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FIRM LEVERAGE AND UNEMPLOYMENT DURING THE GREAT RECESSION

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ABSTRACT

We argue that firms' balance sheets were instrumental in the propagation of shocks during the Great Recession. Using establishment-level data, we show that firms that tightened their debt capacity in the run-up ("high-leverage firms") exhibit a significantly larger decline in employment in response to household demand shocks than firms that freed up debt capacity ("low-leverage firms"). In fact, all of the job losses associated with falling house prices during the Great Recession are concentrated among establishments of high-leverage firms. At the county level, we find that counties with a larger fraction of establishments belonging to high-leverage firms exhibit a significantly larger decline in employment in response to household demand shocks. Thus, firms' balance sheets also matter for aggregate employment.

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1 Introduction

Prominent research argues that (non-financial) firms' balance sheets play an important role in the propagation of business cycle shocks (Bernanke and Gertler (1989), Bernanke, Gertler, and Gilchrist (1996, 1999), Kiyotaki and Moore (1997)). And yet, in the most recent Great Recession, the focus has been almost entirely on either households' balance sheets or those of financial intermediaries.[1] A look at Figure 1 may help understand why. While household leverage rose significantly in the years preceding the Great Recession—and that of investment banks, already at high levels, rose even further—the leverage of (non-financial) firms remained essentially flat.

This paper argues that firms' balance sheets were instrumental in the propagation of shocks during the Great Recession. To be clear, we do not mean to argue that household balance sheets or those of financial intermediaries are unimportant. On the contrary, our results are consistent with the view that falling house prices lead to a drop in consumer demand by households (Mian, Rao, and Sufi (2013)), with important consequences for employment (Mian and Sufi (2014)). But households do not lay off workers. Firms do. Thus, the extent to which demand shocks by households translate into employment losses depends on how firms respond to these shocks. To explore this issue, we construct a unique data set that combines employment and wage data at the establishment level from the U.S. Census Bureau's Longitudinal Business Database (LBD) with balance sheet and income statement data at the firm level from Compustat and house price data at the ZIP code and county level from Zillow.

According to the *firm balance sheet channel*, firms' responses to household demand shocks depend on the strength of their balance sheets. To this end, we note that the seemingly flat line in Figure 1 masks an important fact: there is substantial variation in leverage changes in the years prior to the Great Recession. Indeed, while the median

[1] For work emphasizing the role of household balance sheets during the Great Recession, see, e.g., Mian and Sufi (2011, 2014), Mian, Rao, and Sufi (2013), Guerrieri and Lorenzoni (2011), Hall (2011), Midrigan and Philippon (2011), and Eggertson and Krugman (2012). For work emphasizing the role of financial intermediary balance sheets, and "lender health" more generally, see, e.g., Chodorow-Reich (2014), Adrian and Shin (2011), Gertler and Kyotaki (2011), He and Krishnamurthy (2013), Brunnermeier and Sannikov (2014), and Moreira and Savov (2014).

change in firm leverage (debt over assets) between 2002 and 2006 is virtually zero, the average change in the above-median group is 0.179, and that in the below-median group is -0.265. Thus, some firms come into the Great Recession having just tightened their debt capacity, while others come into the Great Recession having just freed up debt capacity. With a slight abuse of terminology, we call these firms "high-leverage" firms and "low-leverage" firms, respectively.

Our results strongly support the firm balance sheet channel: establishments of high-leverage firms exhibit a significantly larger decline in employment between 2007 and 2009 in response to household demand shocks than establishments of low-leverage firms. In fact, *all* of the job losses associated with falling house prices are concentrated among establishments of high-leverage firms.[2] By contrast, there is no significant association between changes in house prices and changes in employment during the Great Recession among establishments of low-leverage firms. These results are based on more than a quarter million observations and thus precisely estimated.

The granularity of our data allows us to include a wide array of fixed effects. Most of our analysis is cross-sectional—we examine the relation between changes in house prices and changes in employment during the Great Recession. Our tightest specification includes both firm and ZIP code $\times$ industry fixed effects. Thus, accounting for the possibility that high- and low-leverage firms may experience differential job losses for reasons unrelated to changes in house prices, we compare establishments in the same ZIP code and industry—e.g., a local Macy's versus Nordstrom department store, a local Safeway versus Kroger supermarket, or a local Target versus Kmart discount retailer—where some establishments belong to high-leverage firms and others belong to low-leverage firms. In one instance, we also estimate a panel regression with establishment, firm $\times$ year, and ZIP code $\times$ industry $\times$ year fixed effects. The results are always the same.

In line with prior research, we find no significant correlation between changes in house

[2]Given the evidence in Section 3.5—as well as evidence in Mian, Rao, and Sufi (2013) and Mian and Sufi (2014)—we use the terms "falling house prices" and "household demand shocks" interchangeably. Importantly, these household demand shocks are orthogonal to whether firms tightened or freed up debt capacity in the run-up to the Great Recession. As Panel (A) of Table 1 shows, establishments of low- and high-leverage firms experience the same drop in house prices between 2006 and 2009 and are located in areas with the same housing supply elasticity.

prices and changes in employment in the tradable sector. By contrast, we find positive and significant correlations in the non-tradable and "other" sectors. Together, these two sectors account for 97% of all establishments. Hence, there is no need to interact changes in house prices with sector dummies in our regressions. More important, in either sector, the correlation between changes in house prices and changes in employment is only significant among establishments of high-leverage firms. Thus, our results are not driven by industry sector composition effects.

Besides examining whether falling house prices lead to employment losses, we also examine whether they lead to adjustments at the extensive margin, i.e., establishment closures. They do. However, as in the case of employment losses, the effect is entirely concentrated among establishments of high-leverage firms. By contrast, there is no significant association between changes in house prices and establishment closures among establishments of low-leverage firms.

Why do establishments of high-leverage firms respond more strongly to household demand shocks? The interpretation that appears most consistent with our results is that high-leverage firms are financially constrained. First, high-leverage firms look like "typical" financially constrained firms: they have higher leverage ratios (38.3% versus 19.5%) and score worse on popular measures of financial constraints, such as the KZ- and WW-index (Kaplan and Zingales (1997), Whited and Wu (2006)). More important, they also *act* like financially constrained firms. When faced with household demand shocks, high-leverage firms do not (or cannot) raise additional external funds during the Great Recession. Instead, they reduce employment, close down establishments, and cut back on investment. Moreover, house-price induced shocks to establishments of high-leverage firms spill over to other establishments within the same firm, a pattern commonly associated with firms being financially constrained (Lamont (1997), Giroud and Mueller (2014)). The opposite is true of low-leverage firms. When faced with household demand shocks, these firms do not reduce employment, close down establishments, or cut back on investment, and there are no spillovers across establishments. Instead, low-leverage firms increase both their short- and long-term borrowing during the Great Recession, consistent with these firms having freed up debt capacity in the run-up.

The evidence presented in this paper mirrors survey evidence by Campello, Graham, and Harvey (2010), who asked 574 U.S. CFOs in 2008 whether they perceive their firms as being affected by difficulties in accessing credit markets. The majority of CFOs reported that they are either somewhat (210) or very (155) affected.[3] Importantly, firms classified as financially constrained said they would reduce their capital spending by 9%, while financially unconstrained firms said they would keep their capital spending rates largely unchanged. Moreover, and especially relevant for us, financially constrained firms said they would cut their employment by 10.9%, while financially unconstrained firms said they would cut their employment only by 2.7%.

A plausible interpretation of our results is that high-leverage firms, having increased their leverage in the run-up, are unable to borrow further and thus forced to downsize and reduce employment when hit by demand shocks. An alternative hypothesis is that these firms would have downsized and reduced employment even if they were financially unconstrained. We explore three versions of this hypothesis:

i) High-leverage firms expanded too much in the years prior to the Great Recession. Accordingly, they downsize more during the Great Recession.

ii) High-leverage firms have lower productivity. As a result, they suffer more when hit by household demand shocks.

iii) High-leverage firms pay higher wages, and the Great Recession gives them an opportunity to reduce their (above-average) wage bills.

We find little support for any of these hypotheses. If firms respond more strongly to demand shocks in the Great Recession not because they are financially constrained but rather because, e.g., they expanded too much in the run-up, then we would expect to find a significant response also among establishments of low-leverage, high-growth firms. However, we find no significant response among such establishments. Likewise, we find no significant response among establishments of low-leverage, low-productivity firms or low-leverage, high-wage firms. By contrast, we always find a significant response among

[3]Chodorow-Reich (2014) documents that firms borrowing from less "healthy" lenders experience larger employment losses in the Great Recession, lending further support to the notion that financial constraints matter.

establishments of high-leverage firms, regardless of whether these firms have low or high growth, low or high productivity, or low or high wages.

Do firms' balance sheets also matter for *aggregate* employment? In a frictionless labor market, wages would adjust downward, and low-leverage firms would pick up workers laid off by high-leverage firms. As a result, aggregate employment would change only little, or perhaps not at all. Our establishment-level results suggest that this is an unlikely scenario. While high-leverage firms reduce employment in response to household demand shocks, low-leverage firms do not increase employment. Thus, it would seem that firms' balance sheets also matter in the aggregate, with the implication that areas with a greater fraction of establishments belonging to high-leverage firms should experience a larger decline in employment in response to household demand shocks.

To explore this issue, we consider aggregate employment at the county level. In one specification, we classify counties into low- and high-leverage counties based on the employment-weighted fraction of establishments belonging to high-leverage firms. In another specification, we classify counties into low- and high-leverage counties based on the employment-weighted average change in firm leverage between 2002 and 2006 across all establishments in the county. Regardless of which classification we use, we find that high-leverage counties exhibit a significantly larger decline in employment in response to household demand shocks than low-leverage counties. Thus, firms' balance sheets also matter for aggregate employment.

In seminal work, Mian and Sufi (2011) and Mian, Rao, and Sufi (2013) show that rising house prices in the run-up to the Great Recession lead to the build-up of household leverage, causing a sharp drop in consumption as house prices fall between 2006 and 2009.[4] Mian and Sufi (2014) examine the implications of these household demand shocks for aggregate employment at the county level, concluding that the "housing net worth channel" played a significant role during the Great Recession. Our focus is at the establishment level. In particular, we show that establishments of firms that tightened their debt capacity in the run-up exhibit a larger decline in employment in response to

[4]On the relation between house prices and consumption, see also Campbell and Coco (2007) and Case, Quigley, and Shiller (2005, 2013).

household demand shocks than establishments of firms that freed up debt capacity. In fact, *all* of the job losses associated with falling house prices are concentrated among establishments of high-leverage firms.[5]

Other papers focus on the years preceding the Great Recession. Adelino, Schoar, and Severino (2014) find that rising house prices during the run-up lead to more county-level employment growth, especially among small businesses that require little start-up capital. Charles, Hurst, and Notowidigo (2014) find that rising house prices between 2000 and 2007 lead to higher wages and more employment growth, increasing the opportunity cost for college enrollment. While the wage and employment effects are undone by the subsequent housing bust, the adverse effect on schooling persists.

The rest of this paper is organized as follows. Section 2 describes the data, sample selection, main variables, and summary statistics. Section 3 presents our main results, including a longitudinal analysis, instrumental variable (IV) specification, and industry sector analysis. Section 4 presents evidence suggesting that high-leverage firms are financially constrained. Section 5 considers alternative hypotheses. Section 6 focuses on county-level employment. Section 7 concludes.

2 Data and Summary Statistics

We construct a unique data set that combines employment and wage data at the establishment level with balance sheet and income statement data at the firm level and house price data at the ZIP code and county level.

The establishment-level data are provided by the U.S. Census Bureau's Longitudinal Business Database (LBD). An establishment is a "single physical location where business is conducted" (Jarmin and Miranda (2003, p. 15)), e.g., a retail store, restaurant, gas station, warehouse, or manufacturing plant. The LBD covers all business establishments in the U.S. with at least one paid employee.

[5] Panel (A) of Table 1 shows that changes in firm leverage in the run-up are uncorrelated with changes in house prices during the Great Recession. Thus, financial constraints are not an alternative explanation for the cross-sectional evidence presented in Mian and Sufi (2014). Rather, they *interact* with household demand shocks in an intuitive way that is consistent with the firm balance sheet channel.

The firm-level data are from Compustat. We exclude financial firms (SIC 60-69), utilities (SIC 49), and firms with missing financial data between 2002 and 2009. We match the remaining firms to establishments in the LBD using the Compustat-SSEL bridge maintained by the U.S. Census Bureau. As this bridge ends in 2005, we extend the match to 2011 using employer name and ID number (EIN) following the procedure described in McCue (2003). This leaves us with 2,800 firms corresponding to 327,500 establishments with non-missing employment data from 2007 to 2009.[6]

The house price data are from Zillow.[7] Out of the original 327,500 establishments, we are able to match 227,600 establishments to ZIP code-level house prices and 57,200 establishments to county-level house prices, leaving us with a final sample of 284,800 establishments for which we have both firm-level data and house price data.[8]

Our main dependent variable is the percentage change in employment at the establishment level between 2007 and 2009, Δ Log(Emp)$_{07-09}$. Our main independent variable is the percentage change in house prices between 2006 and 2009, Δ Log(HP)$_{06-09}$.[9] This variable is highly correlated with similar variables used in prior research. For instance, the correlation at the MSA level with Δ Housing Net Worth, 2006-2009, the main explanatory variable in Mian, Rao, and Sufi (2013) and Mian and Sufi (2014), is 86.3%. Other papers use house price data from the Federal Housing Finance Agency (FHFA) (e.g., Adelino, Schoar, and Severino (2014), Charles, Hurst, and Notowidigo (2014)). The correlation at the MSA level between our variable, Δ Log(HP)$_{06-09}$, and the corresponding variable constructed from FHFA house price data is 96.4%.

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[6] All sample sizes are rounded to the nearest hundred following disclosure guidelines by the U.S. Census Bureau.

[7] For the period 2006 to 2009, the Zillow Home Value Index (ZHVI) is available for 12,102 ZIP codes and 1,048 counties. See www.zillow.com/research/data for an overview of the ZHVI methodology and a comparison with the S&P/Case-Shiller Home Price Index.

[8] Our results are similar if we use only the 227,600 establishments for which we have ZIP code-level house prices. They are also similar if we use the full set of 327,500 establishments by matching the remaining 42,700 establishments to state-level house prices constructed as population-weighted averages of available ZIP code-level house prices. See Table IA-I of the Internet Appendix.

[9] To facilitate comparison with prior research, we compute changes in house prices from December 2006 to December 2009. That said, our results are similar if we compute changes in house prices from either April 2006 or March 2007 (when house prices peaked) to May 2009 (when they bottomed out). See Table IA-II of the Internet Appendix.

A key variable in our empirical analysis is the change in firm leverage between 2002 and 2006, Δ Lev_{02-06}, where firm leverage is defined as the ratio of the sum of debt in current liabilities and long-term debt divided by total assets (from Compustat).[10,11] As our analysis is at the establishment level, we sort all establishments based on their firms' values of Δ Lev_{02-06}. The median value of Δ Lev_{02-06} is virtually zero, meaning about half of all establishments belong to firms that come into the Great Recession having just tightened their debt capacity, while the other half belong to firms that come into the Great Recession having just freed up debt capacity. With a slight abuse of terminology, we call firms with above- and below-median values of Δ Lev_{02-06} "high-leverage" firms and "low-leverage" firms, respectively.

Panel (A) of Table 1 provides summary statistics for all establishments and separately for establishments of high- and low-leverage firms.[12] As can be seen, establishments of high-leverage firms are smaller (36 versus 43 employees) and experience larger job losses during the Great Recession. Importantly, establishments of high- and low-leverage firms exhibit the same decline in house prices between 2006 and 2009 and the same housing supply elasticity. Hence, whether firms tightened or freed up debt capacity in the run-up to the Great Recession is orthogonal to both the incidence and magnitude of household demand shocks during the Great Recession (but, as we will see, not to how firms respond to these shocks). Interestingly, establishments of high-leverage firms are somewhat underrepresented in the non-tradable sector, while establishments of low-leverage firms are somewhat underrepresented in the "other" sector (i.e., industries that are neither tradable nor non-tradable). This is not a major concern, however. First, we perform separate analyses for each sector and obtain similar results in the non-tradable and "other" sector. Second, all our establishment-level regressions include industry fixed

[10] Our results are similar if we compute Δ Lev_{02-06} using net leverage or market leverage. See Table IA-III of the Internet Appendix.

[11] For theory models emphasizing the role of leverage dynamics prior to crises, see, e.g., Fostel and Geanakoplos (2008) and Geanakoplos (2010).

[12] All growth rates (Δ Log(Emp)_{07-09}, Δ Log(HP)_{06-09}, Δ Log(Emp)_{02-06}, Δ $\text{Log(Assets)}_{02-06}$), financial ratios ($\text{ROA}_{06}$, NPM_{06}, TFP_{06}, Lev_{06}), and financial constraints measures (WW_{06}, KZ_{06}) are winsorized at the 1% level. Changes from 2002 to 2006 in Panel (C) are not separately winsorized, although they may be computed from winsorized 2002 and 2006 values.

effects or, in one instance, ZIP code × industry fixed effects.

Panel (B) provides summary statistics for high- and low-leverage firms as of 2006, at the onset of the Great Recession. As can be seen, high-leverage firms have fewer establishments than low-leverage firms (95 versus 109). Given that the total number of establishments is the same in both groups, this implies that there are fewer low-leverage firms than high-leverage firms (1,300 versus 1,500). Second, high-leverage firms are smaller than low-leverage firms, both in terms of number of employees and book assets. Third, high-leverage firms are less productive in 2006; they have a lower return on assets (ROA), lower net profit margin (NPM), and lower total factor productivity (TFP). Lastly, high-leverage firms have higher leverage ratios (0.383 versus 0.195) and score worse on popular measures of financial constraints, such as the KZ- and WW-index (Kaplan and Zingales (1997), Whited and Wu (2006)).

Panel (C) includes the same firm-level variables as Panel (B). However, instead of showing their levels in 2006, it shows their changes between 2002 and 2006. Three results stand out. First, high-leverage firms expand more than low-leverage firms in the years prior to the Great Recession. This holds irrespective of whether we consider growth in the number of establishments, number of employees, or book assets. Second, high-leverage firms exhibit lower ROA and NPM growth than low-leverage firms. They also exhibit lower TFP growth, albeit this difference is not significant. Third, high-leverage firms experience a tightening of financial constraints (based on the KZ- and WW-index), while low-leverage firms experience a loosening of financial constraints. This last result is not surprising given that high-leverage firms increased their leverage in the run-up, while low-leverage firms decreased their leverage. That being said, the difference between the two groups is substantial: while the average change in leverage among high-leverage firms is 0.179, the average change in leverage among low-leverage firms is -0.265.[13]

We would like to caution that the differences between low- and high-leverage firms may

[13] Although leverage in 2002 and 2006 is winsorized at the 1% level, the change in leverage from 2002 to 2006, Δ Lev$_{02-06}$, is not separately winsorized. Thus, the mean values of 0.179 and -0.265 may appear somewhat high. We do not separately winsorize Δ Lev$_{02-06}$ because—besides affecting the summary statistics in Table 1—it is irrelevant for our results. All that matters is whether a firm's value of Δ Lev$_{02-06}$ lies below or above the median. That, however, is unaffected by how Δ Lev$_{02-06}$ is winsorized.

not be independent of each other. On the contrary, it is plausible that high-leverage firms increased their leverage *because* they needed to fund an expansion or a deficit arising from a productivity shortfall. But this raises the possibility that high-leverage firms respond more strongly to demand shocks during the Great Recession not because they are more financially constrained, but rather because they expanded too much in the run-up or were less productive at the onset of the Great Recession. We will address these alternative hypotheses in Section 5.

3 The Firm Balance Sheet Channel

3.1 Sample Split

Our baseline regression consists of a straightforward sample split between low- and high-leverage firms. The results are shown in Panel (A) of Table 2. The dependent variable is the percentage change in employment at the establishment level between 2007 and 2009, Δ Log(Emp)$_{07-09}$. The main independent variable is the percentage change in house prices between 2006 and 2009, Δ Log(HP)$_{06-09}$. The inclusion of industry fixed effects accounts for the possibility that different industries may experience differential employment losses for reasons unrelated to changes in house prices. Likewise, the inclusion of firm fixed effects accounts for any unobserved heterogeneity across firms. All regressions are weighted by the size of establishments (i.e., their number of employees). Standard errors are clustered at both the state and firm level.

Columns (1) to (3) show that changes in house prices during the Great Recession are associated with profound changes in employment at the establishment level. Across all establishments, a one percent decline in house prices is associated with a 0.053 to 0.068 percent drop in employment. To put these numbers into perspective, consider two establishments, one located in a ZIP code associated with a 25th percentile change in house prices (-22.4%) and the other located in a ZIP code associated with a 75th percentile change in house prices (-3.3%). Our results suggest that the former establishment experiences an *additional* employment loss of 1.01 to 1.30 percent.

We should note that the specification with firm fixed effects is a rather conservative specification that may be "controlling away" some of the effects we are trying to document. For example, some firms may be "regionally concentrated," i.e., they may have most of their establishments in the same region. Given that the firm fixed effects force comparison to be made among establishments within the same firm, this implies that, for regionally concentrated firms, there exists relatively little within-firm variation in house price changes, making it difficult to identify the effect on employment changes. Indeed, moving from columns (1) or (2) to column (3), which includes firm fixed effects, the coefficient on Δ Log(HP)$_{06-09}$ drops from 0.066 and 0.068 to 0.053.

In columns (4) to (6), we estimate the effect of changes in house prices on changes in employment separately for establishments of high-leverage firms. As can be seen, the effect for establishments of high-leverage firms is much stronger than the average effect documented in columns (1) to (3), providing support for the firm balance sheet channel. Lastly, columns (7) to (9) show the effect for establishments of low-leverage firms. Once industry fixed effects are included, there is no significant association between changes in house prices and changes in employment. Overall, these results bring to light a clear pattern that we will encounter in all our subsequent regressions: establishments of high-leverage firms respond more strongly to household demand shocks than establishments of low-leverage firms. In fact, the latter appear not to respond at all.

3.2 Interaction Term

In Panel (B) we do not split the sample into low- and high-leverage firms but rather interact Δ Log(HP)$_{06-09}$ with a dummy variable indicating whether an establishment belongs to a high-leverage firm. The interaction term is always positive and significant, confirming that the differences between low- and high-leverage firms documented in Panel (A) are statistically significant. Also, as is shown in columns (1), (2), and (4), there is no significant association between changes in house prices and changes in employment among establishments of low-leverage firms.

To illustrate the role of fixed effects in this setting, consider column (6), which is

arguably our "tightest" specification. While the inclusion of firm fixed effects accounts for any unobserved heterogeneity across firms, the ZIP code × industry fixed effects force comparison to be made between establishments within the same ZIP code and 4-digit NAICS industry. To this end, we note that while our sample firms are all in Compustat, their establishments are relatively small, with an average size of 39 employees (see Panel (A) of Table 1). Thus, accounting for the possibility that high- and low-leverage firms may exhibit differential job losses for reasons unrelated to changes in house prices, our specification forces comparison to be made between relatively small, local establishments in the same industry and ZIP code, e.g., a local Macy's versus Nordstrom department store, a local Safeway versus Kroger supermarket, or a local Target versus Kmart discount retailer, where some establishments belong to high-leverage firms and others belong to low-leverage firms.

3.3 Longitudinal Analysis

In line with other research on this topic, our analysis is cross-sectional. That said, we obtain similar results if we estimate a panel regression in which the dependent variable is the logarithm of employment at the establishment level in year t, $\log(\text{Emp})_t$, and the main independent variable is the logarithm of house prices in year t-1, $\log(\text{HP})_{t-1}$. The sample period is from 2007 to 2011. Hence, our sample includes employment data from 2007 to 2011 and house price data from 2006 to 2010.

The main benefit of estimating a panel regression is that we can include establishment fixed effects. Accordingly, we can examine whether within-establishment changes in house prices affect within-establishment changes in employment differently for establishments belonging to low- and high-leverage firms. They do. As Panel (C) shows, establishments of high-leverage firms respond more strongly to changes in house prices than establishments of low-leverage firms. In fact, and similar to our results in Panels (A) and (B), establishments of low-leverage firms appear not to respond at all. These results are robust across different fixed-effect specifications, including one that has establishment, firm × year, and ZIP code × industry × year fixed effects.

3.4 Instrumental Variable (IV) Estimation

Unobserved heterogeneity may be driving both changes in house prices and changes in employment. We address this issue by instrumenting changes in house prices using the housing supply elasticity instrument from Saiz (2010). This instrument captures geographical and regulatory constraints to new construction. Accordingly, areas with inelastic housing supply are facing supply constraints due to their topography (steep hills and water bodies) and local regulation.

As Panel (A) of Table 1 shows, housing supply elasticity is orthogonal to whether firms tightened or freed up debt capacity in the years prior to the Great Recession. While the average housing supply elasticity among establishments of high-leverage firms is 1.789, the average housing supply elasticity among establishments of low-leverage firms is 1.809. The difference is statistically insignificant (p-value 0.518).[14] Unfortunately, the housing supply elasticity instrument is only available for Metropolitan Statistical Areas (MSAs), implying that we lose some of our observations, especially of establishments located in rural areas. Table IA-IV of the Internet Appendix replicates the OLS results from Table 2 for the reduced sample of establishments with available housing supply elasticity (247,800 establishments). As can be seen, the results are virtually identical to those in Table 2 (cf. columns (3), (6), and (9) of Panel (A)).

Table 3 presents the IV results. The first-stage regression is shown in column (1). Similar to other first-stage regressions (e.g., Mian, Rao, and Sufi (2013), Mian and Sufi (2014), and Adelino, Schoar, and Severino (2014)), we also find that housing supply elasticity is a strong predictor of house price changes. Importantly, the results of the second-stage regressions in columns (2) to (4) confirm our previous results that establishments of high-leverage firms respond more strongly to household demand shocks than establishments of low-leverage firms.

A possible concern with the housing supply instrument is that it includes local regulatory constraints, which may be driven by the same unobserved heterogeneity that also

[14] Mian, Rao, and Sufi (2013) and Adelino, Schoar, and Severino (2014) compare low- and high-elasticity counties along various other dimensions.

drives employment dynamics. To mitigate this concern, we consider only the (more exogenous) part of the instrument based on an area's topology, "share of unavailable land."[15] As is shown in columns (5) to (8), all results remain similar.

3.5 Industry Sectors

Panel (A) of Table 1 shows that establishments of high-leverage firms are somewhat underrepresented in the non-tradable sector, while establishments of low-leverage firms are underrepresented in the "other" sector. While our establishment-level regressions include industry fixed effects, we can directly address concerns related to industry sector composition by performing separate analyses for each sector.[16]

Table 4 presents the results. Across all establishments, we find no significant correlation between changes in house prices and changes in employment in the tradable sector. By contrast, we find a positive and significant correlation in the non-tradable sector. Together, these findings confirm similar results by Mian and Sufi (2014), who examine changes in employment at the county level. While differences across industry sectors are often a concern, the opposite is true here. Indeed, if the shock in question is a shock to consumer demand by households, then (geographical) variation in house prices should explain variation in employment primarily in the non-tradable sector, where demand by households is local. In contrast, variation in house prices should not correlate strongly with variation in employment in the tradable sector, where demand is largely national or global. Given the evidence in Table 4—as well as evidence by Mian, Rao, and Sufi (2013) and Mian and Sufi (2014)—we use the terms "falling house prices" and "household demand shocks" interchangeably.[17]

[15] We are grateful to Albert Saiz for providing us with the data.

[16] Mian and Sufi (2014) classify an industry as tradable if imports plus exports exceed $10,000 per worker or $500M in total. Retail industries and restaurants are classified as non-tradable. The Appendix of Mian and Sufi provides a list of all 4-digit NAICS industries and their classification. We label industries that are neither tradable nor non-tradable as "other." The "other" sector is comprised of a diverse set of industries that includes, e.g., news and entertainment, transportation and trucking, healthcare and hospitals, and wholesale. Mian and Sufi also provide a second industry classification based on the geographical concentration of industries. Our results are similar if we use this alternative classification. See Table IA-V of the Internet Appendix.

[17] The main alternatives are: i) falling house prices affect local employment by impairing the value

Two further results in Table 4 are important. First, the correlation between changes in house prices and changes in employment across all establishments is positive and significant both in the non-tradable and "other" sector. Together, these two sectors account for 97% of all establishments (see Panel (A) of Table 1).[18] Hence, there is no need to interact changes in house prices with sector dummies in our regressions. Second, in both sectors, the correlation between changes in house prices and changes in employment is only significant among establishments of high-leverage firms. Consequently, our results are not driven by industry sector composition effects.

3.6 Establishment Closures

Does the drop in house prices between 2006 and 2009 also lead to adjustments at the extensive margin, i.e., establishment closures? Arguably, establishment closures constitute an extreme form of employment reduction. On the other hand, it is precisely a feature of the firm balance sheet channel that (even) moderate shocks can get amplified into large losses, making extreme outcomes possible.

In Table 5, we estimate again our baseline regression, except that the sample now also includes establishments that are closed between 2007 and 2009. The dependent variable is a dummy indicating whether an establishment is closed during that period. As can be seen, changes in house prices are negatively and significantly associated with establishment closures on average. However, like in our employment regressions, the effect is entirely concentrated among establishments of high-leverage firms. By contrast, there is no significant association between changes in house prices and establishment closures among establishments of low-leverage firms.

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of collateral associated with local firms' commercial mortgages, and ii) falling house prices affect local employment by affecting local credit supply, e.g., local banks cut lending to local firms after experiencing losses on their mortgage loan portfolios. In either case, however, it is unclear why employment in the tradable sector would remain unaffected; see Mian and Sufi (2014) for further discussions. Moreover, Mian, Rao, and Sufi (2013) provide direct evidence showing that areas with stronger declines in housing net worth exhibit larger drops in consumption spending during the Great Recession.

[18] While non-tradable industries account for 9% of all 4-digit NAICS industries, they account for 44% of all establishments in our sample. In contrast, tradable industries, which are mostly manufacturing industries, account for 28% of all 4-digit NAICS industries but only for 3% of all establishments.

4 Financial Constraints

A plausible interpretation of our results is that high-leverage firms, having increased their leverage in the run-up, are financially constrained during the Great Recession. This interpretation is consistent with Panel (B) of Table 1, which shows that high-leverage firms have much higher leverage ratios (38.3% versus 19.5%) and score worse on popular measures of financial constraints, such as the KZ- and WW-index (Kaplan and Zingales (1997), Whited and Wu (2006)).

But do high-leverage firms also *act* like financially constrained firms? To examine this issue, we turn to firm-level regressions. Precisely, we estimate the firm-level analogue of our baseline regression, except that the main independent variable, Δ Log(HP)$_{06-09}$, is the employment-weighted average change in house prices between 2006 and 2009 across all of the firm's establishments. Accordingly, Δ Log(HP)$_{06-09}$ is the average household demand shock faced by a firm. The dependent variable is either the change in short-term debt, long-term debt, or equity, the change in employment or investment, or the fraction of establishments closed, all between 2007 and 2009. The first three dependent variables measure a firm's access to external finance during the Great Recession (Panel (A)). The last three dependent variables measure if being financially constrained has real consequences at the firm level (Panel (B)).

Table 6 presents the results. As is shown, high-leverage firms indeed act like financially constrained firms in the Great Recession. When faced with household demand shocks, these firms do not (or cannot) raise additional external finance. Instead, high-leverage firms reduce employment, close down establishments, and cut back on investment. The opposite is true of low-leverage firms. When faced with household demand shocks, these firms do not reduce employment, close down establishments, or cut back on investment. Instead, low-leverage firms increase both their short- and long-term borrowing, consistent with these firms having freed up debt capacity in the run-up.

Table 7 provides auxiliary evidence. We estimate a standard "internal capital markets regression" (Lamont (1997), Giroud and Mueller (2014)) in which the main independent variable, Δ Log(HP)$_{06-09}$, is augmented by another variable, Δ Log(HP)$_{06-09}$ (Other

Est.), measuring the employment-weighted average change in house prices between 2006 and 2009 across all of the firm's *other* establishments. If a firm is financially constrained, optimality dictates that income shocks to one firm unit be spread across other units to equate the marginal revenue product across units. Thus, we would expect to find a positive coefficient on Δ Log(HP)$_{06-09}$ (Other Est.). Indeed, we find that among high-leverage firms, house-price induced shocks spill over to other establishments within the same firm, consistent with these firms being financially constrained.[19] By contrast, we find no spillovers among establishments of low-leverage firms.

The evidence presented in this paper mirrors survey evidence by Campello, Graham, and Harvey (2010), who asked 574 U.S. CFOs in 2008 whether they perceive their firms as being financially constrained and what they are planning to do in 2009. The majority of CFOs said that they are either somewhat (210) or very (155) affected by difficulties in accessing credit markets. As the authors note, these perceptions are backed by "tangible financing difficulties" (p. 471). For instance, 81% of firms classified as financially constrained said they experience credit rationing (quantity constraint), 59% complained about higher costs of borrowing (price constraint), and 55% said they had difficulties in initiating or renewing a credit line.[20] Importantly, firms classified as financially constrained said they would reduce their capital spending by 9% in 2009, while financially unconstrained firms said they would keep their capital spending rates largely unchanged. Furthermore, and especially relevant for us, financially constrained firms planned to cut their employment by 10.9% in 2009, whereas financially unconstrained firms planned to cut their employment only by 2.7%.

The effect of financial constraints on firms' ability to access credit, and thus on their capital spending and employment, is reinforced by the fact that credit was tight during the Great Recession.[21] To illustrate, Figure 2 shows the net percentage of banks tightening

[19] The coefficient on Δ Log(HP)$_{06-09}$ is three times larger than the coefficient on Δ Log(HP)$_{06-09}$ (Other Est.), implying that internal capital markets offer some, but not perfect, insurance.

[20] The authors classify "unaffected" and "somewhat affected" firms as financially unconstrained and "very affected" firms as financially constrained. Inferences remain the same if they classify "somewhat affected" firms as financially constrained (p. 477).

[21] When credit is tight, there is typically a "flight to quality," with the implication that borrowers with weak balance sheets are disproportionately affected. For instance, Ivashina and Scharfstein (2010)

their lending standards for loans and credit lines to large and medium firms (Panel (A)) and small firms (Panel (B)), respectively, according to the Senior Loan Officer Opinion Survey conducted quarterly by the Federal Reserve. Already in 2007:Q3, a majority of surveyed banks reported tightening their lending standards. By 2008:Q4, this number climbed to 83.6% (large and medium firms) and 74.6% (small firms), respectively, the highest number ever recorded since the beginning of the survey in 1990. Thus, according to this metric, credit was not only tight during the Great Recession, but it was tighter than during any period in recent history, reinforcing the effect of financial contraints on firms' ability to access credit.

5 Alternative Hypotheses

According to Table 1, high-leverage firms expanded more than low-leverage firms in the years prior to the Great Recession, and they are less productive at the onset of the Great Recession. High-leverage firms also pay higher wages, albeit this difference is not statistically significant.

We already cautioned that these differences between low- and high-leverage firms may not be independent of each other. On the contrary, it is plausible that high-leverage firms increased their leverage *because* they needed to fund an expansion, high wage bills, or a deficit arising from a productivity shortfall. However, this raises the possibility that high-leverage firms respond more strongly to demand shocks in the Great Recession not because they are more financially constrained, but rather because they expanded too much in the run-up or were less productive at the onset of the Great Recession, or because they seized the opportunity to reduce their (above-average) wage bills. In what follows, we investigate each of these alternative hypotheses.[22]

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document that during the (near-) collapse of the syndicated loan market—when lending fell from $701.5 billion in 2007:Q2 to $150.2 billion in 2008:Q4—non-investment grade lending fell significantly more than investment grade lending. The authors conclude that "the near disappearance of non-investment grade issues was part of an overall flight to quality, an extreme version of what is typically observed in recessions (Bernanke, Gertler, and Gilchrist, 1996)" (p. 324).

[22] Given our fixed effects specification, we can rule out alternative hypotheses based on either industry or geographical variation. See Panels (B) and (C) of Table 2.

5.1 Growth

In Table 8, we examine if our results are driven by firms expanding too much in the years prior to the Great Recession. We split the sample along two dimensions using independent sorts. The first dimension is the familiar change in firm leverage between 2002 and 2006, Δ Lev$_{02-06}$. The second dimension is the percentage growth in either employment (Panel (A)) or assets (Panel (B)) between 2002 and 2006. As before, sample splits are based on median values. There are thus four groups: high-leverage, high-growth firms, i.e., those with above-median values of both Δ Lev$_{02-06}$ and Δ Log(Emp)$_{02-06}$ (column (1)), high-leverage, low-growth firms (column (2)), low-leverage, high-growth firms (column (3)), and low-leverage, low-growth firms (column (4)). As can be seen, the number of observations in the four groups is not identical, reflecting the fact that changes in firm leverage between 2002 and 2006 and changes in either employment or asset growth during the same time period are correlated. That said, all four groups have sufficiently many observations; statistical power is therefore not an issue.

If firms respond more strongly to household demand shocks in the Great Recession not because they are financially constrained, but rather because they expanded too much in the run-up, then we would expect to find a significant coefficient on Δ Log(HP)$_{06-09}$ in columns (1) and (3) but not in columns (2) and (4). That is, we would expect to find a significant response only among establishments of high-growth firms. Alternatively, if both financial constraints and firm growth matter, then we would expect to find a significant coefficient on Δ Log(HP)$_{06-09}$ in columns (1), (2), and (3) but not in column (4). That is, we would expect to find a significant response to household demand shocks among all types of establishments, except those belonging to low-leverage, low-growth firms. Either way, we would expect to find a significant coefficient in column (3), that is, among establishments of low-leverage, high-growth firms.

As can be seen, however, the coefficient on Δ Log(HP)$_{06-09}$ in column (3) is insignificant in both panels, suggesting that establishments of low-leverage, high-growth firms do not respond significantly to household demand shocks. In fact, the coefficient is always insignificant among establishments of low-leverage firms. By contrast, the coefficient is

always positive and significant among establishments of high-leverage firms, regardless of whether these firms exhibit low or high growth in the years prior to the Great Recession.

5.2 Productivity

Table 9 examines whether our results are driven by firms having low productivity at the onset of the Great Recession. We again split the sample along two dimensions using independent sorts. The first dimension is the change in firm leverage between 2002 and 2006, Δ Lev_{02-06}, while the second dimension is either return on assets (Panel (A)), net profit margin (Panel (B)), or total factor productivity (Panel (C)), all measured in 2006. As previously, sample splits are based on median values.

By arguments similar to those above, our focus is on establishments of low-leverage, low-productivity firms. If firms respond more strongly to household demand shocks in the Great Recession not because they are financially constrained, but rather because they have low productivity—or if both financial constraints and productivity matter—then we would expect to find a significant coefficient on Δ Log(HP)_{06-09} in column (3), that is, among establishments of low-leverage, low-productivity firms. As can be seen, however, the coefficient in column (3) is insignificant in all three panels. In fact, the coefficient is always insignificant among establishments of low-leverage firms. By contrast, it is always positive and significant among establishments of high-leverage firms, regardless of whether these firms have low or high productivity.

5.3 Wages

Table 10 examines if our results are driven by firms paying above-average wages. We again split the sample along two dimensions using independent sorts. The first dimension is the change in firm leverage between 2002 and 2006, Δ Lev_{02-06}, while the second dimension is the employment-weighted average wage across all of the firm's establishments in 2006. As before, sample splits are based on median values.

Our main focus is again on column (3), that is, on establishments of low-leverage, high-wage firms. If firms respond more strongly to household demand shocks in the

Great Recession not because they are financially constrained, but rather because they pay too high wages—or if both financial constraints and wages matter—then we would expect to find a significant coefficient on Δ Log(HP)$_{06-09}$ in column (3), that is, among establishments of low-leverage, high-wage firms. As can be seen, however, the coefficient in column (3) is statistically insignificant. In fact, the coefficient is always insignificant among establishments of low-leverage firms. By contrast, the coefficient is always positive and significant among establishments of high-leverage firms, regardless of whether these firms pay low or high wages.

6 County-Level Analysis

Do firms' balance sheets also matter for aggregate employment? In a frictionless labor market, wages would adjust downward, and low-leverage firms would pick up workers laid off by high-leverage firms. As a consequence, aggregate employment would change only little, or perhaps not at all. Our results thus far suggest that this is an unlikely scenario. While high-leverage firms reduce employment in response to household demand shocks, low-leverage firms do not increase employment. Accordingly, it would seem that firms' balance sheets also matter in the aggregate, with the implication that areas with a greater fraction of establishments belonging to high-leverage firms should experience a larger decline in employment in response to household demand shocks.

To investigate this issue, we consider employment at the county level. We classify counties into high- and low-leverage counties based on two different measures. The first measure is the employment-weighted fraction of establishments in a county belonging to high-leverage firms. The second measure is the employment-weighted average value of Δ Lev$_{02-06}$ across all of the county's establishments. In either case, we classify a county as high (low) leverage if the respective measure is above (below) the median across all counties. The dependent variable is the percentage change in county-level employment between 2007 and 2009, Δ Log(Emp)$_{07-09}$.[23] The main independent variable is the percentage change in house prices at the county level between 2006 and 2009,

[23] County-level employment is based on the full LBD sample, not the merged LBD-Compustat sample.

Δ Log(HP)$_{06-09}$. All regressions are weighted by the number of employees in a county. Standard errors are clustered at the state level.

Table 11 presents the results. As columns (2) and (3) show, high-leverage counties exhibit a significantly larger decline in employment in response to household demand shocks than low-leverage counties do. This holds regardless of how we classify counties into low- and high-leverage counties. Importantly, the interaction term in column (4) is positive and significant, confirming that the differences between low- and high-leverage counties in columns (2) and (3) are statistically significant. Thus, firms' balance sheets also matter for aggregate employment.

7 Conclusion

This paper argues that firms' balance sheets were instrumental in the propagation of shocks during the Great Recession. Using establishment-level data, we show that establishments of firms that tightened their debt capacity in the run-up ("high-leverage firms") exhibit a significantly larger decline in employment in response to household demand shocks than establishments of firms that freed up debt capacity ("low-leverage firms"). In fact, all of the job losses associated with falling house prices during the Great Recession are concentrated among establishments of high-leverage firms. Likewise, we find that counties with a larger fraction of establishments belonging to high-leverage firms exhibit a significantly larger decline in employment in response to household demand shocks. Thus, firms' balance sheets also matter for aggregate employment.

The interpretation that seems most consistent with our results is that high-leverage firms are financially constrained. First, high-leverage firms look like "typical" financially constrained firms: they have higher leverage ratios and score worse on popular measures of financial constraints. More important, they also act like financially constrained firms. When faced with household demand shocks, high-leverage firms do not (or cannot) raise additional external funds during the Great Recession. Instead, they reduce employment, close down establishments, and cut back on investment. Also, shocks to establishments of high-leverage firms spill over to other establishments within the same firm, a pattern

commonly associated with firms being financially constrained. In contrast, low-leverage firms do not reduce employment, close down establishments, or cut back on investment, and there are no spillovers among establishments. Instead, low-leverage firms increase both their short- and long-term borrowing during the Great Recession, consistent with these firms having freed up debt capacity in the run-up.

Our research has implications for macroeconomic modeling. In particular, it suggests that a model in which households', firms', and financial intermediaries' balance sheets interact might be a useful way to think about the Great Recession. Accordingly, falling house prices may erode the balance sheets of households, leading to a decline in consumer demand. The latter disproportionately affects firms with weak balance sheets, forcing them to downsize and reduce employment. At the same time, falling house prices may erode the balance sheets of financial intermediaries, impairing their capital and access to funding and thus their ability and/or willingness to lend.[24] The tightening of lending standards, in turn, disproportionately affects firms with weak balance sheets ("flight to quality"), reinforcing the adverse effects of household demand shocks.

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[24] Falling house prices may affect the credit supply of both local and national banks, just like the decline in consumer demand may affect both local ("non-tradable") and national ("tradable") consumption spending. Empirically, the challenge is to separate out the local consumption effect from the local credit supply effect. See Section 3.5 and Mian and Sufi (2014) for discussions.

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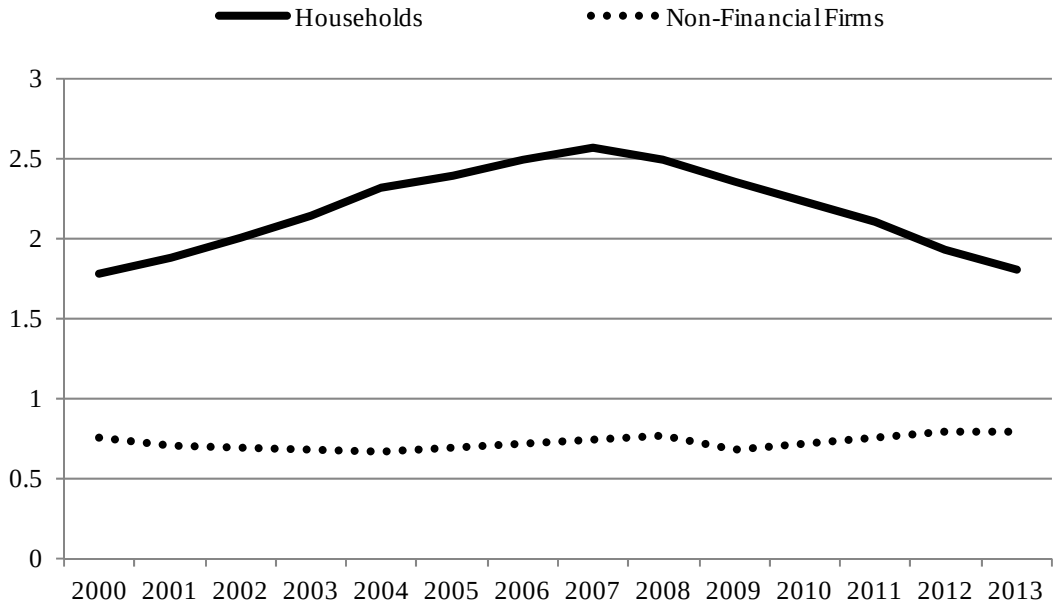
Figure 1
Household, Firm, and Investment Bank Leverage

Panel (A) plots the time series of households' debt-to-income ratio and non-financial firms' debt-to-equity ratio. Debt-to-income ratio is computed as total household debt divided by total household income (wages and salaries). Household debt is obtained from the FRBNY Consumer Credit Panel. Household income is obtained from the BEA. Debt-to-equity ratio is computed as the ratio of total liabilities to stockholders' equity from Compustat. The figure shows the median across all non-financial firms. Panel (B) plots the time series of the debt-to-equity ratios of the top five investment banks.

Panel (A): Households' Debt-to-Income Ratio and Non-Financial Firms' Debt-to-Equity Ratio



Panel (B): Investment Banks' Debt-to-Equity Ratio

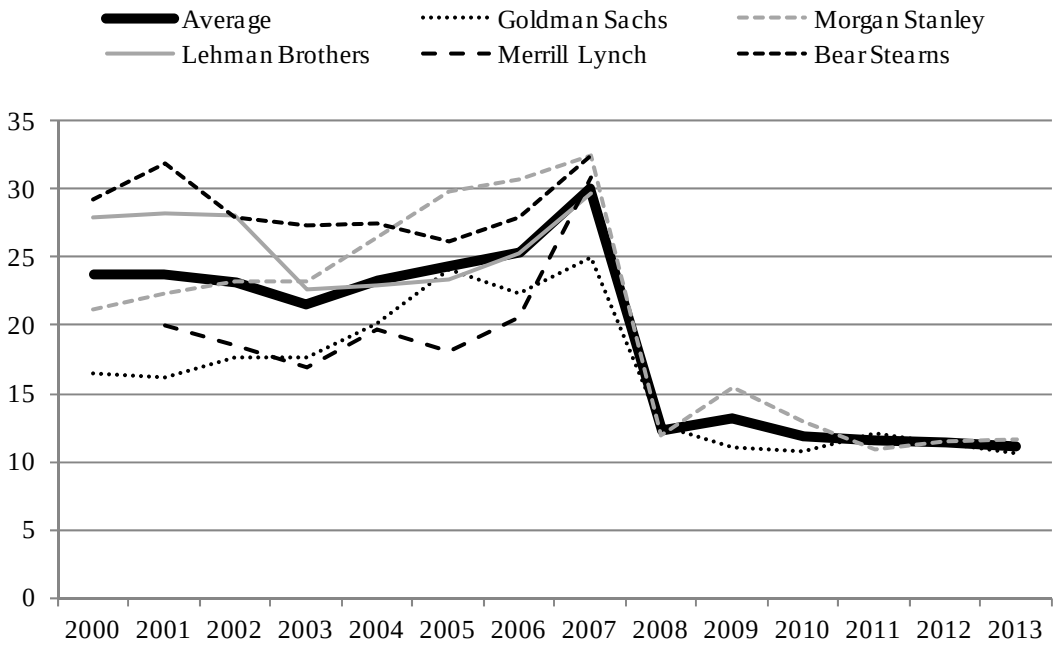
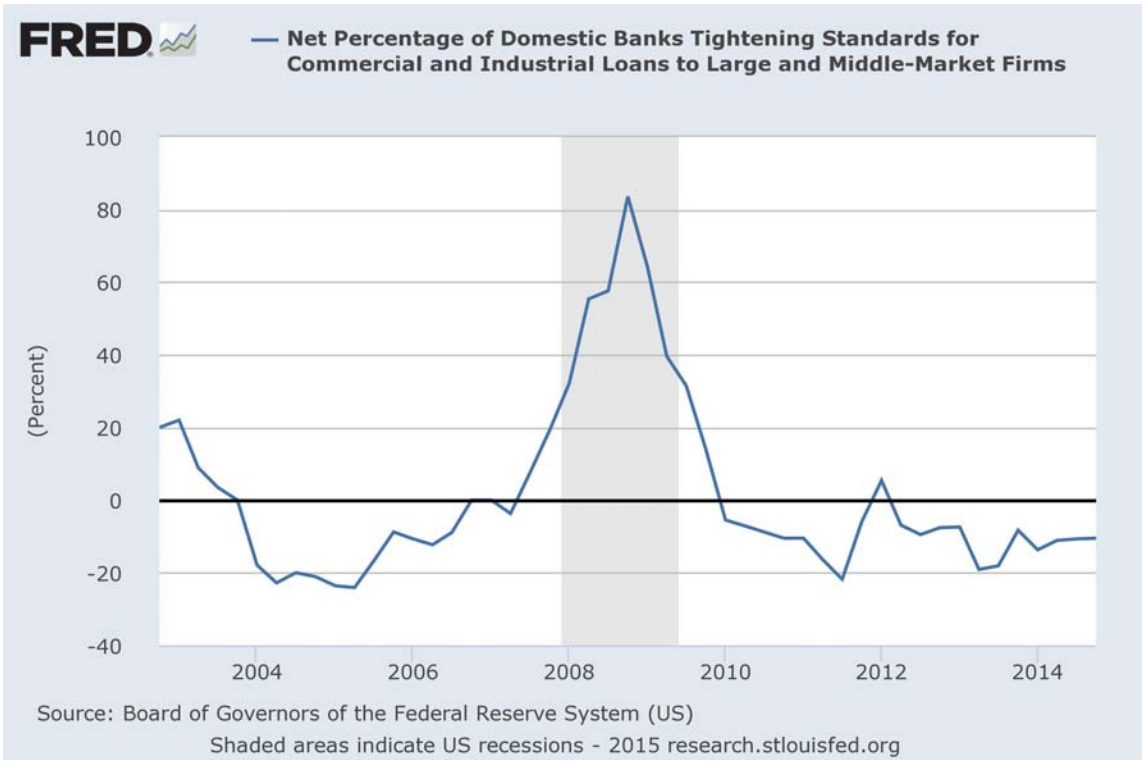


Figure 2
Senior Loan Officer Opinion Survey on Bank Lending Practices

Panel (A): Large and Medium Firms



Panel (B): Small Firms

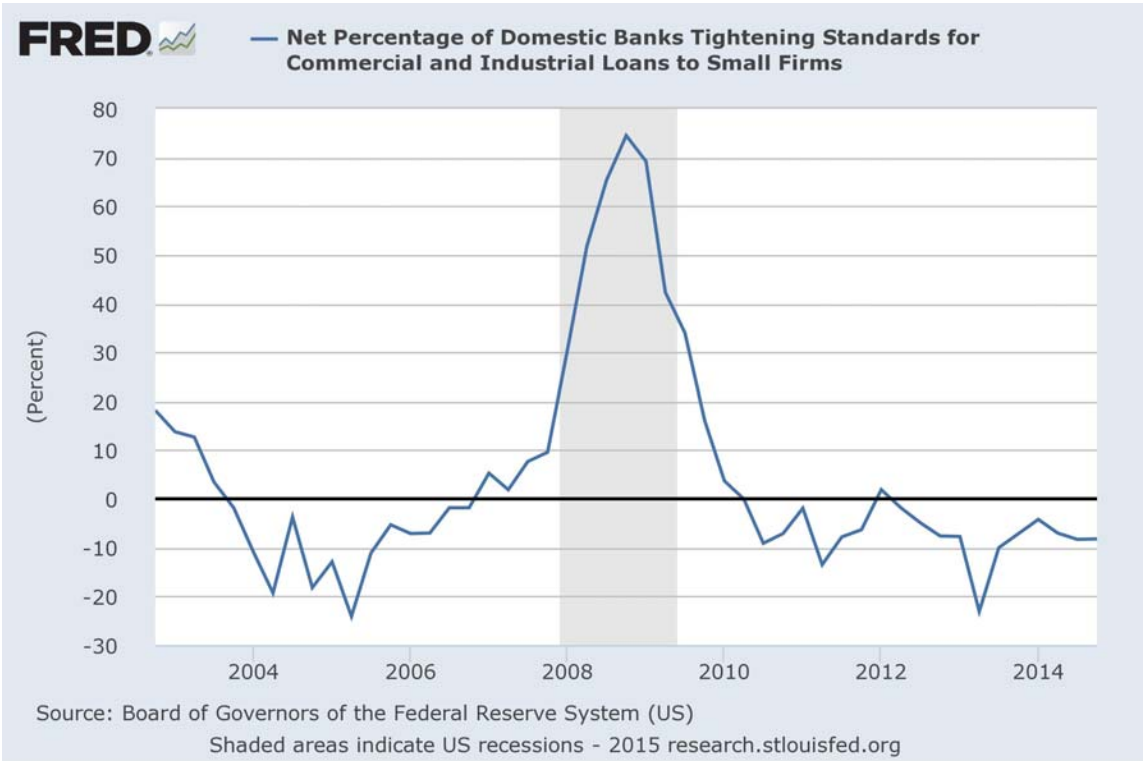


Table 1
Summary Statistics

Panel (A) provides establishment-level summary statistics. Δ Lev$_{02\text{-}06}$ > Median and Δ Lev$_{02\text{-}06}$ < Median refers to establishments with above- and below-median values of Δ Lev$_{02\text{-}06}$, respectively. The last column reports the *p*-value of the difference-in-means test comparing both groups. Δ Lev$_{02\text{-}06}$ is the change in leverage at the firm level between 2002 and 2006. Leverage is the ratio of the sum of debt in current liabilities and long-term debt to total assets. Wages is the ratio of payroll divided by the number of employees. HP (house price) is the Zillow Home Value Index in the establishment's ZIP code or county (if the ZIP code information is missing). Housing Supply Elasticity is described in Saiz (2010). Tradable and non-tradable industries are described in Mian and Sufi (2014). "Other" industries are those that are neither tradable nor non-tradable. Panels (B) and (C) provide firm-level summary statistics. Assets is the book value of total assets. ROA (return on assets) is the ratio of operating income before depreciation to total assets. NPM (net profit margin) is the ratio of operating income before depreciation to sales. TFP (total factor productivity) is the residual from estimating a regression of log(sales) on log(employees) and log(PP&E) across all Compustat firms in the same 2-digit SIC industry. WW is the financial constraints index of Whited and Wu (2006). KZ is the financial constraints index of Kaplan and Zingales (1997). All figures are sample means. Standard deviations are in parentheses. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): Establishment Level

	All	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median	*p* -value
Employees$_{06}$	39	36	43	0.094*
	(63)	(60)	(66)	
Wages$_{06}$	45,362	46,711	44,013	0.536
	(345,108)	(475,871)	(108,569)	
Δ Log(Emp)$_{07\text{-}09}$	-8.2	-9.2	-7.4	0.097*
	(24.2)	(23.4)	(25.0)	
Δ Log(HP)$_{06\text{-}09}$	-14.5	-14.8	-14.1	0.426
	(16.1)	(16.1)	(16.0)	
Housing Supply Elasticity	1.799	1.789	1.809	0.518
	(0.927)	(0.926)	(0.927)	
Census Regions				
Northeast	0.17	0.16	0.18	0.194
	(0.38)	(0.37)	(0.39)	
Midwest	0.21	0.21	0.21	0.940
	(0.41)	(0.41)	(0.41)	
South	0.38	0.39	0.38	0.782
	(0.49)	(0.49)	(0.49)	
West	0.24	0.24	0.23	0.408
	(0.42)	(0.43)	(0.42)	
Industry Sectors				
Tradable	0.03	0.03	0.04	0.058*
	(0.18)	(0.17)	(0.20)	
Non-Tradable	0.44	0.36	0.51	0.050**
	(0.50)	(0.48)	(0.50)	
Other	0.53	0.61	0.45	0.033**
	(0.50)	(0.49)	(0.50)	
Observations	284,800	142,400	142,400	

Table 1
(Continued)

Panel (B): Firm Level (2006)

	All	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median	*p* -value
Establishments$_{06}$	101	95	109	0.146
	(451)	(471)	(426)	
Employees$_{06}$	4,005	3,430	4,663	0.049**
	(16,384)	(14,443)	(18,339)	
Assets$_{06}$	3,040	2,971	3,119	0.083*
	(18,515)	(22,402)	(12,689)	
ROA$_{06}$	0.045	0.026	0.066	0.000***
	(0.177)	(0.182)	(0.168)	
NPM$_{06}$	0.024	0.006	0.044	0.000***
	(0.280)	(0.292)	(0.264)	
TFP$_{06}$	-0.002	-0.023	0.021	0.049**
	(0.599)	(0.620)	(0.575)	
Lev$_{06}$	0.296	0.383	0.195	0.000***
	(0.814)	(1.024)	(0.453)	
WW$_{06}$	-0.251	-0.241	-0.263	0.000***
	(0.135)	(0.133)	(0.136)	
KZ$_{06}$	-4.067	-2.289	-6.101	0.020**
	(44.295)	(50.188)	(36.313)	
Observations	2,800	1,500	1,300	

Table 1
(Continued)

Panel (C): Firm Level (2002-2006)

	All	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median	*p* -value
Δ Establishments$_{02\text{-}06}$	4.4	5.3	3.4	0.000***
	(10.2)	(9.4)	(10.9)	
Δ Log(Emp)$_{02\text{-}06}$	0.052	0.059	0.044	0.000***
	(0.093)	(0.092)	(0.092)	
Δ Log(Assets)$_{02\text{-}06}$	0.110	0.116	0.104	0.013**
	(0.133)	(0.139)	(0.133)	
Δ ROA$_{02\text{-}06}$	0.022	0.014	0.032	0.000***
	(0.127)	(0.128)	(0.127)	
Δ NPM$_{02\text{-}06}$	0.020	0.010	0.032	0.011**
	(0.225)	(0.231)	(0.218)	
Δ TFP$_{02\text{-}06}$	-0.001	-0.011	0.011	0.290
	(0.569)	(0.599)	(0.534)	
Δ Lev$_{02\text{-}06}$	-0.027	0.179	-0.265	0.000***
	(0.984)	(0.899)	(1.024)	
Δ WW$_{02\text{-}06}$	-0.006	0.002	-0.015	0.000***
	(0.080)	(0.079)	(0.081)	
Δ KZ$_{02\text{-}06}$	-0.370	1.756	-2.803	0.013**
	(49.633)	(54.979)	(42.594)	
Observations	2,800	1,500	1,300	

Table 2
Firm Leverage and Unemployment

In Panels (A) and (B), the dependent variable is the percentage change in establishment-level employment from 2007 to 2009, Δ Log(Emp)$_{07\text{-}09}$. The main independent variable is the percentage change in house prices at the establishment's ZIP code or county (if the ZIP code information is missing) from 2006 to 2009, Δ Log(HP)$_{06\text{-}09}$. HP and Δ Lev$_{02\text{-}06}$ are described in Table 1. In Panel (C), the sample is a pooled panel comprised of all establishment-year observations from 2007 to 2011. The dependent variable is the logarithm of establishment-level employment, Log(Emp)$_t$. The main independent variable is the logarithm of house prices in the preceding year, Log(HP)$_{t-1}$. Industry fixed effects are based on 4-digit NAICS codes. All regressions are weighted by the size of establishments (i.e., their number of employees). Standard errors (in parentheses) are clustered at both the state and firm level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): Sample Split

	Δ Log(Emp)$_{07\text{-}09}$								
	All			Δ Lev$_{02\text{-}06}$ > Median			Δ Lev$_{02\text{-}06}$ < Median		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Δ Log(HP)$_{06\text{-}09}$	0.066***	0.068***	0.053***	0.098***	0.103***	0.084***	0.036*	0.031	0.023
	(0.019)	(0.018)	(0.017)	(0.016)	(0.011)	(0.015)	(0.021)	(0.020)	(0.020)
Industry Fixed Effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Firm Fixed Effects	No	No	Yes	No	No	Yes	No	No	Yes
R-squared	0.00	0.03	0.17	0.00	0.04	0.18	0.00	0.05	0.17
Observations	284,800	284,800	284,800	142,400	142,400	142,400	142,400	142,400	142,400

Table 2
(Continued)

Panel (B): Interaction Term

	Δ Log(Emp)$_{07\text{-}09}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Log(HP)$_{06\text{-}09}$	0.035	0.032		0.027		
	(0.021)	(0.020)		(0.021)		
Δ Log(HP)$_{06\text{-}09}$ × (Δ Lev$_{02\text{-}06}$ > Median)	0.063***	0.075***	0.075***	0.058***	0.055***	0.059***
	(0.015)	(0.013)	(0.012)	(0.013)	(0.013)	(0.013)
Δ Lev$_{02\text{-}06}$ > Median	-0.008*	0.003	0.006			
	(0.004)	(0.005)	(0.005)			
Industry Fixed Effects	No	Yes	Yes	Yes	Yes	-
Firm Fixed Effects	No	No	No	Yes	Yes	Yes
ZIP Code Fixed Effects	No	No	Yes	No	Yes	-
ZIP Code × Industry Fixed Effects	No	No	No	No	No	Yes
R-squared	0.00	0.04	0.13	0.17	0.25	0.31
Observations	284,800	284,800	284,800	284,800	284,800	284,800

Table 2
(Continued)

Panel (C): Longitudinal Analysis

	$Log(Emp)_t$				
	(1)	(2)	(3)	(4)	(5)
$Log(HP)_{t-1}$	0.004	0.002	0.006		
	(0.006)	(0.004)	(0.013)		
$Log(HP)_{t-1} \times (\Delta Lev_{02\text{-}06} > Median)$	0.056***	0.055***	0.049***	0.042***	0.045**
	(0.015)	(0.013)	(0.014)	(0.014)	(0.013)
Establishment Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	-	-	-	-
Industry × Year Fixed Effects	No	Yes	Yes	Yes	-
Firm × Year Fixed Effects	No	No	Yes	Yes	Yes
ZIP Code × Year Fixed Effects	No	No	No	Yes	-
ZIP Code × Industry × Year Fixed Effects	No	No	No	No	Yes
R-squared	0.92	0.92	0.93	0.93	0.93
Observations	1,256,000	1,256,000	1,256,000	1,256,000	1,256,000

Table 3
Instrumental Variable (IV) Estimation

This table presents variants of the establishment-level regressions in Panel (A) of Table 2 in which Δ Log(HP)$_{06\text{-}09}$ is instrumented with housing supply elasticity (columns (2) to (4)) and share of unavailable land (columns (6) to (8)), respectively. Both instruments are described in Saiz (2010). For brevity, the table only displays the first-stage regressions associated with columns (2) and (6). Those associated with columns (3) to (4) and (7) to (8) are virtually identical. Industry fixed effects are based on 4-digit NAICS codes. All regressions are weighted by the size of establishments (i.e., their number of employees). Standard errors (in parentheses) are clustered at both the state and firm level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	Instrument: Housing Supply Elasticity				Instrument: Share of Unavailable Land			
	Δ Log(HP)$_{06\text{-}09}$	Δ Log(Emp)$_{07\text{-}09}$			Δ Log(HP)$_{06\text{-}09}$	Δ Log(Emp)$_{07\text{-}09}$		
	First Stage	IV			First Stage	IV		
		All	Δ Lev$_{02\text{-}06}$ > Med.	Δ Lev$_{02\text{-}06}$ < Med.		All	Δ Lev$_{02\text{-}06}$ > Med.	Δ Lev$_{02\text{-}06}$ < Med.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Housing Supply Elasticity	0.072***							
	(0.016)							
Share of Unavailable Land					-0.292***			
					(0.083)			
Δ Log(HP)$_{06\text{-}09}$		0.051***	0.093***	0.009		0.052**	0.105***	-0.002
		(0.019)	(0.025)	(0.025)		(0.027)	(0.036)	(0.032)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.28	0.18	0.19	0.17	0.24	0.18	0.19	0.17
Observations	247,800	247,800	124,500	123,300	247,800	247,800	124,500	123,300

Table 4
Industry Sectors

This table presents variants of the establishment-level regressions in Panel (A) of Table 2 in which the sample is partitioned into non-tradable, tradable, and "other" industries as described in Table 1. Industry fixed effects are based on 4-digit NAICS codes. All regressions are weighted by the size of establishments (i.e., their number of employees). Standard errors (in parentheses) are clustered at both the state and firm level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): Non-Tradable Industries

	Δ Log(Emp)$_{07\text{-}09}$		
	All	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median
	(1)	(2)	(3)
Δ Log(HP)$_{06\text{-}09}$	0.052**	0.104***	0.009
	(0.023)	(0.024)	(0.024)
Industry Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
R-squared	0.23	0.27	0.21
Observations	124,100	50,900	73,200

Panel (B): Tradable Industries

	Δ Log(Emp)$_{07\text{-}09}$		
	All	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median
	(1)	(2)	(3)
Δ Log(HP)$_{06\text{-}09}$	-0.009	0.013	-0.031
	(0.022)	(0.041)	(0.031)
Industry Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
R-squared	0.31	0.33	0.29
Observations	9,900	4,000	5,900

Table 4
(Continued)

Panel (C): Other Industries

	Δ Log(Emp)$_{07\text{-}09}$		
	All	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median
	(1)	(2)	(3)
Δ Log(HP)$_{06\text{-}09}$	0.060***	0.079***	0.020
	(0.015)	(0.014)	(0.021)
Industry Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
R-squared	0.18	0.19	0.13
Observations	150,800	87,500	63,300

Table 5
Establishment Closures

This table presents variants of the establishment-level regressions in Panel (A) of Table 2 in which the sample also includes establishments that are closed between 2007 and 2009. The dependent variable is a dummy indicating whether an establishment is closed during that time period. Industry fixed effects are based on 4-digit NAICS codes. All regressions are weighted by the size of establishments (i.e., their number of employees). Standard errors (in parentheses) are clustered at both the state and firm level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	Establishment Closure$_{07\text{-}09}$		
	All	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median
	(1)	(2)	(3)
Δ Log(HP)$_{06\text{-}09}$	-0.013**	-0.018***	-0.008
	(0.006)	(0.006)	(0.009)
Industry Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
R-squared	0.21	0.22	0.22
Observations	338,100	170,100	168,000

Table 6
Firm-Level Analysis

This table presents firm-level analogues of the establishment-level regressions in Panel (A) of Table 2. Short-Term Debt is the ratio of debt in current liabilities divided by total assets. Long-term debt is the ratio of long-term debt divided by total assets. Equity is the ratio of the book value of equity divided by total assets. CAPEX is the ratio of capital expenditures divided by property, plant and equipment (PP&E). Establishment closures is the number of establishments closed between 2007 and 2009 divided by the number of establishments in 2007. Δ Log(HP)$_{06\text{-}09}$ is aggregated at the firm level by computing the employment-weighted average across all of the firm's establishments. Industry fixed effects are based on 4-digit NAICS codes. Standard errors (in parentheses) are clustered at the state level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): External Finance

	Δ Short-Term Debt$_{07\text{-}09}$		Δ Long-Term Debt$_{07\text{-}09}$		Δ Equity$_{07\text{-}09}$	
	Δ Lev$_{02\text{-}06}$ < Median	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median	Δ Lev$_{02\text{-}06}$ > Median
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Log(HP)$_{06\text{-}09}$	-0.019**	-0.003	-0.022**	-0.005	0.004	0.001
	(0.008)	(0.009)	(0.010)	(0.012)	(0.029)	(0.031)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.15	0.13	0.12	0.10	0.16	0.10
Observations	1,300	1,500	1,300	1,500	1,300	1,500

Panel (B): Employment and Investment

	Δ Log(Emp)$_{07\text{-}09}$		Establishment Closures$_{07\text{-}09}$		Δ CAPEX$_{07\text{-}09}$	
	Δ Lev$_{02\text{-}06}$ < Median	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median	Δ Lev$_{02\text{-}06}$ > Median
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Log(HP)$_{06\text{-}09}$	0.015	0.074***	0.006	-0.024**	0.001	0.024**
	(0.027)	(0.027)	(0.012)	(0.012)	(0.013)	(0.011)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.16	0.15	0.16	0.15	0.18	0.17
Observations	1,300	1,500	1,300	1,500	1,300	1,500

Table 7
Within-Firm Spillovers

This table presents variants of the establishment-level regressions in Panel (A) of Table 2 in which an additional independent variable, Δ Log(HP)$_{06\text{-}09}$ (Other Est.), is included measuring the employment-weighted average value of Δ Log(HP)$_{06\text{-}09}$ across all of the firm's other establishments, excluding the establishment itself. Industry fixed effects are based on 4-digit NAICS codes. All regressions are weighted by the size of establishments (i.e., their number of employees). Standard errors (in parentheses) are clustered at both the state and firm level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	Δ Log(Emp)$_{07\text{-}09}$			
	Δ Lev$_{02\text{-}06}$ > Median		Δ Lev$_{02\text{-}06}$ < Median	
	(1)	(2)	(3)	(4)
Δ Log(HP)$_{06\text{-}09}$	0.078***	0.085***	0.027	0.027
	(0.013)	(0.010)	(0.021)	(0.020)
Δ Log(HP)$_{06\text{-}09}$ (Other Est.)	0.025***	0.028***	0.013	0.008
	(0.007)	(0.006)	(0.009)	(0.008)
Industry Fixed Effects	No	Yes	No	Yes
R-squared	0.00	0.04	0.00	0.05
Observations	142,400	142,400	142,400	142,400

Table 8
Alternative Hypothesis: Growth

This table presents variants of the establishment-level regressions in Panel (A) of Table 2 in which the sample is split along two dimensions using independent sorts. In Panel (A), the second dimension is the percentage change in firm-level employment from 2002 to 2006, Δ Log(Emp)$_{02\text{-}06}$. In Panel (B), the second dimension is the percentage change in firm-level assets from 2002 to 2006, Δ Log(Assets)$_{02\text{-}06}$. Assets is described in Table 1. Industry fixed effects are based on 4-digit NAICS codes. All regressions are weighted by the size of establishments (i.e., their number of employees). Standard errors (in parentheses) are clustered at both the state and firm level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): Employment Growth

	Δ Log(Emp)$_{07\text{-}09}$			
	Δ Lev$_{02\text{-}06}$ > Median		Δ Lev$_{02\text{-}06}$ < Median	
	Δ Log(Emp)$_{02\text{-}06}$ > Med	Δ Log(Emp)$_{02\text{-}06}$ < Med	Δ Log(Emp)$_{02\text{-}06}$ > Med	Δ Log(Emp)$_{02\text{-}06}$ < Med
	(1)	(2)	(3)	(4)
Δ Log(HP)$_{06\text{-}09}$	0.088***	0.077***	0.022	0.025
	(0.017)	(0.024)	(0.019)	(0.025)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.21	0.16	0.24	0.12
Observations	79,700	62,700	53,900	88,500

Panel (B): Asset Growth

	Δ Log(Emp)$_{07\text{-}09}$			
	Δ Lev$_{02\text{-}06}$ > Median		Δ Lev$_{02\text{-}06}$ < Median	
	Δ Log(Assets)$_{02\text{-}06}$ > Med	Δ Log(Assets)$_{02\text{-}06}$ < Med	Δ Log(Assets)$_{02\text{-}06}$ > Med	Δ Log(Assets)$_{02\text{-}06}$ < Med
	(1)	(2)	(3)	(4)
Δ Log(HP)$_{06\text{-}09}$	0.086***	0.078***	0.025	0.022
	(0.017)	(0.019)	(0.025)	(0.024)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.19	0.18	0.22	0.15
Observations	86,800	55,600	52,300	90,100

Table 9
Alternative Hypothesis: Productivity

This table presents variants of the establishment-level regressions in Panel (A) of Table 2 in which the sample is split along two dimensions using independent sorts. In Panel (A) the second dimension is the firm's return on assets (ROA), in Panel (B) it is the firm's net profit margin (NPM), and in Panel (C) it is the firm's total factor productivity (TFP), all in 2006. ROA, NPM, and TFP are described in Table 1. Industry fixed effects are based on 4-digit NAICS codes. All regressions are weighted by the size of establishments (i.e., their number of employees). Standard errors (in parentheses) are clustered at both the state and firm level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): ROA

	Δ Log(Emp)$_{07\text{-}09}$			
	Δ Lev$_{02\text{-}06}$ > Median		Δ Lev$_{02\text{-}06}$ < Median	
	ROA$_{06}$ < Median	ROA$_{06}$ > Median	ROA$_{06}$ < Median	ROA$_{06}$ > Median
	(1)	(2)	(3)	(4)
Δ Log(HP)$_{06\text{-}09}$	0.089***	0.077***	0.028	0.018
	(0.018)	(0.023)	(0.034)	(0.015)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.16	0.24	0.19	0.15
Observations	77,200	65,200	66,800	75,600

Panel (B): NPM

	Δ Log(Emp)$_{07\text{-}09}$			
	Δ Lev$_{02\text{-}06}$ > Median		Δ Lev$_{02\text{-}06}$ < Median	
	NPM$_{06}$ < Median	NPM$_{06}$ > Median	NPM$_{06}$ < Median	NPM$_{06}$ > Median
	(1)	(2)	(3)	(4)
Δ Log(HP)$_{06\text{-}09}$	0.089***	0.076***	0.026	0.016
	(0.014)	(0.027)	(0.019)	(0.027)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.18	0.20	0.13	0.20
Observations	82,500	59,900	59,700	82,700

Table 9
(Continued)

Panel (C): TFP

	Δ Log(Emp)$_{07\text{-}09}$			
	Δ Lev$_{02\text{-}06}$ > Median		Δ Lev$_{02\text{-}06}$ < Median	
	TFP$_{06}$ < Median	TFP$_{06}$ > Median	TFP$_{06}$ < Median	TFP$_{06}$ > Median
	(1)	(2)	(3)	(4)
Δ Log(HP)$_{06\text{-}09}$	0.088***	0.078***	0.028	0.019
	(0.018)	(0.017)	(0.020)	(0.025)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.19	0.18	0.12	0.21
Observations	75,200	67,200	66,200	76,200

Table 10
Alternative Hypothesis: Wages

This table presents variants of the establishment-level regressions in Panel (A) of Table 2 in which the sample is split along two dimensions using independent sorts, where the second dimension is the employment-weighted average wage (payroll divided by employees) across all of the firm's establishments in 2006. Industry fixed effects are based on 4-digit NAICS codes. All regressions are weighted by the size of establishments (i.e., their number of employees). Standard errors (in parentheses) are clustered at both the state and firm level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	Δ Log(Emp)$_{07\text{-}09}$			
	Δ Lev$_{02\text{-}06}$ > Median		Δ Lev$_{02\text{-}06}$ < Median	
	Wages$_{06}$ > Median	Wages$_{06}$ < Median	Wages$_{06}$ > Median	Wages$_{06}$ < Median
	(1)	(2)	(3)	(4)
Δ Log(HP)$_{06\text{-}09}$	0.089***	0.079***	0.019	0.024
	(0.019)	(0.024)	(0.017)	(0.028)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.19	0.19	0.17	0.18
Observations	78,500	63,900	64,800	77,600

Table 11
County-Level Analysis

This table presents county-level analogues of the establishment-level regressions in Panels (A) and (B) of Table 2. Counties are classified into high- and low-leverage counties based on two measures. The first measure is the fraction of establishments in the county belonging to high-leverage firms. The second measure is the employment-weighted average value of Δ Lev$_{02\text{-}06}$ across all of the county's establishments. In both cases, a county is classified as High (Low) Leverage if the respective measure is above (below) the median across all counties. Standard errors (in parentheses) are clustered at the state level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): Fraction of Establishments Belonging to High-Leverage Firms

	Δ Log(Emp)$_{07\text{-}09}$			
	Subsamples			Interaction
	All	High Leverage	Low Leverage	
	(1)	(2)	(3)	(4)
Δ Log(HP)$_{06\text{-}09}$	0.146***	0.188***	0.127***	0.127***
	(0.013)	(0.022)	(0.017)	(0.016)
Δ Log(HP)$_{06\text{-}09}$ × High Leverage				0.061**
				(0.029)
High Leverage				-0.011**
				(0.006)
R-squared	0.10	0.12	0.09	0.10
Observations	1,000	500	500	1,000

Panel (B): Employment-Weighted Average Value of Δ Lev$_{02\text{-}06}$

	Δ Log(Emp)$_{07\text{-}09}$			
	Subsamples			Interaction
	All	High Leverage	Low Leverage	
	(1)	(2)	(3)	(4)
Δ Log(HP)$_{06\text{-}09}$	0.146***	0.185***	0.129***	0.129***
	(0.013)	(0.024)	(0.016)	(0.016)
Δ Log(HP)$_{06\text{-}09}$ × High Leverage				0.055*
				(0.029)
High Leverage				-0.010*
				(0.006)
R-squared	0.10	0.10	0.10	0.10
Observations	1,000	500	500	1,000

Internet Appendix

Table IA-I
Matching House Prices to Establishments

This table presents variants of the establishment-level regressions in Panel (A) of Table 2. In Panel (A), the sample is restricted to establishments with non-missing house prices at the ZIP code level. In panel (B), establishments with missing house prices at the ZIP code or county level are assigned state-level house prices constructed as population-weighted averages of available ZIP code-level house prices. Industry fixed effects are based on 4-digit NAICS codes. All regressions are weighted by the size of establishments (i.e., their number of employees). Standard errors (in parentheses) are clustered at both the state and firm level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): Reduced Sample with Non-Missing House Prices at the ZIP Code Level

	Δ Log(Emp)$_{07\text{-}09}$		
	All	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median
	(1)	(2)	(3)
Δ Log(HP)$_{06\text{-}09}$	0.048***	0.077***	0.020
	(0.016)	(0.016)	(0.018)
Industry Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
R-squared	0.18	0.20	0.17
Observations	227,600	113,300	114,300

Panel (B): Extended (Full) Sample with Imputed State-Level House Prices

	Δ Log(Emp)$_{07\text{-}09}$		
	All	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median
	(1)	(2)	(3)
Δ Log(HP)$_{06\text{-}09}$	0.059***	0.087***	0.032
	(0.018)	(0.017)	(0.020)
Industry Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
R-squared	0.17	0.18	0.16
Observations	327,500	161,300	166,200

Table IA-II
Timing of House Price Changes

This table presents variants of the establishment-level regressions in Panel (A) of Table 2. In Panel (A), Δ Log(HP) is computed for the period April 2006 to May 2009. In Panel (B), Δ Log(HP) is computed for the period March 2007 to May 2009. Industry fixed effects are based on 4-digit NAICS codes. All regressions are weighted by the size of establishments (i.e., their number of employees). Standard errors (in parentheses) are clustered at both the state and firm level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): April 2006 to May 2009

	Δ Log(Emp)$_{07\text{-}09}$		
	All	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median
	(1)	(2)	(3)
Δ Log(HP)$_{\text{April 06- May 09}}$	0.053***	0.085***	0.023
	(0.017)	(0.015)	(0.019)
Industry Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
R-squared	0.17	0.19	0.17
Observations	284,800	142,400	142,400

Panel (B): March 2007 to May 2009

	Δ Log(Emp)$_{07\text{-}09}$		
	All	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median
	(1)	(2)	(3)
Δ Log(HP)$_{\text{March 07- May 09}}$	0.058***	0.095***	0.022
	(0.021)	(0.019)	(0.023)
Industry Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
R-squared	0.17	0.18	0.17
Observations	284,800	142,400	142,400

Table IA-III
Net Leverage and Market Leverage

This table presents variants of the establishment-level regressions in Panel (A) of Table 2 in which Leverage is replaced with Net Leverage and Market Leverage, respectively. Net Leverage is defined as the ratio of debt in current liabilities plus long-term debt minus cash and short-term investments divided by total assets. Market Leverage is defined as the ratio of debt in current liabilities plus long-term debt divided by total assets minus the book value of equity plus the market value of equity (stock price multiplied by the number of shares outstanding). Industry fixed effects are based on 4-digit NAICS codes. All regressions are weighted by the size of establishments (i.e., their number of employees). Standard errors (in parentheses) are clustered at both the state and firm level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): Net Leverage

	Δ Log(Emp)$_{07\text{-}09}$		
	All	Δ Net Lev$_{02\text{-}06}$ > Median	Δ Net Lev$_{02\text{-}06}$ < Median
	(1)	(2)	(3)
Δ Log(HP)$_{06\text{-}09}$	0.053***	0.076***	0.029
	(0.017)	(0.012)	(0.024)
Industry Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
R-squared	0.17	0.18	0.18
Observations	284, 800	142,400	142,400

Panel (B): Market Leverage

	Δ Log(Emp)$_{07\text{-}09}$		
	All	Δ Mkt Lev$_{02\text{-}06}$ > Median	Δ Mkt Lev$_{02\text{-}06}$ < Median
	(1)	(2)	(3)
Δ Log(HP)$_{06\text{-}09}$	0.053***	0.086***	0.023
	(0.017)	(0.016)	(0.020)
Industry Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
R-squared	0.17	0.19	0.16
Observations	284, 800	142,400	142,400

Table IA-IV
OLS Regressions Associated with IV Estimation

This table presents the OLS regressions associated with the IV regressions in Table 3. Industry fixed effects are based on 4-digit NAICS codes. All regressions are weighted by the size of establishments (i.e., their number of employees). Standard errors (in parentheses) are clustered at both the state and firm level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	Δ Log(Emp)$_{07\text{-}09}$		
	All	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median
	(1)	(2)	(3)
Δ Log(HP)$_{06\text{-}09}$	0.052***	0.083***	0.021
	(0.017)	(0.015)	(0.019)
Industry Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
R-squared	0.18	0.19	0.17
Observations	247,800	124,500	123,300

Table IA-V
Geographical Concentration Index

This table presents variants of the establishment-level regressions in Table 4 in which the sample is partitioned based on the geographical concentration (GC) index of Mian and Sufi (2014). Industries in the top quartile are classified as tradable while those in the bottom quartile are classified as non-tradable. "Other" industries are those that are neither tradable nor non-tradable. Industry fixed effects are based on 4-digit NAICS codes. All regressions are weighted by the size of establishments (i.e., their number of employees). Standard errors (in parentheses) are clustered at both the state and firm level. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel (A): Non-Tradable Industries (Bottom Quartile GC Index)

	Δ Log(Emp)$_{07\text{-}09}$		
	All	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median
	(1)	(2)	(3)
Δ Log(HP)$_{06\text{-}09}$	0.067***	0.108***	0.027
	(0.021)	(0.016)	(0.026)
Industry Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
R-squared	0.22	0.22	0.23
Observations	130,700	70,300	60,400

Panel (B): Tradable Industries (Top Quartile GC Index)

	Δ Log(Emp)$_{07\text{-}09}$		
	All	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median
	(1)	(2)	(3)
Δ Log(HP)$_{06\text{-}09}$	0.006	0.015	-0.002
	(0.044)	(0.044)	(0.066)
Industry Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
R-squared	0.29	0.33	0.25
Observations	15,900	8,200	7,700

Table IA-V
(Continued)

Panel (C): Other Industries (Second and Third Quartile GC Index)

	Δ Log(Emp)$_{07\text{-}09}$		
	All	Δ Lev$_{02\text{-}06}$ > Median	Δ Lev$_{02\text{-}06}$ < Median
	(1)	(2)	(3)
Δ Log(HP)$_{06\text{-}09}$	0.040**	0.054**	0.028
	(0.016)	(0.021)	(0.018)
Industry Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
R-squared	0.17	0.18	0.17
Observations	138,200	63,900	74,300