturns* in regional economic activity.

In the case of a temporay employment shock, the subsequent drop in employment is a reversal of, and thus explained by, the initial growth in employment. However, Panel

[11] 53.4 percent of the 99,300 county-year observations associated with Δ Lev$(-3, 0)$ are positive and 46.6 percent are negative. Conditional on being positive (negative), the mean value of Δ Lev$(-3, 0)$ is 0.055 (-0.057) and the standard deviation is 0.058 (0.061).

(B) shows that our main results are only slightly weaker if we control for the initial growth in employment.[12] Indeed, the coefficients in columns (1) to (3) are close to the original coefficients in Table 4 (-0.030 versus -0.035, -0.049 versus -0.053, -0.042 versus -0.046), and their significance is only slightly reduced ($p-$values of 0.076 versus 0.049, 0.003 versus 0.002, 0.013 versus 0.007). Accordingly, buildups in regional firm leverage have *separate* predictive power for medium-run declines in aggregate regional employment over and above their possible short-run effects.

6 National Recessions

All our results so far have been unconditional, in the sense that they do not condition on economic downturns. Rather, they *predict* downturns in regional economic activity following increases in regional firm leverage. Note that increases in regional firm leverage are not simply a by-product of national expansions. During our sample period from 1976 to 2011, the NBER records five recessions: January 1980 to July 1980, July 1981 to November 1982, July 1990 to March 1991, March 2001 to November 2001, and December 2007 to June 2009. Altogether, these five recessions amount to 56 contraction months, leaving us with $35 \times 12 - 56 = 364$ expansion months.[13] Hence, there are about 6.5 times more expansion months than contraction months. In contrast, increases and decreases in regional firm leverage are fairly balanced during the sample period—about 53 percent of observations are increases and 47 percent are decreases.[14]

That being said, national recessions provide an ideal setting to empirically assess whether buildups in leverage bring about fragility and vulnerability to shocks—national recessions constitute significant aggregate shocks. Accordingly, we would expect that

[12]Controlling for the initial employment growth, Δ log(Emp)$(-3, 0)$, may be "overcontrolling" as it precludes the possibility that changes in regional firm leverage affect medium-run employment growth *through* short-run employment growth.

[13]See http://www.nber.org/cycles.html. Dupraz, Nakamura, and Steinsson (2017) measure expansion and contraction months using the unemployment rate. Based on this alternative measure, there are 265 expansion months and 155 contraction months during the 1976–2011 sample period.

[14]Along similar lines, our results are also not driven by firms increasing or decreasing their leverage during national recessions (cf., Erel et al. 2012): the interaction term between Δ Lev$(-3, 0)$ and a recession dummy is insignificant.

regions experiencing larger buildups in firm leverage before a national recession should also experience larger declines in employment during the recession. Due to the short recovery period between 1980 and 1981, we treat the twin recessions of 1980 and 1981–1982 as a single recession from 1980 to 1982. The results are shown in Table 10. Year "0" refers to the year prior to a national recession. For example, in Panel (A), Δ Lev$(-3, 0)$ denotes the change in regional firm leverage from 1976 to 1979, and Δ log(Emp)$(1, 2)$, Δ log(Emp)$(1, 3)$, and Δ log(Emp)$(1, 4)$ is the growth in aggregate regional employment from 1980 to 1981, 1980 to 1982, and 1980 to 1983, respectively.

Inspection of Panels (A) to (D) reveals that regions with stronger buildups in firm leverage prior to a national recession also experience larger employment losses during the recession. This is true for all recessions during our sample period. To interpret the coefficients, note that the standard deviation associated with Δ Lev$(-3, 0)$ is 0.060 in Panel (A), 0.076 in Panel (B), 0.075 in Panel (C), and 0.105 in Panel (D). Consider, for instance, column (2). Both in the 1980–1982 and 2001 recession, the effect of a buildup in firm leverage is similar to the average sample effect in Table 4. In either recession, a one standard deviation increase in regional firm leverage prior to the recession is associated with a 0.4 percent decline in aggregate regional employment during the recession. In the 1990–1991 recession, the effect of a buildup in firm leverage is considerably stronger. In that recession, a one standard deviation increase in regional firm leverage before the recession is associated with a subsequent drop in aggregate regional employment of 1.1 percent. Finally, the effect of a buildup in firm leverage is strongest in the 2007–2009 recession, where a one standard deviation increase in regional firm leverage prior to the recession is associated with a 1.5 percent reduction in aggregate regional employment during the recession. Overall, these results show that the economic significance of leverage buildups prior to national recessions varies across business cycles.

7 Business Cycle Comovement

Do regions whose firm leverage growth comoves more strongly also exhibit stronger comovement in their regional business cycles? We address this question in Table 11 by computing the pairwise correlation of either regional firm leverage growth, Δ Lev$(-3,0)$, or regional employment growth, Δ log(Emp)$(1,4)$, based on approximately five million region-pairs ($n \times (n-1)/2$, where $n \approx 3,100$). That is, for each region-pair, we use the time series to compute $\rho[\Delta$ Lev$(-3,0)]$ and $\rho[\Delta$ log(Emp)$(1,4)]$ and subsequently regress $\rho[\Delta$ log(Emp)$(1,4)]$ on $\rho[\Delta$ Lev$(-3,0)]$ based on all region-pairs. While this is a cross-sectional regression, each region appears in the sample $n-1$ times—the number of pairwise correlations it shares with other regions. Thus, we can absorb region-specific variation by including region (precisely, county) fixed effects.

Table 11 shows the results. As can be seen, the correlation between $\rho[\Delta$ Lev$(-3,0)]$ and $\rho[\Delta$ log(Emp)$(1,4)]$ is positive and significant at the one percent level. Hence, if region i's firm leverage growth comoves more strongly with region j's firm leverage growth than with region k's, then region i's employment growth also comoves more strongly with region j's employment growth than with region k's. To interpret the magnitude of this effect, note that the standard deviation associated with $\rho[\Delta$ Lev$(-3,0)]$ is 0.323. Accordingly, a one standard deviation increase in the pairwise correlation of regional firm leverage growth is associated with a 1.6 percentage point increase in the pairwise correlation of medium-run regional employment growth.

8 Firm versus Household Leverage

In Table 12, we address possible concerns that our results could be picking up the effects of changes in regional *household* leverage. A priori, this seems rather unlikely. While changes in our measure of regional firm leverage capture the effects of leverage buildups by large U.S. publicly listed firms—which are widely spread across regions—changes in regional household leverage reflect choices made by regional households, which are driven by regional factors (e.g., house prices). Indeed, the correlation between changes in regional firm and household leverage in our sample is close to zero ($\rho = 0.015$).

In Panel (A), we include changes in regional household leverage (Δ HH Lev$(-3,0)$) in our main panel specification, except that the sample period is from 1999 to 2011.[15]

[15] Household leverage is the ratio of household debt (mortgage, credit card, and auto loan debt) to

As is shown, we obtain qualitatively similar patterns for firm and household leverage. In either case, buildups in leverage predict subsequent downturns in economic activity. To interpret the coefficients, note that the standard deviations associated with Δ Lev$(-3,0)$ and Δ HH Lev$(-3,0)$ are 0.069 and 0.421, respectively. In column (2), for example, a one standard deviation increase in regional firm leverage predicts a subsequent decline in aggregate regional employment of 0.5 percent, which is almost identical to our baseline estimate. Also, a one standard deviation increase in regional household leverage predicts a subsequent decline in aggregate regional employment of 1.6 percent, which is of similar magnitude as the 2.1 percent decline in GDP growth in Mian, Sufi, and Verner (2017), despite differences in samples and variable definitions. Altogether, these results suggest that the predictability of downturns after buildups in leverage is a broad phenomenon that holds for various types of leverage.

In Panel (B), we include changes in regional household leverage in the cross-sectional specification from Panel (D) of Table 10. As can be seen, we again obtain qualitatively similar patterns for firm and household leverage. To interpret the coefficients, note that the standard deviations associated with Δ Lev$(-3,0)$ and Δ HH Lev$(-3,0)$ are 0.105 and 0.572, respectively. In column (2), for example, this implies that a one standard deviation increase in regional firm leverage prior to the 2007–2009 ("Great") recession is associated with a 1.3 percent decline in aggregate regional employment during the recession. The economic significance of an increase in regional household leverage is exactly identical. Hence, regions with larger buildups in either firm or household leverage prior to the Great Recession exhibit larger declines in aggregate regional employment during the Great Recession.

9 Conclusion

Our paper contributes to a growing literature showing that buildups in leverage predict downturns in economic activity (e.g., Schularick and Taylor 2012; Jordà, Schularick, and Taylor 2013; Mian, Sufi, and Verner 2017). Our empirical approach differs from prior

income at the county level. 1999 is the first available year for which we have data on household debt.

studies in that we exploit *regional* variation in leverage buildups by large U.S. publicly listed firms, allowing us to separate the effects of leverage buildups from regional growth opportunities, or regional shocks more generally. We find that a one standard deviation increase in regional firm leverage—the weighted average leverage ratio of U.S. publicly listed firms operating in a region—predicts a subsequent decline in aggregate regional employment of 0.3 to 0.4 percent. For a given region, our results show that increases in firms' borrowing are associated with "boom-bust" cycles: employment grows in the short run but declines in the medium run. Across different regions, our results imply that regions with larger buildups in firm leverage experience stronger short-run growth, but also stronger medium-run declines, in aggregate regional employment. Altogether, our results suggest that the geographical distribution of U.S. publicly listed firms' operations plays an important role for regional growth cycles.[16]

Our results have policy implications. Prior studies have shown that fiscal or monetary policy shocks differentially impact U.S. regions—because regions are differentially exposed to military buildups (Nakamura and Steinsson 2014) or home-equity based borrowing (Beraja et al. 2018). Our empirical study suggests that fiscal or monetary policy shocks affecting the borrowing decisions of large U.S. publicly listed firms may differentially impact U.S. regions—because regions are differentially exposed to these firms.

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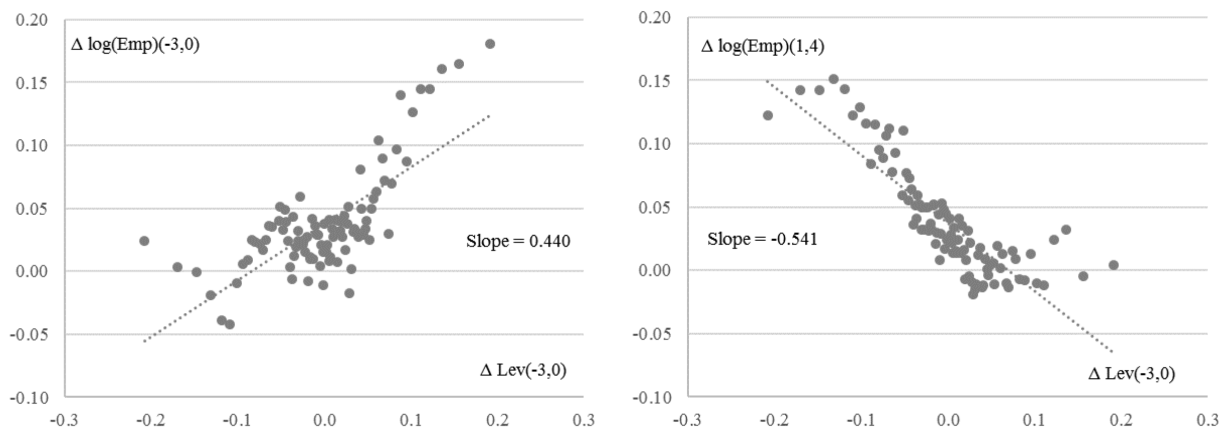
Figure 1
Bin Scatterplots

This figure shows bin scatterplots depicting the relationship between changes in regional firm leverage and either regional employment growth at U.S. publicly listed firms (Panel (A)) or aggregate regional employment growth (Panel (B)). In both panels, the left scatterplots depict the relationship between Δ Lev(-3,0) and Δ log(Emp)(-3,0) based on 99,300 county-year observations, while the right scatterplots depict the relationship between Δ Lev(-3,0) and Δ log(Emp)(1,4) based on 86,500 county-year observations. For any given percentile bin, the plots show the mean values of Δ Lev(-3,0) and either Δ log(Emp)(-3,0) (left plots) or Δ log(Emp)(1,4) (right plots).

Panel (A): Regional employment growth at publicly listed firms



Panel (B): Aggregate regional employment growth

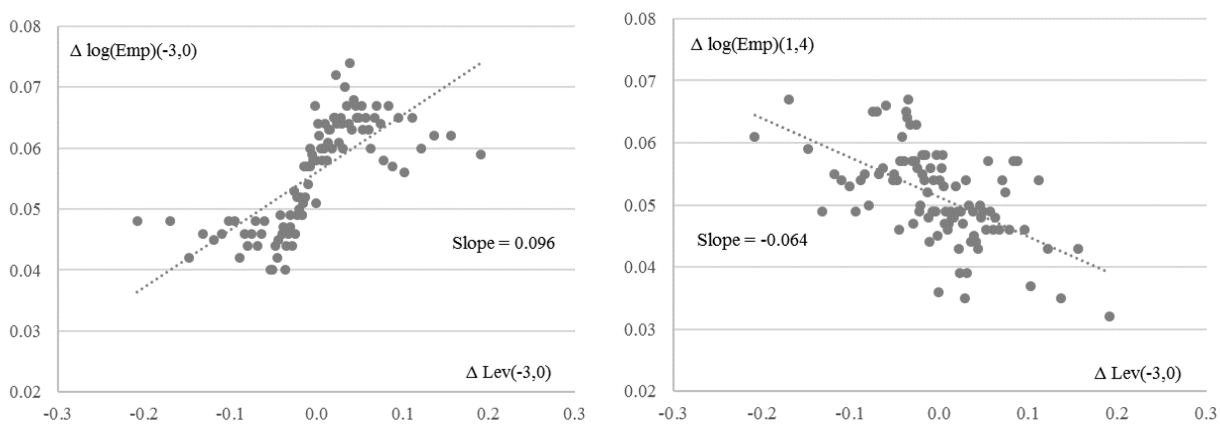


Table 1
"Non-Listed Firm Placebo"

In Panel (A), the dependent variable is employment growth at non-listed firms at the county level. In Panel (B), the dependent variable is wage growth at non-listed firms at the county level. Growth rates are measured over three years from $t + \tau$ to $t + \tau + 3$, where τ ranges from $\tau = -3$ in column (1) to $\tau = 2$ in column (6). Δ Lev(–3,0) is the change in regional firm leverage from $t - 3$ to t as described in Section 2.1. Observations are weighted by county-level employment. Standard errors are double clustered at the county and year level. The sample period is from 1976 to 2011. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): Regional employment growth at non-listed firms

	Δ log(Emp) (-3,0)	Δ log(Emp) (-2,1)	Δ log(Emp) (-1,2)	Δ log(Emp) (0,3)	Δ log(Emp) (1,4)	Δ log(Emp) (2,5)
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Lev(-3,0)	0.006	0.010	-0.003	-0.007	-0.009	-0.003
	(0.027)	(0.022)	(0.019)	(0.023)	(0.025)	(0.019)
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.46	0.47	0.47	0.48	0.49	0.50
Observations	99,300	96,100	92,900	89,700	86,500	83,300

Panel (B): Regional wage growth at non-listed firms

	Δ log(Wages) (-3,0)	Δ log(Wages) (-2,1)	Δ log(Wages) (-1,2)	Δ log(Wages) (0,3)	Δ log(Wages) (1,4)	Δ log(Wages) (2,5)
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Lev(-3,0)	0.008	-0.001	-0.011	-0.011	-0.016	-0.002
	(0.023)	(0.022)	(0.030)	(0.020)	(0.015)	(0.015)
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.60	0.66	0.57	0.63	0.54	0.62
Observations	99,300	96,100	92,900	89,700	86,500	83,300

Table 2
Summary Statistics

Panel (A) provides firm-level summary statistics for all firms (column (1)), publicly listed firms (column (2)), and non-listed firms (column (3)). # ZIP codes is the number of ZIP codes in which the firm has establishments. # Counties, # MSAs, and # States are defined analogously. Leverage is the ratio of the sum of debt in current liabilities (Compustat item DLC) and long-term debt (item DLTT) to total assets (item AT). Δ Lev is the change in leverage from $t - 3$ to t. Panel (B) provides county-level summary statistics for all firms (column (1)), publicly listed firms (column (2)), and non-listed firms (column (3)). Δ log(Emp) is the county-level employment growth from $t - 3$ to t. Employment share is the county-level employment share of publicly listed firms (column (2)) or non-listed firms (column (3)) across all industries. Employment share (non-tradable), employment share (tradable), and employment share (other) are defined analogously for specific industry sectors based on the industry classification in Mian and Sufi (2014). Leverage is the weighted average leverage ratio across all publicly listed firms with establishments in a county. Weights are based on firms' county-level employment shares as described in Section 2.1. All figures are sample means. Standard deviations are in parentheses. The sample period is from 1976 to 2011.

Panel (A): Firm-level summary statistics

	All	Publicly Listed	Non-Listed
	(1)	(2)	(3)
Employees	21	4,282	17
	(729)	(19,616)	(457)
Establishments	1.24	85.46	1.18
	(15.81)	(417.62)	(10.24)
# ZIP codes	1.19	63.63	1.14
	(10.31)	(264.83)	(6.86)
# Counties	1.10	32.32	1.08
	(4.05)	(97.21)	(2.84)
# MSAs	1.07	19.94	1.05
	(2.04)	(45.06)	(1.50)
# States	1.03	8.06	1.02
	(0.64)	(11.62)	(0.51)
Leverage		0.261	
		(0.243)	
Δ Lev		-0.002	
		(0.082)	
Observations	181,732,500	145,600	181,587,000

Table 2
(continued)

Panel (B): County-level summary statistics

	All	Publicly Listed	Non-Listed
	(1)	(2)	(3)
Δ log(Emp)	0.054	0.041	0.062
	(0.190)	(0.266)	(0.244)
Employment share		0.128	0.872
		(0.107)	(0.107)
Employment share (non-tradable)		0.132	0.868
		(0.106)	(0.106)
Employment share (tradable)		0.269	0.731
		(0.278)	(0.278)
Employment share (other)		0.071	0.929
		(0.077)	(0.077)
Leverage		0.288	
		(0.073)	
Δ Lev		-0.002	
		(0.080)	
Observations	99,300	99,300	99,300

Table 3
Bin Scatterplot Regressions

This table presents variants of the regressions in columns (1) and (5) of Table 1 without county or year fixed effects in which the dependent variable is either employment growth at publicly listed firms (Panel (A)) or all (listed and non-listed) firms (Panel (B)) at the county level. Observations are weighted by county-level employment. Standard errors are double clustered at the county and year level. The sample period is from 1976 to 2011. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): Regional employment growth at publicly listed firms

	Δ log(Emp) (-3,0)	Δ log(Emp) (1,4)
	(1)	(2)
Δ Lev(-3,0)	0.481**	-0.526***
	(0.198)	(0.149)
County fixed effects	No	No
Year fixed effects	No	No
R-squared	0.01	0.01
Observations	99,300	86,500

Panel (B): Aggregate regional employment growth

	Δ log(Emp) (-3,0)	Δ log(Emp) (1,4)
	(1)	(2)
Δ Lev(-3,0)	0.097***	-0.069***
	(0.026)	(0.021)
County fixed effects	No	No
Year fixed effects	No	No
R-squared	0.03	0.01
Observations	99,300	86,500

Table 4
Main Results

This table presents variants of the regressions in Table 1 in which the dependent variable is either employment growth at publicly listed firms (Panel (A)) or all (listed and non-listed) firms (Panel (B)) at the county level. Observations are weighted by county-level employment. Standard errors are double clustered at the county and year level. The sample period is from 1976 to 2011. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): Regional employment growth at publicly listed firms

	Δ log(Emp) (-3,0)	Δ log(Emp) (-2,1)	Δ log(Emp) (-1,2)	Δ log(Emp) (0,3)	Δ log(Emp) (1,4)	Δ log(Emp) (2,5)
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Lev(-3,0)	0.476***	0.099	-0.278*	-0.231**	-0.381***	-0.338**
	(0.181)	(0.219)	(0.145)	(0.117)	(0.135)	(0.145)
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.58	0.57	0.60	0.58	0.60	0.58
Observations	99,300	96,100	92,900	89,700	86,500	83,300

Panel (B): Aggregate regional employment growth

	Δ log(Emp) (-3,0)	Δ log(Emp) (-2,1)	Δ log(Emp) (-1,2)	Δ log(Emp) (0,3)	Δ log(Emp) (1,4)	Δ log(Emp) (2,5)
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Lev(-3,0)	0.062***	0.019	-0.033*	-0.035**	-0.053***	-0.046***
	(0.022)	(0.018)	(0.020)	(0.018)	(0.017)	(0.017)
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.38	0.37	0.36	0.35	0.37	0.38
Observations	99,300	96,100	92,900	89,700	86,500	83,300

Table 5
Industry Sectors

This table presents variants of the regressions in columns (4) to (6) of Panel (B) of Table 4 in which the sample is split by industry sector. Regional firm leverage and aggregate regional employment are sector-specific as described in Section 4.1. The classification of industry sectors follows Mian and Sufi (2014). Observations are weighted by county-level employment. Standard errors are double clustered at the county and year level. The sample period is from 1976 to 2011. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): Tradable industries

	Δ log(Emp) (0,3)	Δ log(Emp) (1,4)	Δ log(Emp) (2,5)
	(1)	(2)	(3)
Δ Lev(-3,0)	-0.039*	-0.040**	-0.055**
	(0.021)	(0.020)	(0.025)
County fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
R-squared	0.23	0.23	0.24
Observations	88,300	85,200	82,000

Panel (B): Non-tradable industries

	Δ log(Emp) (0,3)	Δ log(Emp) (1,4)	Δ log(Emp) (2,5)
	(1)	(2)	(3)
Δ Lev(-3,0)	-0.034**	-0.044**	-0.038**
	(0.015)	(0.017)	(0.017)
County fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
R-squared	0.35	0.36	0.36
Observations	89,700	86,500	83,300

Table 5
(continued)

Panel (C): Other industries

	Δ log(Emp) (0,3)	Δ log(Emp) (1,4)	Δ log(Emp) (2,5)
	(1)	(2)	(3)
Δ Lev(-3,0)	-0.037*	-0.063***	-0.060***
	(0.020)	(0.022)	(0.021)
County fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
R-squared	0.29	0.30	0.31
Observations	89,700	86,500	83,300

Table 6
MSAs and States

This table presents variants of the regressions in columns (4) to (6) of Panel (B) of Table 4 in which regions are based on MSAs (Panel (A)) or states (Panel (B)) in lieu of counties. Observations are weighted by region-level employment. Standard errors are double clustered at the region and year level. The sample period is from 1976 to 2011. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): MSAs

	Δ log(Emp) (0,3)	Δ log(Emp) (1,4)	Δ log(Emp) (2,5)
	(1)	(2)	(3)
Δ Lev(-3,0)	-0.071*	-0.110***	-0.097***
	(0.042)	(0.036)	(0.035)
MSA fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
R-squared	0.46	0.46	0.49
Observations	11,300	11,000	10,600

Panel (B): States

	Δ log(Emp) (0,3)	Δ log(Emp) (1,4)	Δ log(Emp) (2,5)
	(1)	(2)	(3)
Δ Lev(-3,0)	-0.129*	-0.183***	-0.128**
	(0.073)	(0.054)	(0.048)
State fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
R-squared	0.60	0.60	0.63
Observations	1,500	1,500	1,400

Table 7
Firms with Distant Headquarters

This table presents variants of the regressions in columns (4) to (6) of Panel (B) of Table 4 in which regional firm leverage is based on firms whose headquarters are located at least 1,000 miles away from the given region (Panel (A)) or in a different state (Panel (B)). Observations are weighted by county-level employment. Standard errors are double clustered at the county and year level. The sample period is from 1976 to 2011. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): Firms with headquarters located 1,000+ miles away

	Δ log(Emp) (0,3)	Δ log(Emp) (1,4)	Δ log(Emp) (2,5)
	(1)	(2)	(3)
Δ Lev(-3,0)	-0.040***	-0.048***	-0.040***
	(0.010)	(0.010)	(0.010)
County fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
R-squared	0.36	0.36	0.38
Observations	60,400	59,000	57,500

Panel (B): Firms with out-of-state headquarters

	Δ log(Emp) (0,3)	Δ log(Emp) (1,4)	Δ log(Emp) (2,5)
	(1)	(2)	(3)
Δ Lev(-3,0)	-0.051**	-0.057**	-0.050**
	(0.017)	(0.019)	(0.020)
County fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
R-squared	0.35	0.35	0.37
Observations	87,600	84,500	81,500

Table 8
Establishment-Level Evidence

This table presents variants of the regressions in columns (4) to (6) of Panel (B) of Table 4 in which employment is at the individual establishment level and the county and year fixed effects are replaced with county × industry × year fixed effects. Industries are measured at the 4-digit NAICS code level. Observations are weighted by establishment-level employment. Standard errors are double clustered at the county and year level. The sample period is from 1976 to 2011. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	Δ log(Emp) (0,3)	Δ log(Emp) (1,4)	Δ log(Emp) (2,5)
	(1)	(2)	(3)
Δ Lev(-3,0)	-0.173**	-0.177**	-0.148*
	(0.082)	(0.080)	(0.090)
County × industry × year fixed effects	Yes	Yes	Yes
R-squared	0.04	0.04	0.05
Observations	4,491,000	3,869,700	3,338,600

Table 9
Mean-Reverting Employment Growth

Panel (A) presents variants of the regressions in columns (4) to (6) of Panel (B) of Table 4 in which Δ Lev(–3,0) is interacted with a dummy indicating whether the change in leverage is positive or negative. Panel (B) presents variants of the regressions in columns (4) to (6) of Panel (B) of Table 4 in which Δ log(Emp)(–3,0) is included as a control. Observations are weighted by county-level employment. Standard errors are double clustered at the county and year level. The sample period is from 1976 to 2011. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): Positive and negative changes in regional firm leverage

	Δ log(Emp) (0,3)	Δ log(Emp) (1,4)	Δ log(Emp) (2,5)
	(1)	(2)	(3)
Δ Lev(-3,0)$^{+}$	-0.046*	-0.062**	-0.058**
	(0.026)	(0.028)	(0.027)
Δ Lev(-3,0)$^{-}$	-0.026	-0.039	-0.029
	(0.034)	(0.042)	(0.047)
County fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
R-squared	0.35	0.37	0.38
Observations	89,700	86,500	83,300

Table 9
(continued)

Panel (B): Controlling for short-run aggregate regional employment growth

	Δ log(Emp) (0,3)	Δ log(Emp) (1,4)	Δ log(Emp) (2,5)
	(1)	(2)	(3)
Δ Lev(-3,0)	-0.030*	-0.049***	-0.042**
	(0.018)	(0.017)	(0.017)
Δ log(Emp)(-3,0)	-0.082***	-0.052***	-0.056***
	(0.013)	(0.010)	(0.010)
County fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
R-squared	0.38	0.37	0.39
Observations	89,700	86,500	83,300

Table 10
National Recessions

This table presents (cross-sectional) variants of regressions similar to those in Panel (B) of Table 4 in which the sample is restricted to the 1980-82 recession, 1990-91 recession, 2001 recession, or 2007-09 recession, and in which the dependent variable is aggregate regional employment growth over one, two, or three years beginning with the first recession year. (Year "0" is the year before the recession.) For brevity, the table only displays the coefficients and standard errors associated with Δ Lev(–3,0). Observations are weighted by county-level employment. Standard errors are robust standard errors. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	Δ log(Emp) (1,2)	Δ log(Emp) (1,3)	Δ log(Emp) (1,4)
	(1)	(2)	(3)
Panel (A): 1980-82 Recession	-0.039***	-0.065***	-0.076***
	(0.010)	(0.014)	(0.013)
Panel (B): 1990-91 Recession	-0.124***	-0.148***	-0.150***
	(0.011)	(0.016)	(0.013)
Panel (C): 2001 Recession	-0.067***	-0.056***	-0.030
	(0.014)	(0.018)	(0.020)
Panel (D): 2007-09 Recession	-0.133***	-0.139***	-0.147***
	(0.032)	(0.038)	(0.035)

Table 11
Business Cycle Comovement

The dependent variable, ρ[Δ log(Emp)(1,4)], is the pairwise time-series correlation of medium-run aggregate regional employment growth between any two counties. ρ[Δ Lev(-3,0)] is the pairwise time-series correlation of regional firm leverage growth between any two counties. Standard errors are clustered at the county level. The sample period is from 1976 to 2011. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	ρ [Δ log(Emp)(1,4)]
	(1)
ρ [Δ Lev(-3,0)]	0.049***
	(0.013)
County fixed effects	Yes
R-squared	0.63
Observations	4,925,100

Table 12
Firm versus Household Leverage

Panel (A) presents variants of the regressions in columns (4) to (6) of Panel (B) of Table 4 in which the change in regional household leverage, Δ HH Lev(–3,0), is included as a control. Regional household leverage is the ratio of household debt (mortgage, credit card, and auto loan debt) to income at the county level. Panel (B) presents variants of the regressions in Panel (D) of Table 10 in which Δ HH Lev(–3,0) is included as a control. Observations are weighted by county-level employment. In Panel (A), standard errors are double clustered at the county and year level. In Panel (B), standard errors are robust standard errors. In Panel (A), the sample period is from 1999 to 2011. In Panel (B), the sample is restricted to the 2007-09 recession. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): Panel specification (1999-2011)

	Δ log(Emp) (0,3)	Δ log(Emp) (1,4)	Δ log(Emp) (2,5)
	(1)	(2)	(3)
Δ Lev(-3,0)	-0.041*	-0.075**	-0.057*
	(0.025)	(0.031)	(0.030)
Δ HH Lev(-3,0)	-0.019*	-0.039**	-0.025**
	(0.011)	(0.012)	(0.010)
County fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
R-squared	0.66	0.60	0.72
Observations	9,000	8,000	5,900

Table 12
(continued)

Panel (B): 2007-09 recession

	Δ log(Emp) (1,2)	Δ log(Emp) (1,3)	Δ log(Emp) (1,4)
	(1)	(2)	(3)
Δ Lev(-3,0)	-0.138***	-0.127***	-0.126***
	(0.037)	(0.046)	(0.046)
Δ HH Lev(-3,0)	-0.018***	-0.022***	-0.023***
	(0.005)	(0.004)	(0.004)
R-squared	0.01	0.01	0.01
Observations	2,000	2,000	2,000