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Financial Shocks and Industrial Employment

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Abstract:

By using the U.S. NBER-CES industry-level data for the 1962-2005 period, we analyze how exogenous changes in firms' borrowing costs, measured by the spread between Baa and Aaa rated corporate bonds, affect employment dynamics and whether external finance dependence differences across industries lead to different employment responses to financial shocks. In order to identify the exogenous changes in the spreads, we use an index based on the exogenous economic and non-economic events provided by Bloom (2009). Our estimates suggest that a 1-standard deviation exogenous increase in the cost of borrowing, corresponding to a 0.28 percentage point increase in spreads, reduces employment growth by 0.39-0.70 percent for the industries at the median of external finance dependence distribution, depending on the specification. We also find that the industries with higher external finance dependence face higher employment losses following adverse financial shocks. Finally, our out of sample forecasts for the 2008-2009 crisis imply that the increase in spreads between August 2008 and December 2008 can generate a 4.7-5.8 percent decline in manufacturing industry employment, keeping all other factors constant, where the actual decline was 11.4% for 2009.

Key Words: Employment, financial shocks, external finance dependence, working capital channel.

Jel Classification: E24, J23, J63

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1 Introduction

Understanding the effects of financial conditions on economic activity is at the center of current academic and policy debates. There is a large body of theoretical and empirical research on the implications of financial conditions for economic growth, business cycles fluctuations and crises.[1]. On the other hand, a particular question of interest is how financial conditions affect firms' demand for inputs, such as physical capital and employment. In contrast with the arguments of Modigliani and Miller (1958), financial market imperfections, such as those generated by information asymmetries between lenders and borrowers, may lead to external finance premiums on funds that firms borrow[2]. Therefore, as also demonstrated by a vast number of emprical studies, the capital structure of a firm becomes relevant for its value and investment decisions. However, fewer studies explore the possible effects of financial conditions on employment dynamics, rather than on investment decisions[3].

This study aims at providing empirical evidence on how financial conditions affect employment dynamics in the economy and whether dependence on external finance plays a key role in the magnitude of such an effect. In particular, we estimate the employment response to exogenous variations in the spread between Baa rated and Aaa rated bonds on industry level employment dynamics, by focusing on whether these dynamics differ with respect to industries' external finance dependence, using industry-level data from the NBER-CES dataset for 1962-2005. Motivated by the studies, such as Neumeyer and Perri (2005), where higher interest rates would have adverse effects on labor demand if firms must borrow to finance their wage bill, we augment the standard labor demand equation, such as the one proposed

[1] For example, see Rajan and Zingales (1998), Levine (2005) and Beck et al. (2000) for finance and growth, see Braun and Larrain (2005) for finance and business cycles, see Ranciere et al. (2008) for finance and crisis, see Bernanke et al. (1999) and Carstrom and Fuerst (1997) for theoretical models of financial constraints, see Christiano et al. (2009) for the effects of financial frictions in a full-fledged DSGE model.

[2] See Jensen and Meckling (1976), Stiglitz and Weiss (1981) and Myers and Majluf (1984) for theoretical contributions on this dimension.

[3] See Chirinko (1993), Schiantarelli (1996), Hubbard (1998), and Bond and Van Reenen (2007) for detailed surveys of the literature on the effects of financial conditions on investment. See Nickell and Wadwhani (1991), Nickell and Nicolitsas (1999), Benito and Hernando (2008) and Campello et al (2010) for the empirical evidence on the effects of financial conditions on employment. See Spaliara (2009) for effects of financial conditions on joint decision of capital and labor.

by Hamermesh (1986, 1993), by adding borrowing costs. The inclusion of borrowing costs in the labor demand function is mainly inspired by models with working capital channel, such as Christiano and Eichenbaum (1992), Christiano, Eichenbaum and Evans (2005) and Neumeyer and Perri (2005), which imply that variations in borrowing costs may affect the aggregate employment dynamics through their effect on the firms' demand for labor.[4] In particular, we formalize this approach with a small structural model by show that when firms face working capital constraints on their wage bill, interest rates on the working capital directly affects the employment decision.

A particular difficulty in estimating the effects of variations in the spread between high risk and low risk bonds on the employment is the possible endogeneity of the spreads to variations in the employment. One type of endogeneity, which results in a negative relationship between the spreads and employment is that deterioration in the expectations about the future economic activity can lead to an increase in the spreads and a decline in the employment at the same time.[5]

In contrast, another source of endogeneity, which may lead to a positive correlation between the spreads and the employment is due to the new firms with no credit history or existing firms with relatively low credit rating, whose relative number and borrowing opportunities can increase during periods of high economic activity. In particular, the periods of expansion are associated with investment and employment expansions by firms with lower credit rating, who would increase the bond supply at the low end, and hence widen the spread between bonds with high credit rating and low credit rating.

Thus, the estimation of the employment effects of variations in the spreads requires us to instrument the variations in the spreads. Following Bloom (2009), we use 16 exogenous events, such as wars, terror attacks, international oil shocks and economic events, in 1962-2005 period in order to capture the exogenous variations in the spreads. We also check the robustness of our results to the use of 10 non-economic

[4] The models with working capital channel have been recently shown to improve predictions of dynamic general equilibrium models used for business cycle analysis. For example, Neumeyer and Perri (2005) and Mendoza (2010) explain with working capital frictions the sudden stops in developing countries and countercyclical net exports. Tillmann (2009) studies optimal monetary policy with working capital channel. Ata and Başçı (2004) shows the existence of competitive equilibrium in an economy with working capital and increasing returns.

[5] For example, see Gilchrist et al (2009).

events out of total of 16 events, as in Bloom (2009). Finally, we make use of the industry level external financial dependence indices, provided by Rajan and Zingales (1998), in order to test whether industries with more dependence on external funds face larger employment losses during periods of higher financing costs.

Our findings indicate that when we do not instrument the changes in spreads between Baa and Aaa rated bonds with exogenous events, the estimated effects of changes in spreads on the manufacturing employment are either very small or insignificant. However, when we use instrument for capturing exogenous variations in spreads, we get negative significant effects at nonnegligible magnitudes. For example, one standard deviation increase in the spreads, corresponding to an increase of 28 basis points in our sample, slows down the growth of manufacturing sector employment by around 0.39-0.70 percent. Moreover, we show that the effect is more pronounced for the industries with higher external finance dependence levels. Finally, out of sample forecasts for the 2008-2009 crisis based on our estimations imply that, by itself, the increase in spreads between August 2008 and December 2008 around the Lehmann collapse can generate a 4.7-5.8 percent decline in manufacturing industry employment for 2009, keeping all other factors constant.[6]

In order to present our arguments, we first give a short summary of the literature in Section 2. Section 3 presents the data and the empirical methodology including a small structural model which shows the employment implications of higher borrowing costs. Section 4 presents estimation results, where we show that exogenous increases in the borrowing costs have adverse effect on the employment dynamics in United States with larger employment losses for the industries with higher dependence on external finance. Section 5 presents the concluding remarks.

[6] Where, the actual decrease in the data was 11.4%.

2 Related Literature

Starting with the seminal work of Fazzari et al. (1988), many empirical studies document that the financial constraints are an important determinant of firms' investment decisions[7]. On the other hand, compared to the vast number of studies on the effects of financial conditions on investment dynamics, there is a limited number of studies focusing on the effects of financial conditions on employment. For the effect of financial conditions on employment dynamics in the United States, Sharpe (1994) shows that employment growth of highly leveraged firms is more sensitive to financial market conditions over the business cycle. Gilchrist et al. (2009) construct corporate credit spreads from secondary bond prices data for different firm groups in the U.S. with similar expected default probabilities. Authors show that the increases in corporate bond spreads has a substantial predictive power for decreases in economic activity and employment in the proceeding periods.

Some studies have also analyzed the effect of financial conditions on employment for the countries other than United States. For example, Nickell and Wadwhani (1991) document a negative relationship between firms' debt to equity ratios and employment in United Kingdom. In a related study, Nickell and Nicolitsas (1999) ask whether the financial pressure affects the employment negatively in the United Kingdom. In particular, authors augment the standard labor demand equation by adding controls for financial conditions. They use ratio of firms' interest payments to cash flow as a financial pressure proxy, and the product of debt-capital ratio and the Treasury bill yields as an instrument for capturing the exogenous variations in this measure. Using this financial pressure variable, they find that deterioration in financial conditions, proxied by ratio of firms' interest payments to profits, decreases the labor demand, with a significantly higher effect observed for small firms. Spaliara (2009) analyzes the effects of financial factors on the joint decision of capital and labor for firms in the United Kingdom, and finds that constrained firms exhibits higher sensitivities of the capital–labour ratio to firm-specific characteristics. Funke et al. (1999) and Ogawa (2003) show that debt to asset ratio negatively affects the employment using a sample

[7] See also Chirinko (1993), Schiantarelli (1996), Hubbard (1998), Bond and Van Reenen (2007) for reviews of this literature and Agca and Mozumdar (2008), Carpenter and Guariglia (2008) and Islam and Mozumdar (2007) for recent evidence on effect of financial conditions on investment dynamics.

of German firms and Japanese firms, respectively. Benito and Hernando (2008) show that financial factors affect temporary employment more than permanent employment for Spain. Similarly, Caggese and Cunat (2008) shows that financially constrained firms in Italy have a higher tendency to employ temporary workers, which absorb a larger part of variation in total employment. Finally, using survey data from chief financial officers in 39 countries, Campello et al. (2010) find that financially constrained firms planned to decrease employment more than the unconstrained firms during the global crisis of 2008.

Our paper has two principle differences from earlier studies. First, we exploit the variations in the corporate bond spreads induced by exogenous economic and non-economic events to analyse the effect of financial shocks on the industrial employment dynamics in United States for over four decades. Second, using a similar methodology to Nickell and Nicolitsas (1999), i.e. interacting the external finance dependence ratios with changes in cost of borrowing, we show that the industries with higher external finance dependence rates face higher employment losses during exogenous changes in the financial conditions. [8]

3 Data and Methodology

3.1 Data

In this study, we use the NBER-CES Manufacturing Industry Database for 1958-2005 period. Our dataset covers the employment of the production and non-production workers from 459 4-digit manufacturing industries. The NBER-CES dataset provides annual industry-level data on employment, production, wage bill, input costs, investment, capital stock, total factor productivity, and industry specific price

[8] It is worth noting that a recent study by Duygan-Bump et al. (2010) also focuses on the differential effect of changes in financial conditions on employment, exploiting the variations due to 2007-2009 financial turmoil in United States. Besides the role of external finance dependence in amplifying employment response to financial shocks, they also look at whether this differential effect differs by the size of the firm that the individuals were employed before the shock. It is worth noting that we get similar results in terms of emphasizing the role of external finance dependence in magnifying the employment effects of financial shocks. However, our study differs from Duygan-Bump et al (2010) in terms of our focus on a longer time period with industrial level data, and exploiting the variations in corporate bond spreads induced by exogenous events as a measure of financial shocks.

indices[9]. The estimation of the labor demand function with NBER-CES dataset requires derivation of some variables from the raw data, in which we closely follow Slaughter (2001) who also estimated industry level labor demand functions for United States. In particular, we obtain the nominal wage as the total nominal payroll divided by number of workers. The cost of other inputs in the production, such as energy and materials, are provided in the form of nominal price indices. Since a direct measure of cost of capital is not available in the NBER-CES database, we use nominal industry level value added divided by the industry level real capital stock as a proxy. The real output is estimated as the total value of shipments in the industry divided by the shipments-price index.

The variable that we use for the variations in the financial conditions is the spread between the interest rates on Baa and Aaa rated bonds interacted with the industry level external finance dependence ratios. The spread data is obtained from Moody's using corporate bonds with Aaa and Baa ratings. The spread between Baa and Aaa rated bonds represents the tightness in the financial conditions, as a measure for variations in the borrowing cost in the economy. As a rationale for the use of such a proxy, one may consider the information asymmetries in the credit market, which leads to a spread between the risk free interest rates and the interest rates faced by financially constrained firms, as discussed by Bernanke, Gertler and Gilchrist (1999). The recent literature suggests that such a spread has an important explanatory power for the economic activity in United States.[10]

However, a particular issue concerning the spread data is that it has no cross-sectional variation across industries. Therefore, in the specifications using this data, we cannot control for year effects, which would control for common factors across industries affecting employment. In order to overcome this problem, we generate an alternative measure for financial conditions by interacting the spread with the industry level external finance dependence index by Rajan and Zingales (1998).[11] Besides allowing us

[9] Data definitions and the summary statistics of the variables that we use are given in Appendix Tables 1 and 2, respectively. Also see Bartelsman and Gray (1996) for a detailed decription of the database.

[10] For example, see Friedman and Kuttner (1998), Emery (1999), Gertler and Lown (1999), Ewing et al. (2003), Gilchrist et al. (2009).

[11] Rajan and Zingales (1998) calculates the external finance dependence ratios as the capital expenditures above cash flow from operations divided by capital expenditures, as measured in 1980s.

to control for time fixed effects, this measure also provides important insights into whether industries with higher dependence on external funds face higher employment losses following deteriorations in financial conditions.

Finally, considering the possibility that the variations in the spread are endogenous to the changes in the economic activity and the employment dynamics in the economy, we exploit the variations in the spreads induced by the uncertainty series proposed by Bloom (2009). However, our dataset is constrained by the fact that the uncertainty shock index by Bloom (2009) is available for 1962-2008 period, and therefore our final dataset used for estimations covers 1962-2005 period.

3.2 Methodology

For the estimation of labor demand elasticities, Hamermesh (1986, 1993) suggests the following labor demand equation:

$$\ln(L_{j,t}) = \alpha + \sum_i \beta_i \ln(w_{i,j,t}) + \gamma Y_{j,t} + \varepsilon_{j,t} \tag{1}$$

where $L_{j,t}$ is the labor input used in sector j, $w_{i,j,t}$ is the factor price for i^{th} input in j^{th} industry at time t, $Y_{j,t}$ is the output of industry j and and $\varepsilon_{j,t}$ is the error term. In this specification, β_i gives the constant-output elasticity of labor demand with respect to factor price of input i. Therefore, β_L gives the own-price elasticity, and β_i for $i \neq L$ is equal to the cross–price elasticity for the labor demand.

A potential determinant of the input demands, which have not been covered extensively in the literature, is the financial constraints faced by firms. Such a factor becomes important especially when the firms need to borrow in advance to finance their payments for input costs. Unlike the functional form given in Equation (1), when there are financial frictions, the demand for inputs may be affected in a non-trivial manner by the changes in financial market conditions or the monetary policy stance, as suggested by the models allowing for a *working capital channel* that requires the factor payments to be made in advance.

To show the effect of this financial friction on the factor demand assume that the firm has the following

constant returns to scale production function:

$$Y_t = K_t^{\eta} L_t^{1-\eta} \tag{2}$$

where Y_t is the product of the firm, produced with capital stock (K_t) and labor input (L_t) rented from perfectly competitive factor markets. Suppose that the firms are required to pay $\theta \in [0, 1]$ fraction of their wage bills in advance to labor before production takes place. That is, $\theta W_t L_t$ is paid to the workers at period t.[12] As in Christiano and Eichenbaum (1992), Christano, Eichenbaum and Evans (2005) and Neumeyer and Perri (2005), we assume that the firms will borrow this amount from financial markets at a gross nominal interest rate of $R_{t-1} = 1 + r_{t-1}$ at period $t-1$. The resulting profit function of the firm becomes:

$$\Pi_t = K_t^{\eta} L_t^{1-\eta} - W_t L_t - R_t^k K_t - (R_{t-1} - 1)\theta W_t L_t \tag{3}$$

where R_t^k is the rental rate of capital. The last term in Equation (3) is the net interest cost of working capital constraint to the firm. First order condition of the profit function with respect to labor yields the following labor demand in log-deviations form from the corresponding steady state values:

$$\hat{L}_t = \hat{K}_t - \frac{1}{\eta}\hat{W}_t - \xi \hat{R}_{t-1} \tag{4}$$

In particular, $\xi > 0$ reflects the elasticity of labor demand with respect to gross interest rate, which is a function of η, θ and steady state value of gross interest rate $\bar{R}$. This suggests that an increase in the the cost of borrowing, i.e. $\hat{R}_{t-1}$, will have a direct negative effect on the labor demand of the firm through higher financing costs. In other words, with higher borrowing cost, the firms may need to decrease the amount of labor it hires next period to be able to finance the same amount of advance payment.

With this observation, we test if the variations in the cost of borrowing affects the employment dynamics by augmenting the labor demand specification suggested by Hamermesh (1986, 1993) with the

[12] We can also assume that firm is required to pay a fraction of total input bill, namely wage bill and capital bill. However, this does not affect the main points of the analysis.

inclusion of borrowing cost term in the economy:

$$\ln(L_{j,t}) = \alpha + \sum \beta_i \ln(w_{j,i,t}) + \gamma Y_{j,t} + \delta \ln(R_{t-1}) + \varepsilon_{j,t} \tag{5}$$

where R_{t-1} is the term capturing the cost of borrowing in the economy and δ corresponds to the elasticity of employment with respect to the firms' borrowing cost.

On the other hand, a couple of practical issues regarding the estimation of Equation (5) needs to be taken into account. First, since the factor prices other than wages in our dataset reflect the nominal indices, rather than the actual levels of factor prices, their distribution across industries at a particular time does not correspond to their actual cross-sectional distribution. Thus, the estimating factor price elasticities in levels, as shown in Equation (5), can be misleading. Therefore, following Slaughter (2001), we prefer estimating the equation by taking first differences across time and using $\ln(R_{t-1}) \approx r_{t-1}$:

$$\Delta \ln(L_{j,t}) = \alpha + \phi_j + \sum \beta_i \Delta \ln(w_{j,i,t}) + \gamma \Delta Y_{j,t} + \delta \Delta r_{t-1} + u_{j,t} \tag{6}$$

In this specification, Δ is used to denote year-on-year change in the corresponding variables, and ϕ_j denotes the time invariant industry specific factors in the change of the employment, reflecting the industry-specific trend in the employment. We use the spread between Baa and Aaa rated bonds at time $t-1$, denoted by Baa_Aaa_{t-1}, as a proxy for the cost of borrowing r_{t-1}.

The second practical issue is that due to the lack of cross-sectional variation in Baa_Aaa_{t-1}, we cannot include in this regression time fixed effects to account for unobserved variations in the employment growth common to all industries. This is particularly important considering the length of the time dimension of our sample period.

To overcome this issue, we interact the spread variable with the external financial dependence (EFD) ratios by Rajan and Zingales (1998) compiled for 1980s, which has a significant variation across industries. With this final modification, our measure for the variations in the financial conditions become $\triangle Baa\_Aaa_{t-1} \times EFD_j$. Finally, with the inclusion of the time fixed effects, denoted as η_t, the augmented labor demand equation can be written as follows:

$$\Delta \ln(L_{j,t}) = \alpha + \phi_j + \eta_t + \sum \beta_i \Delta \ln(w_{j,i,t}) + \gamma \Delta Y_{j,t} + \delta(\triangle Baa\_Aaa_{t-1}) \times (EFD_j) + u_{j,t} \quad (7)$$

We will estimate both equations (6) and (7) with panel data for 459 industries with fixed effects to see the effects of borrowing costs on the employment decision of firms but emphasize the results from equation (7) which also includes year fixed effects as a control for unobserved common employment variations across industries in United States in our sample period.

4 Estimation Results

4.1 OLS Results

We first present the results in Table 2 where the changes in the spread between the Baa and Aaa rated bonds are treated as exogenous. In columns 1 and 2, we use the change in the spread between Baa and Aaa rated bonds without interacting with external finance dependence measures. These columns show that the growth rate of employment falls significantly, albeit at a small magnitude, when the spreads increase, regardless of controls for the industry fixed effects. For example, for the specification presented in column 2, one standard deviation increase in the borrowing costs leads to a 0.17% decrease in the employment.

In columns 3 to 5, we use the change in spreads interacted with external finance dependence. With this measure, we again find statistically significant but a small effect of change in spreads on employment in specifications without year fixed effects. But, when we introduce the year fixed effects as a control for unobserved annual employment changes common to all industries, the negative effect of spreads on employment becomes insignificant, suggesting that the variations in the changes in the spread do not explain the variations in employment growth.

However, at this point a relevant question is what derives the variations in the changes in the spread. This is important for our estimation methodology and for the results as long as there is a feedback from the employment growth to the changes in the spread. As Figure 1 suggests, the correlation between the

spread and employment is negative. Such a negative correlation may reflect different possibilities, such as the increases in the spreads and a decline in the economic activity, when there is deterioration in the expectations about the future real economic activity. Alternatively, the periods of high economic activity may be result in lower loan to value ratio for the firms, as a result of which the spreads may decline.

Another source of endogeneity, which may lead to point estimates for spreads close to zero, is due to the feedback from increase in employment and industry size on the spreads. In particular, for a given level of economic activity and industry output, an increase in the firms' demand for employment and other inputs or an increase in the industry employment due to new entries to the industry may lead to increases in the spreads between interest rates on the risky and non-risky bonds[13]. In other words, at a given level of supply of loanable funds and economic activity, an increase in firms' demand for inputs may push the borrowing costs in the economy up as the firms' leverage increases. Therefore, such a positive relationship between spreads and demand for loanable funds induced by higher demand for inputs may balance the potential negative effect of an exogenous increase in the spreads on employment. As a result, with OLS, one can get an insignificant estimate for the overall effect of changes in spreads on employment, as we observe in Table 2.

4.2 2SLS Results

Due to possible endogeneity discussed in the preceding section, one may need to exploit the exogenous variations in the changes in the spread and estimate their effect on employment via instrumental variables approach. For the choice of instruments that would help us to identify exogenous changes in the financial conditions, we follow Bloom (2009) and use the list of economic and noneconomic events that took place between 1962-2005. The total list includes 16 exogenous events including wars, terrorist attacks, OPEC oil shocks as well as economic and financial shocks, shown in Table 1. Alternatively, we test the robustness of our results by using 10 non-economic events such as wars, terror events and OPEC shocks, as in Bloom (2009).

[13] This conjecture is also consistent with Bernanke et al (1999), who show that increases in the leverage are associated with increases in the risk premium.

Figure 2a and 2b present the link between the occurrence of the exogenous events documented by Bloom (2009) and the changes in the spreads. These suggest that there is a significant correlation between these events and the variations in the spread. Alternatively, the first-stage diagnostics for the relationship between the spread and the index based on these events is presented in Tables 3a and 3b, which confirm the existence of a very strong positive relationship between the changes in the spread, i.e. $\triangle Baa\_Aaa_{t-1}$ and the exogenous shocks due to these events in first two columns of Tables 3 and 3b.

Finally, for the specification where we use the interaction between the changes in the spread and external finance dependence by industries, we use the interaction between the index of exogenous events and the external finance dependence as an instrument for $\triangle Baa\_Aaa_{t-1} \times EFD_i$. The columns 3-5 of Tables 3a and 3b show that both of our alternative instruments are strongly correlated with the interaction between the changes in spreads and the external finance dependence, both with and without year and industry fixed effects. Based on these results, one can conclude that the shocks due to these exogenous events induce exogenous variations in the change of the spread between returns on Baa and Aaa rated bonds. For the rest of the analysis, we denote the indices of the exogenous events used for the exogenous variations in spreads with $Bloom_{t-1}$.

Using the $Bloom_{t-1}$ and $Bloom_{t-1} \times EFD_i$ as instruments for $\triangle Baa\_Aaa_{t-1}$ and $\triangle Baa\_Aaa_{t-1} \times EFD_i$, respectively, the Tables 4a and 4b present the results for the endogeneity test for the changes in the spreads. In the spirit of Hausman (1978), these tables suggest that the parts of $\triangle Baa\_Aaa_{t-1}$ and $\triangle Baa\_Aaa_{t-1} \times EFD_i$ unexplained by $Bloom_{t-1}$ and $Bloom_{t-1} \times EFD_i$ have a strong positive correlation with the growth rate of the employment implying endogeneity of the changes in spreads between Baa and Aaa rated bonds and its interaction with external finance dependence measures.

In Table 5a, we present the estimation results where the annual percentage point change in the spread between Baa and Aaa rated bonds is instrumented by the index based on 16 exogenous events. In the first two columns, we present the results from the specification where the changes in spread are not interacted with the external finance dependence measures of the industries. In both of these specifications, we obtain that one standard deviation increase in the spread, which corresponds to an increase by 0.282 percentage

points, decreases the growth rate of employment in manufacturing industry by 2.2 percent. With an alternative instrument based on 10 exogenous events in Table 5b, we find that this effect may be as large as 3 percent.

However, one may argue that absence of year fixed effects in this specification may lead to biases if there are common factors across industries correlated both with employment and spreads. Therefore, to overcome this problem, we use the interaction between the annual change in the spread and the external finance dependence ratios by industries, instead of the spread itself. The columns 3-5 of Table 5a present the IV estimates for the effect of interaction between external finance dependence ratio and spreads, instrumented by the interaction between external finance dependence ratio and the index of exogenous events based on 16 events. In Column 3, there are no controls for the year and industry fixed effects, whereas we introduce the industry fixed effects in column 4. In both cases, we again observe quite high estimates for the negative impact of increases in spreads on employment growth. In particular, these results suggest that one standard deviation increase in spreads, corresponding to an increase of 0.282 percentage points, decreases the employment growth by -0.95 to -1.10 percentage points in the industries with median level of external finance dependence. This number implies that the effect is around 6 percentage points for the industries at the 90^{th}percentile of the external finance dependence distribution.

Finally, we also control for the year fixed effects in column 5 of Table 5a. Since we have full set of controls, we call it our preferred specification. with this specification, we get much smaller but still statistically significant and economically non-negligible effect. For the median industry at the external finance dependence distribution, the decline in employment growth rate in response to 1 standard deviation increase in spreads is 0.39 percentage points. In the alternative specification, where we use the instrument based on the index constructed using 10 noneconomic exogenous events in Table 5b, we find that the median industry faces a 0.7 percentage point drop in employment growth in response to 1 standard deviation exogenous increase in the spread between Baa and Aaa rated bonds.

One major implication of these results is that a large fraction of the employment loss observed in 2009 can be explained by the financial shock in United States in late 2008. In particular, using the 1.87

percentage point increase in the spread between Baa and Aaa rated bonds, from 1.51 in August 2008 to 3.38 in December 2008, we predict the employment slowdown for the median and average industries in 2009 with respect to external finance dependence rates as 4.67 and 5.78 percentage points respectively. This is a non-negligible number considering the fact that the actual slow-down in manufacturing industry employment in between end of 2008 and end of 2009 was 11.4 percentage points.

Our results also indicate differential effects of increases in cost of borrowing on industry employment growth with respect to the external finance dependence level of the industries. In particular, the effect of 1 percentage point increase in the spreads on employment for industry j is:

$$\frac{\partial \Delta \ln(L_{j,t})}{\partial \triangle Baa\_Aaa_{t-1}} = \delta \times EFD_j \tag{8}$$

which varies by the external finance dependence ratio of the industry, EFD_j. Figure 3 quantifies this effect for different values at external finance dependence ratio distribution for two alternative specifications using different instruments, presented in fifth columns of Table 5a and Table 5b. In particular, we observe that the slow-down in employment growth for the industries at the $75^{\text{th}}$and 90^{th}percentile of external finance dependence ratio distribution is approximately 2 and 3 times that for the median industry. Depending on the specification, the observed slowdown in employment growth due to an exogenous 1 standard deviation increase in spreads is around 0.75-1.40 percentage points for the industries at the 75th percentile and 1.25-2.25 percentage points for the industries at the 90th percentile of the external finance dependence distribution.

5 Conclusion

In an economy where the firms face various financial frictions, the financial resources may be regarded as a factor of production. An implication of such a case is that the variations in financial conditions may affect employment both indirectly, through its effect on overall economic activity, and directly through its effect on firms' cost of borrowing for financing their working capital.

In this paper, we provide empirical evidence for United States for the 1962-2005 period for existence of such a channel. In terms of the magnitude of the effect, we find that 1 percentage point increase in

spread between Baa and Aaa rated bonds, as a proxy for increase in firms' cost of borrowing, leads to a slow down in employment growth rate at the magnitude of 2.3 percentage points. We show that this effect is higher for the industries with more reliance on external financial resources, such as 7.3 percentage point slow down for the industries at the 90^{th}percentile of the external finance dependence distribution.

Our study deserves attention for a couple of reasons. First, our results not only complement the literature on the effects of financial frictions on the demand for factors of production, where the number of studies focusing on the effect on employment dynamics and labor demand is limited compared to the studies focusing on investment dynamics. Second, we quantify the heterogenous effect of exogenous changes in borrowing costs on the employment dynamics by industries. Finally, our results deserve attention for their implications for the recent financial crisis, as they highlight the potential for the policymakers to limit the employment losses during financial turmoils by mitigating the deterioration of the cost of borrowing and the credit conditions in the economy.

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Table 1:

Exogenous Events Used for Extracting Exogenous Changes in Spreads Between Baa-Aaa Rated Bonds (1962-2005)

Event	Date	Type of Event
Cuban Missile Crises	October 1962	Terror
Assasination of J.K. Kennedy	November 1963	Terror
Vietnam Buildup	August 1966	War
Cambodia and Kent State	May 1970	War
OPEC I, Arab-Israel War	December 1973	Oil
Franklin National	October 1974	Economic
OPEC II	November 1978	Oil
Afghanistan, Iran Hostages	March 1980	War
Monetary Policy Cycle Turning Point	October 1982	Economic
Black Monday	November 1987	Economic
Gulf War I	November 1990	War
Asian Crises	November 1997	Economic
Russian Crises	September 1998	Economic
9/11 Terrorist Attack	September 2001	Terror
Worldcom and Enron	September 2002	Economic
Gulf War II	February 2003	War

Source: Bloom (2009), p.676

Table 2: Determinants of Annual Rate Of Change In Industry's Employment - OLS Results

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	Annual Rate of Change in Employment	Annual Rate of Change in Employment	Annual Rate of Change in Employment	Annual Rate of Change in Employment	Annual Rate of Change in Employment
Lag of Annual Percentage Points Change in Baa-Aaa Spread	-0.005	-0.006	-	-	-
	(0.002)***	(0.002)***	-	-	-
Interaction between Lag of Annual Percentage Points Change in Baa-Aaa Spread and External Financial Dependence of Sector i	-	-	-0.011	-0.012	-0.005
	-	-	(0.004)***	(0.004)***	(0.006)
Annual Rate of Change in Industry's Average Wage	-0.632	-0.626	-0.634	-0.628	-0.657
	(0.024)***	(0.025)***	(0.024)***	(0.025)***	(0.027)***
Annual Rate of Change in Industry's Cost of Capital	0.083	0.083	0.083	0.083	0.092
	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.010)***
Annual Rate of Change in Value of Real Output	0.556	0.552	0.557	0.552	0.522
	(0.016)***	(0.014)***	(0.016)***	(0.014)***	(0.015)***
Annual Rate of Change in Price of Materials	0.216	0.187	0.216	0.188	0.135
	(0.019)***	(0.017)***	(0.019)***	(0.017)***	(0.019)***
Annual Rate of Change in Price of Energy	0.042	0.053	0.042	0.052	0.001
	(0.009)***	(0.008)***	(0.009)***	(0.008)***	(0.012)
Industry Fixed Effects	No	Yes	No	Yes	Yes
Year Fixed Effects	No	No	No	No	Yes
Impact Factor %	-0.14	-0.17	-0.07	-0.08	-0.03
Observations	19660	19660	19660	19660	19660
R-squared	0.60	0.62	0.60	0.62	0.65

Notes: (1) OLS results using annual data from NBER-CES data set for 1962-2005. (2) Baa-Aaa spread refers to the difference of returns for Baa and Aaa-rated corporate bonds from Moody's. External Fianancial Dependence is the difference of capital expenditures and cash flows for the industries, generated by Rajan and Zingales (1998). The standard deviation of lag of annual change in Baa-Aaa spreads is 0.282 and median value of External Financial Dependence is 0.24. (3) Robust standard errors in parentheses clustered for within industry correlation. (4) * significant at 10%, ** significant at 5%, *** significant at 1%. (5) Impact Factor for colums 1 and 2 refers to the impact of one standard deviation increase in lag of annual change of Baa-Aaa spreads on annual change of employment. Impact factor for columns 3-5 refers to the impact of one standard deviation increase in lag of annual change of Baa-Aaa spreads for the median level of External Financial Dependence on annual change of employment.

Table 3a: First Stage Regressions for Instrumental Variables

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	Lag of Annual Percentage Points Change in Baa-Aaa Spread	Lag of Annual Percentage Points Change in Baa-Aaa Spread	Interaction between Lag of Annual Percentage Points Change in Baa-Aaa Spread and External Financial Dependence of Sector i	Interaction between Lag of Annual Percentage Points Change in Baa-Aaa Spread and External Financial Dependence of Sector i	Interaction between Lag of Annual Percentage Points Change in Baa-Aaa Spread and External Financial Dependence of Sector i
One Year Lag of Exogenous Events Documented by Bloom (2009)	0.15	0.15	-	-	-
	(0.001)***	(0.001)***	-	-	-
Interaction between One Year Lag of Exogenous Events Documented by Bloom (2009) and External Financial Dependence of Sector i	-	-	0.118	0.151	0.153
	-	-	(0.001)***	(0.001)***	(0.000)***
Annual Rate of Change in Industry's Average Wage	0.828	0.837	0.248	0.249	0.004
	(0.048)***	(0.049)***	(0.023)***	(0.024)***	(0.014)
Annual Rate of Change in Industry's Cost of Capital	0.004	0.008	0.021	0.015	0.013
	(0.022)	(0.023)	(0.007)***	-0.008	(0.006)**
Annual Rate of Change in Value of Real Output	-0.152	-0.161	-0.087	-0.072	-0.025
	(0.025)***	(0.029)***	(0.010)***	(0.011)***	(0.008)***
Annual Rate of Change in Price of Materials	-0.53	-0.552	-0.127	-0.148	0.029
	(0.048)***	(0.051)***	(0.015)***	(0.017)***	(0.013)**
Annual Rate of Change in Price of Energy	0.333	0.34	0.085	0.092	0.00
	(0.028)***	(0.029)***	(0.009)***	(0.010)***	(0.016)
Industry Fixed Effects	No	Yes	No	Yes	Yes
Year Fixed Effects	No	No	No	No	Yes
Observations	19660	19660	19660	19660	19660
R-squared	0.10	0.10	0.07	0.08	0.55

Notes: (1) OLS results using annual data from NBER-CES data set for 1962-2005. (2) Exogenous Events Documented by Bloom(2009) are 16 events reported in Table 1. (3) Baa-Aaa spread refers to the difference of returns for Baa and Aaa-rated corporate bonds from Moody's. External Fianancial Dependence is the difference of capital expenditures and cash flows for the industries, generated by Rajan and Zingales (1998). The standard deviation of lag of annual change in Baa-Aaa spreads is 0.282 and median value of External Financial Dependence is 0.24. (4) Robust standard errors in parentheses clustered for within industry correlation. (5) * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 3b: First Stage Regressions for Instrumental Variables:

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	Lag of Annual Percentage Points Change in Baa-Aaa Spread	Lag of Annual Percentage Points Change in Baa-Aaa Spread	Interaction between Lag of Annual Percentage Points Change in Baa-Aaa Spread and External Financial Dependence of Sector i	Interaction between Lag of Annual Percentage Points Change in Baa-Aaa Spread and External Financial Dependence of Sector i	Interaction between Lag of Annual Percentage Points Change in Baa-Aaa Spread and External Financial Dependence of Sector i
One Year Lag of Exogenous Non-economic Events Doc. by Bloom (2009)	0.088	0.088	-	-	-
	(0.001)***	(0.001)***	-	-	-
Interaction between One Year Lag of Exogenous Noneconomic Events Doc. by Bloom (2009) and External Financial Dependence of Sector i	-	-	0.078	0.088	0.088
	-	-	(0.001)***	(0.001)***	(0.000)***
Annual Rate of Change in Industry's Average Wage	0.875	0.883	0.262	0.264	0.006
	(0.050)***	(0.051)***	(0.025)***	(0.025)***	-0.015
Annual Rate of Change in Industry's Cost of Capital	-0.018	-0.012	0.01	0.01	0.014
	(0.021)	(0.023)	(0.007)	(0.008)	(0.006)**
Annual Rate of Change in Value of Real Output	-0.178	-0.191	-0.083	-0.082	-0.027
	(0.026)***	(0.029)***	(0.010)***	(0.012)***	(0.008)***
Annual Rate of Change in Price of Materials	-0.491	-0.511	-0.124	-0.135	0.03
	(0.049)***	(0.052)***	(0.015)***	(0.016)***	(0.013)**
Annual Rate of Change in Price of Energy	0.316	0.321	0.083	0.086	0.002
	(0.029)***	(0.030)***	(0.009)***	(0.009)***	(0.017)
Industry Fixed Effects	No	Yes	No	Yes	Yes
Year Fixed Effects	No	No	No	No	Yes
Observations	19660	19660	19660	19660	19660
R-squared	0.05	0.05	0.03	0.04	0.53

Notes: (1) OLS results using annual data from NBER-CES data set for 1962-2005. (2) Exogenous Events Documented by Bloom(2009) are 16 events reported in Table 1. (3) Baa-Aaa spread refers to the difference of returns for Baa and Aaa-rated corporate bonds from Moody's. External Fianancial Dependence is the difference of capital expenditures and cash flows for the industries, generated by Rajan and Zingales (1998). The standard deviation of lag of annual change in Baa-Aaa spreads is 0.282 and median value of External Financial Dependence is 0.24. (4) Robust standard errors in parentheses clustered for within industry correlation. (5) * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 4a: The Correlation Between The Residuals in First Stage Regressions and Annual Rate of Change in Employment

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	Annual Rate of Change in Employment	Annual Rate of Change in Employment	Annual Rate of Change in Employment	Annual Rate of Change in Employment	Annual Rate of Change in Employment
Lag of Annual Percentage Points Change in Baa-Aaa Spread	-0.079	-0.077	-	-	-
	(0.006)***	(0.006)***	-	-	-
Interaction between Lag of Annual Percentage Points Change in Baa-Aaa Spread at t and External Financial Dependence of Sector i	-	-	-0.141	-0.162	-0.058
	-	-	(0.024)***	(0.018)***	(0.024)**
Residuals from the First Stage Regressions	0.079	0.077	0.137	0.161	0.057
	(0.006)***	(0.006)***	(0.025)***	(0.018)***	(0.024)**
Annual Rate of Change in Industry's Average Wage	-0.564	-0.559	-0.598	-0.586	-0.657
	(0.025)***	(0.025)***	(0.025)***	(0.025)***	(0.027)***
Annual Rate of Change in Industry's Cost of Capital	0.081	0.082	0.083	0.084	0.093
	(0.011)***	(0.010)***	(0.011)***	(0.010)***	(0.010)***
Annual Rate of Change in Value of Real Output	0.543	0.538	0.547	0.54	0.521
	(0.016)***	(0.014)***	(0.016)***	(0.014)***	(0.015)***
Annual Rate of Change in Price of Materials	0.188	0.159	0.204	0.174	0.137
	(0.020)***	(0.017)***	(0.019)***	(0.017)***	(0.019)***
Annual Rate of Change in Price of Energy	0.063	0.073	0.051	0.064	0.001
	(0.009)***	(0.008)***	(0.009)***	(0.008)***	(0.012)
Industry Fixed Effects	No	Yes	No	Yes	Yes
Year Fixed Effects	No	No	No	No	Yes
Observations	19660	19660	19660	19660	19660
R-squared	0.60	0.62	0.60	0.62	0.65

Notes: (1) OLS results using annual data from NBER-CES data set for 1962-2005. (2) Baa-Aaa spread refers to the difference of returns for Baa and Aaa-rated corporate bonds from Moody's. External Fianancial Dependence is the difference of capital expenditures and cash flows for the industries, generated by Rajan and Zingales (1998). The standard deviation of lag of annual change in Baa-Aaa spreads is 0.282 and median value of External Financial Dependence is 0.24. (3) Robust standard errors in parentheses clustered for within industry correlation. (4) * significant at 10%, ** significant at 5%, *** significant at 1%. (5) Residuals from the First Stage Regressions refer to the residuals in the corresponding columns of the Table 3a.

Table 4b: The Correlation Between The Residuals in First Stage Regressions and Annual Rate of Change in Employment

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	Annual Rate of Change in Employment	Annual Rate of Change in Employment	Annual Rate of Change in Employment	Annual Rate of Change in Employment	Annual Rate of Change in Employment
Lag of Annual Percentage Points Change in Baa-Aaa Spread	-0.107	-0.102	-	-	-
	(0.013)***	(0.012)***	-	-	-
Interaction between Lag of Annual Percentage Points Change in Baa-Aaa Spread at t and External Financial Dependence of Sector i	-	-	-0.206	-0.231	-0.104
	-	-	(0.042)***	(0.035)***	(0.050)**
Residuals from the First Stage Regressions	0.104	0.098	0.198	0.223	0.102
	(0.013)***	(0.013)***	(0.042)***	(0.035)***	(0.049)**
Annual Rate of Change in Industry's Average Wage	-0.537	-0.536	-0.58	-0.567	-0.657
	(0.027)***	(0.027)***	(0.027)***	(0.026)***	(0.027)***
Annual Rate of Change in Industry's Cost of Capital	0.08	0.081	0.083	0.085	0.093
	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.010)***
Annual Rate of Change in Value of Real Output	0.538	0.533	0.542	0.534	0.52
	(0.016)***	(0.014)***	(0.016)***	(0.014)***	(0.015)***
Annual Rate of Change in Price of Materials	0.177	0.149	0.198	0.167	0.138
	(0.019)***	(0.017)***	(0.019)***	(0.017)***	(0.019)***
Annual Rate of Change in Price of Energy	0.071	0.081	0.056	0.069	0.001
	(0.009)***	(0.009)***	(0.009)***	(0.008)***	(0.012)
Industry Fixed Effects	No	Yes	No	Yes	Yes
Year Fixed Effects	No	No	No	No	Yes
Observations	19660	19660	19660	19660	19660
R-squared	0.6	0.62	0.6	0.62	0.65

Notes: (1) OLS results using annual data from NBER-CES data set for 1962-2005. (2) Baa-Aaa spread refers to the difference of returns for Baa and Aaa-rated corporate bonds from Moody's. External Fianancial Dependence is the difference of capital expenditures and cash flows for the industries, generated by Rajan and Zingales (1998). The standard deviation of lag of annual change in Baa-Aaa spreads is 0.282 and median value of External Financial Dependence is 0.24. (3) Robust standard errors in parentheses clustered for within industry correlation. (4) * significant at 10%, ** significant at 5%, *** significant at 1%. (5) Residuals from the First Stage Regressions refer to the residuals in the corresponding columns of the Table 3b.

Table 5a: Determinants of Annual Rate Of Change In Industry's Employment - IV Results exogenous events documented by Bloom(2009)

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	Annual Rate of Change in Employment	Annual Rate of Change in Employment	Annual Rate of Change in Employment	Annual Rate of Change in Employment	Annual Rate of Change in Employment
Lag of Annual Percentage Points Change in Baa-Aaa Spread	-0.079	-0.077	-	-	-
	(0.006)***	(0.006)***	-	-	-
Interaction between Lag of Annual Percentage Points Change in Baa-Aaa Spread at t and External Financial Dependence of Sector i	-	-	-0.141	-0.162	-0.058
	-	-	(0.023)***	(0.018)***	(0.024)**
Annual Rate of Change in Industry's Average Wage	-0.564	-0.559	-0.598	-0.586	-0.657
	(0.026)***	(0.026)***	(0.025)***	(0.026)***	(0.027)***
Annual Rate of Change in Industry's Cost of Capital	0.081	0.082	0.083	0.084	0.093
	(0.011)***	(0.010)***	(0.011)***	(0.010)***	(0.010)***
Annual Rate of Change in Value of Real Output	0.543	0.538	0.547	0.54	0.521
	(0.016)***	(0.014)***	(0.016)***	(0.014)***	(0.015)***
Annual Rate of Change in Price of Materials	0.188	0.159	0.204	0.174	0.137
	(0.018)***	(0.016)***	(0.019)***	(0.017)***	(0.019)***
Annual Rate of Change in Price of Energy	0.063	0.073	0.051	0.064	0.001
	(0.009)***	(0.009)***	(0.009)***	(0.008)***	(0.012)
Industry Fixed Effects	No	Yes	No	Yes	Yes
Year Fixed Effects	No	No	No	No	Yes
Impact Factor %	-2.23	-2.17	-0.95	-1.10	-0.39
Kleibergen-Paap Wald rk F statistic	25000	23000	11000	53000	1800000
Observations	19660	19660	19660	19660	19660
R-squared	0.56	0.58	0.58	0.59	0.65

Notes: (1) IV results using annual data from NBER-CES data set for 1962-2005. (2) Baa-Aaa spread refers to the difference of returns for Baa and Aaa-rated corporate bonds from Moody's. External Fianancial Dependence is the difference of capital expenditures and cash flows for the industries, generated by Rajan and Zingales (1998). The standard deviation of lag of annual change in Baa-Aaa spreads is 0.282 and median value of External Financial Dependence is 0.24. (3) Robust standard errors in parentheses clustered for within industry correlation. (4) * significant at 10%, ** significant at 5%, *** significant at 1%. (5) Impact Factor for colums 1 and 2 refers to the impact of one standard deviation increase in lag of annual change of Baa-Aaa spreads on annual change of employment. Impact factor for columns 3-5 refers to the impact of one standard deviation increase in lag of annual change of Baa-Aaa spreads for the median level of External Financial Dependence on annual change of employment. (6) Instrument used in columns 1 and 2 is the one-year lagged value of index of 16 exogenous noneconomic events documented by Bloom (2009). Instrument used in columns 3-5 is the one-year lagged value of index of 16 exogenous events documented by Bloom (2009) interacted with External Financial Dependence measures of Rajan and Zingales (1998).

Table 5b: Determinants of Annual Rate Of Change In Industry's Employment - IV Results with Exogenous Non-economic Events Documented by Bloom (2009)

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	Annual Rate of Change in Employment	Annual Rate of Change in Employment	Annual Rate of Change in Employment	Annual Rate of Change in Employment	Annual Rate of Change in Employment
Lag of Annual Percentage Points Change in Baa-Aaa Spread	-0.107	-0.102	-	-	-
	(0.013)***	(0.013)***	-	-	-
Interaction between Lag of Annual Percentage Points Change in Baa-Aaa Spread at t and External Financial Dependence of Sector i	-	-	-0.206	-0.231	-0.104
	-	-	(0.042)***	(0.035)***	(0.050)**
Annual Rate of Change in Industry's Average Wage	-0.537	-0.536	-0.58	-0.567	-0.657
	(0.029)***	(0.029)***	(0.028)***	(0.028)***	(0.027)***
Annual Rate of Change in Industry's Cost of Capital	0.08	0.081	0.083	0.085	0.093
	(0.011)***	(0.010)***	(0.011)***	(0.011)***	(0.010)***
Annual Rate of Change in Value of Real Output	0.538	0.533	0.542	0.534	0.52
	(0.016)***	(0.014)***	(0.016)***	(0.014)***	(0.015)***
Annual Rate of Change in Price of Materials	0.177	0.149	0.198	0.167	0.138
	(0.018)***	(0.016)***	(0.018)***	(0.016)***	(0.019)***
Annual Rate of Change in Price of Energy	0.071	0.081	0.056	0.069	0.001
	(0.009)***	(0.009)***	(0.009)***	(0.008)***	(0.012)
Industry Fixed Effects	No	Yes	No	Yes	Yes
Year Fixed Effects	No	No	No	No	Yes
Impact Factor %	-3.02	-2.88	-1.39	-1.56	-0.70
Kleibergen-Paap Wald rk F statistic	6133	5628	12000	16000	240000
Observations	19660	19660	19660	19660	19660
R-squared	0.52	0.55	0.55	0.56	0.64

Notes: (1) IV results using annual data from NBER-CES data set for 1962-2005. (2) Baa-Aaa spread refers to the difference of returns for Baa and Aaa-rated corporate bonds from Moody's. External Fianancial Dependence is the difference of capital expenditures and cash flows for the industries, generated by Rajan and Zingales (1998). The standard deviation of lag of annual change in Baa-Aaa spreads is 0.282 and median value of External Financial Dependence is 0.24. (3) Robust standard errors in parentheses clustered for within industry correlation. (4) * significant at 10%, ** significant at 5%, *** significant at 1%. (5) Impact Factor for colums 1 and 2 refers to the impact of one standard deviation increase in lag of annual change of Baa-Aaa spreads on annual change of employment. Impact factor for columns 3-5 refers to the impact of one standard deviation increase in lag of annual change of Baa-Aaa spreads for the median level of External Financial Dependence on annual change of employment. (6) Instrument used in columns 1 and 2 is the one-year lagged value of index of 10 exogenous noneconomic events documented by Bloom (2009). Instrument used in columns 3-5 is the one-year lagged value of index of 10 exogenous noneconomic events documented by Bloom (2009) interacted with External Financial Dependence measures of Rajan and Zingales (1998).

Appendix Table 1: Variable Definitions

Variable Names	Definitions
Annual Rate of Change in Employment	The annual difference of logged employment. Source: NBER-CES.
Annual Rate of Change in Industry's Average Wage	The annual difference of logged nominal wages.Wages are defined as as nominal annual payroll divided by the number of workers for each sector. Source: NBER-CES.
Annual Rate of Change in Value of Real Output	The annual difference of logged real ouput where real output of sector is defined as nominal shipments of the sector divided by the shipments-price index of that sector. Source: NBER-CES.
Annual Rate of Change in Industry's Cost of Capital	The annual difference of logged cost of capital where cost of capital is defined as nominal value added per unit of real capital for each sector. Source: NBER-CES.
Annual Rate of Change in Price of Materials	The annual difference of logged nominal price index for materials for each sector. Source: NBER-CES.
Annual Rate of Change in Price of Energy	The annual difference of logged nominal price index for energy for each sector. Source: NBER-CES.
Baa Bond Rates	Annual average of Baa rated bond rates. Ex: 3 is used for 3%. Source: Moody's.
Aaa Bond Rates	Annual average of Aaa rated bond rates. Ex: 3 is used for 3%. Source: Moody's.
Annual Percentage Points Change in Baa-Aaa Spread	The annual difference of Baa and Aaa rated bond spreads. = (Baa-Aaa) at time (t) - (Baa-Aaa) at time (t-1).
External Financial Dependence Measure of Rajan and Zingales (1998)	External Financial Dependence measure for ISIC industries in the U.S. during the 1980s from Rajan and Zingales (1998, AER).
Exogenous Events Documented by Bloom (2009)	16 Exogenous events in the period of 1962-2005 documented by Bloom (2009, Econometrica). 10 are non-economic events and 6 are economic events. List is provided in Table 1.

Appendix Table 2: Summary Statistics of Main Variables in the Regressions for the period of 1962-2005

Variable Name	Obs	Mean	Median	Std. Dev.	Min	Max
Annual Rate of Change in Employment	19660	-0.008	-0.002	0.101	-0.894	0.976
Annual Rate of Change in Industry's Average Wage	19660	0.048	0.047	0.046	-0.334	0.802
Annual Rate of Change in Value of Real Output	19660	0.019	0.023	0.122	-1.139	1.536
Annual Rate of Change in Industry's Cost of Capital	19660	0.023	0.026	0.150	-2.775	1.731
Annual Rate of Change in Price of Materials	19660	0.033	0.023	0.059	-0.509	0.893
Annual Rate of Change in Price of Energy	19660	0.044	0.029	0.081	-1.527	0.931
Baa Rate	19660	9.087	8.563	2.689	4.828	16.113
Aaa Rate	19660	8.084	7.623	2.347	4.259	14.171
Baa-Aaa Spread	19660	1.003	0.920	0.405	0.373	2.326
Annual Change in Baa-Aaa Spread	19660	0.003	-0.032	0.282	-0.813	0.853
Lag of Annual Change in Baa-Aaa Spread	19660	0.001	-0.032	0.282	-0.813	0.853
External Financial Dependence Measure of Rajan and Zingales (1998)	19660	0.297	0.240	0.286	-0.450	1.490

Figure 1: Employment and Spreads in the U.S. 1962-2010

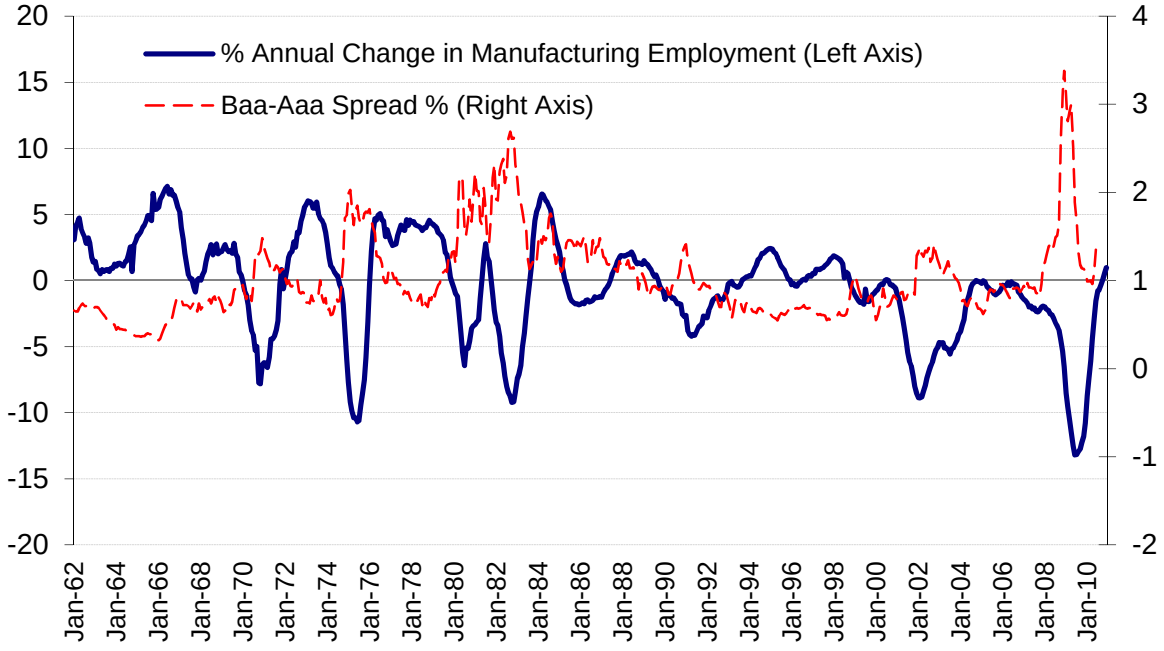


Figure 2a: All events of Bloom (2009) and Change in Spreads

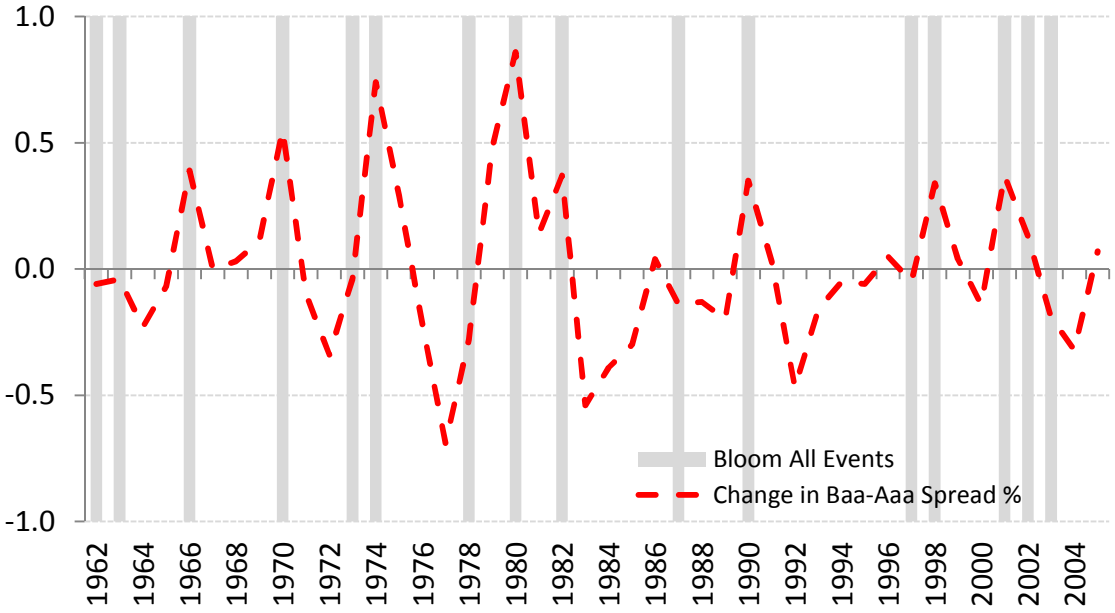


Figure 2b: Noeconomic events of Bloom (2009) and Change in Spreads

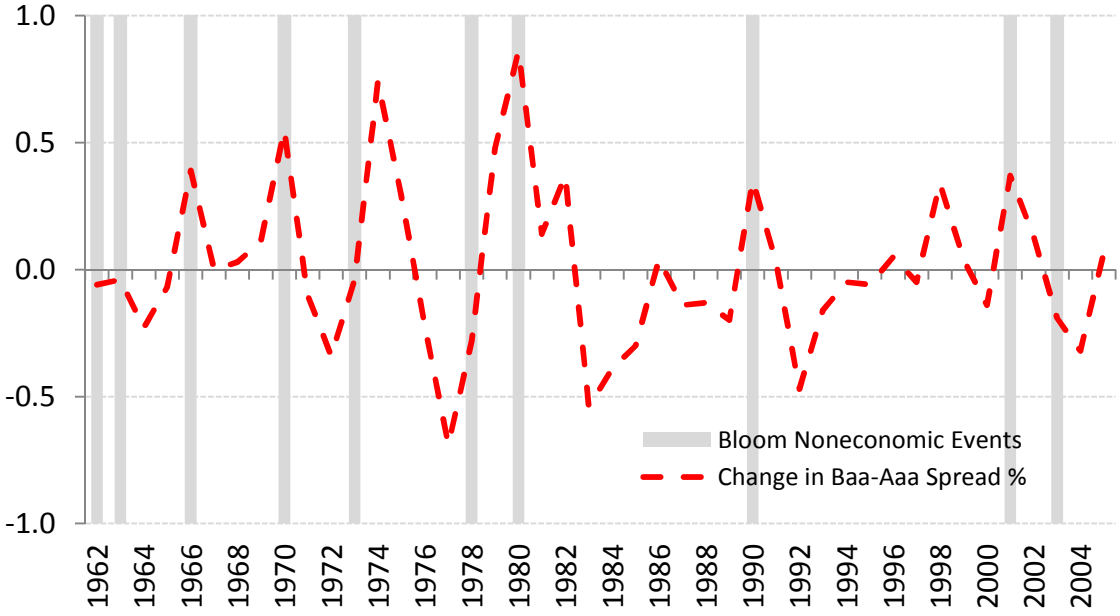
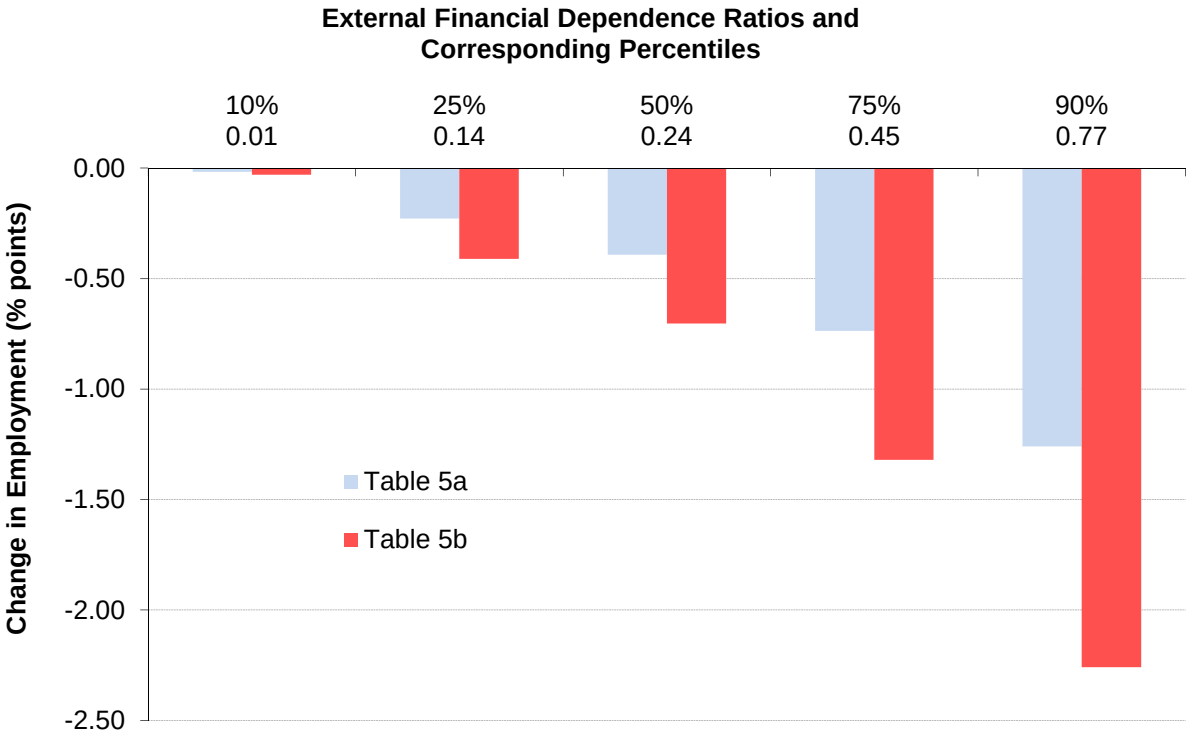


Figure 3: Impact Factor from Tables 5a and 5b



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