Investment Cash Flow Sensitivities Really Reflect Related Investment Decisions*

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Investment Cash Flow Sensitivities Really Reflect Related Investment Decisions

Abstract

A large literature estimates the sensitivity of capital investment to internally generated cash flows to investigate the impact of financing frictions on corporate investment. A debate over whether investment-cash flow sensitivity reflects financing frictions or something else has been ongoing for many years without resolution. This paper provides a novel and intuitive explanation for documented patterns in investment-cash flow sensitivity. We argue and provide strong corroborating evidence that investment-cash flow sensitivity reflects a fundamental economic connection between capital investment and working capital investment as interrelated manifestations of firm growth, rather than reflecting consequences of financing frictions. We dissect the primary cash flow measure used in the literature, earnings before depreciation (*EBD*), into cash flow from operations (*CFO*), and a non-cash component, working capital accruals (*WCACC*) which represents net investment in working capital items like inventory and accounts receivable. By analyzing investment-*WCACC* and investment-*CFO* sensitivities, we provide systematic evidence in favor of a growth rather than a financing frictions interpretation of investment-cash flow sensitivity, showing that the fundamental investment component of *WCACC* is the primitive driver of investment-*EBD* sensitivity, while *CFO*, rather than serving as a source of investment financing, represents noise that obscures the primitive growth relation.

Introduction

Beginning with the seminal work of Fazzari, Hubbard, and Petersen (1988), an important literature utilizes estimated coefficients from regressing firms' capital investment on internally generated cash flow (i.e., investment-cash flow sensitivity) to explore the impact of financing constraints on investment decisions and to investigate theories of financing frictions.[1] This approach builds on the idea that if financing frictions cause internal funds to have a cost advantage over outside debt or equity finance, then the capital investment decisions of financially constrained firms will be influenced by internally generated cash flows, after controlling for investment opportunities. Consistent with the existence of significant financing frictions, many studies find that firms which are classified as a priori more likely to confront binding financing constraints display a greater sensitivity of capital investment to cash flow.[2]

Following an influential paper by Kaplan and Zingales (1997), a literature has emerged that criticizes the investment cash flow sensitivity approach along several key dimensions.[3] One line of argument posits that investment cash flow sensitivity results are an artifact of measurement error in investment opportunities (i.e., Tobin's Q) rather than a manifestation of financing frictions. According to this argument cash flow acts as a proxy for investment opportunities not captured by Tobin's Q and does so differentially across firms (e.g., Poterba 1988, Gilchrist and Himmelberg 1995, Erickson and Whited 2000, and Alti 2003). A second line of criticism focuses on the central role played by the a priori partitioning of firms based on

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[1] As noted in Brown and Petersen (2009) "The study of the investment-cash flow sensitivity constitutes one of the largest empirical literatures in corporate finance." The investment-cash flow sensitivity has also been used in the accounting literature. The standard approach to estimating investment-cash flow sensitivity is to run fixed effects panel regressions of capital investment on cash flow and Tobin's Q (to control for investment opportunities).

[2] A typical design partitions firms based on measures of the a priori likelihood that they face financing constraints and then examines whether investment-cash flow sensitivity increase as financial constraints intensify. For literature reviews see Schiantarelli (1996), Hubbard (1998), and Bond and Van Reenen (2007).

[3] See Fazzari, Hubbard, and Petersen's (2000) response to Kaplan and Zingales (1997), and the Kaplan and Zingales (2000) rebuttal. Also see Hubbard (1998) for an excellent synthesis of the criticism leveled against the investment-cash flow sensitivity approach.

financing constraints in establishing the interpretation of investment cash flow sensitivity. This literature shows that the ordering of investment-cash flow sensitivity across financing constraint partitions is sensitive to how constraints are measured, finding that investment-cash flow sensitivity can actually be decreasing in financing constraints under some measures (e.g., Kaplan and Zingales 1997, Cleary 1999, and Hadlock and Pierce 2010). In a third criticism, Moyen (2004) posits a potential correlated omitted variable problem, showing that positive investment-cash flow sensitivities can be generated even if firms do not face financing frictions because current debt financing is correlated with cash flow and debt finance is omitted in the regression.

Despite this extensive criticism, the investment-cash flow sensitivity approach continues to be widely used as a tool to study a variety of issues in corporate finance and accounting.[4] Thus, the correct interpretation of investment-cash flow sensitivity remains an important open issue awaiting resolution.

In this paper, we provide a novel and intuitive explanation for documented patterns in investment-cash flow sensitivity that exploits the fundamental nature of the cash flow variable. We argue and provide strong corroborating evidence that estimated investment-cash flow sensitivity reflects a fundamental economic connection between capital investment and working capital investment as interrelated manifestations of firm growth, rather than reflecting consequences of financing frictions. We show that our explanation ties together the different strands of criticisms of the investment-cash flow sensitivity approach discussed earlier.

Our point of departure is the fact that prior research generally defines internally generated cash flow as accounting earnings before depreciation and amortization (*EBD*). *EBD* can be

[4] For example, recent studies examine earnings quality and capital investment (Biddle and Hilary 2006, Li and Tang 2008, Polk and Sapienza 2008), information asymmetry and investment-cash flow sensitivity (Ascioglu, Hegde, and McDermott, 2008), changes in investment-cash flow sensitivity over time (Brown and Petersen 2009), asset tangibility and financing constraints (Almeida and Campello 2007), and U-shaped investment (Cleary, Povel and Raith 2007), among many others.

decomposed into an accrual component (*WCACC*) which primarily reflects net investment in non-cash working capital items such as inventory and accounts receivable, and a cash component, cash flow from operations (*CFO*). Our analysis exploits key distinctions in the nature of these two components to reveal insight into the essence of investment-*EBD* sensitivity. To the extent that capital investment represents an increase in firms' scale capacity, it is natural to expect corresponding investment in working capital items such as inventory and accounts receivable as captured by *WCACC*. This raises the possibility that investment-*EBD* sensitivity primarily captures the direct connection between fixed capital and working capital investment as two related indicators of underlying firm growth. Alternatively, since *CFO* represents internally available cash, investment-*EBD* sensitivity may capture the role of *CFO* in funding investments by firms constrained in their ability to access outside capital. Of course, it is possible that *WCACC* and *CFO* jointly impact investment, for example by jointly influencing the cost of external capital or the availability of collateral.

To distinguish the financing frictions interpretation from the growth interpretation, we begin our analysis by replacing *EBD* first with *WCACC* and then with *CFO*, and examining how investment-*WCACC* sensitivity[5] and investment-*CFO* sensitivity vary across a priori financial constraint partitions.[6] Under a financing frictions interpretation, firms constrained in their ability to access outside capital should rely on internally generated cash flows as an important funding source for capital investment, implying that investment-*CFO* sensitivity will be positive and increasing with financial constraints. Under this interpretation, there is no clear prediction for investment-*WCACC* sensitivity. For example, Fazzari and Petersen (1993) posit that working

[5] Although for convenience we refer throughout to the estimated coefficient on *WCACC* in the investment regression as "investment-*WCACC* sensitivity", we interpret the coefficient as a reflection of the co-movement of fixed and working capital investment rather than the causal effect of working capital investment on capital investment.
[6] We focus on three widely used a priori financial constraint partitions: dividend payout ratio, firm age, and the financial constraint measure developed in Cleary (1999) referred to as Z_{FC}.

capital can serve as a source of liquidity to facilitate smoothing of fixed investment by financially constrained firms, implying that the coefficient on change in working capital will be negative for financially constrained firms (see Section 4.2 below).

Turning to the growth interpretation, we argue that if investment-*EBD* sensitivity captures the growth connection between fixed capital and working capital investment, then investment-*WCACC* sensitivity should be positive and increase with firm growth. To connect our growth story to the extant financing frictions story, we empirically establish that classic measures of financing constraints such as dividend yield, firm age and Cleary's Z_{FC} metric, are strongly correlated with measures of firm growth implying that these financing constraint partitions can also be interpreted as growth partitions.[7] We argue that the extent to which *WCACC* reflects investment in working capital as opposed to random timing fluctuations in accruals increases with firm growth, and predict that investment-*WCACC* sensitivity will therefore increase in firm growth.[8] Under a growth interpretation, we have no clear prediction for the association between investment-*CFO* sensitivity and growth, although the generally negative relation between *CFO* and firm growth may result in investment-*CFO* sensitivity actually being negative.

Consistent with the growth story, we find that investment-*WCACC* sensitivity is positive and increasing in firm growth. In contrast, we find that investment-*CFO* sensitivity is often *negative* and tends to decrease as financing constraints increase, rejecting the hypothesis that investment decisions of constrained firms are relatively more sensitive to internally generated cash flows than for less constrained firms.

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[7] We find that dividend yield and firm age are negatively correlated with growth, while Cleary's Z_{FC} metric is positively correlated with growth. Thus, our growth interpretation whereby investment-cash flow sensitivity increases with growth reconciles conflicting results in the literature where investment-cash flow sensitivity increases with financial constraints for some measures (e.g., dividend yield and firm age) and decreases in financial constraints under other measures (e.g., Cleary's Z_{FC}).

[8] Zhang (2007) shows that working capital accruals are highly positively related to other growth attributes, such as growth in number of employees, growth in sales, growth in fixed assets, and growth in financing activities.

To more powerfully distinguish the growth from the financing constraint interpretation, we delve deeper into the underlying drivers of investment-*WCACC* sensitivity. We consider the fact that *WCACC* not only reflects investment in working capital but also captures random fluctuations in working capital due to timing issues that are independent of growth.[9] To separate random timing from working capital investment, we build on Dechow and Dichev (2002), who estimate the random timing component of accruals by regressing current period accruals on past, current, and future cash flows. We extend the Dechow and Dichev model to also include growth proxies, using the fitted value of the three cash flow variables to capture the random timing component of accruals and the fitted value of growth variables to capture the fundamental investment component. We find that the pattern in investment-*WCACC* sensitivity is driven by the fundamental investment component of *WCACC*, not the random timing component.[10]

We also consider implications of including *WCACC* and *CFO* simultaneously in the investment equation. If, as we hypothesize, investment-*EBD* sensitivity reflects connections between capital investment and working capital investment as related manifestations of growth, we predict that when both *WCACC* and *CFO* are included the primary role of *CFO*, operating through its negative correlation with *WCACC*, is to filter out random timing noise in *WCACC* that obscures the fundamental investment component. We document evidence consistent with this prediction, supporting the hypothesis that the investment component of *WCACC* is the primitive driver of investment-*EBD* sensitivity, while *CFO*, rather than serving as a source of investment financing, represents noise that obscures the primitive growth relation.

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[9] A significant literature considers the random timing of accruals (e.g., Financial Accounting Standards Board 1978; Dechow 1994; Dechow and Dichev 2002). There also is a line of research on the fundamental investment of accruals (e.g., Stickney, Brown, and Wahlen (2003, Chapter 3); Fairfield et al. 1996; Zhang 2007; Wu et al. 2010).

[10] To reinforce the investment interpretation of *WCACC*, we also separately examine individual working capital accruals (e.g., changes in inventory and changes in accounts receivable) and find that the sensitivity of investment to the individual components of *WCACC* exhibit the same pattern as documented for investment-*WCACC* sensitivity.

A further implication of the growth interpretation is that investment-*EBD* sensitivity should be higher for high-growth firms than for low-growth firms. We directly test this implication by substituting growth proxies in place of the a priori measures of financial constraints and find that investment-*EBD* sensitivity increases monotonically in firm growth. We then examine the relative power of financial constraint versus growth proxies, and find that investment-*EBD* sensitivity significantly increases with growth while the financial constraint measures have no incremental explanatory power in the presence of the growth measures.

Our paper contributes to the unresolved debate over the correct interpretation of investment-cash flow sensitivity. While the ongoing literature acknowledges potential problems with investment-cash flow sensitivity, this approach is still widely used, and simply caveating potential problems is no substitute for understanding what drives investment-cash flow sensitivity. The main point of our paper is that the extant literature has ignored the connection between fixed investment and the working capital investment component of *EBD* as complementary factors of production, and misinterpreted the resulting investment-*EBD* sensitivity as the (causal) effect of cash flows on investment. Hence, the literature attributes investment-cash flow sensitivity to financing frictions, when it is more plausibly a manifestation the connection between fixed and working capital investment that reflects firms' underlying decisions to expand capacity.[11] We are the first paper in the literature to discover this connection by disaggregating *EBD* into distinct *WCACC* and *CFO* components.[12] We believe our

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[11] The co-movement between fixed and working capital investment is consistent with a number of potential mechanisms that could underlie capacity expansion decisions, including changes in the cost of capital, exogenous shocks in investment opportunities, executive's empire building behavior, or managerial irrationality. It is important to note that the potentially simultaneous nature of the determination of fixed and working capital investment does not cause bias or other econometric problems in the regression of capital investment on working capital investment as long as the regression results are narrowly interpreted as we do as evidence of their co-movement rather than the effect of working capital investment on capital investment.

[12] We emphasize that our paper does not imply that financing constraints are unimportant for investment decisions. A range of empirical strategies avoid investment-cash flow sensitivities. These include using an Euler equation

reinterpretation of the evidence provides a sound basis for intelligently reinterpreting a range of extant empirical results, and creates potential new opportunities for understanding corporate investment decisions.

The rest of the paper is organized as follows. Section 2 lays out the conceptual and empirical framework and hypothesis development. Section 3 presents our main empirical analyses of investment-cash flow sensitivities. In section 4, we explore alternative explanations. In section 5 we verify the robustness of our results to alternative empirical specifications, while section 6 concludes.

2. Conceptual and Empirical Framework

We begin our discussion by stating the basic panel regression equation used widely in the literature to estimate investment-*EBD* sensitivity:

$$I_t / K_{t-1} = \beta_1 q_{t-1} + \beta_2 EBD_t / K_{t-1} + FIRMDUMMIES + YEARDUMMIES + e_t\ , \qquad (1)$$

where I_t is capital investment in period *t*, K_{t-1} is capital stock at the beginning of period *t*, q_{t-1} is average *q* in year *t-1*, and EBD_t, measured as earnings before extraordinary items plus depreciation and amortization expense in year *t*, is the cash flow variable commonly used in the literature.[13] The empirical specification in equation (1) builds on the foundation of the Q-theory of investment (Tobin 1969, Hayashi 1982), extended to allow for financing frictions (Fazzari et al. 1988). Q-theory posits that in perfect markets without financing frictions, investment is

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approach (e.g., Hubbard, et al.(1995), Bond and Meghir (1994), Carpenter (1992), and Whited (1992)), examining the cash flow sensitivity of cash balances (Almeida, Campello and Weisbach (2004)), trying alternative measures of financing constraints (e.g., Whited and Wu (2006) and Hennessy and Whited (2007)), and exploiting natural experiments (Blanchard, et al. 1994, Lamont 1997, and Rauh 2006).

[13] With few exceptions existing studies define cash flow as earnings before depreciation (Compustat data item 18 plus data item 14). Papers using this definition include Fazzari et al. (1988), Whited (1992), Fazzari and Petersen (1993), Kaplan and Zingales (1997), Erickson and Whited (2000), Almeida and Campello (2007), Cleary et al. (2007), Polk and Sapienza (2008), and Hadlock and Pierce (2010). While Cleary (1999) in addition adds back changes in deferred taxes, his cash flow measure follows the rest of literature by embedding changes in non-cash working capital items. In table 4 below we replicate the main results in Cleary (1999) with the standard *EBD* measure.

completely determined by investment opportunities (i.e., marginal *q*) and adjustment costs (captured by β_1 in (1)).

Fazzari et al. (1988) explicitly recognize that investment spending must be financed and that internally generated cash flow represents an important source of finance. With perfect capital markets there is no reason to expect realizations of internal cash flow to impact optimal investment decisions. However, if financing frictions due to agency problems drive a wedge between the cost of internal and external funds, the capital investment decisions of financially constrained firms will be influenced by internally generated cash flows, after controlling for investment opportunities. The coefficient β_2 in (1) captures sensitivity of investment to internally generated cash flows (*EBD*), and is commonly referred to as investment-cash flow sensitivity.

Many studies document that investment-cash flow sensitivity is higher for firms a priori classified as being more financially constrained than for firms classified as less constrained (see Hubbard (1998) for a review of the literature). However, we argue that estimated investment-cash flow sensitivity reflects a fundamental economic connection between capital investment and working capital investment as interrelated manifestations of firm growth, rather than reflecting consequences of financing frictions.

Our argument exploits the fact that *EBD* can be disaggregated as

$$\begin{aligned} EBD &= E + DEPEXP \\ &= (CFO + ACCRUALS) + DEPEXP \\ &= (CFO + WCACC - DEPEXP) + DEPEXP \\ &= CFO + WCACC, \end{aligned} \qquad (2)$$

where *E* is earnings before extraordinary items, *ACCRUALS* is total accruals (the difference between accounting net income and cash flow from operations), *WCACC* is working capital accruals, *CFO* is cash flow from operations, and *DEPEXP* is depreciation and amortization expense. The *WCACC* component of *EBD* primarily reflects net investment in non-cash working capital items such as inventory and accounts receivable.

Accrual accounting systems recognize economic events in firms' financial statements independently of the timing of cash flows associated with these events. In (2), the relation *EBD= CFO + WCACC* reflects the fact that accrual accounting transforms *CFO* into *EBD* via a series of adjustments captured by *WCACC*. The *WCACC* component of *EBD* can be conceptualized as consisting of two aspects: (1) random fluctuations in working capital due to timing issues that are largely independent of growth, and (2) investments in non-cash working capital which are a direct manifestation of firm growth.

The first aspect of *WCACC* derives from accrual accounting's short term role in smoothing out random timing fluctuations in cash flows (e.g., Dechow (1994)). For example, consider a firm in steady state with constant scale of operations over time. An increase in accounts receivable due to a customer delaying payments unexpectedly would simultaneously reduce *CFO* and increase *WCACC* by the same amount. Similarly, if the firm automatically replenishes inventory to upper threshold S when inventory level hits lower threshold s, an unexpected change in the timing of sales to customers would generate random fluctuations in *WCACC* unrelated to firm growth as inventory levels bounce between s and S. The random timing component of *WCACC* bears no conceptual relation to capital investment and we do not expect this component to impact estimated investment-*EBD* sensitivity. We later verify this by directly estimating the random timing component of *WCACC* and showing that it is unrelated to fixed investment regardless of firms' financing constraints or growth characteristics.

The second aspect of *WCACC* derives from accrual accounting's role in long-term smoothing over firms' business and life cycles. Accrual accounting acts to smooth earnings by recognizing higher (lower) earnings than cash flows during periods of growth (decline), implying that the difference between earnings and cash flows is sensitive to firms' business stage. During expansions, firms increase levels of fixed assets, employees, production output, and sales to customers. Investment in fixed assets for growing firms is naturally accompanied by investment in working capital items like inventory and accounts receivable to support the increasing scale of operations, where this growth in working capital impacts *WCACC* and *CFO*. For example, if a growing firm invests in higher inventory levels by spending cash, *CFO* decreases but *WCACC* increases to reflect the fact that this inventory growth represents an investment asset rather than an expense of the period. The fact that *WCACC* embeds a fundamental investment aspect represents the foundation of our hypothesis that investment-*EBD* sensitivity primarily captures the direct connection between fixed capital and working capital investment as two related indicators of underlying firm growth.

Given this direct connection between fixed capital and working capital investment, it is intuitive that estimated *EBD*-investment sensitivity will vary systematically with firm growth.[14] To see this, consider first that capital investment of high growth firms is plausibly higher in magnitude and reflects a higher proportion of capacity expanding investment relative to that of low growth firms where investment is likely dominated by replacement of depreciated capital. Further, growth in working capital investment will be related to capacity expanding investment, not replacement investment. Because the connection between capital and working capital investment is driven by capacity expanding investment, the higher proportion of capacity expanding versus replacement investment for high growth relative to low growth firms implies

[14] Recall that many studies document that investment-cash flow sensitivity is higher for firms a priori classified as being more financially constrained than for firms classified as less constrained. We justify our consideration of this issue in terms of growth rather than financial constraints partitions by the fact that we empirically establish below that dividend yield, firm age and Cleary's Z_{FC} metric are strongly correlated with measures of firm growth, implying that these financial constraint partitions can be interpreted as growth partitions.

that the correlation between capital investment and working capital investment will be higher for high growth relative to low growth firms.

Second, higher capacity expanding versus replacement investment suggests that the volatility of investment will be higher for high growth relative to low growth firms. When investment approximates replacement capital (i.e., depreciation) it will tend to be small in magnitude and fairly steady over time. In contrast, capacity expanding investment will tend to be large in magnitude and reflect significant volatility given the general lumpiness of manufacturing investment (e.g., Doms and Dunne 1997). Higher investment volatility in turn increases the volatility of the working capital investment component of *WCACC* relative to random timing fluctuations, driving a higher correlation between *WCACC* and capital investments for high growth firms. For slow growth or steady state firms, random fluctuations dominant the working capital investment aspect of *WCACC*, resulting in a lower correlation between capital investment and *WCACC* for these firms.

To clarify why the correlation between capital investment and working capital investment is higher for higher growth firms, consider the following simple example. Assume that

1. Capital Investment is given by *I*. The proportion of *I* representing capacity expanding investment (as opposed to replacement of depreciated capital) is given by the fraction *G*. *G* is strictly increasing in firm growth.[15] Let $VAR(I) = \sigma_I^2$;
2. Working capital investment, $WCI = a \cdot (G \cdot I)$. That is, working capital investment is proportional to the growth component of capital investment, $G \cdot I$; and
3. Working capital accruals, $WCACC = WCI + \varepsilon = a(GI) + \varepsilon$, where ε is independently distributed random fluctuation in *WCACC* due to timing issues and $VAR(\varepsilon) = \sigma_\varepsilon^2$.

It is now straightforward to show that the correlation between *I* and *WCACC* is given by

[15] *G* can be conceptualized as the expected value of the ratio $\frac{growth\ investment}{(growth\ investment + replacement\ investment)}$. That is, the growth component of capital investment is equal to the product $G \cdot I$.

$$\rho(I,WCACC) = \frac{a}{\left(a + \dfrac{\sigma_\varepsilon^2}{G\sigma_I}\right)^{1/2}}. \tag{3}$$

We next use (3) to derive sufficient conditions under which $\frac{\partial\rho(I,WCACC)}{\partial growth} > 0$.

It is directly evident from (3) that $\rho(I,WCACC)$ is increasing in $G\sigma_I / \sigma_\varepsilon^2$. Holding σ_I and σ_ε constant, $\rho(I,WCACC)$ is strictly increasing in *G* which itself increases with growth, and holding *G* and σ_ε constant, $\rho(I,WCACC)$ is increasing in growth if $\frac{d\sigma_I}{dgrowth} > 0$. It is also the case that $\frac{dG}{dgrowth} > 0$ and $\frac{d\sigma_I}{dgrowth} > 0$ implies that $\frac{dG\sigma_I}{dgrowth} > 0$. In table 3, panels B and C, below, we provide descriptive evidence consistent with $\frac{dG}{dgrowth} > 0$ and $\frac{d\sigma_I}{dgrowth} > 0$. Finally, it is possible that the random timing noise σ_ε increases with growth, requiring the further condition that as firm growth increases, $G\sigma_I$ must increase faster than the σ_ε. While we do not think it is likely that random timing noise would in general increase faster than changes in fundamentals, this is an empirical question. In sections 3.3.1 and 3.3.2 we deal with composition of *WCACC* head on by empirically decomposing *WCACC* into fundamental working capital investment and random fluctuations components and showing that the random timing component is basically unrelated to capital investment.

Finally, it is plausible that in terms of reversibility of investment, it is more costly to downsize capital investment than to downsize working capital investment. So for low growth firms, working capital is adjusted downward faster than capital investment, resulting in a lower correlation.[16]

3. Empirical analysis of investment-cash flow sensitivity

In section 3.1 we describe our sample and present descriptive statistics. In section 3.2 we show that investment-cash flow sensitivities are driven by *WCACC*, not by *CFO*. In section 3.3, we further test direct implications of our growth theory.

3.1 Sample and descriptive statistics

Our sample selection procedure follows that of Gilchrist and Himmelberg (1995), Almeida et al. (2004), and Almeida and Campello (2007). We consider the universe of manufacturing firms (2000<=SIC<=3999) spanning the period 1971 to 2006. We delete:

(1) Firm-years with beginning PP&E less than $5 million (in 1982 dollars) in order to avoid the small denominator problem.

(2) Firm-years with asset growth exceeding 100% in order to avoid large M&A transactions and seasoned equity offers.

(3) Firms-years with negative *q* or with *q* in excess of 10 to reduce measurement error.

Additionally, following Bond and Meghir (1994) and Almeida and Campello (2007), we do not require that firms have no-missing observations throughout the sample period. Instead, we only require that firms have at least five consecutive years of data in the sample period in order to address survivorship bias.

Following the literature, investment (*I*) is measured as capital expenditures. Tobin's *q* is measured as the market value of assets divided by the book value of assets.[17] *EBD* is earnings

[16] Consistent with this conjecture, we document in untabulated results that low growth firms are characterized by positive capital investment but negative *WCACC*.
[17] In section 5, we try alternative measures of investment opportunities and implement a range of other robustness checks.

before extraordinary items plus depreciation. Working capital accruals (*WCACC*) are defined as changes in current assets excluding the cash balance, minus changes in current liabilities excluding debt and taxes payable. Cash flow from operations (*CFO*) equals earnings plus depreciation expense minus working capital accruals.[18] Beginning capital (K_{t-1}) is beginning net property, plant, and equipment.

Table 1 provides descriptive statistics and describes precisely how all variables are measured. Panel A shows that sample firms on average invest 23.6% of beginning capital. All variables exhibit significant variation, where the variables *EBD*, *CFO*, and *WCACC*, all scaled by K_{t-1}, range from large positive to large negative values.

Table 1, panel B reports a correlation matrix. Focusing on Pearson correlations (results from Spearman correlations are qualitatively similar), the investment variable, I_t/K_{t-1}, exhibits correlations of .26 or higher with all variables except for *CFO* (ρ = .06). All variables are correlated with q at greater than .17 except for *CFO* (ρ = .06). Also note that *CFO* and *WCACC* are negatively correlated at -.37. This large negative correlation is well documented in the literature (see e.g., Dechow (1994) and Dechow, Kothari and Watts (1998)). Despite the large negative correlation between *WCACC* and *CFO*, *WCACC* is highly correlated with capital investment ((ρ = .26) while *CFO* is only correlated with investment at a level of .06. This fact will prove important to our analysis.

3.2 Separate analysis of investment-*WCACC* and investment-*CFO* sensitivity

In table 2, we examine the relation between investment and *EBD*, *CFO*, and *WCACC*, after controlling for q but before considering any a priori partitioning of firms. Table 2, column 1 documents the well-known positive and significant investment-cash flow sensitivity, with a

[18] We measure *WCACC* using the balance sheet method. A more direct method uses the cash flow statement, but this data is available only from 1989 forward. In section 5, we verify that our results are not an artifact of using the balance sheet method.

coefficient on *EBD* of .122 and a t-statistic of 16.56. In contrast, column 2 substitutes *CFO* for *EBD* and documents a negative relation between fixed investment and *CFO* (t = -3.09), while column 3 reveals a strong, positive relation between investment and *WCACC* (t = 20.23). Our main premise is that *WCACC* captures growth in non-cash working capital and so is naturally correlated with other investments in growth like capital expenditures.

Introducing a priori financing constraint partitions: dividend payouts, firm age and Z_{FC}

We next introduce three partitioning variables that have been used widely in the literature to classify firms as financially constrained: dividend payout ratio, firm age, and Cleary's (1999) financial constraint index, Z_{FC}, whereby lower values of all three partitioning variables are classified as being more financially constrained. The premise of Z_{FC} is that firms who cut dividends are more likely to be financially constrained. Following Cleary (1999), we use discriminant analysis, classifying firms into dividend cut, no change, and dividend increase groups based on the following beginning-of-period variables: current ratio (*Current*), debt ratio (*Debt*), fixed charge coverage (*FCCov*), net income margin (*NI%*), sales growth (*SalesGrowth*), and slack/net fixed assets (*SLACK/K*)[19]. Z_{FC} is estimated using the following model (see Cleary (1999) for more detail):

$$\begin{aligned} Z_{FC} &= \beta_1 Current + \beta_2 FCCov + \beta_3 SLACK / K + \beta_4 NI\% \\ &\quad + \beta_5 SalesGrowth + \beta_6 Debt \end{aligned} \qquad (4)$$

An important criticism of the investment-cash flow sensitivity approach focuses on the fact that the ordering of investment-cash flow sensitivity across financing constraint partitions is sensitive to how financial constraints are measured. While Fazzari et al. (1988) and others

[19] Note that Slack is defined as balance sheet cash + short term investments + (0.50 x inventory) + (0.70 x accounts receivable) - short term loans.

document that investment-cash flow sensitivity increases in financing constraints measured as dividend payout and firm age (among others), Kaplan and Zingales (1997) and Cleary (1999) develop alternative measures of financial constraints and show that that investment-cash flow sensitivities are *higher* for unconstrained firms.[20] We argue that our growth interpretation can reconcile these conflicting results, contending that it is differences in growth characteristics of firms across a priori partitions that underpin documented patterns in investment-*EBD* sensitivities, not differences in financing constraints.

In table 3, Panel A we document that all three partitioning variables are significantly correlated with firm growth. In panel A, we see that the dividend payout ratio and firm age are negatively related to employee growth, sales growth and earnings growth, while Cleary's Z_{FC} is significantly positively related to all three growth measures. In table 3, panels B and C we document that the standard deviation of capital investment increases with growth, i.e. $\frac{d\sigma_I}{dGrowth} > 0$ in the notation of the example in section 2. Further supporting the intuition of the example in section 2 for why $\frac{\partial\rho(I, WCACC)}{\partial Growth} > 0$, table 3, panels B and C both reflect that $\frac{dG}{dGrowth} > 0$.[21] In panel B we compute standard deviation of investment ($Std(I_t/K_{t-1})$) and average proportion of growth investment (G) across quartiles of growth measures using pooled firm years, while in panel C we compute firm specific $Std(I_t/K_{t-1})$ and firm average G, and then partition all firms into four growth quartiles based on a firm's average growth characteristics.

[20] We focus on Cleary's Z_{FC} as it is implementable using a large data sample, while Kaplan and Zingales (1997) construct a small sample measure based on in-depth analysis of firms' financial reports.

[21] In panels B and C we proxy for the factor G with the ratio *growth investment / (growth investment + replacement investment)*, where replacement investment is depreciation (data14) and growth investment is computed as the remaining portion *(investment – replacement investment).*

While the evidence in tables 1, 2 and 3 is suggestive of our growth story, we turn next to panel estimations that dissect investment-*EBD* sensitivity into investment-*WCACC* and investment-*CFO* sensitivities, after controlling for investment opportunities, *q*. Table 4 consists of three panels, one for each of the partitioning variables dividend payout ratio, firm age, and Z_{FC}. After partitioning firms into quartiles, we run panel regressions of investment on a cash flow construct and *q* for firms in each quartile, iteratively using one of three different cash flow measures, *EBD*, *WCACC*, and CFO. For parsimony, we only report the coefficients and t-statistics for the cash flow measures and the differences between the coefficients for the bottom and top quartiles of each partitioning variable. All regression models include firm and year fixed effects with standard errors clustered at the firm level (see table 4 for details).

In table 4, the column labeled *EBD/K* represents a replication of the basic Fazzari, et al. (1988) result. We document that *EBD*-investment sensitivities vary systematically across partitions based on the financial constraint variables. For dividend payout ratio partitions, the sensitivity coefficient decreases almost monotonically from .132 in the bottom quartile (high financial constraints, high growth) to .116 in the top quartile (low financial constraints, low growth). The sensitivity coefficient difference between the bottom and top quartiles is positive and significant at the 5% level, consistent with relatively high investment cash flow sensitivity in firms with high financial constraints and high growth. For firm age, the bottom quartile has a sensitivity of .93, while the second through top quartiles have roughly the same sensitivity (.085, .083 and .084 respectively). As with results for the dividend payout ratio, the positive difference in the sensitivity for the bottom and top firm age quartiles is consistent with relatively high investment cash flow sensitivity in firms with high financial constraints and high growth. However, in this case the difference is not quite significant at conventional levels (t stat = 1.54).

For Z_{FC} the sensitivity increases monotonically from .039 in the bottom quartile (high financial constraints, low growth) to .181 in the top quartile. This difference is negative and highly significant (t=-15.18), consistent with relatively high investment cash flow sensitivity in firms with *low* financial constraints and high growth.

The remaining two columns of Table 4 report results for the *CFO* and *WCACC* components of *EBD*. Under the financing frictions story, firms constrained in their ability to access outside capital rely on internally generated cash flows as an important funding source, implying that investment-*CFO* sensitivity should be positive and increase with financial constraints. However, in table 4 we see that for partitions based on both dividend payout ratio and firm age, *CFO*-investment sensitivity is significantly *higher* for less financially constrained (Q4) than for more constrained firms (Q1). Further, *CFO* sensitivities are often negative or statistically insignificant. For example, the most financially constrained firms under the dividend payout ratio and firm age partitions show a negative relation between investment and *CFO*. With respect to Z_{FC}, investment-*CFO* sensitivities are higher for less financially constrained firms, and are negative for the more financially constrained firms. Thus, we reject the hypothesis that investment decisions of constrained firms are more sensitive to internally generated cash flows than for less constrained firms.

Finally table 4 shows that investment-*WCACC* sensitivity varies monotonically across partitions based on all three financial constraint variables. For dividend payout ratio and firm age partitions (inversely related to growth), investment-*WCACC* sensitivity decreases monotonically from the bottom quartile to the top quartile, while for Z_{FC} partitions (positively related to growth) the ordering is reversed. The differences in *WCACC* sensitivity for Q1-Q4 are significantly positive in all three panels. That is, investment-*WCACC* sensitivity increases monotonically with growth, reconciling the contradictory findings between Fazzari, Hubbard, and Petersen (1988) and Cleary (1999) (also Kaplan and Zingales 1997) where investment-cash flow sensitivity increases with financial constraints for some measures (e.g., dividend yield and firm age) and decreases under other measures (e.g., Cleary's Z_{FC}).

3.3 Direct implications of a growth story for investment-cash flow sensitivity

To further distinguish the growth from the financing constraint interpretation, we investigate underlying drivers of investment-*WCACC* sensitivity. In section 3.3.1 we separate the random timing component of *WCACC* from working capital investment component, and find that the pattern in investment-*WCACC* sensitivity is driven by the fundamental investment component of *WCACC*. In section 3.3.2, we include *WCACC* and *CFO* simultaneously in the investment equation, providing evidence that the primary role played by *CFO* is to filter out random timing noise in *WCACC* that obscures the fundamental investment component. And in section 3.3.3, we show that investment-*EBD* sensitivity increases significantly with measures of firm growth, Further, investment-*EBD* sensitivity does not increase significantly with financial constraints (as measured by dividend payout, firm age, and Z_{FC}) once we control for growth.

3.3.1 Decomposing WCACC into fundamental investment and random timing components

To distinguish fundamental investment and random timing components of *WCACC*, we adapt the Dechow and Dichev (2002) framework by including two growth proxies as follows

$$\begin{aligned} WCACC_t / K_{t-1} = \alpha_0 + \alpha_1 CFO_{t-1} / K_{t-1} + \alpha_2 CFO_t / K_{t-1} + \alpha_3 CFO_{t+1} / K_{t-1} \\ + \alpha_4 SGR_t + \alpha_5 EMPGR_t + e_t . \end{aligned} \quad (5)$$

In (5), *SGR* is sales growth from year t-1 to t (in percentage), and *EMPGR* is the growth in the number of employees (in percentage). Following Dechow and Dichev (2002), the fitted value of the three cash flow variables from (5) is used to capture the random timing component of accruals (*WCACC_RT*). That is

$$WCACC\_RT_t = \alpha_1 CFO_{t-1} / K_{t-1} + \alpha_2 CFO_t / K_{t-1} + \alpha_3 CFO_{t+1} / K_{t-1}. \quad (6)$$

From Dechow and Dichev (2002), we expect $\alpha_1 > 0$, $\alpha_2 < 0$, and $\alpha_3 > 0$.

We use sales growth and employee growth to proxy for change in a firm's scale. These proxies for growth (*SGR* and *EMPGR*) are not exhaustive. The fitted value of the two growth variables is posited to capture the fundamental investment component of accruals (*WCACC_FI*). That is

$$WCACC\_FI_t = \alpha_4 SGR_t + \alpha_5 EMPGR_t \ . \quad (7)$$

As fundamental investment in working capital should be positively correlated with growth, we expect $\alpha_4 > 0$ and $\alpha_5 > 0$.

In adopting this approach, we note that the original Dechow-Dichev model is designed to capture accruals' short-term role in smoothing out random timing fluctuations in cash flows. As Dechow and Dichev (2002) acknowledge, their model ignores accruals' long-term role in smoothing earnings over firms' business and life cycles. Panel A of Table 5 shows that the adjusted R^2 increases on average across models estimated for each 2-digit SIC code by .19 to .55 from adding the two growth variables to capture accruals' long-term smoothing role. The residual likely captures random timing and investment information as well as accrual quality due to incomplete controls of accrual short-term and long-term roles in the model. Hence, we do not include the residual in either the estimated random component or the fundamental investment component of accruals. Rather, we conduct our tests based on the relatively clean proxies from the fitted variables on cash flows or growth.[22]

[22] On accrual quality, Richardson et al. (2005) rate changes in inventory and accounts receivable as low reliability and changes in accounts payable (ΔAP) as high reliability accruals. In untabulated analyses, we find that the behavior of investment- ΔAP sensitivity is consistent with the behavior of investment- ΔINV and investment-

Panel A of table 5 shows that the coefficient estimates are consistent with our prediction in every industry ($\alpha_1 > 0$, $\alpha_2 < 0$, $\alpha_3 > 0$, $\alpha_4 > 0$, and $\alpha_5 > 0$). Additionally, the coefficients are similar to those in Dechow and Dichev (2002), despite different samples and our inclusion of two growth proxies.

Using the *WCACC* decomposition from (6) and (7), we examine relations between capital investment and the two components of *WCACC*. We expect capital investment to be positively associated with the investment component (*WCACC_FI*) and unrelated with the random timing component (*WCACC_RT*). We estimate

$$I_t / K_{t-1} = \beta_1 q_{t-1} + \beta_2 WCACC\_RT_t / K_{t-1} + \beta_3 WCACC\_FI_t / K_{t-1}$$
$$FIRMDUMMIES + YEARDUMMIES + e_t. \qquad (8)$$

Panel B of table 5 shows that the coefficient on *WCACC_RT* is 0.007 and insignificantly different from zero (t=1.32), while the coefficient on *WCACC_FI* is 0.309, with a t-statistic of 40.8. In panel C, we estimate equation (8) for each financing constraint partition, finding that *WCACC_FI* is the main driver of the investment-*WCACC* sensitivity patterns across dividend payout, firm age and Z_{FC} partitions.

3.3.2 Including WCACC and CFO simultaneously in the investment regression

The previous analyses consider investment-*WCACC* and investment-*CFO* sensitivity separately, showing that investment-*WCACC* sensitivity is positive and increasing with growth, that investment-*CFO* sensitivity is often negative and does not generally increase with growth, and that capital investment is strongly correlated with the investment component of *WCACC*, but not with the random timing component. However, given that *EBD* = *WCACC*+*CFO*, it is important that we consider *WCACC* and *CFO* simultaneously, leading to the model

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ΔAR sensitivities (see table 8, panel B), suggesting that capacity expansion rather than earnings quality explains our results.

$$I_t / K_{t-1} = \beta_0 + \beta_1 q_{t-1} + \beta_2 WCACC_t / K_{t-1} + \beta_3 CFO_t / K_{t-1} + e_t \,, \qquad (9)$$

where β_0 represents firm and year dummies.

What are the implications of the growth interpretation of investment-cash flow sensitivity for equation (9)? If, as we hypothesize, investment-*EBD* sensitivity reflects the growth connection between capital investment and working capital investment, we argue that when $WCACC_t$ and CFO_t are both included, CFO_t will proxy for the random timing component of $WCACC_t$ (the cash flow variables in the Dechow-Dichev (2002) model) and essentially serve to filter out random timing noise in *WCACC* that obscures the fundamental investment component. To examine this proposition consider the regression

$$WCACC_t = \alpha_0 + \alpha_1 CFO_t + v_t \,. \qquad (10)$$

Given the well known negative correlation between *WCACC* and *CFO*, we predict that $\alpha_1 < 0$.

Applying the logic we developed earlier with the Dechow and Dichev framework, we interpret the fitted value from (10) as an estimate of the random timing component, which should be unrelated to investment, and the residual (v_t) as the fundamental investment component of *WCACC*, which should be directly related to investment. This suggests the following model:

$$\begin{aligned} I_t / K_{t-1} &= \beta_0 + \beta_1 q_{t-1} + \beta_2 v_t + e_t \\ &= \beta_0 + \beta_1 q_{t-1} + \beta_2 (WCACC_t / K_{t-1} - (\alpha_0 + \alpha_1 CFO_t / K_{t-1})) + e_t \qquad (11) \\ &= (\beta_0 - \beta_2 * \alpha_0) + \beta_1 q_{t-1} + \beta_2 WCACC_t / K_{t-1} + (-\beta_2 * \alpha_1) CFO_t / K_{t-1} + e_t \,. \end{aligned}$$

The final equation in (11) suggests that if investment-*EBD* sensitivity is driven by the fundamental investment aspect of *WCACC*, the role of CFO_t, via its negative correlation with

WCACC, is to filter random noise out of *WCACC*. This is reflected in the coefficient on CFO_t, $-\beta_2 * \alpha_1 > 0$, where the inequality follows from our predictions that $\beta_2 > 0$ and $\alpha_1 < 0$.[23]

The results in table 6 are consistent with our predictions. Panel A shows that α_1 = -0.417, while in panel B we see that the coefficient on CFO_t is 0.057, which is not statistically different from our predicted value in equation (11) of $-\beta_2 * \alpha_1$ = -0.130*(-0.417) = 0.054. This evidence supports our hypothesis that the investment component of *WCACC* is the primitive driver of investment-*EBD* sensitivity, while *CFO*, rather than serving as a source of investment financing, represents noise that obscures the primitive growth relation.

3.3.3 Influence of financing constraints on investment-EBD sensitivity, controlling for growth

As we argued in section 2 earlier, the growth interpretation whereby investment-*EBD* sensitivity reflects that capital and working capital investment are interrelated manifestations of growth, implies that the investment-*EBD* sensitivity should be higher for high-growth firms than for low-growth firms. We empirically test this implication in this section, using sales growth (*SGR*), growth in earnings (*EGR*), and growth in the number of employees (*EMPGR*) to proxy for growth. Specifically, we consider the following three models:

$$I_t / K_{t-1} = \beta_1 q_{t-1} + \beta_2 EBD_t / K_{t-1} + \beta_3 SGRrank + \beta_4 (EBD_t / K_{t-1}) * SGRrank + FIRMDUMMIES + YEARDUMMIES + e_t \,, \quad (12)$$

$$I_t / K_{t-1} = \beta_1 q_{t-1} + \beta_2 EBD_t / K_{t-1} + \beta_3 EGRrank + \beta_4 (EBD_t / K_{t-1}) * EGRrank + FIRMDUMMIES + YEARDUMMIES + e_t \,, \quad (13)$$

$$I_t / K_{t-1} = \beta_1 q_{t-1} + \beta_2 EBD_t / K_{t-1} + \beta_3 EMPGRrank + \beta_4 (EBD_t / K_{t-1}) * EMPGRrank + FIRMDUMMIES + YEARDUMMIES + e_t \,. \quad (14)$$

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[23] The absolute value of α_1 should be less than one. If $WCACC_t$ and CFO_t are perfectly matched on the timing issue, the coefficient on CFO_t would equal to -1. Thus, any noise or mismatch, such as the mismatch due to past or future cash flows, drives the coefficient on CFO_t towards zero, suggesting a value of α_1 between -1 and 0. Thus, we expect the coefficient on CFO_t to be less than the coefficient on $WCACC_t$ ($-\beta_2 * \alpha_1 < \beta_2$).

SGRrank, *EGRrank*, and *EMPGRrank* are the percentile rankings of *SGR*, *EGR*, and *EMPGR*, respectively and are converted to a [0,1] scale. We expect a positive β_4 in all three models.

Panel A of table 7, columns 1-3 show that the coefficients on the interaction terms are positive and statistically significant (all t-statistics ≥7), verifying that investment-*EBD* sensitivity is stronger for high-growth firms. We jointly consider all three growth proxies in column 4, finding that all three interaction terms have significant positive coefficients.

In table 7, panel B, we reexamine the association of investment-*EBD* sensitivity with financing constraint proxies (dividend payout, firm age, and Z_{FC}), before and after controlling for growth variables. We run the following two regression models:

$$\begin{aligned} I_t / K_{t-1} &= \beta_1 q_{t-1} + \beta_2 EBD_t / K_{t-1} \\ &+ \beta_3 FINCONSTrank + \beta_4 (EBD_t / K_{t-1}) * FINCONSTrank \\ &+ FIRMDUMMIES + YEARDUMMIES + e_t \end{aligned} \quad (15)$$

and

$$\begin{aligned} I_t / K_{t-1} &= \beta_1 q_{t-1} + \beta_2 EBD_t / K_{t-1} \\ &+ \beta_3 FINCONSTrank + \beta_4 (EBD_t / K_{t-1}) * FINCONSTrank \\ &+ \beta_5 SGRrank + \beta_6 (EBD_t / K_{t-1}) * SGRrank \\ &+ \beta_7 EGRrank + \beta_8 (EBD_t / K_{t-1}) * EGRrank \\ &+ \beta_9 EMPGRrank + \beta_{10} (EBD_t / K_{t-1}) * EMPGRrank \\ &+ FIRMDUMMIES + YEARDUMMIES + e_t \end{aligned} \quad (16)$$

FINCONSTrank is the percentile rankings of one of the three proxies for financial constraints (i.e. dividend payout ratio, firm age, or Z_{FC}), converted to a [0,1] scale. Model (15) simply replicates Table 4 and prior literature using a regression framework. We expect a negative β_4 in Model (15) for dividend payout ratio and firm age and a negative β_4 for Z_{FC}. Model (16) is designed to see whether the financial constraint proxy still plays a role after controlling for growth. If *SGR*, *EGR*, and *EMPGR* absorb the growth information in the financial constraint proxy, we expect β_4 in Model (16) to be close to zero.

The interaction of *EBD* with financial constraints as measured by dividend payout ratio and firm age has a significant negative coefficient as reported in table 7, panel B in columns (1) and (2), and a significant positive coefficient with financial constraints as measured by Z_{FC} as reported in column (3), thus replicating table 4 and prior literature. Columns (4)–(6) show that after controlling for growth, investment-*EBD* sensitivity no longer varies significantly with *PAYOUT*, *AGE*, or Z_{FC}, while the interactions between *EBD* and growth proxies are still highly significant in most cases. These results further bolster the case that it is growth, not financial constraints, that drive the variation in investment-*EBD* sensitivity.

4. Alternative explanations

In this section we consider alternative explanations for our empirical results. In section 4.1, we consider the possibility that our evidence is consistent with the financing frictions interpretation to the extent that *EBD* is associated with the cost of outside capital and thus firms' access to external capital. In section 4.2, we revisit Fazzari and Petersen (1993) who argue that working capital is a source of liquidity that enables smoothing of capital investment by financially constrained firms.

4.1 Does *EBD* proxy for the wedge between internal and external capital?

We next consider whether *EBD* directly captures financing frictions. Specifically, we first consider the possibility that the level of *EBD* itself is used to price capital, resulting in *EBD* being negatively related to the cost of capital. If this is the case, higher *EBD* could reflect a lower financing wedge between external and internal capital and investment-*EBD* sensitivity may indeed reflect financing frictions. If *EBD* is the primitive driver of investment-*EBD* sensitivity rather than *WCACC*, then *WCACC* should have no incremental explanatory power over and above *EBD* for explaining capital investment. However, if the fundamental investment aspect of *WCACC* is the primitive driver of investment-*EBD* sensitivity as we propose, we expect *WCACC* to load over and above *EBD* and investment-*WCACC* sensitivity to increase with growth. Also, because *WCACC* embeds random timing fluctuations, our growth explanation allows for *EBD* to play a role filtering noise from *WCACC*, similar to what we demonstrated for *CFO* in tables 5 and 6. In table 8, panel A we include both *EBD* and *WCACC* in the capital investment regressions. Columns 1-3 replicate our main result that investment-*WCACC* sensitivity varies with proxies for financial constraints consistent with our growth story. Columns 4-6 show that similar results hold even after adding *EBD*, although the statistical significance is somewhat reduced by the muti-collinearity with *EBD.*

In table 8, panel B, we examine the sensitivity of capital investment to changes in inventory and changes in accounts receivable. Beginning with Sloan (1996), a large literature documents that high (low) accruals predict lower (higher) future returns, suggesting a potential connection between *WCACC* and the equity cost of capital. To distinguish our growth interpretation explanation from this cost of capital story, we estimate investment sensitivity for individual components of *WCACC* that prior literature suggests may differentially impact firms' access to capital. We exploit results in Bernard and Stober (1989), Abarbanell and Bushee (1998), and Thomas and Zhang (2002), who show that while the component of *WCACC* due to change in inventory impacts future returns, this is not generally the case for the accounts receivable component. Thus, a positive coefficient on change in inventory (*ΔINV*) and a zero (or negative) coefficient on change in receivables (*ΔAR)* would support the capital access story while rejecting the investment-investment story. In table 8, panel B we document that both *ΔINV*-

investment and Δ*AR*-investment sensitivities are positive and significant, and increase monotonically across financial constraint partitions consistent with our growth theory.

We also consider the possibility under a growth interpretation that working capital investment may lag capital investment, as a firm needs to have buildings and machines ready before increasing inventory production and accounts receivable. Under the cost of capital story, it is unclear how the capital market can use future *WCACC* to price equity given that future *WCACC* is unknown when a firm makes investment decisions. In untabulated results, we find that capital investment and future *WCACC* are positively correlated even after controlling for contemporaneous *WCACC*.

As discussed earlier, co-movement of fixed and working capital investment is consistent with a number of potential mechanisms that could underlie capacity expansion decisions, including changes in the cost of capital, exogenous shocks in investment opportunities, executive's empire building behavior, or managerial irrationality. With that said, we end this section by emphasizing that our growth interpretation of investment-*EBD* sensitivity directly accommodates an intuitive cost of capital story. As complementary production factors, investment in fixed capital and working capital investment would co-move with firms' rational responses to cost of capital changes. Here, fixed capital and working capital investment are inter-related consequences of a firm's response to the cost of capital changes, not an ex ante proxy for access to capital. Consistent with this story, Wu et al. (2010) use a *q*-theory model to show analytically that fixed capital and working capital accruals co-move in response to changes in the discount rate. Their theory implies that when the discount rate falls, more investment projects become profitable, increasing both fixed investment and working capital accruals, and future returns decrease on average because the lower discount rate means lower expected returns going forward. The opposite holds for discount rate increases. They provide empirical evidence consistent with this optimal investment hypothesis (see also Zhang 2007 and Dechow, Richardson, and Sloan 2008, p. 564).

4.2 Revisiting Fazzari and Petersen (1993)

Fazzari and Petersen (1993) argue that financially constrained firms can offset the impact of cash-flow shocks on fixed investment by adjusting working capital. If firms draw down working capital to mitigate the impact of adverse shocks to cash flow on capital investment, the coefficient on working capital investment will be negative in a fixed-investment regression after controlling for *q* and *EBD*. Incorporating change in working capital (ΔWC) as an independent variable, they find that the coefficient on ΔWC is negative and indeed more negative for financially constrained firms as proxied by the dividend payout ratio. We reinterpret this result in light of our analysis.

The ΔWC measure in Fazzari and Petersen (1993) is defined as changes in current assets minus changes in current liabilities. We decompose this measure into two components as

$$\begin{aligned} \Delta WC &= \Delta \text{Current Assets} - \Delta \text{Current Liabilities} \\ &= WCACC + (\Delta CASH_{BS} - \Delta STD - \Delta TP), \end{aligned} \tag{17}$$

where $\Delta CASH_{BS}$ is change in cash and cash equivalents on the balance sheet, ΔSTD is change in short-term debt, and ΔTP is change in taxes payable. It can be seen from (17) that ΔWC is comprised of $WCACC$ plus ($\Delta CASH_{BS}$-ΔSTD-ΔTP), where this latter term measures the change in the balance sheet cash account less changes in short term debt and taxes payable.

In table 9 we replicate Fazzari and Petersen (1993) by adding ΔWC to our equation (1). Similar to Fazzari and Petersen (1993), the coefficient on ΔWC is negative and significant, and is (modestly) more negative for firms with lower dividend payout ratios. We then disaggregate ΔWC into its two components *WCACC* and ($\Delta CASH_{BS}$-ΔSTD-ΔTP) and estimate:

$$\begin{aligned} I_t / K_{t-1} &= \beta_1 q_{t-1} + \beta_2 EBD_t / K_{t-1} + \beta_3 WCACC_t / K_{t-1} + \beta_4 (\Delta CASH_{BS} - \Delta STD - \Delta TP)_t / K_{t-1} \\ &+ FIRMDUMMIES + YEARDUMMIES + e_t \end{aligned} \quad (18)$$

Table 9 shows that the coefficient on ($\Delta CASH_{BS}$-ΔSTD-ΔTP) is significantly negative and relatively more negative for low dividend ratio firms, while the coefficient on *WCACC* is positive and larger for low dividend ratio firms. The positive coefficient on *WCACC* is expected given our previous analysis above. Thus, the negative coefficient on ΔWC found in Fazzari and Petersen (1993) is driven by the ($\Delta CASH_{BS}$-ΔSTD-ΔTP) component of ΔWC, loosely consistent with the simple story that investment consumes cash or increases debt. We find no evidence that *WCACC* serves as a source of financing to smooth production.

5. Sensitivity and Robustness

5.1 Additional proxies for investment opportunities

In untabulated analyses, we extend the main regression (equation 1) to include additional proxies for investment opportunities, including q_t, q_{t-2}, and q_{t-3}. In addition, we estimate specifications adding the median analyst forecast of long-term growth and the median analysts forecast of year *t+1*'s earnings scaled by assets per share in year *t*. The basic relations documented in table 4 continue to hold in these specifications.

5.2. Measurement error in *WCACC*

We have thus far estimated working capital accruals from the balance sheet because the statement of cash flows is only available after 1989. Hribar and Collins (2002) show that balance sheet-based accrual measures may suffer from measurement error due primarily to mergers and acquisitions. While large M&A transactions with asset growth exceeding 100% are excluded from our sample, we further show that our results are robust to the following three specifications. First, because *WCACC* is based on the balance sheet approach, we measure capital expenditure using the balance sheet approach as changes in net property, plant, and equipment plus depreciation expense. Next, we exclude observations where sales from mergers and acquisitions exceed 5% of total sales. Finally, we measure both *CFO* and *WCACC* from the statement of cash flows using the post-1989 sample period due to the availability of the statement of cash flow.

5.3. Sub-period analysis

We also examine whether our key results are sensitive to specific time periods. We break our sample period into twosubperiods: 1971-1988 and 1989-2006. In untabulated results, we find that the correlation between *CAPEX* and *WCACC* is strong and the correlation increases with growth proxies in each sub-period. Similar results hold using even finer sub-period partitions.

6. Summary and Conclusion

A large and growing literature investigates the extent to which financing frictions inhibit capital investment by firms. An important stream of the literature approaches the issue by estimating the sensitivity of capital investment to internally generated cash flows. This investment-cash flow sensitivity approach continues to be widely used in corporate finance and accounting despite extensive criticism that questions the validity of investment-cash flow sensitivity as a manifestation of financing frictions. Thus, the correct interpretation of investment-cash flow sensitivity remains an important open issue awaiting resolution.

The main contribution of this paper is to provide an intuitive and plausible explanation for documented patterns in investment-cash flow sensitivity. Most importantly, we isolate a central underlying driver of investment-cash flow sensitivity. We argue that investment-cash flow sensitivity reflects a fundamental economic connection between capital investment and working capital investment as interrelated manifestations of firm growth, rather than reflecting consequences of financing frictions. The paper provides a series of empirical analyses that together provide strong evidence supporting this hypothesis.

We attack the issue by dissecting the primary cash flow measure used in the literature, earnings before depreciation (*EBD*), into cash flow from operations (*CFO*) and working capital accruals (*WCACC*). We first separately examine investment-*WCACC* sensitivity and investment-*CFO* sensitivity. We document that investment-*CFO* sensitivity is often negative and does not generally increase with financing constraints, rejecting the hypothesis that investment of constrained firms is relatively more sensitive to internally generated cash flows. In contrast, we find that investment-*WCACC* sensitivity is positive and increases with growth consistent with a deep connection between fixed and working capital investment. We next investigate underlying drivers of investment-*WCACC* sensitivity by decomposing *WCACC* into fundamental investment and random timing components. We provide evidence that the investment component of *WCACC* is the primitive driver of investment-*EBD* sensitivity, while *CFO* reflects the random timing aspect of accruals that basically obscures the primitive growth relation. Finally, we examine the relative power of financial constraint versus growth proxies, showing that investment-*EBD* sensitivity significantly increases with growth while financial constraint measures have no incremental explanatory power in the presence of the growth measures.

These results tie together the disparate strands of criticism discussed in the introduction into a unified argument against a financing frictions interpretation. One strand argues that investment-cash flow sensitivity results from measurement error in investment opportunities whereby cash flow proxies for investment opportunities not captured by Tobin's Q. Our structural decomposition illuminates that rather than simply proxying for investment opportunities, *EBD* embeds investment growth itself via *WCACC*. A second strand shows that the ordering of investment-cash flow sensitivity across financial constraint partitions is sensitive to how financial constraints are measured. Our results that investment-cash flow sensitivity increases with growth reconciles conflicting results where investment-cash flow sensitivity increases with financial constraints for some measures (e.g., dividend yield and firm age) and decreases in financial constraints under other measures (e.g., Cleary's Z_{FC}). Lastly, with respect to the issue of omitted variables, we provide evidence suggesting that the literature inappropriately attributes the co-movement of fixed and capital investment resulting from firms' capacity expansion decisions to financing frictions. We believe our reinterpretation of the evidence provides a sound basis for intelligently reinterpreting extant empirical results and opens opportunities to gain deeper insight into the fundamental nature of capital investment together with its related factors of wealth production.

References

Abarbanell, Jeffery and Brian Bushee. 1998. Abnormal Stock Returns to a Fundamental Analysis Strategy. Accounting Review 73 (1998): 19-45.

Ascioglu, A., Hegde, S.P., McDermott, J.B., 2008. Information asymmetry and investment-cash flow sensitivity. Journal of Banking and Finance 32, 1036–1048.

Almeida, Heitor and Murillo Campello. 2007. Financial constraints, asset tangibility, and corporate investment. *The Review of Financial Studies* v 20 n 5, 1429.

Almeida, Heitor, Murillo Campello, and Michael Weisbach. 2004. The cash flow sensitivity of cash. *Journal of Finance* 59, 1777-1804.

Alti, Aydogan. 2003. How sensitive is investment to cash flow when financing is frictionless? *Journal of Finance* 58, 707-722.

Bernard, Victor and Thomas Stober. 1989. The Nature and Amount of Information Reflected in Cash Flows and Accruals. *The Accounting Review*: 624-652.

Biddle, Gary and Gilles Hilary. 2006. Accounting Quality and Firm-level Capital Investment. *The Accounting Review,* Vol. 81, No. 5, 2006, 963-982.

Blanchard, Olivier Jean, Florencio Lopez-de-Silanes, and Andrei Shleifer. 1994. What do firms do with cash windfalls? *Journal of Financial Economics* 36, 337-360.

Bond, Stephen and Costas Meghir. 1994. Dynamic investment models and the firm's financial policy. *Review of Economic Studies* 61, 197-222.

Bond, S., Van Reenen, J., 2007. Microeconometric Models of Investment and Employment. Handbook of Econometrics. In: Heckman, J.J., Leamer, E.E. (Eds.), Handbook of Econometrics, vol. 6A. North Holland, Amsterdam, pp. 4417–4498.

Carpenter, Robert E., 1992, The effect of liquidity on firm financial constraints, Unpublished PhD. dissertation (Washington University, St. Louis, MO).

Carpenter, Robert E., Steven M. Fazzari, and Bruce C. Petersen. 1994. Inventory Investment, Internal-Finance Fluctuations, and the Business Cycle. *Brookings Papers on Economic Activity* (1994:2), 75–138.

Cleary, Sean. 1999. The relationship between firm investment and financial status. *Journal of Finance*, 673-692.

Cleary, Sean, Paul Povel and Michael Raith. 2007. The U-shaped investment curve: theory and evidence, *Journal of Financial and Quantitative Analysis* 42, 1-39.

Cooper R. and J. Ejarque. 2003. Financial frictions and investment: Requiem in Q. Review of Economic Dynamics, 6: 710-728.

Dechow, P. 1994. Accounting earnings and cash flows as measures of firm performance: The role of accounting accruals. *Journal of Accounting & Economics* 26, 1-34.

Dechow, P., and I. Dichev. 2002. The quality of accruals and earnings: The role of accrual estimation errors. *The Accounting Review* 77, 35-59.

Dechow, P., S. Kothari, and R. Watts. 1998. The relation between earnings and cash flows. *Journal of Accounting and Economics* 25, 133-168.

Dechow, P. M., S. A. Richardson and R. G. Sloan. 20088. The Persistence and Pricing of the Cash Component of Earnings. *Journal of Accounting Research* 46, 537–66.

Dechow, P., R. Sloan, and A. Sweeney, 1995, Detecting earnings management. *The Accounting Review*, 70: 193-225.

Doms, M., and T. Dunne, 1998. Capital Adjustment Patterns in Manufacturing Plants. *Review of Economic Dynamics* 1**,** 409-429.

Erickson, Timothy and Toni Whited. 2000. Measurement error and the relationship between investment and q. *Journal of Political Economy* 108, 1027-1057.

Fazzari, Steven, R. Glenn Hubbard, and Bruce Petersen. 1988. Financing constraints and corporate investment. *Brookings Papers on Economic Activities*, 141-195.

Fazzari, Steven, R. Glenn Hubbard, and Bruce Petersen. 2000. Investment-cash flow sensitivities are useful: A comment on Kaplan and Zingales. *Quarterly Journal of Economics*, 695-705.

Fazzari, Steven and Bruce Petersen. 1993. Working capital and fixed investment: new evidence on financing constraints. *Rand Journal of Economics* 24, 328-342.

Fairfield, P.M., J. S.Whisenant, and T. Yohn. 2003. Accrued Earnings and Growth: Implications for Future Profitability and Market Mispricing. The Accounting Review 78, 353–71.

Financial Accounting Standards Board (FASB). 1978. Objectives of financial reporting by business enterprises. Statement of Accounting Concepts No. 1. Norwalk, CT

Gilchrist, Simon and Charles Himmelberg. 1995. Evidence on the role of cash flow for investment. *Journal of Monetary Economics* 36, 541-572.

Gomes, J. 2001. Financing Investment. *American Economic Review* 91:1263–85.

Hadlock, C. and J. Pierce. 2010. New evidence on measuring financial constraints: Moving beyond the KZ index. *Review of Financial Studies* 23-5, 1909-1940.

Hayashi, F. 1982. Tobin’s marginal and average q: A neoclassical interpretation. Econometrica 50: 213-24.

Hennessy, Christopher and Toni Whited. 2007. How costly is external financing: Evidence from a structural estimation. Journal of Finance, 62: 1705-1745.

Hribar, Paul and Dan Collins. 2002. Errors in estimating accruals: Implications for empirical research. *Journal of Accounting Research* 40, 105-134.

Hubbard, R. Glenn. 1998. Capital market imperfections and investment. *Journal of Economic Literature* 36, 193-227.

Hubbard, R. G., A. Kashyap, and T. Whited. 1995. Internal Finance and Firm Investment. *Journal of Money, Credit, and Banking* 27:683–701.

Kaplan, Steven and Luigi Zingales. 1997. Do investment-cash flow sensitivities provide useful measures of financing constraints? *Quarterly Journal of Economics,* 169-215.

Kaplan, Steven and Luigi Zingales. 2000. Investment-cash flow sensitivities are not valid measures of financing constraints. *Quarterly Journal of Economics*, 707-712.

Li K. and V. Tang. 2008. Earnings quality and future capital investment: Evidence from discretionary accruals. Georgetown University working paper.

Lamont, Owen. 1997. Cash flow and investment: evidence from internal capital markets, *Journal of Finance* 42, 83-109.

Petkova, R. 2006, Do the Fama-French factors proxy for innovations in predictive variables? Journal of Finance 61, 581-612

Polk, C., and P. Sapienza. 2008. The Stock Market and Corporate Investment: A Test of Catering Theory. *Review of Financial Studies*, 22(1): 187-217..

Poterba, James M. 1988. Comment on ‘Financing constraints and corporate investment’, Brookings Paper on Economic Activity 1, 200–204.

Rauh, J. 2006. Investment and Financing Constraints: Evidence from the Funding of Corporate Pension Plans. *Journal of Finance* 61:33–71.

Sloan, Richard, 1996, “Do stock prices fully reflect information in accruals and cash flows about future earnings?” The Accounting Review 71, 289-315.

Schiantarelli, F., 1996. Financial constraints and investment: Methodological issues and international evidence. Oxford Review of Economic Policy, 70–89.

Stickney, C.P., P. Brown, and J.M. Wahlen. Financial reporting and statement analysis: A strategic approach, 5th ed., Mason, OH: South-Western College Publishing, 2003.

Thomas, Jacob and Hui Zhang, 2002, “Inventory Changes and Future Returns,” Review of Accounting Studies 7, 163-187.

Tobin, J. 1969. A general equilibrium approach to monetary theory. Journal of Money, Credit, and Banking, 1: 15-29.

Whited, Toni. 1992. Debt, Liquidity Constraints, and Corporate Investment: Evidence from Panel Data. Journal of Finance 47:425–60.

Whited, Toni and Guojun Wu 2006. Financial Constraints Risk. *Review of Financial Studies* 19 (2006): 531-559.

Wu, J., L. Zhang, X.F., Zhang, 2010. The q-theory approach to understanding the accrual anomaly. Journal of Accounting Research 48, 177-233.

Zhang, X. Frank. 2007. Accruals, investment, and the accrual anomaly. *The Accounting Review* 82, 1333-1363.

Table 1 Descriptive statistics

Panel A: Descriptive statistics

Variable	Mean	Std	Min	Q1	Median	Q3	Max
I_t/K_{t-1}	0.236	0.190	0.014	0.115	0.186	0.289	1.102
q_{t-1}	1.487	0.942	0.552	0.920	1.181	1.684	5.936
EBD_t/K_{t-1}	0.305	0.551	-2.304	0.155	0.297	0.491	2.201
CFO_t/K_{t-1}	0.277	0.571	-2.270	0.105	0.270	0.482	2.275
$WCACC_t/K_{t-1}$	0.027	0.391	-1.409	-0.100	0.011	0.144	1.594

Panel B. Correlation Matrix (Pearson correlations are shown above the diagonal with Spearman below)

	I_t/K_{t-1}	q_{t-1}	EBD_t/K_{t-1}	CFO_t/K_{t-1}	$WCACC_t/K_{t-1}$
I_t/K_{t-1}	1	0.331	0.264	0.062	0.264
q_{t-1}	0.323	1	0.182	0.060	0.170
EBD_t/K_{t-1}	0.437	0.350	1	0.710	0.339
CFO_t/K_{t-1}	0.175	0.142	0.612	1	-0.374
$WCACC_t/K_{t-1}$	0.256	0.225	0.321	-0.393	1

I_t is capital expenditure (data128). K_{t-1} is beginning capital stock measured as net property, plant, and equipment (data8). q_{t-1} is average q at the beginning of the period measured as the market value of assets divided by the book value of assets ((data6+data25*data199-data60-data74)/data6). EBD_t is cash flow as measured as earnings before extraordinary items (data18) plus depreciation (data14). $WCACC_t$ is working capital accruals measured as (ΔCA - $\Delta CASH_{BS}$) – (ΔCL - ΔSTD - ΔTP), where ΔCA = change in current assets (data4), $\Delta CASH_{BS}$ = change in cash and cash equivalents (data1), ΔCL = change in current liabilities (data5), ΔSTD = change in short-term debt (data34), and ΔTP = change in tax payable (data71). CFO_t is cash flows from operations measured as earnings before extraordinary items minus accruals, where accruals are equal to working capital accruals minus depreciation. The sample includes all manufacturing firms (SIC code between 2000 and 3999) with non-missing capital expenditure and cash flow variables from 1971 to 2006. We require that firms have at least five consecutive years of data in the sample period. All variables are winsorized at 1% and 99%.

Table 2 Regressions of investment on Tobin's *q* and cash flows

	1	2	3
q_{t-1}	0.077 (19.22)	0.102 (25.33)	0.087 (21.94)
EBD_t/K_{t-1}	0.122 (16.56)		
CFO_t/K_{t-1}		-0.014 (-3.09)	
$WCACC_t/K_{t-1}$			0.101 (20.23)
Firm & Year Dummies	YES	YES	YES
R^2	0.209	0.154	0.203

We run three regressions as follows.

Model 1: $I_t / K_{t-1} = \beta_1 q_{t-1} + \beta_2 EBD_t / K_{t-1} + FIRMDUMMIES + YEARDUMMIES + e_t$

Model 2: $I_t / K_{t-1} = \beta_1 q_{t-1} + \beta_2 CFO_t / K_{t-1} + FIRMDUMMIES + YEARDUMMIES + e_t$

Model 3: $I_t / K_{t-1} = \beta_1 q_{t-1} + \beta_2 WCACC_t / K_{t-1} + FIRMDUMMIES + YEARDUMMIES + e_t$

I_t is capital expenditure. K_{t-1} is beginning capital stock (net property, plant, and equipment). q_{t-1} is average q at the beginning of the period measured as the market value of assets divided by the book value of assets. EBD_t is cash flow as measured as earnings before extraordinary items plus depreciation. CFO_t is cash flows from operations. $WCACC_t$ is working capital accruals measured as changes in non-cash current assets minus changes in non-debt current liabilities. The regressions are standard panel regressions with firm and year fixed effects and with standard errors clustered at the firm level. The sample includes all manufacturing firms (SIC code between 2000 and 3999) with non-missing capital expenditure and cash flow variables from 1971 to 2006. We require that firms have at least five consecutive years of data in the sample period. T-statistics are in parentheses.

Table 3 Firm growth, financing constraint proxies, and investment volatility

Panel A: Correlations between "proxies" for financial constraints and growth

	Dividend Payout Ratio	Firm Age	The financial constraint index Z_{FC} in Cleary (1999)
	Spearman correlations		
Employee growth	-0.154**	-0.135**	0.182**
Sales growth	-0.211**	-0.094**	0.171**
Earnings growth	-0.262**	-0.021**	0.176**
	Pearson correlations		
Employee growth	-0.021**	-0.118**	0.149**
Sales growth	-0.030**	-0.096**	0.127**
Earnings growth	-0.032**	-0.012*	0.112**

** Significant at 0.01 level.

Panel B: The standard deviation of investment ($Std(I_t/K_{t-1})$) and average G across quartiles of growth measures

Partitioned by	Variable	Q1 (low growth)	Q2	Q3	Q4 (high growth)	Q4-Q1
Employee Growth	$Std(I_t/K_{t-1})$	0.142	0.135	0.159	0.251	0.109 (0.00)
	G	-0.035	0.107	0.211	0.278	0.313 (0.00)
Sales Growth	$Std(I_t/K_{t-1})$	0.149	0.141	0.159	0.250	0.101 (0.00)
	G	-0.013	0.136	0.199	0.244	0.257 (0.00)
Earnings Growth	$Std(I_t/K_{t-1})$	0.165	0.151	0.171	0.229	0.064 (0.00)
	G	0.077	0.189	0.225	0.172	0.095 (0.00)

Panel C: Firm level data – Firm specific standard deviation of investment ($Std(I_t/K_{t-1})$) and firm average G across quartiles of growth measures

Partitioned by	Variable	Q1 (low growth)	Q2	Q3	Q4 (high growth)	Q4-Q1
Employee Growth	$Std(I_t/K_{t-1})$	0.139	0.130	0.146	0.198	0.059 (0.00)
	G	-0.039	0.091	0.124	0.182	0.221 (0.00)
Sales Growth	$Std(I_t/K_{t-1})$	0.136	0.126	0.148	0.200	0.064 (0.00)
	G	-0.017	0.099	0.129	0.143	0.160 (0.00)
Earnings Growth	$Std(I_t/K_{t-1})$	0.158	0.115	0.141	0.178	0.020 (0.06)
	G	-0.007	0.134	0.167	0.121	0.128 (0.00)

Employee growth is the growth in the number of employees (data29) from year t-1 to t, measured as ($data29_t$ – $data29_{t-1}$)/$data29_{t-1}$. Similarly, sales growth is the growth in sales (data12) from year t-1 to t. Earnings growth is the growth in operating income before depreciation (data13) from year t-1 to t, where earnings in year t-1 has to be positive. Dividend payout ratio is dividend and stock repurchase divided by earnings before interest and tax. Firm age is the number of years since first time covered by CRSP. Z_{FC} is the financial constraint index in Cleary (1999). I_t is capital expenditure. K_{t-1} is beginning capital stock (net property, plant, and equipment). G is the fraction of total investment that represents capacity expanding investment, growth investment/(growth investment + replacement investment), where replacement investment is depreciation (data14) and growth investment is the remaining portion (*investment – replacement investment*). In Panel B, each year we partition firms into four equal-size groups based on employee growth, sales growth and earnings growth, and then calculate average G and the standard deviation of investment for each resulting group. In Panel C, we calculate firm-level average G and the standard deviation of investment for each firm and then partition all firms into four growth quartiles. The sample includes all manufacturing firms (SIC code between 2000 and 3999) with non-missing capital expenditure and cash flow variables from 1971 to 2006. We require that firms have at least five consecutive years of data in the sample period. In panels B and C, p-values are in parentheses.

Table 4 *EBD*-, *CFO*- and *WCACC*-investment sensitivity and financing constraint quartiles

Panel A: Four quartiles based on Dividend Payout Ratio (negatively related to growth)

	The coefficient estimates of		
	EBD_t/K_{t-1}	CFO_t/K_{t-1}	$WCACC_t/K_{t-1}$
Bottom quartile (Q1) (most financially constrained) (high growth)	0.132 (16.56)	-0.014 (-3.09)	0.101 (20.23)
Second quartile (Q2)	0.153 (13.32)	0.016 (2.50)	0.083 (11.84)
Third quartile (Q3)	0.149 (13.49)	0.004 (0.55)	0.083 (12.08)
Top quartile (Q4) (least financially constrained) (low growth)	0.116 (11.80)	0.012 (2.15)	0.071 (11.61)
Most constrained – least constrained (high growth – low growth)	0.016 (1.98)	-0.026 (-3.64)	0.030 (3.87)

Panel B: Four quartiles based on Firm Age (negatively related to growth)

	The coefficient estimates of		
	EBD_t/K_{t-1}	CFO_t/K_{t-1}	$WCACC_t/K_{t-1}$
Bottom quartile (Q1) (most financially constrained) (high growth)	0.093 (13.30)	-0.006 (-1.21)	0.089 (15.49)
Second quartile (Q2)	0.085 (12.68)	-0.001 (-0.23)	0.085 (17.07)
Third quartile (Q3)	0.083 (12.47)	0.010 (2.41)	0.079 (15.43)
Top quartile (Q4) (least financially constrained) (low growth)	0.084 (11.14)	0.014 (2.67)	0.058 (10.54)
Most constrained – least constrained (high growth – low growth)	0.009 (1.54)	-0.020 (-2.79)	0.031 (3.89)

Panel C: Four quartiles based on Firm financial constraint index Z_{FC} (Cleary 1999, positively related to growth)

	The coefficient estimates of		
	EBD_t/K_{t-1}	CFO_t/K_{t-1}	$WCACC_t/K_{t-1}$
Bottom quartile (Q1) (most financially constrained) (low growth)	0.039 (8.20)	-0.014 (-3.63)	0.058 (14.18)
Second quartile (Q2)	0.096 (12.52)	-0.016 (-3.02)	0.084 (14.56)
Third quartile (Q3)	0.144 (15.39)	-0.004 (-0.67)	0.095 (14.65)
Top quartile (Q4) (least financially constrained) (high growth)	0.181 (20.69)	0.032 (4.95)	0.113 (14.94)
Most constrained – least constrained (low growth – high growth)	-0.142 (-15.18)	-0.046 (-6.32)	-0.055 (-6.50)

Each year we partition firms into four quartiles based on dividend payout ratio, firm age, or Z_{FC}. Then we run the following three regressions for each resulting quartile.

Model A: $I_t / K_{t-1} = \beta_1 q_{t-1} + \beta_2 EBD_t / K_{t-1} + FIRMDUMMIES + YEARDUMMIES + e_t$

Model B: $I_t / K_{t-1} = \beta_1 q_{t-1} + \beta_2 CFO_t / K_{t-1} + FIRMDUMMIES + YEARDUMMIES + e_t$

Model C: $I_t / K_{t-1} = \beta_1 q_{t-1} + \beta_2 WCACC_t / K_{t-1} + FIRMDUMMIES + YEARDUMMIES + e_t$

The table reports β_2 estimates from these three regressions. Dividend payout ratio is dividend and stock repurchase divided by earnings before interest and tax. Firm age is the number of years since first time covered by CRSP. Z_{FC} is the financial constraint index in Cleary (1999). I_t is capital expenditure. K_{t-1} is beginning capital stock. q_{t-1} is average q at the beginning of the period measured as the market value of assets divided by the book value of assets. EBD_t is cash flow as measured as earnings before extraordinary items plus depreciation. CFO_t is cash flows from operations. $WCACC_t$ is working capital accruals measured as changes in non-cash current assets minus changes in non-debt current liabilities. The regressions are standard panel regressions with firm and year fixed effects and with standard errors clustered at the firm level. The sample includes all manufacturing firms (SIC code between 2000 and 3999) with non-missing capital expenditure and cash flow variables from 1971 to 2006. We require that firms have at least five consecutive years of data in the sample period. T-statistics are in parentheses.

Table 5 Decomposing *WCACC* into random timing and fundamental investment components

Panel A:
$$WCACC_t / K_{t-1} = \alpha_0 + \alpha_1 CFO_{t-1} / K_{t-1} + \alpha_2 CFO_t / K_{t-1} + \alpha_3 CFO_{t+1} / K_{t-1} + \alpha_4 SGR_t + \alpha_5 EMPGR_t + e_t$$

2-digit SIC industry	CFO_{t-1}/K_{t-1}	CFO_t/K_{t-1}	CFO_{t+1}/K_{t-1}	SGR_t	$EMPGR_t$	Adj. R^2
20	0.22	-0.58	0.17	0.23	0.12	0.63
21	0.11	-0.54	0.12	0.46	0.43	0.59
22	0.21	-0.57	0.13	0.60	0.31	0.66
23	0.22	-0.68	0.11	1.44	0.42	0.67
24	0.18	-0.57	0.17	0.37	0.20	0.59
25	0.22	-0.63	0.13	0.60	0.18	0.66
26	0.19	-0.47	0.19	0.19	0.16	0.56
27	0.17	-0.38	0.09	0.52	0.27	0.40
28	0.11	-0.19	0.12	0.11	0.32	0.24
29	0.25	-0.49	0.20	0.06	0.05	0.52
30	0.21	-0.53	0.19	0.45	0.27	0.55
31	0.22	-0.59	0.15	1.89	0.43	0.67
32	0.21	-0.50	0.16	0.22	0.20	0.51
33	0.18	-0.53	0.18	0.27	0.24	0.57
34	0.20	-0.55	0.15	0.39	0.30	0.60
35	0.16	-0.39	0.11	0.73	0.54	0.48
36	0.17	-0.35	0.11	0.61	0.45	0.43
37	0.18	-0.62	0.16	0.42	0.26	0.59
38	0.21	-0.38	0.16	0.60	0.54	0.49
39	0.20	-0.58	0.14	0.95	0.52	0.61
Average	0.19	-0.51	0.15	0.56	0.31	0.55
Average incremental R^2 from adding growth						0.19
Dechow & Dichev (2002), Table 3, panel B	0.19	-0.51	0.15			0.34

Panel B: $I_t / K_{t-1} = \beta_0 + \beta_1 q_{t-1} + \beta_2 WCACC\_RT_t / K_{t-1} + \beta_3 WCACC\_FI_t / K_{t-1} + e_t$

	q_{t-1}	$WCACC\_RT_t / K_{t-1}$	$WCACC\_FI_t / K_{t-1}$	Year & Firm Dummies	R^2
coefficient (t-stat)	0.062** (27.79)	0.007 (1.32)	0.309** (40.80)	YES	0.194

Panel C: $I_t / K_{t-1} = \beta_0 + \beta_1 q_{t-1} + \beta_2 WCACC\_RT_t / K_{t-1} + \beta_3 WCACC\_FI_t / K_{t-1} + e_t$ across financial constraint quartiles

	q_{t-1}	$WCACC\_RT_t / K_{t-1}$	$WCACC\_FI_t / K_{t-1}$	Year & Firm Dummies	R^2
Dividend payout (Q1) (most financially constrained)	0.083** (20.93)	0.021* (2.21)	0.330** (24.09)	YES	0.242
Dividend payout (Q2)	0.064** (15.66)	-0.022 (-1.95)	0.317** (19.70)	YES	0.174
Dividend payout (Q3)	0.052** (14.98)	0.003 (0.29)	0.248** (15.23)	YES	0.154
Dividend payout (Q4) (least financially constrained)	0.036** (10.68)	0.002 (0.19)	0.244** (15.10)	YES	0.127
Most – least constrained (high – low growth)	0.047** (9.33)	0.019 (1.30)	0.086** (3.62)		
Firm age (Q1) (most financially constrained)	0.073** (20.15)	0.008 (0.82)	0.340** (25.75)	YES	0.227
Firm age (Q2)	0.069** (18.88)	0.018 (1.89)	0.297** (22.84)	YES	0.196
Firm age (Q3)	0.060** (16.75)	0.001 (0.08)	0.288** (21.22)	YES	0.188
Firm age (Q4) (least financially constrained)	0.036** (10.18)	-0.004 (-0.53)	0.220** (15.14)	YES	0.176
Most – least constrained (high – low growth)	0.038** (7.44)	0.012 (1.02)	0.120** (6.06)		
Z_{FC} (Q1) (most financially constrained)	0.076** (14.56)	0.022* (2.38)	0.260** (18.50)	YES	0.179
Z_{FC} (Q2)	0.077** (16.94)	0.017 (1.55)	0.271** (22.94)	YES	0.173
Z_{FC} (Q3)	0.068** (16.51)	-0.001 (-0.06)	0.288** (19.41)	YES	0.193
Z_{FC} (Q4) (least financially constrained)	0.051** (17.05)	-0.043** (-3.26)	0.378** (20.87)	YES	0.207
Most – least constrained (low – high growth)	0.025** (4.20)	0.065** (4.73)	-0.118** (-5.09)		

Panel A reports the coefficient estimated of the accrual model by industry. We expand the Dechow-Dichev (2002) model by including two growth variables and decompose *WCACC* into two components: the random timing component (*WCACC_RT*) and the fundamental investment component (*WCACC_FI*). In Panel B, we examine whether these two components are related to capital expenditure. Panel C report regression results by financial constraint partitions. I_t is capital expenditure. K_{t-1} is beginning capital stock. $WCACC_t$ is working capital accruals measured as changes in non-cash current assets minus changes in non-debt current liabilities. CFO_t is cash flows from operations. SGR_t is sales growth measured as sales in year t minus sales in year t-1 and then scaled by sales in year t-1. Similarly, $EMPGR_t$ is growth in the number of employees. The sample includes all manufacturing firms (SIC code between 2000 and 3999) with non-missing capital expenditure and cash flow variables from 1971 to 2006. We require that firms have at least five consecutive years of data in the sample period. The regressions are standard panel regressions with firm and year fixed effects and with standard errors clustered at the firm level. T-statistics are in parentheses. ** and * indicate statistical significance at the 1% and 5% levels, respectively.

Table 6 Including *WCACC* and *CFO* simultaneously in the model

Panel A: $WCACC_t / K_{t-1} = \alpha_0 + \alpha_1 CFO_t / K_{t-1} + v_t$

	CFO_t / K_{t-1}	Year & Firm Dummies	R^2
coefficient (t-stat)	-0.417** (-43.02)	YES	0.293

Panel B: $I_t / K_{t-1} = \beta_0 + \beta_1 q_{t-1} + \beta_2 WCACC_t / K_{t-1} + \beta_3 CFO_t / K_{t-1} + e_t$

	q_{t-1}	$WCACC_t / K_{t-1}$	CFO_t / K_{t-1}	Year & Firm Dummies	R^2
coefficient (t-stat)	0.059** (26.16)	0.130** (31.45)	0.057** (15.61)	YES	0.172
The predicted coefficient on CFO_t / K_{t-1} ($-\beta_2 * \alpha_1$)			0.0542		
The difference between β_3 and its predicted value ($-\beta_2 * \alpha_1$)			0.003 (0.79)		

** and * indicate statistical significance at the 1% and 5% levels, respectively.

In Panel A, we regress *WCACC* on *CFO*. The fitted value of the regression model captures the random timing component and the residual captures the fundamental investment component.

$$WCACC_t / K_{t-1} = \alpha_0 + \alpha_1 CFO_t / K_{t-1} + v_t$$

In Panel B, we examine the association between capital expenditure and the fundamental investment component of *WCACC*. According to our theory, CAPEX should be positively correlated with the fundamental investment component (v_t) but not the random timing component of *WCACC*.

$$\begin{aligned} I_t / K_{t-1} &= \beta_0 + \beta_1 q_{t-1} + \beta_2 v_t + e_t \\ &= \beta_0 + \beta_1 q_{t-1} + \beta_2 (WCACC_t / K_{t-1} - (\alpha_0 + \alpha_1 CFO_t / K_{t-1})) + e_t \\ &= \beta_0 - \beta_2 * \alpha_0 + \beta_1 q_{t-1} + \beta_2 WCACC_t / K_{t-1} + (-\beta_2 * \alpha_1) CFO_t / K_{t-1} + e_t \end{aligned}$$

where I_t is capital expenditure, K_{t-1} is beginning capital stock, $WCACC_t$ is working capital accruals measured as changes in non-cash current assets minus changes in non-debt current liabilities, and CFO_t is cash flows from operations. The sample includes all manufacturing firms (SIC code between 2000 and 3999) with required non-missing capital expenditure and cash flow variables from 1971 to 2006. We require that firms have at least five consecutive years of data in the sample period. The regressions are standard panel regressions with firm and year fixed effects and with standard errors clustered at the firm level. T-statistics are in parentheses.

Table 7 Investment-cash flow sensitivity conditional on growth variables

Panel A: The variation between the *I-EBD* sensitivity and growth proxies

$$I_t / K_{t-1} = \beta_0 + \beta_1 q_{t-1} + \beta_2 EBD_t / K_{t-1} + \beta_3 SGRrank + \beta_4 (EBD_t / K_{t-1}) * SGRrank + e_t$$
$$I_t / K_{t-1} = \beta_0 + \beta_1 q_{t-1} + \beta_2 EBD_t / K_{t-1} + \beta_3 EGRrank + \beta_4 (EBD_t / K_{t-1}) * EGRrank + e_t$$
$$I_t / K_{t-1} = \beta_0 + \beta_1 q_{t-1} + \beta_2 EBD_t / K_{t-1} + \beta_3 EMPGRrank + \beta_4 (EBD_t / K_{t-1}) * EMPGRrank + e_t$$

	1	2	3	4
q_{t-1}	0.057** (25.47)	0.052** (22.21)	0.053** (24.07)	0.043** (19.71)
EBD_t / K_{t-1}	0.035** (8.09)	0.062** (11.33)	0.037** (8.97)	0.027** (4.94)
SGRrank	0.093** (30.62)			0.080** (22.99)
EBD * *SGRrank*	**0.066**** **(8.59)**			**0.047**** **(3.26)**
EGRrank		-0.005 (-1.77)		-0.066** (-21.54)
EBD * *EGRrank*		**0.108**** **(12.78)**		**0.058**** **(4.64)**
EMPGRrank			0.120** (39.33)	0.087** (28.13)
EBD * *EMPGRrank*			**0.061**** **(7.91)**	**0.032**** **(2.67)**
Year & Firm Dummies	YES	YES	YES	YES
R^2	0.188	0.175	0.208	0.232

Panel B: Relation between *I-EBD* sensitivity and financial constraints conditional on growth

	1	2	3	4	5	6
q_{t-1}	0.049** (20.40)	0.063** (27.49)	0.061** (25.05)	0.038** (17.32)	0.046** (21.09)	0.045** (19.39)
EBD_t / K_{t-1}	0.149** (16.46)	0.082** (12.99)	0.048** (9.50)	0.049** (3.74)	0.034** (4.15)	0.009 (1.38)
PAYOUTrank	-0.017** (-7.05)			-0.013** (-5.40)		
*EBD*PAYOUTrank*	**-0.034**** **(-2.35)**			**-0.013** **(-0.89)**		
AGErank		-0.071** (-27.62)			-0.057** (-23.17)	
*EBD*AGErank*		**-0.028*** **(-2.25)**			**-0.009** **(-0.76)**	
$Z_{FC}rank$			0.081** (25.81)			0.061** (20.61)
$EBD*Z_{FC}rank$			**0.041**** **(4.46)**			**0.026** **(1.94)**
SGRrank				0.079** (22.27)	0.079** (22.80)	0.075** (21.42)
*EBD*SGRrank*				0.037* (1.97)	0.041** (2.88)	0.038** (2.49)
EGRrank				-0.073** (-22.17)	-0.066** (-21.25)	-0.070** (-23.04)
*EBD*EGRrank*				0.013 (0.73)	0.053** (4.31)	0.054** (4.11)
EMPGRrank				0.077** (24.15)	0.082** (26.53)	0.079** (25.98)
*EBD*EMPGRrank*				0.087** (5.20)	0.028* (2.40)	0.026* (2.09)
Year & Firm Dummies	YES	YES	YES	YES	YES	YES
R^2	0.177	0.178	0.181	0.238	0.245	0.244

** and * indicate statistical significance at the 1% and 5% levels, respectively.

In Panel A, we directly examine whether the I-*EBD* sensitivities vary with growth proxies, where growth is proxied by sales growth (SGR), growth in earnings (EGR), and growth in the number of employees (EMPGR). In Panel B, we examine whether the I-EBD sensitivities vary with financial constraints conditional on growth proxies. I_t is capital expenditure. K_{t-1} is beginning capital stock. EBD_t is cash flow as measured as earnings before extraordinary items plus depreciation. q_{t-1} is average q at the beginning of the period measured as the market value of assets divided by the book value of assets. SGR_t is sales in year t minus sales in year t-1 and then scaled by sales in year t-1. Similar definitions apply to EGR_t and $EMPGR_t$. *PAYOUT* is dividend payout ratio. *AGE* is firm age. Z_{FC} is the financial constraint index in Cleary (1999). The rank variables are in percentile rankings and converted to a [0,1] scale, where rankings are obtained by ranking observations and assigning them to 100 portfolios. The sample includes all manufacturing firms (SIC code between 2000 and 3999) with non-missing capital expenditure and cash flow variables from 1971 to 2006. We require that firms have at least five consecutive years of data in the sample period. The regressions are standard panel regressions with firm and year fixed effects and with standard errors clustered at the firm level. T-statistics are in parentheses.

Table 8 Does *EBD* proxy for the cost of capital?

Panel A: Including *EBD* and *WCACC* simultaneously in the investment equation

	1	2	3	4	5	6
q_{t-1}	0.062** (26.48)	0.069** (30.94)	0.065** (28.14)	0.046** (20.13)	0.061** (27.09)	0.059** (24.77)
EBD_t / K_{t-1}				0.124** (13.76)	0.057** (8.83)	0.031** (5.83)
$WCACC_t / K_{t-1}$	0.105** (16.83)	0.094** (16.93)	0.057** (12.25)	0.073** (11.64)	0.071** (12.28)	0.048** (9.56)
$PAYOUTrank$	-0.020** (-8.05)			-0.014** (-6.08)		
$EBD * PAYOUTrank$				**-0.025** **(1.71)**		
$WCACC * PAYOUTrank$	**-0.026**** **(-2.50)**			**-0.019** **(-1.78)**		
$AGErank$		-0.072** (-28.05)			-0.069** (-27.19)	
$EBD * AGErank$					**0.013** **(1.19)**	
$WCACC * AGErank$		**-0.031**** **(-3.40)**			**-0.029**** **(-3.15)**	
$Z_{FC} rank$			0.095** (32.06)			0.079** (25.55)
$EBD * Z_{FC} rank$						**0.036**** **(3.64)**
$WCACC * Z_{FC} rank$			**0.032**** **(3.65)**			**0.020*** **(2.07)**
Year & Firm Dummies	YES	YES	YES	YES	YES	YES
R^2	0.154	0.174	0.186	0.195	0.193	0.197

Panel B: Sensitivity of investment to changes in accounts receivables or changes in inventory

	1	2	3	4	5	6
q_{t-1}	0.064** (27.20)	0.069** (30.62)	0.067** (28.11)	0.061** (26.70)	0.065** (29.80)	0.063** (27.31)
ΔAR	0.160** (19.96)	0.152** (18.25)	0.084** (13.10)			
ΔINV				0.184** (23.62)	0.197** (23.52)	0.121** (18.85)
PAYOUTrank	-0.023** (-9.64)			-0.022** (-9.25)		
ΔAR*PAYOUTrank*	**-0.073** (-5.25)**					
ΔINV*PAYOUTrank*				**-0.056** (-4.12)**		
AGErank		-0.043** (-22.51)			-0.041** (-21.91)	
ΔAR*AGErank*		**-0.070** (-4.73)**				
ΔINV*AGErank*					**-0.084** (-5.68)**	
$Z_{FC}rank$			0.049** (20.79)			0.044** (19.19)
ΔAR* $Z_{FC}rank$			**0.085** (5.96)**			
ΔINV* $Z_{FC}rank$						**0.095** (6.96)**
Year & Firm Dummies	YES	YES	YES	YES	YES	YES
R^2	0.154	0.164	0.163	0.176	0.190	0.191

** and * indicate statistical significance at the 1% and 5% levels, respectively.

In Panel A, we include *EBD* and *WCACC* simultaneously in the investment equation to examine whether *EBD* subsumes the information in *WCACC* with respect to explaining capital investment. q_{t-1} is average q at the beginning of the period measured as the market value of assets divided by the book value of assets. EBD_t is cash flow as measured as earnings before extraordinary items plus depreciation. $WCACC_t$ is working capital accruals measured as changes in non-cash current assets minus changes in non-debt current liabilities. In panel B, we examine the investment sensitivity to two specific components of WCACC: Changes in accounts receivables (ΔAR_t) and changes in inventory (ΔINV_t). In both panels, the dependent variable is capital expenditure scaled by beginning capital stock (I_t/K_{t-1}). *PAYOUT* is dividend payout ratio. *AGE* is firm age. Z_{FC} is the financial constraint index in Cleary (1999). The rank variables are in percentile rankings and converted to a [0,1] scale, where rankings are obtained by ranking observations and assigning them to 100 portfolios. The results are based on the firm- and year-fixed effect regressions with standard errors clustered at the firm level. The sample includes all manufacturing firms (SIC code between 2000 and 3999) with non-missing capital expenditure and cash flow variables from 1971 to 2006. We require that firms have at least five consecutive years of data in the sample period. T-statistics are in parentheses.

Table 9 Regressions of investment on changes in working capital

	1	Low dividend payout ratio	High dividend payout ratio	2	Low dividend payout ratio	High dividend payout ratio
q_{t-1}	0.061 (26.05)	0.066 (21.99)	0.030 (10.63)	0.058 (25.71)	0.063 (21.28)	0.028 (10.59)
EBD_t/K_{t-1}	0.101 (25.07)	0.147 (20.85)	0.140 (17.65)	0.084 (20.83)	0.126 (18.66)	0.127 (16.11)
$\Delta WC_t/K_{t-1}$	-0.023 (-10.74)	-0.024 (-7.30)	-0.022 (-5.66)			
$WCACC_t/K_{t-1}$				0.038 (10.96)	0.039 (8.21)	0.034 (5.50)
$(\Delta CASH_{BS}-\Delta STD-\Delta TP)_t/K_{t-1}$				-0.037 (-17.01)	-0.041 (-12.59)	-0.035 (-8.51)
Firm & Year Dummies	YES	YES	YES	YES	YES	YES
R^2	0.164	0.198	0.153	0.187	0.224	0.174

Investment (I_t) is capital expenditure. K_{t-1} is beginning capital stock. q_{t-1} is average q at the beginning of the period measured as the market value of assets divided by the book value of assets. EBD_t is cash flow as measured as earnings before extraordinary items plus depreciation. ΔWC_t is changes in working capital, which are equal to current assets minus current liabilities. *WCACC* is working capital accruals measured as changes in non-cash current assets minus changes in non-debt current liabilities. $\Delta CASH_{BS}$ is change in cash and cash equivalents on the balance sheet, ΔSTD is change in short-term debt, and ΔTP is change in taxes payable. Note that $\Delta WC_t = WCACC_t + (\Delta CASH_{BS}-\Delta STD-\Delta TP)_t$. Dividend payout ratio is dividend and stock repurchase divided by earnings before interest and tax. Each year we partition the sample into two equal-size groups (low and high) based on dividend payout ratio. The regressions are standard panel regressions with firm and year fixed effects and with standard errors clustered at the firm level. The sample includes all manufacturing firms (SIC code between 2000 and 3999) with non-missing capital expenditure and cash flow variables from 1971 to 2006. We require that firms have at least five consecutive years of data in the sample period. T-statistics are in parentheses.