The Adjustment of Labor and Capital to Financial Constraints*

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Abstract

Financial market imperfections can have significant impact on employment decisions of firms. We illustrate the economic importance of this channel by demonstrating that the responsiveness of employment decisions to firms' financial health is much larger than the much-studied responsiveness of investment decisions to cash-flows. We use a simple model to show how adjustment costs to labor and capital in a world with credit market frictions gives rise to these patterns. Our empirical analysis suggests that financial constraints play a crucial role in firm-level employment decisions. In fact, financial constraints seem to affect labor more than capital.

JEL classification:

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Introduction

A large body of work by financial economists focuses on the impact of financial market imperfections on investment behavior. In this paper we argue that such imperfections should impact *both* factors of production – capital and labor – and hence analyze the effects of financial constraints on firm employment and investment decisions. We show empirically that similar to the vast literature on investment, firm employment is also sensitive to internal cash-flows, cash holdings and debt leverage. Moreover, the sensitivity of employment decisions to financial variables is much higher than the corresponding sensitivities of capital and investment. For example, the cash-flow sensitivity of employment is 0.713 compared to only 0.152 in the case of investment. We argue that labor is more responsive to financial constraints since it is likely to have lower adjustment costs than capital – and is therefore a relatively easier margin for firms to adjust. In doing so, this paper sheds new light on the adjustment of factors of production to financial constraints and on the crucial role that finance plays in firm-level employment decisions.

We begin by showing that even for firms that are not financially constrained the average change in employment within a firm is more cyclical than firm-level investment. We argue that the empirical regularities found in the data are consistent with a model in which adjustment costs for labor are lower than those for capital. Higher adjustment costs of capital stem from asset specificity which limits the ability of firms to sell-off excess capacity in bad times as well as from the time it takes to build additional capacity in good times. In contrast, human capital is on average less specific.

We then develop a simple price-theory model of a firm that must decide on how to adjust its factors of production – capital and labor – in the presence of financing constraints. We propose that the combination of limited internal funds and costly external finance will reduce employment for two reasons. First, when labor investment requires financing – i.e. when there is a mismatch between payments to labor and the ultimate generation of cash flow – increased financial constraints will naturally cause firms to reduce their workforce. Second, because capital investment requires financing, increased financial constraints will cause firms to disinvest, which, because of complementarities between labor and capital in production, will cause firms to reduce employment. Since the cost of external finance is counter-cyclical (e.g., Bernanke and Gertler 1995), financial constraints will amplify the variation in employment levels over the business cycle. In addition, we show that with adjustment costs being higher for capital than for labor, the sensitivity of employment to financial constraints will be larger than the sensitivity of investment. As such, financial constraints may therefore amplify the variation of employment over the business cycle more than they do for investment.

In order to empirically understand how financial constraints impact investment and employment decisions, we estimate the sensitivity of employment and investment to cash-flows as well as cash holdings and leverage. We find that in specifications that do not include firm fixed-effects the sensitivity of labor to cash flow is 0.469 after controlling for a battery of firm-level variables and industry and year fixed-effects. The estimates suggest that when financial constraints are binding the ability of firms to increase their labor force is constrained by the availability of internal funds. Likewise, we find that cash holdings is positively and statistically significant in explaining the change in the number of employees with a coefficient of 0.201. Moreover, our empirical tests enable us to compare the sensitivities of both employment and investment changes to cash flows and financial leverage. Using different measures of investment we find that the sensitivity of investment to cash flow is between 0.096 and 0.143. Including firm fixed-effects dramatically increase the point estimates. For example, the sensitivity of employment to cash flow is 0.713 and is 4.8 higher than the investment-cash flow sensitivity. Likewise, the effect of liquidity on changes in the number of employees is almost fourfold the effect of liquidity on changes in investment.

To alleviate concerns of endogeneity and measurement error, we then use several techniques previously employed in the investment-to-cash flow literature. In particular, we show that the sensitivities of the changes in the number of employees and investment to cash-flow are higher for firms that are more likely to be financially constrained. In addition, using the sorting/sample-splits approach we show that the sensitivity of both employment and investment are higher for firms with higher financial leverage. As predicted by our model and consistent with our previous results we find that the sensitivity to cash flows is much higher for labor than for investment.

We also follow the approach in Almeida et al. (2010) by using a 'maturing-debt' empirical strategy which exploits heterogeneity in the maturity of long-term debt across firms. Our empirical tests examine whether firms with long-term debt maturing in a particular year reduce their investment or labor force by more than their peers that do not face the need to refinance maturing long-term debt. We find a negative and statistically significant relation between the maturing long-term debt variable and the change in the number of firm employees. That is – consistent with the presence of financial frictions – when firms have a large amount of debt coming to maturity which needs to refinanced, part of their adjustment occurs through a reduction in their labor force. Moreover, similar to our previous results, the sensitivity of employment to maturing long-term debt is more significant both economically and statistically than the sensitivities of different measures of investment or capital.

Taken together, our findings are consistent with the view that finance is an important determinant of firm-level employment. Our results are also consistent with the notion that adjustment costs are higher for capital than for labor. The reason for this likely stems from capital being harder to redeploy across firms due to asset specificity (e.g., see Ramey and Shapiro (2002)). As financial constraints become binding, firms need to adjust both inputs – capital and labor. While most of prior research has focused on the effect of financial constraints on capital formation, our model and empirical results suggest that – in fact financial constraints seem to affect labor more than capital.

Our paper is related to several strands of literature. First, it is connected to the work that examines the impact of credit market imperfections and investment behavior (e.g., Fazzari, Hubbard and Petersen(1988), Hoshi, Kashyap and Scharfstein (1991), Whited (1992), Calomiris and Hubbard (1995), Gilchrist and Himmelberg (1995)). This work has evaluated the effect of financial health of the firm to variety of investments, such as inventories and R&D (Kashyap, Lamont and Stein (1994) and Hall (1992)), as well as labor hoarding (Sharpe (1994)). Our work broadens this literature by encompassing both factors of production – and by doing so, provides insights that allow us to see the role that finance may play in firm-level employment decisions. Our work also ties the relative sensitivities of these factors to financial health of the firm with the adjustment cost literature in macroeconomics (e.g., Caballero, Engel and Haltiwanger (1995), Abel and Eberly (1996), Hamermesh and Pfann (1996), Caballero and Eduardo (1999) and Hall (2002)). Finally, while most of our analysis is at the firm level, given the large magnitudes of the economic effects, our work also provides a starting point for trying to understand the role of firm level financial constraints in rationalizing changes in aggregate long-term unemployment and investment (see Hall (2010)).

The rest of the paper is organized in the following manner. Section 1 presents a simple price-theory model that analyzes the effects of financial constraints on employment and investment in the presence of financial constraints. Section 2 displays the data and summary statistics. Section 3 contains the empirical analysis of the relation between employment, investment and financial constraints. Section 4 concludes.

I. Model

Consider a firm which has a preexisting and exogenously given stock of K_0 units of capital and L_0 units of labor. At date 1, the firm must decide on the level of capital and labor it will employ to produce output, $F(K_0 + I_1, L_1)$. The production function F is concave and, for simplicity, the price of capital and labor is normalized to 1.[1] Following Kaplan and Zingales (1997), the firm has initial wealth of W, but can raise external finance $e = I_1 + L_1 - W$ at a cost of $\frac{1}{2}\theta(I_1 + L_1 - W)^2$.Further, we assume that the firm faces adjustment costs in capital and labor given by $\frac{1}{2}\mu_K I_1^2$ and $\frac{1}{2}\mu_L(L_1 - L_0)^2$, respectively, where both μ_K and μ_L are positive. Following prior literature (see e.g. Hamermesh and Pfann (1996) and Hall (2002)), we will assume that labor adjustment costs are smaller than capital adjustment costs: $\mu_L < \mu_K$.

Combining these assumptions together, we have that the firm faces a static one-period problem in which it maximizes:

$$\max_{I_1, L_1} F(K_0 + I_1, L_1) - I_1 - L_1 - \frac{1}{2}\theta e^2 - \frac{1}{2}\mu_K I_1^2 - \frac{1}{2}\mu_L(L_1 - L_0)^2 \tag{1}$$

where $I_1 + L_1 \leq w + e$. Since F is concave, (1) is a concave problem with a unique solution. Further, as is common, we will assume that $F_{KL} \geq 0$ so that labor and capital are (weakly) complementary. Finally, for simplicity, we assume that the firm's level of wealth is sufficiently small so that in the optimal solution the firm raises a strictly positive amount of external finance.

Before we solve the model it is useful to note that in the current formulation we are implicitly assuming that labor expenditures must be financed by the firm. Put differently, there is a timing mismatch, and in particular a lag, between payments made to labor and ultimate revenue collection. Similar to capital, then, labor in our model features investment component. Clearly, this assumption may be a better fit for some industries than for others.[2]

[1] Note that the model is in partial equilibrium as the prices of the factors of production are exogenously given. Our main results continue to hold if wages are downward rigid.

[2] The assumption that labor has an investment component is not necessary to obtain the result that costly external finance will affect firms' labor decisions. For example, in a world of labor adjustment costs, the need to finance ongoing losses in the face of temporary negative demand shocks will tend to reduce firm employment levels. This is the subject of ongoing research.

A. The impact of internal wealth and financial constraints on investment and labor

We begin by analyzing how the optimal level of capital investment and labor expenditures vary with the level of the firm's internal wealth W and the degree of financial constraints θ. To solve (1) we calculate the first order conditions:

$$\partial I_1 \; : \; F_K(K_0 + I_1^*, L_1^*) - 1 - \theta(I_1^* + L_1^* - W) - \mu_K I_1^* = 0 \tag{2}$$

$$\partial L_1 \; : \; F_L(K_0 + I_1^*, L_1^*) - 1 - \theta(I_1^* + L_1^* - W) - \mu_L (L_1^* - L_0) = 0. \tag{3}$$

Differentiating the first order conditions with respect to W_1 we obtain:

$$\begin{aligned} F_{KK}(K_0 + I_1^*, L_1^*)\frac{\partial I_1^*}{\partial W} + F_{KL}(K_0 + I_1^*, L_1^*)\frac{\partial L_1^*}{\partial W} - \theta(\frac{\partial I_1^*}{\partial W} + \frac{\partial L_1^*}{\partial W} - 1) - \mu_K \frac{\partial I_1^*}{\partial W} &= 0 \\ F_{KL}(K_0 + I_1^*, L_1^*)\frac{\partial I_1^*}{\partial W} + F_{LL}(K_0 + I_1^*, L_1^*)\frac{\partial L_1^*}{\partial W} - \theta(\frac{\partial I_1^*}{\partial W} + \frac{\partial L_1^*}{\partial W} - 1) - \mu_L \frac{\partial I_1^*}{\partial W} &= 0 \end{aligned} \tag{4}$$

To simplify notation we will use $F_{KK}^* \equiv F_{KK}(K_0 + I_1^*, L_1^*)$, $F_{KL}^* \equiv F_{KL}(K_0 + I_1^*, L_1^*)$, and $F_{LL}^* \equiv F_{LL}(K_0 + I_1^*, L_1^*)$. We can then rewrite the system in (4) as:

$$\mathbf{H}\begin{pmatrix} \frac{\partial I_1^*}{\partial W} \\ \frac{\partial L_1^*}{\partial W} \end{pmatrix} = -\theta \begin{pmatrix} 1 \\ 1 \end{pmatrix} \tag{5}$$

$$\mathbf{H} = \begin{pmatrix} F_{KK}^* - \theta - \mu_K & F_{KL}^* - \theta \\ F_{KL}^* - \theta & F_{LL}^* - \theta - \mu_L \end{pmatrix}. \tag{6}$$

Note that $\mathbf{H}$ is the Hessian of (1) evaluated at the optimum. Inverting the Hessian matrix provides the solution for $\frac{\partial I_1^*}{\partial W}$ and $\frac{\partial L_1^*}{\partial W}$, the partial derivative of the optimal levels of investment and labor with respect to the initial level of wealth, W.[3] This is given by:

$$\begin{pmatrix} \frac{\partial I_1^*}{\partial W} \\ \frac{\partial L_1^*}{\partial W} \end{pmatrix} = -\frac{\theta}{\Delta}\begin{pmatrix} F_{LL}^* - \mu_L - F_{KL}^* \\ F_{KK}^* - \mu_K - F_{KL}^* \end{pmatrix} \tag{7}$$

$$where\, \Delta = \det(\mathbf{H}). \tag{8}$$

This leads to our first proposition:

Proposition 1: Assume that in the optimal solution the firm raises a strictly positive amount of external finance $e = I_1 - L_1 - W$. Then $\frac{\partial I_1^*}{\partial W} > 0$ and $\frac{\partial L_1^*}{\partial W} > 0$.

Proof: The determinant of the Hessian satisfies $\Delta = \lambda_1 \lambda_2$ where λ_1 and λ_2 are the eigenvalues of $\mathbf{H}$. Under our assumptions, (1) is a strictly concave program which implies that $\mathbf{H}$ is negative definite,

[3] The second order conditions are guaranteed to hold due to the concavity of the problem.

meaning that both λ_1 and λ_2 are negative. Therefore, Δ is strictly positive. The proposition is then a direct result of the fact that $\theta > 0$ and $F^*_{KK} < 0$, $F^*_{LL} < 0$, and $F^*_{KL} \geq 0$.

Proposition 1 is quite intuitive: if the firm is financially constrained in that it relies, at least in part, on external financing, an exogenous increase in firm wealth will allow it to increase both investment and labor expenditures.

Using similar arguments, it is easy to show:

Proposition 2: Assume that in the optimal solution the firm raises a strictly positive amount of external finance $e = I_1 - L_1 - W$. Then $\frac{\partial I_1^*}{\partial \theta} < 0$ and $\frac{\partial L_1^*}{\partial \theta} < 0$. Further, $sign(\frac{\partial L_1^*}{\partial \mu_L}) = sign(L_0 - L_1^*)$ and $sign(\frac{\partial I_1^*}{\partial \mu_L}) = sign[(L_1^* - L_0)(\theta - F^*_{KL})$.

Proof: First consider the comparative statics with respect to θ. Differentiating the first order condition (3) with respect to θ we obtain

$$\begin{aligned} F^*_{KK}\frac{\partial I_1^*}{\partial \theta} + F^*_{KL}\frac{\partial L_1^*}{\partial \theta} - (I_1^* + L_1^* - W) - \theta(\frac{\partial I_1^*}{\partial \theta} + \frac{\partial L_1^*}{\partial \theta}) - \mu_K\frac{\partial I_1^*}{\partial \theta} &= 0 \\ F^*_{KL}\frac{\partial I_1^*}{\partial \theta} + F^*_{LL}\frac{\partial L_1^*}{\partial \theta} - (I_1^* + L_1^* - W) - \theta(\frac{\partial I_1^*}{\partial \theta} + \frac{\partial L_1^*}{\partial \theta}) - \mu_L\frac{\partial I_1^*}{\partial \theta} &= 0 \end{aligned}$$

In matrix notation we thus have:

$$\mathbf{x}^*_\theta := \begin{pmatrix} \frac{\partial I_1^*}{\partial \theta} \\ \frac{\partial L_1^*}{\partial \theta} \end{pmatrix} = (I + L_1^* - W)\mathbf{H}^{-1}\begin{pmatrix} 1 \\ 1 \end{pmatrix}. \tag{9}$$

The proof then continues identically to that of Proposition 1. The comparative statics with respect to μ_L are proven in a similar manner by differentiating the first order conditions by μ_L.

Proposition 2 states that if the firm is financially constrained, an increase in the cost of external finance – i.e. an increase in θ – will reduce the optimal level of both investment and labor expenditures, as is intuitive. To understand the comparative statics with respect to μ_L note that when the optimal level of production calls for a reduction in the labor force, i.e. $L_1^* < L_0$, increases in labor adjustment costs make it more costly to adjust labor downward. Thus, an in increase in μ_L will tend to increase the optimal labor force. In contrast, when $L_1^* > L_0$, increases in μ_L will make it more costly to adjust the labor force upwards, and hence will reduce the optimal level of labor.

Consider now the effect of μ_L on I_1^*, first for the case of no complementarities – i.e. when $F_{KL} = 0$. Assuming that $L_1^* < L_0$, an increase in μ_L will increase the optimal level of labor L_1^*. Since this increase must be financed externally, the marginal cost of raising capital for investment into capital will increase. Hence, as stated in the proposition, the optimal level of investment, I_1^*, will decrease. Add now to the firm's calculus complementarities between capital and labor. The increase in labor stemming from the increase in μ_L will now increase the marginal productivity of capital due the complementarities in the production function. There are thus two opposing forces affecting capital investment. On the one hand the marginal productivity of investment increases when μ_L increases, but on the other, financing increased investment becomes more costly. As the proposition states, investment will increase, i.e. when the first effect dominates the second, $\frac{\partial I_1^*}{\partial \mu_L} > 0$ when $F_{KL}^* > \theta$.

B. The impact of financial constraints on the relative sensitivity of capital and labor to wealth

We continue by investigating the relative magnitudes of $\frac{\partial I_1^*}{\partial W}$ and $\frac{\partial L_1^*}{\partial W}$. We are interested in the conditions under which labor is more responsive than investment to variations in firm internal wealth, W. Defining the ratio of the sensitivities of labor and investment to wealth by:

$$r := \frac{\frac{\partial L_1^*}{\partial W}}{\frac{\partial I_1^*}{\partial W}} \tag{10}$$

$$= \frac{(F_{KK}^* - \mu_K) - F_{KL}^*}{(F_{LL}^* - \mu_L) - F_{KL}^*}, \tag{11}$$

we have:

Proposition 3: In the optimal solution, labor is more sensitive than capital to variations in wealth – i.e. $\frac{\partial L_1^*}{\partial W} > \frac{\partial I_1^*}{\partial W}$ – when

$$F_{LL}^* - F_{KK}^* > \mu_L - \mu_K. \tag{12}$$

Proposition 3 is quite intuitive. Assuming no adjustment costs, this condition simplifies to $F_{LL}^* > F_{KK}^*$, or equivalently, due to the negativity of the second derivatives of F , to $|F_{LL}^*| < |F_{KK}^*|$. Thus, the firm will adjust more on the labor margin than the capital margin when the diminishing returns to labor are smaller than those to capital. Put differently, if the benefits of labor present less curvature than the benefits of capital, labor adjustment will be easier. The right hand side of (12) simply corrects for the differential adjustment costs of labor and capital. Below, we provide a sufficient condition for (12) to hold for the case of a Cobb-Douglas production function.

Consider now how the ratio of sensitives to wealth, $r = \frac{\frac{\partial L_1^*}{\partial W}}{\frac{\partial I_1^*}{\partial W}}$, varies with variation in the degree of financial constraints, θ. Note that although θ does not appear explicitly in (11), it does appear implicitly in that the partial derivatives are all calculated at the optimal points I_1^* and L_1^*, which according to Proposition 2, decrease in θ. The following proposition provides a sufficient condition for r to be increasing in θ:

Proposition 4: The ratio of sensitivities $r = \frac{\frac{\partial L_1^*}{\partial W}}{\frac{\partial I_1^*}{\partial W}}$ is increasing in the severity of financial constraints, θ, when the matrix

$$\mathbf{C} = \begin{pmatrix} F^*_{KKK} - F^*_{KKL} & F^*_{KKL} - F^*_{KLL} \\ F^*_{KKL} - F^*_{KLL} & F^*_{KLL} - F^*_{LLL} \end{pmatrix}$$

is positive definite.

Proof: From (11) we can calculate

$$\begin{aligned} sign\left(\frac{\partial r}{\partial \theta}\right) &= sign\left\{\begin{pmatrix} A \\ B \end{pmatrix}^T \begin{pmatrix} \frac{\partial I_1^*}{\partial \theta} \\ \frac{\partial L_1^*}{\partial \theta} \end{pmatrix}\right\} \\ A &= (F^*_{LL} - \mu_L - F^*_{KL})(F^*_{KKK} - F^*_{KKL}) \\ &\quad -(F^*_{KK} - \mu_K - F^*_{KL})(F^*_{KLL} - F^*_{KKL}) \\ B &= (F^*_{LL} - \mu_L - F^*_{KL})(F^*_{KKL} - F^*_{KLL}) \\ &\quad -(F^*_{KK} - \mu_K - F^*_{KL})(F^*_{LLL} - F^*_{KLL}) \end{aligned} \tag{13}$$

From the form of $\mathbf{H}^{-1}$ and from (9) we obtain:

$$\begin{pmatrix} A \\ B \end{pmatrix}^T \begin{pmatrix} \frac{\partial I_1^*}{\partial \theta} \\ \frac{\partial L_1^*}{\partial \theta} \end{pmatrix} = \Delta(I_1^* + L_1^* - W)\begin{pmatrix} 1 \\ 1 \end{pmatrix}^T \mathbf{H}^{-1}\mathbf{C}'\mathbf{H}^{-1}\begin{pmatrix} 1 \\ 1 \end{pmatrix} \tag{14}$$

$$where\ \mathbf{C} = \begin{pmatrix} F^*_{KKK} - F^*_{KKL} & F^*_{KKL} - F^*_{KLL} \\ F^*_{KKL} - F^*_{KLL} & F^*_{KLL} - F^*_{LLL} \end{pmatrix}. \tag{15}$$

The proposition then follows from the fact that both Δ and $I_1^* + L_1^* - W$ are positive.

To gain intuition for Proposition 4 it is useful to consider the case where there are no complementarities between capital and labor. When this occurs, Proposition 4 states that a sufficient condition for $\frac{\partial r}{\partial \theta}$ to be positive is that $\begin{pmatrix} F^*_{KKK} & 0 \\ 0 & -F^*_{LLL} \end{pmatrix}$ is positive definite, which occurs if and only if $F^*_{KKK} > 0$ and $F^*_{LLL} < 0$. Following the intuition of the theoretical argument in Kaplan and Zingales (1997), the impact of financial constraints on the relative sensitivity of capital and labor to wealth depends on the sign of the third derivative of the production function. In particular, as in Kaplan and Zingales (1997), when $F^*_{KKK} > 0$ and $F^*_{LLL} < 0$, then $\frac{\partial^2 L_1^*}{\partial W^2} > 0$ while $\frac{\partial^2 K_1^*}{\partial W^2} < 0$ which of course implies that $\frac{\partial r}{\partial \theta}$ will be increasing in θ. [4] More generally, once complementarities between capital and labor are reintroduced, Proposition 4 shows that third-order cross-partial derivatives become important in determining whether r is monotonic in financial constraints, θ, as shown in the formula of the matrix $\mathbf{C}$.

[4] These inequalities rely on the assumption that the cost of external finance is quadratic.

C. The impact of labor adjustment costs on the relative sensitivity of capital and labor to wealth

We turn now to analyzing the impact of labor adjustment costs, μ_L, on the relative sensitivity of capital and labor to firm wealth. Following the lines of Proposition 4 we show

Proposition 5: For the ratio of wealth sensitivities $r = \frac{\frac{\partial L_1^*}{\partial W}}{\frac{\partial I_1^*}{\partial W}}$, we have

$$sign\left(\frac{\partial r}{\partial \mu_L}\right) = sign\left(\Delta \begin{pmatrix} 1 \\ 1 \end{pmatrix}^T \mathbf{H}^{-1}\mathbf{C}'\mathbf{H}^{-1}\begin{pmatrix} 0 \\ L_1^* - L_0 \end{pmatrix} + \Delta \begin{pmatrix} 1 \\ 1 \end{pmatrix}^T \mathbf{H}^{-1}\begin{pmatrix} 0 \\ 1 \end{pmatrix}\right).$$

However, for the special case of no complementarity between labor and capital, if $\mathbf{C}$ is positive definite then $sign\left(\frac{dr}{d\mu_L}\right) = sign(L_1^* - L_0)$.

Proof: In the Appendix.

To understand proposition 5, consider the simplifying case where there is no complementarity between labor and capital. When the optimal level of production calls for a reduction in the labor force, i.e. $L_1^* < L_0$, increases in μ_L will tend to increase the optimal labor force, as it is now more costly to adjust labor downward.that when $L_1^* < L_0$, increases in labor adjustment costs are similar to reductions in the cost of external financial, θ. As such, along the lines of Proposition 4, when $\mathbf{C}$ is positive definite, increases in labor adjustment costs will reduce the relative sensitivity of capital and labor to wealth.

In contrast, when optimal level of production calls for an increase in the labor force, i.e. $L_1^* \geq L_0$, increases in μ_L will tend to reduce the optimal labor force, as it is now more costly to adjust labor upward. Thus, increases in μ_L have a similar effect as increases in the cost of external finance. Along the lines of proposition 4 then, when $\mathbf{C}$ is positive definite, increases in labor adjustment costs will increase the relative sensitivity of capital and labor to wealth.

D. The Cobb-Douglas production function case

Proposition 3 shows that for a general production function we cannot unambiguously state that labor is more sensitive than capital to variation in wealth. For the case of a Cobb-Douglas production function, we have the following proposition:

Proposition 6: Assume that production is given by $F(K, L) = AK^\alpha L^\beta$. If production is labor intensive in that $\beta \geq \alpha$, then for sufficiently small μ_L, we have that $\frac{\partial L_1^*}{\partial W} > \frac{\partial I_1^*}{\partial W}$.

Proof: In the Appendix.

The intuition of Proposition 6 is as follows. If labor adjustment costs are sufficiently low, when the firm needs to adjust its factors of production due to a reduction in internal wealth, W, it will prefer to do so along the labor margin. The condition that $\beta \geq \alpha$guaraantees that at optimal point, curvature of production with respect to labor is smaller than that with respect to capital, i.e. that $|F_{LL}^*| < |F_{KK}^*|$ as described in Proposition 3.

From Proposition 4 we know that the impact of financial constraints on the relative sensitivity of capital and labor to firm wealth depends on third order derivatives of the production function. As the following proposition shows, for the special case of a Cobb-Douglas production function, we cannot unambiguously sign $\frac{\partial r}{\partial \theta}$.

Proposition 7: Assume that production is given by $F(K, L) = AK^{\alpha}L^{\beta}$. We have that the matrix $\mathbf{C}$ given in Proposition 4 is neither positive nor negative definite. Thus, the sign of $\frac{\partial r}{\partial \theta}$ depends on the particular values chosen for the parameters.

Proof: If production is Cobb-Douglas with $0 < \alpha, \beta < 1$, then $F_{KKK} > 0$, $F_{LLL} > 0$, $F_{KKL} < 0$ and $F_{KLL} < 0$. It then follows that $0 > \det(\mathbf{C}) = \lambda_1\lambda_2 \Rightarrow sign(\lambda_1) = -sign(\lambda_2)$.

Since the relation between the ratio of capital and labor wealth sensitivities to financial constraints cannot be unambiguously signed, we solve the firm's maximization problem (1) numerically and graph $r = \frac{\frac{\partial L_1^*}{\partial W}}{\frac{\partial I_1^*}{\partial W}}$ as a function of θ and μ_L .This can be seen in Figure 1.

As can be seen, r, the relative magnitude of labor and capital wealth sensitivities, is a non-monotonic function of θ as predicted in Proposition 7. To see this better, Figure 2 plots r on θ for various values of μ_L between 0.1 and 2.9 (where μ_K is fixed at 3).

As the figure shows, the effect of the cost of external finance (θ) on the relative magnitude of labor and capital wealth sensitivities, r, depends on the size of the adjustment costs. For low adjustment costs (up to approximately $\mu_L = 0.6$), increases in the cost of external finance decrease the relative magnitude of the labor-wealth sensitivity as compared to the capital-wealth sensitivity. In contrast, beyond a certain threshold of labor adjustment cost (above $\mu_L = 0.6$), increases in the cost of external finance magnify the relative sensitivity of labor to wealth as compared to the sensitivity of capital to wealth.

Consider now the effect of increases in labor adjustment costs on the relative sensitivity of labor and capital to wealth, holding the cost of external finance constant. This is shown Figure 3. As can be seen, holding constant the cost of external finance, decreases in labor adjustment costs increase the sensitivity of labor to wealth as compared to the sensitivity of capital to wealth. This is intuitive: as labor adjustment costs decrease, the firm will adjust more along the labor margin than the capital margin in response to a reduction in wealth.

II. Data and Summary Statistics

Our main data is the Compustat Annual Industrial Files. We use these files to collect information on all non-financial firms between 1970 and 2009 with non-missing observations for the different dependent and independent variables in the analysis. In addition to balance sheet and income statement information, Compustat also reports the number of workers employed by a firm. We define a number of dependent variables to be used in the empirical analysis. First, we calculate the annual change in the number of employees at the firm level. Further, we calculate percent changes in a number of variables of interest. In particular, we calculate the yearly percentage change for (i) number of employees, (ii) investment (capital expenditure), (iii) property plant and equipment and (iv) inventories using the first difference in the logarithms of the dependent variable. To construct our sample we eliminate firms with less than 1,000 employees and, additionally, winsorize all variables by removing outliers at the 1st and 99th percentiles. This results in a sample of 42,017 firm-year observations. All dollar figures are adjusted for inflation using the Consumer Product Index before calculating ratios or percentage changes.

Table 1 reports descriptive statistics on the characteristics of the firms in our sample. The first four lines present summary statistics of our main dependent variables. As the table shows, the mean annual percentage change in the number of employees, $\%\Delta$ *employees*, is 3.3% (median=1.7%) and ranges from -76.0% to 84.1%. The mean percentage change in investment, $\%\Delta$ *investment*, is 0.241%, while the mean percentage changes in property plant & equipment $\%\Delta$ *PP&E* and inventories $\%\Delta$ *inventories* are 2.1% and 0.267%, respectively. We also supplement our analysis with the analysis of the level of investment (measured as investment scaled by beginning of the period assets) or I/K. We report the summary statistics for scaled investment and obtain similar numbers to those found in studies of investment and financial constraints (see e.g., Rauh (2006)).

It is worth noting that the annual percentage change in the number of firm employees is significantly more volatile than the corresponding change in either investment, property plant and equipment, or inventories. As can be seen in the table, the standard deviation of $\%\Delta$ *employees* is 23.0% which is more than four time higher than the standard deviation of the annual changes of the other main dependent variables. This higher volatility of the change in employment compared to the volatility of change in investment is consistent with our notion of lower costs of adjustment for labor relative to costs of capital. While our focus will be to assess how these relative volatilities respond to financial constraints, it is worth stressing that if adjustment costs for labor are lower than those for capital, than even in the absence of financial constraints a decline in the demand for factors of production may result in labor being more volatile than capital.

The reminder of Table 1 provides descriptive statistics on the explanatory variables used in the analysis. We include in all of our regressions variables that pertain to firm size (in logs), Tobin's Q, leverage, liquidity (measured as cash and marketable securities scaled by assets), asset maturity, profitability, a dummy for whether the firm has a credit rating, and a measure of Total Factor Productivity (TFP) at the 4-digit SIC level. Appendix A provides detailed information on the definitions of the variables used in the paper, their construction, and their data sources.

III. Empirical Analysis

A. Employment and Investment Cash-flow Sensitivities

In this section we study the sensitivity of employment and investment decisions of firms to their cash flows. Similar to other studies in the literature (see e.g., Fazzari et al (1998), Rauh (2006)), we estimate different variants of the following regressions:

$$Y_{it} = \alpha + \beta_p \times Profitability_{it} + \mathbf{X}_{it-1}\lambda + \mathbf{y}_t\theta + \mathbf{z}_i\psi + \epsilon_{it}, \qquad (16)$$

where Y_{it} is one of our four dependent variables: $\%\Delta employees$, $\%\Delta investment$, $Investment/Assets_{t-1}$, or $\%\Delta PP\&E$. $\mathbf{X}_{it-1}$ is a vector of firm specific control variables which include lagged values of the firm market-to-book ratio, firm internal liquidity ($Liquidity_{it-1}$), the log of the book value of firm assets, firm leverage, asset maturity, profitability, and the credit rating dummy. All regressions include year fixed effects, $\mathbf{y}_t$, to account for changing macroeconomic conditions. In addition, we account for unobserved industry- or firm- level time invariant heterogeneity by including either four-digit SIC fixed effects or firm fixed effects, denoted by the variable $\mathbf{z}$. All regressions are estimated with heteroscedasticity robust standard errors which are clustered by firm.

The main focus of our analysis is on the sensitivity of the different dependent variables to $Profitability_{it}$ or cash flows which we measure, following standard literature practice, as operating income divided by beginning of period assets. As argued by Fazzari et al (1998) (henceforth FHP), a neo-classical model of investment with perfect capital markets implies that the coefficient of cash flow – β_p in specification 16 – should be zero. In contrast, a positive and significant coefficient implies that some firms face financial constraints due to limited access to external financing and hence must rely on internal cash flows.

The FHP approach has been subject to criticism based on either the endogeneity of the main explanatory variables – that is, cash flows are capturing investment opportunities not captured fully by Q – or on theoretical grounds (see for example, Poterba (1988), Kaplan and Zingales (1997) and Stein (2003)). While these criticisms could be potentially important for us as well, it is worth emphasizing that our focus is on evaluating the differential predictive power of profitability for variation in labor as compared to capital investment, and how this differential predictive power depends on the degree of financial constraints of the firm. Put differently, we are interested not just in the level of β_p, but on how this coefficient varies depending on whether the dependent variable is capital or labor related. A priori, it is not clear what the critiques of the FHP approach imply regarding the relative magnitudes of the sensitivity of labor and capital to cash flow. We return to this issue below in discussing the relative sizes of β_p for capital and labor regressions.

We report the results from estimating different variants of regression 16 in Table 2. Each column in the table displays the estimates from a separate regression. The first four columns include 4-digit SIC fixed-effects while the last 4 columns include firm fixed-effects. We use the same set of control variables in all regressions as well as year fixed-effects. Standard errors are clustered by firm. As can be seen, Column 1 of Table 2 documents a positive and statistically significant relation between the percentage change in number of employees and profitability. The coefficient on profitability, β_p, is 0.469 and is statistically significant at the one percent level, controlling for a battery of firm variables and industry and year fixed-effects. A positive β_p suggests that when financial constraints are binding, the ability of a firm to increase its labor force is constrained by the availability of internal funds. The magnitude of the β_p coefficient implies that a one standard deviation increase in profitability is associated with a 14% change in the number of employees. This represents approximately two-thirds of the standard deviation of the unconditional percentage change in the number of employees. While this magnitude should be taken with caution – given the concerns about omitted variables pointed earlier and the potential endogeneity of profitability – we note that the specification controls for lagged values of market-to-book ratio, firm internal liquidity, size, leverage and asset maturity.

Turning to the other control variables, we find that the change in the number of employees is, as expected, positively related to the market-to-book ratio and to firms with longer-lived assets. Other measures of the firm's finances are consistent with the positive relation between profitability and the change in number of employees. We find that liquidity is positively and statistically significant in explaining the change in the number of employees (coefficient=0.201 and is statistically significant at the 1 percent level). Likewise, similar to the results in Calomiris, Orphanides, and Sharpe (1994) and Sharpe (1994), we find that the coefficient of leverage is negative and significant.

Taken together, these findings are consistent with the view that financial constraints are potentially an important determinant of firm-level employment decision. However, given the concerns about the endogeneity of profitability (liquidity and leverage) and the economic opportunities available, we are cautious at this stage in arguing for a causal link between financial measures and employment.

Columns 2 to 4 of Table 2 present results of a specification similar to that of Column 1, but use investment related dependent variables rather than an employment dependent variable. We employ different measures to capture investment changes at the firm level: the percentage change of investment, investment scaled by assets, and the percentage change in capital measured by property plant and equipment. These regressions are similar in their specification to those that have been employed in the vast investment-to-cashflow literature (See for example, Baker, Stein and Wurgler (2003), Fazzari et al. (1988), Rauh (2006)). Indeed, the point estimates of β_p are similar to those found in prior work: our estimates are between 0.096 (when using $\%\Delta investment$ as the dependent variable) and 0.143 (when using $Investment/Assets_{t-1}$ as the dependent variable). These are very close to Rauh's (2006) estimate of 0.111 or Baker, Stein, and Wurgler (2003) estimates that vary between 0.110 and 0.145.[5]

Taken together, Columns 1 through 4 of Table 2 present a comparison between the sensitivities of employment and investment changes to variation in cash flows.This comparison plainly shows that labor is far more sensitive to cash flow than is investment. Focusing on β_p in Columns 1 and 2, we find that the percent change in labor is over 4.5 times more sensitive to profitability than is the percent change in capital investment. Similarly, when using the level of investment scaled by assets (Column 3) or the percent change in PP&E (Column 4) as dependent variables, labor is between 3.3 and 4.2 times more sensitive to profitability than is capital.

[5]See Rauh (2006) p. 53 Table 2, and Baker, Stein, and Wurgler p. 987 Table 3.

While the first four columns of Table 2 include industry fixed effects, we use firm-fixed effects in the last four columns of the table. As can be seen, the inclusion of firm fixed effects increase the point estimates of the coefficients on profitability and slightly strengthen the result that labor is more sensitive to cash flow than is capital. In particular, as can be seen in the fifth column of Table 2, β_p is now 0.713 (significant at the one percent level) in the employee percent change regression, representing a sensitivity to profitability which is 4.8 times higher than the sensitivity of capital to profitability in Columns 6-8. Focusing on firm internal liquidity or leverage rather than firm profitability reveals a similar result: labor is more sensitive than capital to variation in both liquidity and firm leverage. Controlling for firm fixed-effects, the relation between liquidity and the percent change in the number of employees is almost fourfold the relation between liquidity and changes in investment. Similarly, leverage exhibits a negative relation with employment that is twice as large as its relation with investment or capital.

Our results thus far are consistent with the notion of adjustment costs being larger for capital than for labor as argued by (e.g., Hamermesh and Pfann (1996); Ramey and Shaprio (2002); Hall (2002) and Cooper and Haltiwanger (2006)). Adjusting labor in response to shifts in underlying economic conditions – such as variation in product market demand, is thought to be easier than adjusting capital levels. For example, capital may be harder to redeploy across firms due to the specificity of assets. In contrast, to the extent that labor skills are transferable across firms, labor adjustment costs will tend to be lower. The differential adjustment cost between labor and capital will feed into firms' calculus of how to respond to binding financial constraints. As financial constraints tighten, firms will adjust both factors of production – capital and labor. Lower adjustment costs of labor imply then that this factor of production is the more flexible of the two and hence is the factor that is more sensitive to variation in cash flow. While most prior research has focused on the effect of financial constraints on capital formation, our model and empirical results suggest that financial constraints may have a significantly larger impact on labor and employment.

At this point, it is useful to return to the critique of Fazzari et al. and discuss how it applies to the results presented here. Along the lines of this critique, one potential explanation for the finding that labor is more sensitive than capital to cash flow is that cash flow is a better proxy for labor "investment opportunities" than for capital investment opportunities. Under this hypothesis, variation in cash flow will predict changes in labor more than changes in investment. While we can by no means rule out this critique, we do note that we know of no evidence – both theoretical or empirical – that would suggest that cash flow is indeed a better proxy for labor investment opportunities. A more subtle variation of this critique is that, by construction, firm level Q ratios are better measures of capital investment opportunities than labor investment opportunities. Thus, in the regressions, firm Q is more successful at absorbing capital investment opportunities than labor investment opportunities. As a result, the coefficient on cash flow is lower in the capital regressions as compared to the labor regressions. We alleviate this concern by removing firm level of Q from all of our regressions and in unreported results we find that our main finding still holds – labor is more sensitive to cash flow than is capital. Thus, it does not seem to be the case that controlling for Q is driving the differential sensitivity result.

In Table 3 we restrict the analysis to only manufacturing firms. This results in a sample size of 22,746 compared to the 42,017 firm-year observations in our previous sample.[6] As the table shows, our results – especially in specifications with firm fixed effects – are similar to those reported in Table 2. Similar to prior results which employ the full sample, the sensitivity of employment changes to financial health of the firm is much larger relative to that of the different measures of investment. In fact, restricting attention to the manufacturing subsample, labor sensitivity to cash flows only increases: as Column 1 of Table 3 shows, the coefficient on profitability in the labor change specification is β_p=0.631 as compared to 0.469 in Table 2. Similarly, as Column 5 shows, once we control for firm fixed-effects, β_p=0.787 in the labor change specification as compared to 0.713 in Table 2. Finally, comparing the sensitivity of labor to cash flow to that of capital, β_p is approximately five times higher in the employee change regressions than in the regressions with capital or investment as dependent variables presented in Columns 6-8. Similarly, the coefficient of lagged leverage is about three times higher in the employee change regressions in Column 5 as compared to regressions that use capital or investment-based dependent variables (Columns 6-8). The larger magnitudes found in the analysis with manufacturing firms are consistent with the predictions from the model if we plausibly argue that labor in manufacturing is more likely to be require financing as compared to labor in services which might be fully paid with completion of a transaction (such as waiters or realtors.)

[6]We define manufacturing firms as those operating in 4-digit SIC 2000-3999.

B. Does Capital Adjustment Drive Labor Sensitivities to Cash-flows?

One potential criticism of our findings is that our results are driven solely by capital adjusting to financial constraints. According to this view, financial constraints do not affect labor directly since, unlike capital, labor does not require financing. Instead, as in the investment-cash-flow sensitivity literature, investment is limited by the availability of internal funds, and labor, in turn, is adjusted for the decline in capital. That is, the sensitivity of labor to cash flows stems from the omission of investment from the regressions and not from an intrinsic need to finance labor; financial pressure causes firms to disinvest which mechanically leads to reduction in their labor force. This alternative view hinges on the notion that while capital requires upfront investment to smooth the lumpiness associated with fixed costs, labor expenses are variable costs that are paid out of sales. An extreme variant of this story is the case in which labor is fully paid with the completion of a transaction – for example as in the case of waiters, bellhops or realtors – and hence labor hoarding, hiring and firing are unaffected by financing needs. Still, in most production activities, and particularly those associated with manufacturing as opposed to services – labor is not paid only upon the sale of goods in the market, but rather needs to be financed throughout the production process.[7]

Moreover, even the theoretical argument for labor representing solely a variable cost is not widely acceptable. Research in labor economics has suggested that labor is not a variable factor of production but rather a fixed, or at least a quasi-fixed, factor (e.g., Oi (1962), Hamermesh (1989), Hamermesh and Pfann (1996)) . This argument has been suggested first by Oi (1962) who writes:

> *The cyclical behavior of labor markets reveals a number of puzzling features for which there are no truly satisfying explanations. [...] I believe that the major impediment to rational explanations for these phenomena lies in the classical treatment of labor as a purely variable factor. In this paper I propose a short-run theory of employment which rests on the premise that labor is a quasi-fixed factor. The fixed employment costs arise from investments by firms in hiring and training activities.*[8]

While we argue that labor has lower adjustment costs than capital, labor also has fixed-costs aspects that require financing to bridge upfront costs and revenues. These may give rise to the role that

[7] The argument that labor must be financed is similar to that in the literature on financial constraints and inventory investment: firms must finance inventory investment during the production process.
[8] See Oi (1962) page 538.

financial constraints play in the inability of firms to hoard highly trained employees even when the decline in demand for the firm's goods may be temporary.

In order to test the alternative explanation that capital adjustments are fully responsible for the sensitivity of employment changes to financial constraints we directly include *contemporaneous* changes in investment ($\%\Delta investment$) as well as the concurrent level of scaled investment ($Investment/Assets_{t-1}$) in the employment-based variants of regression 16. Results are reported in Table 4. If labor responds to cash-flows only through indirect complementarities between labor and capital, then controlling for concurrent measures of investment should fully absorb this effect and β_p in these regressions should be equal to zero.

As Table 4 demonstrates, controlling for the contemporaneous changes in investments ($\%\Delta investment$) as well as the concurrent level of scaled investment ($Investment/Assets_{t-1}$) barely affects the economic significance of our main findings. Both the percent change in investment and concurrent investment are positively and significantly correlated with employment change, suggesting that capital and labor indeed move together, probably due to the demand for production factors and capital-labor complementarities. In particular, the coefficients on the financial variables are hardly affected by the inclusion of investment-based measures. As Column 1 shows, when we account for industry fixed-effects β_p declines to 0.526 (compared to 0.631 in Column 1 of Table 3. Including firm fixed-effects results in a slight decrease of β_p from 0.787 to 0.700. Similar patterns are observed for the liquidity measure. As Table 4 shows, we also control for the contemporaneous changes in the number of employees ($\%\Delta employees$) which slightly lowers the sensitivities of the investment variables to cash-flow. Most importantly, the relative capital-labor sensitivity remains the same as before.[9]

To summarize, we find that labor is more sensitive to cash flows than is capital even after accounting for the contemporaneous changes in investment. Our analysis therefore suggests that the potential effect of financial constraints on employment is unlikely to be entirely driven by an accompanying change in investment in response to these constraints.

[9] In unreported results we also add as an additional control the 4-digit SIC TFP growth. By doing so we are trying to control better for investment opportunities making sure our results are not likely to be driven by the omitted investment opportunities. Our results are unchanged.

C. Leverage Stratification and Employment and Investment Cash-flow Sensitivities

We now turn to test whether the sensitivities of the changes in the number of employees and investment to cash-flow are higher for firms that are more likely to be financially constrained. In particular, we examine how the effects we document vary with the financial leverage of the firm. To do so we sort manufacturing firms into three groups based on their leverage. Sorting firms based on a-priori measures of financial constraints and estimating investment cash-flow sensitivities has been used in several previous studies (e.g. Fazzari et al. (1988), Hoshi, Kashyap and Scharfstein (1991), Ramirez (1995) and Rauh (2006)).

We re-estimate the employment and investment regressions for each of the terciles and report the results in Tables 5 and 6. All the regressions are estimated with firm and year fixed-effects.[10] As Table 5 shows,the sensitivity of both percentage changes in investment and employment to cash-flows increases when moving from least leveraged firms (tercile 1) to most leveraged firms (tercile 3). Most importantly, the sensitivity to cash flows is much higher for labor than for investment. For example, β_p in the regressions with employment as the dependent variable is 0.946 for high levered firms as compared to 0.662 for low levered firms. In contrast the sensitivity of the percentage change in investment to cash flow is 0.110 for low leverage firms compared to 0.183 for firms in the highest leverage tercile. To test the robustness of the comparison between labor and investment we employ additional dependent variables that are based on different measures of investment and capital. In particular, we use investment scaled by assets and percentage change in inventories as dependent variables and report the results in Table 6. The point estimates from these regressions are very similar to those obtained when we use investment change as the dependent variable.

These tests also suggest that measurement error concerns highlighted earlier are not likely driving our findings. In particular, one could have plausibly argued that our earlier regressions evaluating the labor and investment sensitivities suffered from measurement error in investment opportunities – as measured by Q – which in turn is captured partially by financial health variables. Consequently, the relation between financial health and employment or investment was spurious and represented only a mechanical relation between investment opportunities and capital or labor. By demonstrating that our results increase along leverage terciles – a sensible measure for financial

[10] We have also estimated the regressions using industry fixed-effects and obtained very similar results. These are not report for brevity.

health – we alleviate some of these endogeneity concerns. The relevant criticism for our findings therefore has to be that not only is there measurement error in investment opportunities – but also that this error has to be worse for highly leveraged firms. However, it is not a priori clear why the measurement error in Q should be correlated with leverage as a stratifying variable.[11]

We supplement the regressions with univariate analysis and summary statistics comparing the volatility and sensitivity of labor and investment along the leverage stratification. Table 7 displays summary statistics stratified by leverage terciles for each of the dependent variables. As the table demonstrates, even without controlling for firm characteristics there is a stark difference between both the volatilities of labor and investment, as well as the average change in either employment of investment along leverage terciles. Panel A of Table 7 shows that the standard deviation of employment changes in each of the leverage terciles is about three times higher than the standard deviation of investment changes as reported in Panels B and C. Likewise, the average difference in $\%\Delta employees$ between the high and low leverage firms is 4.712% (t-statistic=15.62), compared to mean differences of 1.292%, 0.646%, and 1.406%, for $\%\Delta investment$, $Investment/Assets_{t-1}$, and $\%\Delta PP\&E$, respectively. Figures 5, 6, and 7 plot the responsiveness of labor, investment change and percentage change in inventories stratified by leverage and across the business cycle and demonstrate these results as well.

D. The Effects of Maturing Long-term Debt on Employment and Investment

We now attempt to alleviate endogeneity concerns about profitability and leverage by using the 'maturing-debt' approach suggested by Almeida et al. (2009). The 'maturing-debt' empirical strategy exploits heterogeneity in the maturity of long-term debt across firms. The empirical tests examine whether firms with long-term debt maturing in a particular year reduce their investment or labor force by more than their peers that do not face the need to refinance maturing long-term debt in the same year. If external capital is costly (e.g., Myers and Majluf (1984)) then firms which need to refinance large amounts of maturing long-term debt will, as a result, adjust their real activities and reduce employment and investment.

The identification strategy relies on the assumption that variation in the amount of long-term debt maturing in any given year is exogenous to corporate outcomes in that particular year. To

[11] The sorting method has also been criticized theoretically by Kaplan and Zingales (1997) as it requires assumptions about the third derivatives of the production function.

lend credence to this assumption, we use as our main independent variable measures of maturing long-term debt which take into account liabilities that were issued with a time-lag to the year of interest. For example, we compare employment and investment outcomes of firms which in a particular year have a large amount of maturing five-year debt to those with a small amount of such debt maturing. Since this portion of the maturing debt was issued a significant amount of time prior to the year of maturity, variation in its level is arguably exogenous to market conditions and investment opportunities that eventually arise in the year in which the debt becomes due.

Compustat reports the amount of long-term debt which is payable in more than one year through more than five years from the firm's fiscal year end. We collect data on the amount of future maturing debt. Specifically, we utilize Compustat variables *dd3*, *dd4*, and *dd5* which represent, respectively, the amount of long-term debt maturing three, four, and five years after the annual reporting date. To measure the maturing debt structure of a firm in a particular year we construct lagged values of these debt maturity variables: *l2_dd3* is the two-year lag of *dd3*, *l3_dd4* is the three year lag of *dd3* and *l4_dd5* is the four year lag of *dd5*. By construction, these variables measure the amount of long-term debt maturing in the upcoming year of debt that was issued at least two, three, or four years prior to the base year. For example, at year t, *l2_dd3* measures the amount of long-term debt maturing at $t+1$ that was issued *prior* to year $t-2$.

We scale the lagged variables by beginning of year assets. Next, we construct a dummy variable that takes on the value of one for those firms for which long-term debt coming due in the upcoming year and issued at least i years ago is larger than 5 percent of total assets. We also define equivalent dummy variables using 10, 15, and 20 percent threshold levels. These variables capture whether a firm has a significant amount of long term debt maturing in the upcoming year which requires refinancing. By examining debt that was issued prior to the year of analysis, we alleviate concerns that the level of maturing debt co-moves with other market variables which have a direct impact on employment or investment decisions. As control variables we use the same set of controls as in the previous section. Following Lamont, Kashyap, and Stein (1994), we also construct a dummy variable which takes on a value of one if a firm has a credit rating to measure the firm's access to the long-term bond market.[12]

Table 8 provides summary statistics for the maturing debt variables. The average amount of debt coming due in the upcoming year with an original maturity of greater than two, three, and

[12] As is standard, we assume that firms with a missing observation in their credit rating are unrated.

four years equals on average 2.6, 2.2, and 2.3 percent of assets, respectively. We next define dummy variables that take the value of 1 if the maturing debt exceeds 5, 10, and 15 percent of the firm's total assets. As the table shows, 12.4 percent of firm-year observation have refinancing requirements that exceed 5 percent of total assets and that were issued at least 2 year prior to the year in which the debt comes due. Turning to higher levels of maturing debt, Table 8 shows that 5 percent of firm-year observations in the sample must refinance maturing long-term debt that was issued at least 2 years before the current year and that exceeds 10 percent of total assets. Similarly, 2.7 percent of the sample need to refinance maturing long-term debt that is higher than 15 percent of total assets.

Having defined the maturing debt variables, our baseline regression specification is:

$$Y_{it} = \alpha + \beta_{LT} \times (Long\ term\ debt\ due)_{it} + \mathbf{X}_{it-1}\lambda + \mathbf{y}_t\theta + \mathbf{z}_i\psi + \epsilon_{it}, \tag{17}$$

where Y_{it} is one of our four dependent variables: $\%\Delta employees$, $\%\Delta investment$, $Investment/Assets_{t-1}$, or $\%\Delta PP\&E$. $Long\ term\ debt\ due_{it}$ is one of the dummy variables described above that measures whether the value of long-term debt maturing in year $t+1$ and issued two years prior to year t is greater than 5, or 10 percent of the book value of firm assets. $\mathbf{X}_{it-1}$ is a vector of firm specific control variables. These include lagged values of the firm market-to-book ratio, firm internal liquidity, $Liquidity_{it-1}$, the log of the book value of firm assets, firm leverage, asset maturity, profitability, and the credit rating dummy. All regressions include year fixed effects, $\mathbf{y}_t$, and depending on the specification also include either four-digit SIC fixed effects or firm fixed-effects, denoted by the variable $\mathbf{z}$. All regressions are estimated with heteroscedasticity robust standard errors which are clustered by firm.

Results are presented in Table 9. As column 1 demonstrates, we find a negative and statistically significant relation between the maturing long-term debt variable and the change in the number of firm employees. The coefficient of -0.018 (statistically significant at the 1 percent level) implies that firms that have maturing debt that requires refinancing and that is worth at least 5% of the firm's total assets reduce the number of their employees by close to 2 percent. That is, consistent with the presence of financial frictions, when firms have a large amount of debt coming to maturity which must be refinanced, part of their adjustment occurs through a reduction in labor force. As Column 5 shows, this negative relation holds when we include firm-fixed effects as well (coefficient=-0.016, statistically significant at the 1 percent level). While these results confirm that financial constraints affect employment at the firm level, it is also useful to compare the effects of maturing long-term debt on different measures of investment and capital.

We do not find a statistical significant relationship between maturing long-term debt and the percentage change in investment (columns 2 and 6) whether we include industry or firm fixed-effects. In fact, not only do we not find a statistical significant relation between maturing long-term debt and investment changes, but the coefficient (while not significant) is also positive. In Columns 3 and 7 we find that controlling for the host of control variables and either industry or firm fixed-effects, maturing long-term debt does affect adversely the level of investment scaled by assets $Investment/Assets_{t-1}$. While we do not restrict our analysis to the financial crisis of 2008-2009, this result is consistent with the findings of Almeida et al. (2010) for the crisis years. Similarly, as Columns 4 and 8 show, the percentage change in capital at the firm level measured by $\%\Delta PP\&E$. is negatively and significantly correlated with maturing long-term debt.

A comparison of the coefficients of long-term debt due in the different regressions presented in Table 9 reveals the same patterns found in our previous analysis. The sensitivity of the percentage change in employees to measures of financial constraints – maturing long-term debt in this table – is more significant both economically and statistically than the sensitivities of different measures of investment or capital to this measure. In our regressions the coefficient of interest β_{LT} is about three times higher in the employee change regressions than in those with capital or investment as dependent variables.

We obtain similar results when we repeat the analysis using a dummy variable for maturing long-term debt that exceed ten percent of total assets (Table 10). As the table shows, the sensitivity of the change in the number of employees to maturing long-term debt β_{LT}, is now higher and equals -0.021 which is consistent with a larger refinancing need than the five percent-based dummy variable in Table 9. As before, β_{LT} is about three times higher in the employment-based regressions compared to regressions that use investment or capital based dependent variables.

It is also important to note that while we focus our attention on maturing long-term debt as the key explanatory variable in our regressions, we still obtain the same magnitudes as before for both the profitability, liquidity and leverage variables. In some sense we are 'over controlling' in these regressions capturing separate effects of cash flow, cash holdings and leverage, while studying the effect of debt that needs to be rolled-over on each of the dependent variables. As would be expected, we find that the firm market-to-book ratio is positively related to employment growth.

Consistent with Kashyap, Lamont, and Stein (1994), we also find a positive relation between firm internal liquidity and the change in firm employment levels. In addition, we find that increased leverage predicts lower employment growth. This could be driven by the fact that firms in distress increase their leverage ratios, or alternatively, reflect firms' decision to reduce their labor force when faced with large future liabilities. We note though that the negative relation between the long-term debt maturity variables and the reduction in the labor force does not simply reflect a leverage effect, as the results hold even after controlling for leverage.

We have also repeated the analysis of regression 17, using different threshold levels to define significant levels of long-term debt. In particular, rather than using 5% and 10% thresholds, we define dummy variables that take on the value of one if long-term debt maturing in the upcoming year is greater than 15 or 20 percent of assets. In unreported results we find that the negative relation between upcoming long-term debt and changes in firm level employment are robust to using different threshold levels when we control for 4-digit SIC fixed-effects. Further, as would be expected, the economic significance of the effect monotonically increases with the threshold level: as firms need to refinance a larger amount of debt, the reduction in employment levels is greater. However, some of these effects become statistically insignificant when we add firm fixed-effects since there is not sufficient within-firm variation when we require very large maturing debt cutoffs for the dummy variables.

Finally, similar to the analysis in the previous section, in Table 11 we control for both the contemporaneous change in investment, $\%\Delta investment$, as well as the concurrent level of scaled investment ($Investment/Assets_{t-1}$) to control for the possibility that the effect on employment is completely driven by an accompanying change in investment and not through a direct link between the firm's financial position and its ability to retain labor or its need to fire employees. We also add as an additional control the 4-digit SIC level of TFP growth which restricts the sample to manufacturing industries. By doing so we are trying to control better for investment opportunities making sure that the variation in maturing debt is less likely to be driven by omitted investment opportunities. As expected, the percentage change in employees is positively related to TFP growth. Moreover, after controlling for TFP growth, we find an even stronger effect of maturing long-term debt on employment outcomes. Consistent with results in the previous section, we find that after controlling for concurrent investment conditions and TFP growth the results not only hold but actually increase in magnitudes and are much larger than those of either investment or capital.

IV. Conclusion

We analyze the effect of financial constraints on firm employment and investment decisions. We show that labor is more responsive to financial constraints and that firms are more likely to adjust their labor force rather than their stock of capital when hit by financial constraints. We argue that finance plays a crucial role in firm-level employment decisions. While our results are based on firm-level data there is an important macro-message in our paper. Financial constraints are important for employment and can potentially amplify variation in employment levels over the business cycle.

References

Abel, Andrew, and Eberly, Janice, "Investment and q with Fixed Costs: An Empirical Analysis", *Working Paper, Wharton School* (1996).

Almeida, Heitor, Campbello, Murillo, Laranjeira, Bruno and Weisbenner, Scott, "Corporate Debt Maturity and the Real Effects of the 2007 Credit Crisis", *Working Paper* (2009).

Baker, Malcolm, Stein, Jeremy and Wurgler Jeffrey, "When does the market matter? Stock prices and the investment of equity-dependent firms", *Quarterly Journal of Economics*, 118 (2003), 969-1005.

Bernanke, Ben and Gertler, Mark, "Inside the Blackbox: The Credit Channel of Monetary Policy Transmission", *Journal of Economic Perspectives*, 9 (1995), 27-48.

Caballero, Ricardo, and Engel, Eduardo, "Explaining Investment Dynamics in U.S. Manufacturing: A Generalized (S, s) Approach", *Econometrica* 67 (1999), 783-826.

Caballero, Ricardo, Engel, Eduardo and Haltiwanger, John, "Plant-Level Adjustment and Aggregate Investment Dynamics." *Brookings Papers on Economic Activity* 2 (1995), 1-39.

Calomiris, Charles, and Hubbard, Glen, "Internal Finance and Investment: Evidence from the Undistributed Profits Tax of 193637", *Journal of Business*, 68 (1995), 443-482.

Calomiris, Charles, Orphanides, Athanasios and Sharpe, Steven, "Leverage as a state variable for employment, inventory accumulation, and fixed investment", *Working Paper, Board of Governors of the Federal Reserve System* (1994).

Cooper, Russell, and Haltiwanger, John, "On the Nature of Capital Adjustment Costs.", 73 (2006), *Review of Economic Studies*, 611-633.

Fazzari, Steven, Hubbard, Glen and Petersen, Bruce, "Financing Constraints and corporate investment", *Brookings Papers on Economic Activity* (1988), 141-195.

Gilchrist, Simon, and Himmelberg Charles, "Evidence on the Role of Cash Flow for Investment", *Journal of Monetary Economics*, 36 (1995), 531-572.

Hamermesh, Daniel "Labor Demand and the Structure of Adjustment Costs", *American Economic Review*, 79(1989), 674-689.

Hamermesh, Daniel, and Pfann, Gerard, "Adjustment Costs in Factor Demand.", *Journal of Economic Literature*, 34(1996), 1264-1292.

Hall, Brownyn, "Investment and Research and Development at the Firm Level: Does the Source of Funding Matter?", *NBER Working Paper 4096* (1992).

Hall, Robert, "Industry Dynamics and Adjustment Costs", *NBER Working Paper 8849* (2002).

Hall, Robert, "Why Does the Economy Fall to Pieces after a Financial Crisis?", *Journal of Economic Perspectives*, 24 (2010), 3-20.

Hoshi, Takeo, Kashyap, Anil and Scharfstein, David, "Corporate structure, liquidity, and investment: evidence from Japanese industrial groups", *Quarterly Journal of Economics* 106 (1991), 33-60.

Kaplan, Steve, and Zingales, Luigi, "Do investment-cash flow sensitivities provide useful measures of financing constraints?", *Quarterly Journal of Economics* 112 (1997), 159-216.

Kashyap, Anil, Lamont, Owen and Stein, Jeremey, " Credit Conditions and the Cyclical Behavior of Inventories, *Quarterly Journal of Economics*, (1994), 555-82.

Myers, Stewart, and Majluf, Nicholas, "Corporate financing and investment decisions when firms have information that investors do not have", *Journal of Financial Economics* 13 (1984), 187-222.

Oi, Walter, "Labor as a Quasi-fixed Factor", *Journal of Political Economy*, 70 (1962), 538-555.

Poterba, James, "Comment on Financing Constraints and Corporate Investment," *Brookings Papers on Economic Activity*, 1988, 200-204.

Ramey, Valerie and Shapiro, Matthew, "Displaced Capital: A Study of Aerospace Plant Closings", *Journal of Political Economy* 109 (2001), 958-992.

Ramirez, Carlos, "Did J.P. Morgan's Men Add Liquidity? Corporate Investment, Cash Flow, and Financial Structure at the Turn of the Century", *Journal of Finance*, 2 (1995), 661-678.

Rauh, Joshua , "Investment and Financing Constraints: Evidence from the Funding of Corporate Plans," *Journal of Finance* 61(1) (2006a), 33-71.

Sharpe, Steven, "Financial Market Imperfections, Firm Leverage, and the Cyclicality of Employment", *American Economic Review*, 84 (1994), 1060-74.

Stein, Jeremy, "Agency, Information and Corporate Investment", *Handbook of the Economics and Finance, Edited by G.M. Constantinidies, M. Harris and R. Stulz* (2003).

Whited, Toni, "Debt, Liquidity Constraints, and Corporate Investment: Evidence from Panel Data", *Journal of Finance*, 47 (1992), 1425-1460.

Appendix A: Variable description and construction

For reference, the following is a list of the variables used in the paper, their construction and their sources.

%Δ employees : the percentage log change in number of employees from *t-1* to *t* [Compustat annual item *emp*]. (source: Compustat).

%Δ investment: the percentage log change in investment from *t-1* to *t* [Compustat annual item *capx*]. (source: Compustat).

%Δ inventories: the percentage log change in investment from *t-1* to *t* [Compustat annual item *invt*]. (source: Compustat).

%Δ PP&E: the percentage log change in property plant and equipment from *t-1* to *t* [Compustat annual item *ppegt*]. (source: Compustat).

%Δ TFP: a 4-factor TFP annual growth rate at the 4-digit SIC level. (source: NBER-CES Manufacturing Industry Database).

I/K: capital expenditure scaled by beginning of period's assets. [Compustat annual item $capx_t$ divided by at_{t-1}]. (source: Compustat).

Size: either the dollar book value or the natural logarithm of the book value of the assets [Compustat annual Item *at*] (Source: Compustat).

Market to Book: book value of assets [Compustat annual item *at*] plus the market value of equity [Compustat annual items *at+(csho*prcc_f)*] minus the book value of equity and deferred taxes [Compustat annual item *ceq+txdb*], all over (book value of assets*0.9 [Compustat annual item *at*]+market value of assets*0.10. (Source: Compustat).

Profitability: EBITDA [Compustat annual item *oibdp*] over beginning of period assets [Compustat annual item *at*] (Source: Compustat).

Leverage: total debt [Compustat annual items *dltt+dlc+dclo*] divided by total assets [Compustat annual item *at*]. (Source: Compustat).

Asset maturity: net property, plant, and equipment [Compustat annual item *ppegt*] divided by annual depreciation expenses [Compustat annual item *dp*]. (Source: Compustat).

Liquidity: cash plus marketable securities [Compustat annual item *cashplus*] divided by total assets [Compustat annual item *at*] (Source: Compustat).

Long-term debt due issued 2 years ago: a dummy that take the value of 1 if the amount of long-term debt maturing three years after the annual reporting date [Compustat annual item *dd3*] lagged by two years divided by total assets [Compustat annual item *at*] is higher than 5%, 10%, 15% or 20%. (Source: Compustat).

Credit Rating Dummy: A dummy variable that takes the value of one and zero otherwise, if the firm has an S&P Long-Term Domestic Issuer Credit Rating. (Source: Standard and Poors).

Table 1:
Descriptive Statistics: Main Variables

This table provides descriptive statistics for the variables used in the empirical analysis. We report mean, median, 25th and 75th percentiles, standard deviation and the minimum and maximum values of these variables. Appendix A provides information on construction and definitions of these variables.

	Mean	25th Percentile	Median	75th Percentile	Standard Deviation	Min	Max
%Δ employees	3.336%	-5.716%	1.739%	12.052%	25.035%	-76.029%	84.134%
%Δ investment	0.241%	-0.500%	0.001%	0.793%	5.561%	-19.445%	20.828%
%Δ PP&E	2.130%	-0.496%	1.155%	4.120%	5.792%	-12.986%	22.707%
%Δ inventories	0.267%	-0.248%	0.000%	0.551%	4.609%	-13.146%	15.755%
Investment/Assets$_{t-1}$	0.079	0.024	0.052	0.098	0.094	0.000	0.494
Size$_{t-1}$	4.20	0.087	0.362	1.815	18.163	0.003	813.809
Asset Maturity$_{t-1}$	14.881	8.014	12.914	18.310	10.426	1.544	53.626
Q$_{t-1}$	1.602	0.956	1.231	1.840	1.065	0.084	9.844
Liquidity$_{t-1}$	0.159	0.021	0.066	0.204	0.212	0.000	1.000
Leverage$_{t-1}$	0.280	0.073	0.241	0.396	0.406	0.000	1.168
Profitability$_t$	0.058	0.041	0.119	0.187	0.319	-3.885	0.621
Credit rating dummy$_{t-1}$	0.280	0.000	0.000	1.000	0.449	0.000	1.000

Table 2:
Employment, Investment and Cash Flow (All Firms)

This table reports the results of regressions relating employment and investment decisions of firms to their cash flows for all the firms in our sample. The dependent variables used in the regressions are *%Δemployees*, *%Δinvestment*, *Investment/Assets*, or *%ΔPP&E*. All regressions include lagged values of the firm market-to-book ratio, firm internal liquidity, the log of the book value of firm assets, firm leverage, asset maturity, profitability, the credit rating dummy and year fixed effects. The first four regressions also include four-digit SIC fixed effects while the last four include firm fixed effects. All regressions are estimated with heteroscedasticity robust standard errors which are clustered by firm and reported in parentheses. Variable definitions are provided in Appendix A. a, b and c denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	%Δ employees (1)	%Δ investment (2)	I/K (3)	%Δ PP&E (4)	%Δ employees (5)	%Δ investment (6)	I/K (7)	%Δ PP&E (8)
Q_{t-1}	0.023 a	0.002 b	0.019 a	0.010 a	0.017 a	0.003 a	0.023 a	0.011 a
	(0.004)	(0.001)	(0.002)	(0.001)	(0.004)	(0.002)	(0.002)	(0.001)
Liquidity_{t-1}	0.201 a	0.040 a	-0.018 b	0.020 a	0.272 a	0.072 a	-0.009	0.034 a
	(0.017)	(0.004)	(0.007)	(0.005)	(0.002)	(0.006)	(0.008)	(0.006)
Log size_{t-1}	-0.008 a	0.003 a	-0.005 a	0.006 a	0.045 a	0.006 a	0.002	0.030 a
	(0.001)	(0.001)	(0.001)	(0.001)	(0.006)	(0.002)	(0.002)	(0.002)
Leverage_{t-1}	-0.021 b	-0.011 a	-0.021 a	-0.010 a	-0.087 a	-0.033 a	-0.044 a	-0.038 a
	(0.010)	(0.002)	(0.003)	(0.002)	(0.012)	(0.004)	(0.004)	(0.004)
Asset	0.002 a	0.0004 a	0.001 a	0.171 a	0.004 a	0.001 a	0.002 a	0.286 a
maturity_{t-1}	(0.0002)	(0.0001)	(0.0001)	(0.018)	(0.0004)	(0.0001)	(0.0001)	(0.027)
Profitability_t	0.469 a	0.096 a	0.143 a	0.112 a	0.713 a	0.148 a	0.152 a	0.153 a
	(0.025)	(0.005)	(0.010)	(0.006)	(0.028)	(0.006)	(0.009)	(0.007)
Adjusted R^2	0.15	0.06	0.36	0.17	0.28	0.04	0.59	0.30
Fixed-Effects								
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4-digit SIC	Yes	Yes	Yes	Yes	No	No	No	No
Firm	No	No	No	No	Yes	Yes	Yes	Yes
Observations	42,017	42,017	42,017	42,017	42,017	42,017	42,017	42,017

Table 3:
Employment, Investment and Cash Flow
(Manufacturing Firms Only)

This table reports the results of regressions relating employment and investment decisions of firms to their cash flows for only manufacturing firms in our sample. These firms are defined as those operating in 4-digit SIC 2000-3999. The dependent variables used in the regressions are *%Δemployees*, *%Δinvestment*, *Investment/Assets*, or *%ΔPP&E*. All regressions include lagged values of the firm market-to-book ratio, firm internal liquidity, the log of the book value of firm assets, firm leverage, asset maturity, profitability, the credit rating dummy and year fixed effects. The first four regressions also include four-digit SIC fixed effects while the last four include firm fixed effects. All regressions are estimated with heteroscedasticity robust standard errors which are clustered by firm and reported in parentheses. Variable definitions are provided in Appendix A. a, b and c denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	%Δ employees (1)	%Δ investment (2)	I/K (3)	%Δ PP&E (4)	%Δ employees (5)	%Δ investment (6)	I/K (7)	%Δ PP&E (8)
Q_{t-1}	-0.005	-0.0005	0.011 a	0.007 a	-0.002	0.002 a	0.015 a	0.011 a
	(0.004)	(0.001)	(0.002)	(0.001)	(0.005)	(0.002)	(0.002)	(0.001)
Liquidity_{t-1}	0.204 a	0.046 a	-0.021 b	0.028 a	0.237 a	0.072 a	-0.022 a	0.034 a
	(0.022)	(0.005)	(0.008)	(0.007)	(0.030)	(0.008)	(0.008)	(0.008)
Log size_{t-1}	-0.007 a	0.003 a	-0.002 a	0.007 a	0.059 a	0.006 b	0.002	0.031 a
	(0.002)	(0.001)	(0.001)	(0.001)	(0.008)	(0.003)	(0.002)	(0.003)
Leverage_{t-1}	-0.002	-0.005 b	-0.015 a	-0.004	-0.081 a	-0.027 a	-0.036 a	-0.035 a
	(0.010)	(0.002)	(0.004)	(0.003)	(0.014)	(0.004)	(0.004)	(0.005)
$\text{Asset maturity}_{t-1}$	0.002 a	0.0006 a	0.001 a	0.141 a	0.005 a	0.001 a	0.002 a	0.348 a
	(0.0003)	(0.0001)	(0.0002)	(0.030)	(0.0005)	(0.0002)	(0.0002)	(0.052)
Profitability_{t}	0.631 a	0.116 a	0.156 a	0.135 a	0.787 a	0.156 a	0.141 a	0.154 a
	(0.030)	(0.007)	(0.009)	(0.008)	(0.034)	(0.010)	(0.009)	(0.009)
Adjusted R^2	0.17	0.07	0.31	0.17	0.27	0.05	0.55	0.27
Fixed-Effects								
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4-digit SIC	Yes	Yes	Yes	Yes	No	No	No	No
Firm	No	No	No	No	Yes	Yes	Yes	Yes
Observations	22,746	22,746	22,746	22,746	22,746	22,746	22,746	22,746

Table 4:
Accounting for contemporaneous changes in Investment and Labor (Manufacturing Firms Only)

This table reports the results of regressions relating employment and investment decisions of firms to their cash flows. The sample consists of only manufacturing firms defined to be those that are operating in 4-digit SIC 2000-3999. The dependent variables used in the regressions are %Δ*employees*, %Δ*investment* or *Investment/Assets*. We control for contemporaneous change in investment as well as for the concurrent level of scaled investment in employment regressions and for contemporaneous change in employment in investment regressions. All regressions include lagged values of the firm market-to-book ratio, firm internal liquidity, the log of the book value of firm assets, firm leverage, asset maturity, profitability, the credit rating dummy and year fixed effects. The first three regressions also include four-digit SIC fixed effects while the last three include firm fixed effects. All regressions are estimated with heteroscedasticity robust standard errors which are clustered by firm and reported in parentheses. Variable definitions are provided in Appendix A. a, b and c denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	%Δ employees	%Δ investment	I/K	%Δ employees	%Δ investment	I/K
	(1)	(2)	(3)	(4)	(5)	(6)
%Δ investment$_t$	0.195 a			0.125 a		
	(0.019)			(0.019)		
I/K$_t$	0.520 a			0.482 a		
	(0.040)			(0.049)		
%Δ employees $_t$		0.045 a	0.043 a		0.038 a	0.030 a
		(0.003)	(0.003)		(0.002)	(0.003)
Q$_{t-1}$	-0.011 a	-0.0003	0.011 a	-0.009 c	0.002 a	0.015 a
	(0.004)	(0.001)	(0.002)	(0.005)	(0.002)	(0.002)
Liquidity$_{t-1}$	0.206 a	0.037 a	-0.029 b	0.239 a	0.063 a	-0.029 a
	(0.021)	(0.005)	(0.008)	(0.029)	(0.008)	(0.008)
Log size$_{t-1}$	-0.007 a	0.003 a	-0.002 a	0.057 a	0.004	0.0003
	(0.002)	(0.001)	(0.001)	(0.007)	(0.003)	(0.002)
Leverage$_{t-1}$	0.007	-0.005 b	-0.014 a	-0.059 a	-0.024 a	-0.035 a
	(0.009)	(0.002)	(0.004)	(0.014)	(0.004)	(0.004)
Asset maturity$_{t-1}$	0.001 a	0.001 a	0.001 a	0.004 a	0.001 a	0.002 a
	(0.0003)	(0.0001)	(0.0002)	(0.001)	(0.0002)	(0.0002)
Profitability$_t$	0.526 a	0.088 a	0.131 a	0.700 a	0.126 a	0.118 a
	(0.029)	(0.007)	(0.009)	(0.033)	(0.010)	(0.009)
Adjusted R^2	0.19	0.08	0.33	0.29	0.06	0.55
Fixed-Effects						
Year	Yes	Yes	Yes	Yes	Yes	Yes
4-digit SIC	Yes	Yes	Yes	No	No	No
Firm	No	No	No	Yes	Yes	Yes
Observations	22,746	22,746	22,746	22,746	22,746	22,746

Table 5:
Employment and Investment Cash Flow Sensitivities: Stratified by Leverage (Manufacturing Firms Only)

This table reports the results of regressions relating employment and investment decisions of firms to their cash flows estimated in terciles stratified by leverage . The sample consists of only manufacturing firms, defined to be those that are operating in 4-digit SIC 2000-3999. The dependent variables used in the regressions are %Δ*employees* in the first three columns and %Δ*investment* in the last three. All regressions include lagged values of the firm market-to-book ratio, firm internal liquidity, the log of the book value of firm assets, firm leverage, asset maturity, profitability, the credit rating dummy, year and firm fixed effects. All regressions are estimated with heteroscedasticity robust standard errors which are clustered by firm and reported in parentheses. Variable definitions are provided in Appendix A. a, b and c denote statistical significance at the 1%, 5%, and 10% levels, respectively.

		Leverage Terciles			Leverage Terciles	
	1	*2*	*3*	*1*	*2*	*3*
	%Δ employees (1)	%Δ employees (2)	%Δ employees (3)	%Δ investment (4)	%Δ investment (5)	%Δ investment (6)
Q_{t-1}	-0.004	0.018	0.017	0.003	0.002 a	0.015 a
	(0.006)	(0.011)	(0.014)	(0.002)	(0.004)	(0.005)
Liquidity_{t-1}	0.217 a	0.367 a	0.303 a	0.053 a	0.126 a	0.113 a
	(0.045)	(0.070)	(0.070)	(0.011)	(0.020)	(0.020)
Log size_{t-1}	0.038 b	0.092 a	0.067 a	0.006	0.013 a	0.008 c
	(0.018)	(0.013)	(0.013)	(0.007)	(0.005)	(0.005)
Leverage_{t-1}	-0.079	-0.107 c	-0.101 a	-0.026	-0.148 a	-0.028 a
	(0.060)	(0.064)	(0.025)	(0.022)	(0.029)	(0.008)
Asset maturity_{t-1}	0.005 a	0.005 a	0.005 a	0.002 a	0.001 a	0.0003
	(0.001)	(0.001)	(0.001)	(0.0004)	(0.0004)	(0.001)
Profitability_t	0.662 a	0.744 a	0.946 a	0.110 a	0.223 a	0.183 a
	(0.053)	(0.063)	(0.073)	(0.017)	(0.021)	(0.019)
Adjusted R^2	0.37	0.35	0.26	0.06	0.07	0.05
Fixed-Effects						
Year	Yes	Yes	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,582	7,582	7,582	7,582	7,582	7,582

Table 6:
Scaled Investment, Inventories and Cash Flow Sensitivities: Stratified by Leverage (Manufacturing Firms Only)

This table reports the results of regressions relating investment and inventory decisions of firms to their cash flows estimated in terciles stratified by leverage . The sample consists of only manufacturing firms, defined to be those that are operating in 4-digit SIC 2000-3999. The dependent variables used in the regressions are I/K in the first three columns and $\%\Delta inventories$ in the last three. All regressions include lagged values of the firm market-to-book ratio, firm internal liquidity, the log of the book value of firm assets, firm leverage, asset maturity, profitability, the credit rating dummy, year and firm fixed effects. All regressions are estimated with heteroscedasticity robust standard errors which are clustered by firm and reported in parentheses. Variable definitions are provided in Appendix A. a, b and c denote statistical significance at the 1%, 5%, and 10% levels, respectively.

		Leverage Terciles			Leverage Terciles	
	1	*2*	*3*	*1*	*2*	*3*
	I/K	I/K	I/K	%Δ inventories	%Δ inventories	%Δ inventories
	(1)	(2)	(3)	(4)	(5)	(6)
Q_{t-1}	-0.006 a	-0.011 a	-0.006	-0.003	0.002 a	0.013 a
	(0.002)	(0.004)	(0.004)	(0.003)	(0.004)	(0.005)
Liquidity_{t-1}	0.031 a	0.025	0.047 a	0.085 a	0.131 a	0.111 a
	(0.008)	(0.025)	(0.014)	(0.017)	(0.023)	(0.022)
Log size_{t-1}	-0.001	-0.0002	-0.007 a	0.036 a	0.047 a	0.039 a
	(0.002)	(0.002)	(0.002)	(0.009)	(0.007)	(0.007)
Leverage_{t-1}	-0.060 a	-0.083 a	-0.010	-0.017	-0.079 a	-0.030 a
	(0.014)	(0.016)	(0.007)	(0.024)	(0.031)	(0.008)
$\text{Asset maturity}_{t-1}$	0.002 a	0.001 a	0.0005 b	0.001 a	0.002 a	0.002 a
	(0.0002)	(0.0002)	(0.0002)	(0.0004)	(0.001)	(0.001)
Profitability_{t}	0.084 a	0.133 a	0.143 a	0.184 a	0.302 a	0.290 a
	(0.011)	(0.016)	(0.015)	(0.020)	(0.026)	(0.022)
Adjusted R^2	0.18	0.25	0.13	0.15	0.15	0.25
Fixed-Effects						
Year	Yes	Yes	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,329	7,304	7,257	7,582	7,582	7,582

Table 7:
Employment, Investment and Leverage (Manufacturing Firms Only)

This table provides summary statistics of $\%\Delta employees$ (Panel A), $\%\Delta investment$ (Panel B), $\%\Delta PP\&E$ (Panel C) and $\%\Delta inventories$ (Panel D) in terciles stratified by leverage. We report mean, median, 25th and 75th percentiles, standard deviation and the minimum and maximum values of these variables. Variable definitions are provided in Appendix A.

Panel A: %Δ employees: Stratified by Leverage

	Mean	25th Percentile	Median	75th Percentile	Standard Deviation	Min	Max
Low leverage	5.235%	-2.740%	2.769%	10.274%	18.210%	-35.937%	77.340%
Middle leverage	1.628%	-4.999%	0.494%	7.110%	17.035%	-51.446%	60.977%
High leverage	0.523%	-7.288%	0.000%	6.865%	18.921%	-53.552%	60.977%
Difference (Low vs. High)	4.712%						
T-test for equal means	(15.62)						

Panel B: %Δ investment: Stratified by Leverage

	Mean	25th Percentile	Median	75th Percentile	Standard Deviation	Min	Max
Low leverage	0.915%	-0.904%	0.289%	2.179%	6.065%	-18.135%	22.772%
Middle leverage	0.347%	-1.756%	0.142%	2.500%	7.253%	-22.889%	23.306%
High leverage	-0.377%	-2.014%	-0.065%	1.486%	6.863%	-23.052%	21.887%
Difference (Low vs. High)	1.292%						
T-test for equal means	(12.28)						

Panel C: %Δ PP&E: Stratified by Leverage

	Mean	25th Percentile	Median	75th Percentile	Standard Deviation	Min	Max
Low leverage	2.494%	-0.026%	1.357%	4.125%	5.215%	-10.089%	21.279%
Middle leverage	2.048%	-0.653%	1.121%	4.177%	5.935%	-13.566%	22.926%
High leverage	1.848%	-0.989%	0.915%	4.054%	6.165%	-13.886%	23.485%
Difference (Low vs. High)	0.646%						
T-test for equal means	(9.36)						

Panel D: %Δ inventories: Stratified by Leverage

	Mean	25th Percentile	Median	75th Percentile	Standard Deviation	Min	Max
Low leverage	1.231%	-0.960.%	0.455%	2.739%	7.380%	-19.572%	28.938%
Middle leverage	0.218%	-2.214%	0.180%	2.672%	7.800%	-24.129%	24.003%
High leverage	-0.175%	-2.236%	-0.073%	1.935%	7.777%	-22.236%	21.030%
Difference (Low vs. High)	1.406%						
T-test for equal means	(11.42)						

Table 8:
Maturing Long-term Debt Approach: Summary Statistics

This table provides descriptive statistics for the variables used in the analysis that uses the 'maturity-debt' approach. In Panel A we report the summary statistics of the amount of long-term debt coming due in the upcoming year as a percent of assets. In Panels B, C and D we report summary statistics of the dummy variable that takes a value of 1 if the maturing debt exceeds 5 percent, 10 percent and 15 percent of the firm's total assets, respectively. In each of the panels we take the long-term debt coming due in the upcoming year with an original maturity of greater than two, three, and four years. We report mean, median, 25th and 75th percentiles, standard deviation and the minimum and maximum values of these variables. Appendix A provides information on construction and definitions of these variables.

	Mean	25th Percentile	Median	75th Percentile	Standard Deviation	Min	Max
Panel A: Long-term debt due of total assets							
Long-term debt due issued 2 years ago	0.026	0.000	0.007	0.026	0.101	0.000	0.267
Long-term debt due issued 3 years ago	0.022	0.000	0.004	0.021	0.091	0.000	0.239
Long-term debt due issued 4 years ago	0.023	0.000	0.003	0.018	0.199	0.000	0.253
Panel B: Long-term debt due>5% of total assets (dummy variables)							
Long-term debt due issued 2 years ago	0.124	0.000	0.000	0.000	0.329	0.000	1.000
Long-term debt due issued 3 years ago	0.101	0.000	0.000	0.000	0.301	0.000	1.000
Long-term debt due issued 4 years ago	0.092	0.000	0.000	0.000	0.289	0.000	1.000
Panel C: Long-term debt due>10% of total assets (dummy variables)							
Long-term debt due issued 2 years ago	0.050	0.000	0.000	0.000	0.217	0.000	1.000
Long-term debt due issued 3 years ago	0.039	0.000	0.000	0.000	0.193	0.000	1.000
Long-term debt due issued 4 years ago	0.037	0.000	0.000	0.000	0.189	0.000	1.000
Panel D: Long-term debt due>15% of total assets (dummy variables)							
Long-term debt due issued 2 years ago	0.027	0.000	0.000	0.000	0.163	0.000	1.000
Long-term debt due issued 3 years ago	0.021	0.000	0.000	0.000	0.144	0.000	1.000
Long-term debt due issued 4 years ago	0.022	0.000	0.000	0.000	0.146	0.000	1.000

Table 9:

The Effect of Maturing Long-term Debt on Employment and Investment (Maturing Debt at least 5% of Firm's Assets)

This table reports the results of regressions relating employment and investment decisions of firms to their maturing long-term debt for firms in our sample. The dependent variables used in the regressions are *%Δemployees*, *%Δinvestment*, *Investment/Assets*, or *%ΔPP&E*. All regressions include lagged values of the firm market-to-book ratio, firm internal liquidity, the log of the book value of firm assets, firm leverage, asset maturity, profitability, the credit rating dummy and year fixed effects. The first four regressions also include four-digit SIC fixed effects while the last four include firm fixed effects. All regressions are estimated with heteroscedasticity robust standard errors which are clustered by firm and reported in parentheses. Variable definitions are provided in Appendix A. a, b and c denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Long-term debt due>5% of total assets							
	%Δ employees (1)	%Δ investment (2)	I/K (3)	%Δ PP&E (4)	%Δ employees (5)	%Δ investment (6)	I/K (7)	%Δ PP&E (8)
Long-term debt due issued 2 years ago	-0.018 a	0.0004	-0.005 a	-0.005 a	-0.016 a	0.001	-0.004 a	-0.005 a
	(0.004)	(0.002)	(0.001)	(0.001)	(0.005)	(0.002)	(0.001)	(0.002)
Q_{t-1}	0.008 b	0.001	0.012 a	0.008 a	0.005	0.003 c	0.016 a	0.008 a
	(0.004)	(0.001)	(0.002)	(0.001)	(0.006)	(0.002)	(0.002)	(0.002)
Liquidity_{t-1}	0.200 a	0.038 a	-0.027 a	0.018 a	0.297 a	0.071 a	-0.017 b	0.037 a
	(0.021)	(0.006)	(0.008)	(0.006)	(0.032)	(0.010)	(0.008)	(0.009)
Log size_{t-1}	0.001	0.004 a	-0.003 a	0.007 a	0.060 a	0.009 a	-0.001	0.032 a
	(0.002)	(0.001)	(0.001)	(0.001)	(0.008)	(0.003)	(0.002)	(0.003)
Leverage_{t-1}	-0.022	-0.011 a	-0.022 a	-0.013 a	-0.087 a	-0.030 a	-0.037 a	-0.038 a
	(0.015)	(0.003)	(0.004)	(0.003)	(0.019)	(0.006)	(0.006)	(0.008)
$\text{Asset maturity}_{t-1}$	0.002 a	0.0004 a	0.001 a	0.282 a	0.005 a	0.001 a	0.002 a	0.454 a
	(0.0003)	(0.0001)	(0.0001)	(0.046)	(0.001)	(0.0002)	(0.0002)	(0.090)
Credit rating dummy_{t-1}	-0.022 a	0.0002	-0.006 a	-0.003 c	-0.028 a	-0.001 a	-0.006 b	-0.008 a
	(0.004)	(0.001)	(0.002)	(0.0015)	(0.001)	(0.003)	(0.003)	(0.003)
Profitability_{t}	0.525 a	0.118 a	0.146 a	0.136 a	0.767 a	0.189 a	0.145 a	0.188 a
	(0.031)	(0.009)	(0.013)	(0.009)	(0.042)	(0.013)	(0.012)	(0.012)
Adjusted R^2	0.15	0.06	0.38	0.16	0.28	0.04	0.63	0.30
Fixed-Effects								
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4-digit SIC	Yes	Yes	Yes	Yes	No	No	No	No
Firm	No	No	No	No	Yes	Yes	Yes	Yes
Observations	20,994	20,994	20,994	20,994	20,994	20,994	20,994	20,994

Table 10:
The Effect of maturing Long-term Debt on Employment and Investment (Maturing Debt at least 10% of Firm's Assets)

This table reports the results of regressions relating employment and investment decisions of firms to their maturing long-term debt for firms in our sample. The dependent variables used in the regressions are *%Δemployees*, *%Δinvestment*, *Investment/Assets*, or *%ΔPP&E*. All regressions include lagged values of the firm market-to-book ratio, firm internal liquidity, the log of the book value of firm assets, firm leverage, asset maturity, profitability, the credit rating dummy and year fixed effects. The first four regressions also include four-digit SIC fixed effects while the last four include firm fixed effects. All regressions are estimated with heteroscedasticity robust standard errors which are clustered by firm and reported in parentheses. Variable definitions are provided in Appendix A. a, b and c denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Long-term debt due>10% of total assets							
	%Δ employees (1)	%Δ investment (2)	I/K (3)	%Δ PP&E (4)	%Δ employees (5)	%Δ investment (6)	I/K (7)	%Δ PP&E (8)
Long-term debt due issued 2 years ago	-0.021 a	-0.001	-0.008 a	-0.008 a	-0.016 a	0.0001	-0.004 a	-0.005 a
	(0.006)	(0.001)	(0.002)	(0.002)	(0.007)	(0.002)	(0.001)	(0.002)
Q_{t-1}	0.008 b	0.001	0.012 a	0.008 a	0.005	0.003 c	0.016 a	0.008 a
	(0.004)	(0.001)	(0.002)	(0.001)	(0.006)	(0.002)	(0.002)	(0.002)
Liquidity_{t-1}	0.201 a	0.038 a	-0.027 a	0.018 a	0.298 a	0.071 a	-0.017 b	0.037 a
	(0.021)	(0.006)	(0.008)	(0.006)	(0.032)	(0.010)	(0.008)	(0.009)
Log size_{t-1}	0.0003	0.004 a	-0.003 a	0.007 a	0.060 a	0.009 a	-0.001	0.032 a
	(0.020)	(0.001)	(0.001)	(0.001)	(0.008)	(0.003)	(0.002)	(0.003)
Leverage_{t-1}	-0.025 c	-0.011 a	-0.023 a	-0.013 a	-0.089 a	-0.030 a	-0.038 a	-0.038 a
	(0.015)	(0.003)	(0.004)	(0.003)	(0.018)	(0.006)	(0.006)	(0.008)
$\text{Asset maturity}_{t-1}$	0.002 a	0.0004 a	0.001 a	0.283 a	0.005 a	0.001 a	0.002 a	0.454 a
	(0.0003)	(0.0001)	(0.0001)	(0.046)	(0.001)	(0.0002)	(0.0002)	(0.090)
Credit rating dummy_{t-1}	-0.022 a	0.0002	-0.006 a	-0.003	-0.028 a	-0.001	-0.005 b	-0.008 a
	(0.004)	(0.001)	(0.002)	(0.001)	(0.008)	(0.003)	(0.003)	(0.003)
Profitability_t	0.524 a	0.119 a	0.146 a	0.135 a	0.767 a	0.189 a	0.145 a	0.188 a
	(0.031)	(0.009)	(0.013)	(0.009)	(0.042)	(0.013)	(0.012)	(0.012)
Adjusted R^2	0.15	0.06	0.39	0.16	0.27	0.04	0.63	0.30
Fixed-Effects								
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4-digit SIC	Yes	Yes	Yes	Yes	No	No	No	No
Firm	No	No	No	No	Yes	Yes	Yes	Yes
Observations	20,994	20,994	20,994	20,994	20,994	20,994	20,994	20,994

Table 11:
The Effect of maturing Long-term Debt on Employment and Investment: Robustness (Maturing Debt at least 5% of Firm's Assets)

This table reports the results of regressions relating employment and investment decisions of firms to their maturing long-term debt for firms in our sample. The dependent variables used in the regressions are *%∆employees*, *%∆investment*, *Investment/Assets*, or *%∆PP&E*. We control for contemporaneous change in investment as well as for the concurrent level of scaled investment in employment regressions and for contemporaneous change in employment in investment regressions. We also add as an additional control the 4-digit SIC level of TFP growth which restricts the sample to manufacturing industries (those with 4-digit SIC 2000-3999). All regressions include lagged values of the firm market-to-book ratio, firm internal liquidity, the log of the book value of firm assets, firm leverage, asset maturity, profitability, the credit rating dummy and year fixed effects. The first four regressions also include four-digit SIC fixed effects while the last four include firm fixed effects. These regressions are estimated with heteroscedasticity robust standard errors which are clustered by firm and reported in parentheses. Variable definitions are provided in Appendix A. a, b and c denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Long-term debt due>5% of total assets							
	%∆ employees	%∆ investment	I/K	%∆ PP&E	%∆ employees	%∆ investment	I/K	%∆ PP&E
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Long-term debt due	-0.022 a	0.002	-0.002	-0.003	-0.019 b	0.002	-0.004 b	-0.004
issued 2 years ago	(0.007)	(0.002)	(0.002)	(0.002)	(0.009)	(0.003)	(0.002)	(0.003)
$\%\Delta TFP_t$	0.095 a	0.036 a	0.033 a	-0.001	0.052	0.027 c	0.016	-0.005
	(0.036)	(0.013)	(0.012)	(0.012)	(0.040)	(0.016)	(0.011)	(0.014)
$\%\Delta$ investment$_t$	0.149 a				0.085 a			
	(0.026)				(0.028)			
I/K_t	0.475 a				0.428 a			
	(0.062)				(0.088)			
$\%\Delta$ employees $_t$		0.036 a	0.035 a	0.115 a		0.029 a	0.024 a	0.103
		(0.004)	(0.004)	(0.006)		(0.005)	(0.005)	(0.007)
Q_{t-1}	0.002	0.002	0.010 a	0.006 a	-0.005	0.005 b	0.014 a	0.008 a
	(0.006)	(0.001)	(0.002)	(0.002)	(0.009)	(0.002)	(0.003)	(0.002)
Liquidity$_{t-1}$	0.241 a	0.032 a	-0.025 a	0.003	0.226 a	0.063 a	-0.028 a	-0.011
	(0.028)	(0.007)	(0.009)	(0.007)	(0.050)	(0.013)	(0.010)	(0.012)
Log size$_{t-1}$	-0.004	0.003 a	-0.002	0.007 a	0.057 a	0.001	-0.003	0.029 a
	(0.003)	(0.001)	(0.001)	(0.001)	(0.014)	(0.007)	(0.003)	(0.006)
Leverage$_{t-1}$	0.031 c	-0.003	-0.021 a	-0.005	-0.042	-0.019 b	-0.045 a	-0.031 a
	(0.018)	(0.004)	(0.007)	(0.005)	(0.029)	(0.008)	(0.008)	(0.009)
Asset maturity$_{t-1}$	-0.001	0.001 b	0.001 a	0.001 a	0.004 a	0.001 a	0.002 a	0.002 a
	(0.001)	(0.0001)	(0.0002)	(0.0002)	(0.001)	(0.0004)	(0.0004)	(0.0005)
Credit rating	-0.001	0.002	-0.002	0.004	0.003	0.001	0.002	0.0003
dummy$_{t-1}$	(0.001)	(0.002)	(0.003)	(0.003)	(0.012)	(0.004)	(0.003)	(0.004)
Profitability$_t$	0.423 a	0.078 a	0.104 a	0.075 a	0.654 a	0.120 a	0.103 a	0.074 a
	(0.049)	(0.010)	(0.013)	(0.009)	(0.068)	(0.018)	(0.014)	(0.013)
Adjusted R^2	0.19	0.06	0.33	0.27	0.31	0.03	0.57	0.36
Fixed-Effects								
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4-digit SIC	Yes	Yes	Yes	Yes	No	No	No	No
Firm	No	No	No	No	Yes	Yes	Yes	Yes
Observations	6,847	6,847	6,847	6,847	6,847	6,847	6,847	6,847

Figure 1. Firm-level employment changes versus firm-level investment changes

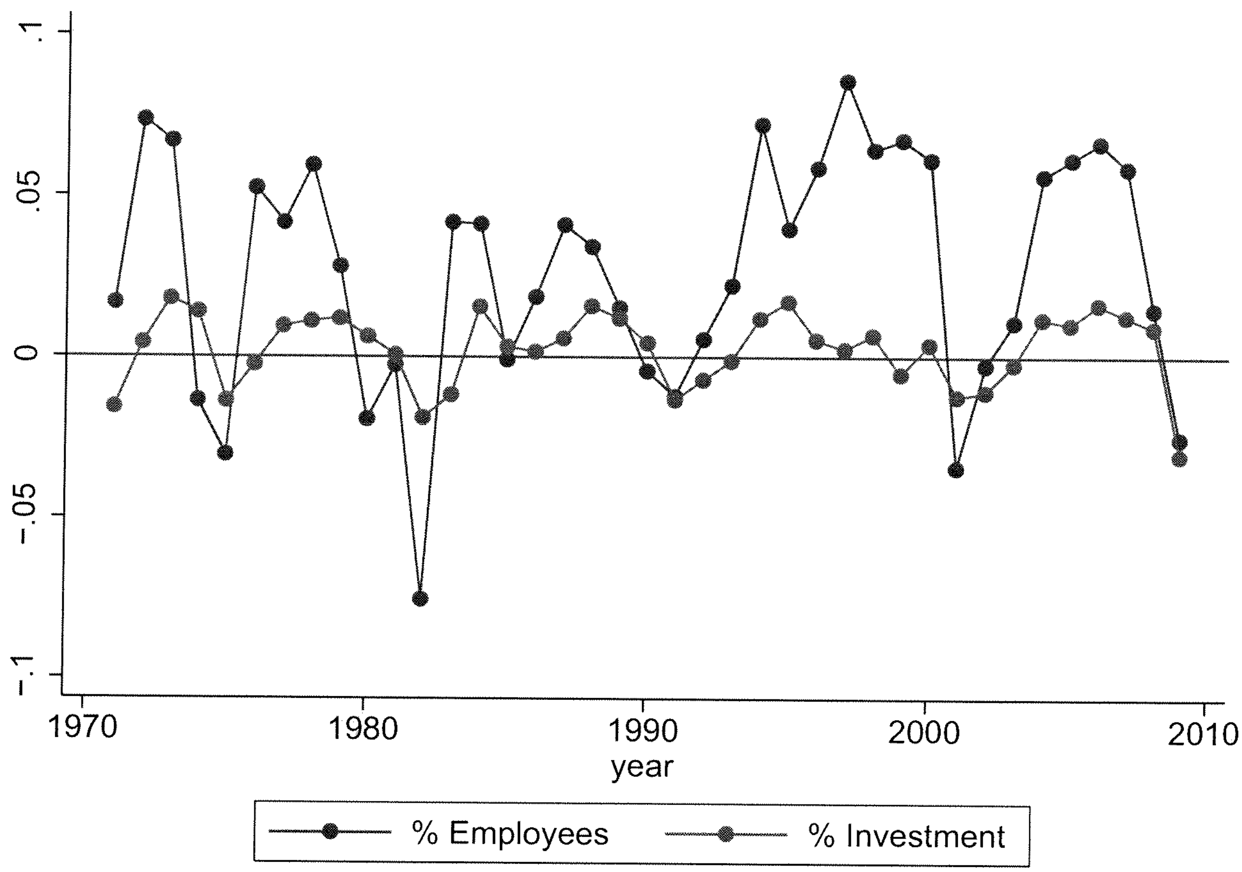

Figure 2. The relative magnitude of labor and capital wealth sensitivities, r, as a function of θ and μ_L.

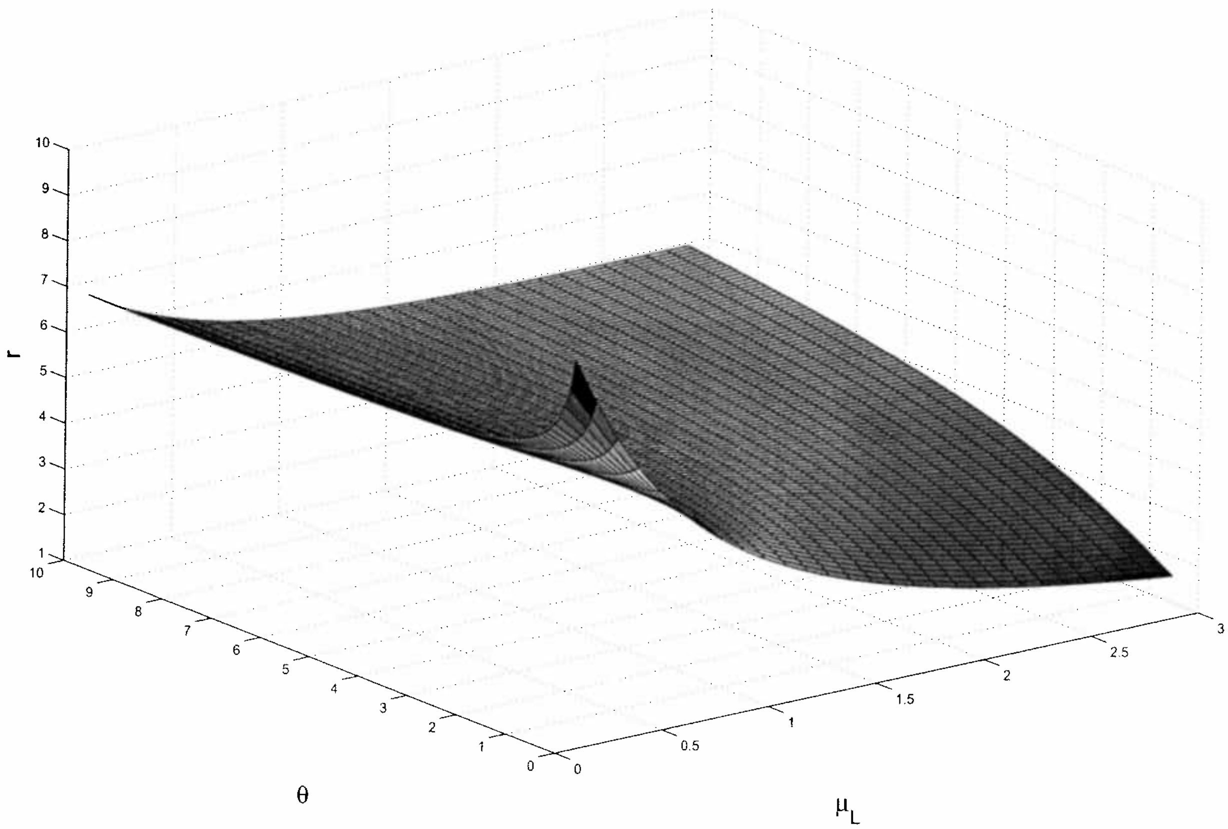

Figure 3. **The relative magnitude of labor and capital wealth sensitivities, r, as a function of θ for various values of μ_L.**

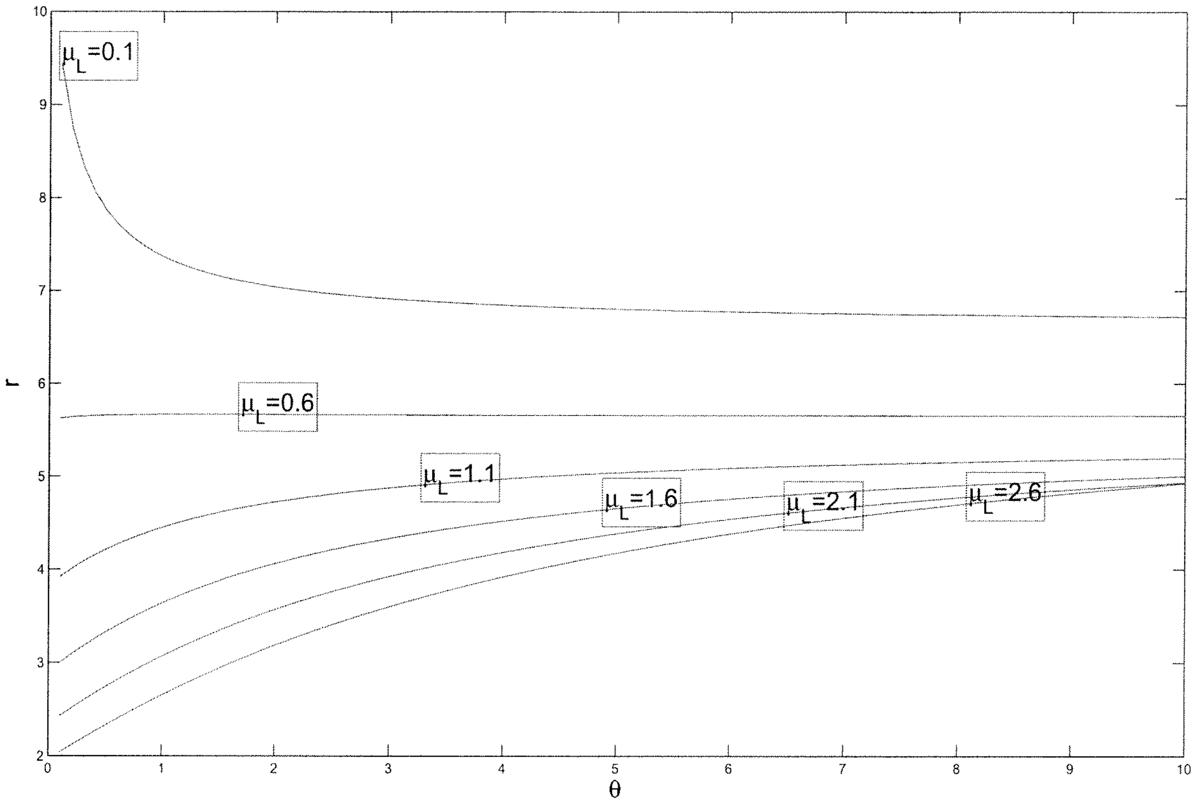

Figure 4. The relative magnitude of labor and capital wealth sensitivities, r, as a function of μ_L for various values of θ.

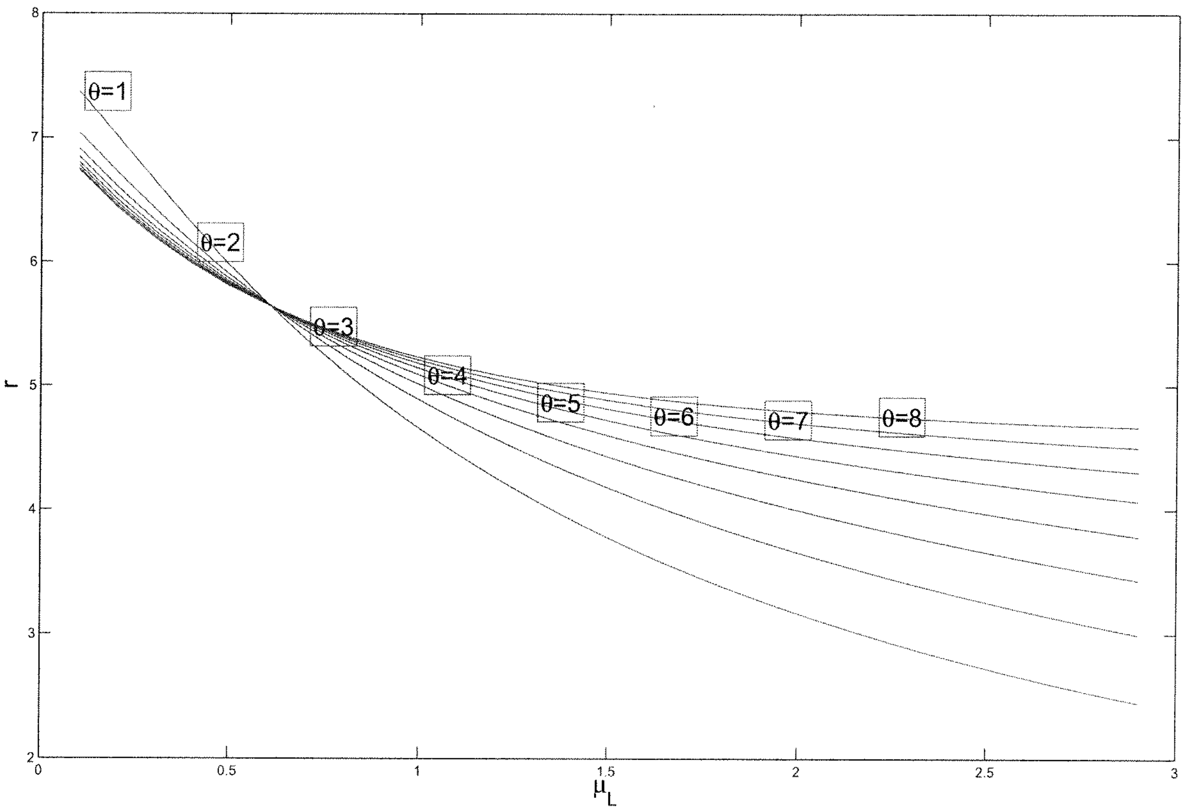

Figure 5. Firm-level employment changes stratified by leverage terciles

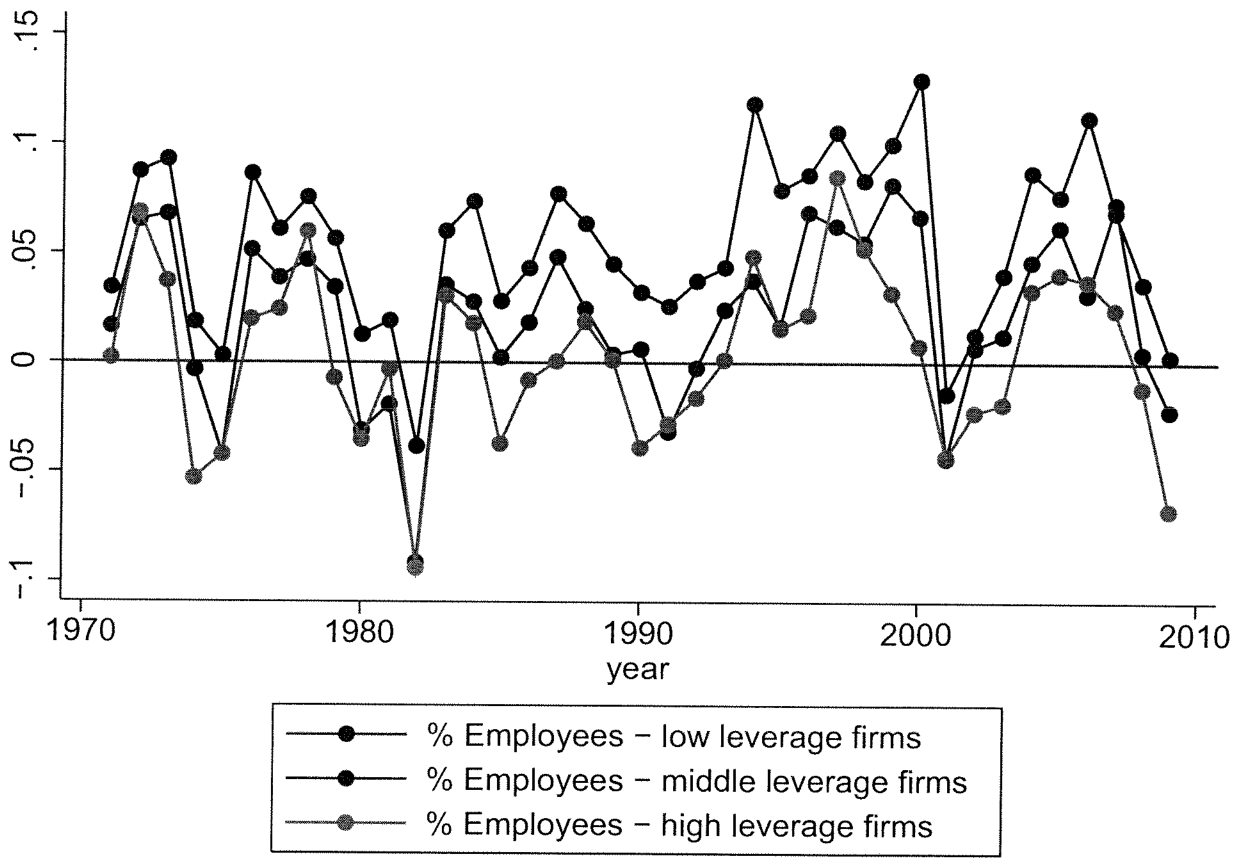

Figure 6. Firm-level investment changes stratified by leverage terciles

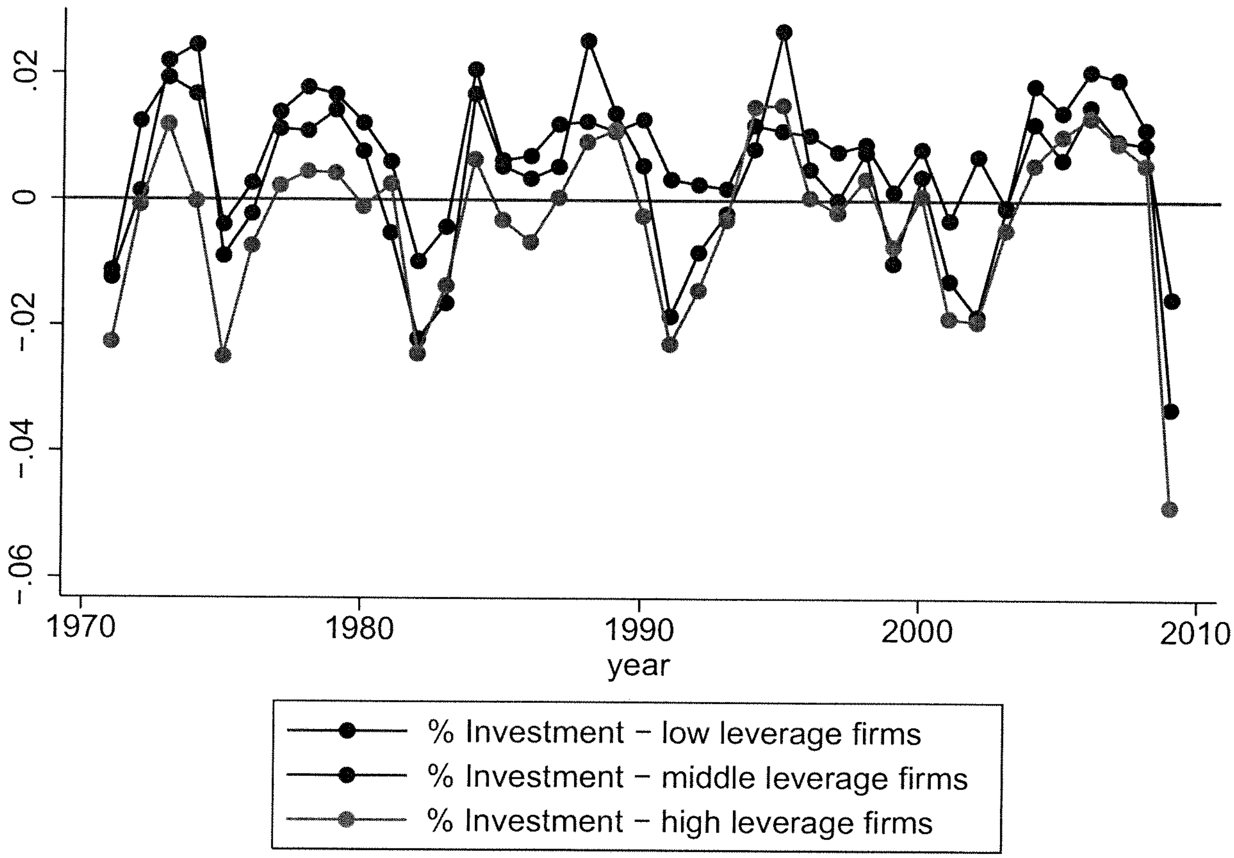

Figure 7. Firm-level inventories changes stratified by leverage terciles