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Investment spending by US public firms is highly concentrated. The 100 largest spenders account for 60% of total capital expenditures and drive most of the variation in aggregate investment. This high concentration creates a disconnect between the average public firm and macroeconomic aggregates. For large firms, cash flow remains the primary driver of investment spending and has not declined in importance as it has for smaller public firms. The cash flowing to big spenders provides a better forecast of future investment opportunities than noisy proxies for Tobin's *q* even though these firms are not financially constrained. These results suggest that, at least for the largest spenders, it is unlikely that measurement error drives the significance of cash flow. Our results are also inconsistent with recent models that predict higher investment-cash flow sensitivity for small young growth firms and suggest that cash flow is still the most important determinant of macroeconomic fluctuations in investment spending.

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Investment spending by US public firms is highly concentrated. The 100 largest spenders account for 60% of total capital expenditures and drive most of the variation in aggregate investment. This high concentration creates a disconnect between the average public firm and macroeconomic aggregates. For large firms, cash flow remains the primary driver of investment spending and has not declined in importance as it has for smaller public firms. The cash flowing to big spenders provides a better forecast of future investment opportunities than noisy proxies for Tobin's *q* even though these firms are not financially constrained. These results suggest that, at least for the largest spenders, it is unlikely that measurement error drives the significance of cash flow. Our results are also inconsistent with recent models that predict higher investment-cash flow sensitivity for small young growth firms and suggest that cash flow is still the most important determinant of macroeconomic fluctuations in investment spending.

At the aggregate level, firm profitability drives investment spending more than variation in stock market prices, but the opposite is true at the micro level. In the cross section, many studies document the influence of market prices (via Tobin's *q*) on investment (e.g., Erickson and Whited (2000), (2012)). However, a host of other studies show the stock market remains a sideshow in explaining aggregate investment (e.g., Blanchard, Rhee, and Summers (1993) and Morck, Shleifer, and Vishny (1990)).

In this paper, we offer a straightforward resolution to this puzzle. Contrary to the evidence for the average firm, we show variation in cash flow and not Tobin's *q* is highly predictive of future investment for the largest investment spenders.[1] The largest 10% of investment spenders make up 75% of aggregate US investment. Thus, while *q* predicts the mean firm's cross-sectional investment, it is cash flow variation that drives large firm investment, and thus US aggregate investment.

The fact that investment policy at large firms is so strikingly different from the mean firm's investment requires some re-thinking of the evidence in Chen and Chen (2012), who argue that the investment-cash flow sensitivity of the average firm has declined markedly over the past 4 decades. In contrast, we show that the marginal effect of cash flow on aggregate investment has actually increased over the last 30 years. In terms of economic magnitude, our results directly contradict the findings in Chen and Chen (2012). Far from being less important, variations in cash flow for the largest spenders are as critical in explaining aggregate investment behavior now as they have ever been.

[1] This result has been hinted at before, at least going back to Gilchrist and Himmelberg (1995) and Erikson and Whited (2000) who find that larger firms have higher investment-cash flow sensitivity. However, both studies focus on other issues and do not explore the economic reasons for and implications of the high investment-cash flow sensitivities in the upper tail of the distribution.

We also find that fluctuations in the capital expenditures of just the top 100 spenders explain nearly two thirds of the variation in aggregate net fixed private non-residential investment. Most of this explanatory power comes from just the top 50 spenders, whose investment explains 58% of the fluctuations in aggregate investment. More formally, in a standard VAR model, the cash flows of the largest 5% of spenders predict future changes in GDP investment whereas the impact of their aggregate q is negative.

The largest capital investors behave differently. The top 10% earn over 70% of all corporate profits, disburse more than 70% of aggregate dividends, and are net repurchasers of equity. Our results complement past studies like Gabaix (2011) and Doms and Dunne (1998) who also focus on the skewed aggregate impact of large firms. Instead of focusing on the average COMPUSTAT firm to make inferences about aggregate investment behavior, theoretical models may need to shift towards the behavior of the top capital spenders to get a better understanding of how economies create productive capital.

Our results also question the economic significance of the findings in Baker, Stein, and Wurgler (2003), who link investment to stock prices (proxy for Tobin's q) through the equity financing channel. Although we also find that equity dependent firms have more sensitivity to Tobin's q, when sorted by actual capital investment, these firms constitute less than 1% of total investment. These results are consistent with Bakke and Whited (2010) who find no support for the equity dependence and mispricing channels for large firms. While the stock market may drive investment for a large number of small firms, we show that it remains a sideshow for the small number of large firms that dominate aggregate investment.

The cash flow-dependent investors that drive aggregate investment are by any measure the least financially constrained firms in the US. While many papers have argued that investment-cash flow sensitivities are poor proxies for financial constraints, we show directly that investment-cash flow sensitivity is, if anything, a proxy for financial slack. These results are consistent with recent studies that also show cash flow sensitivities are unlikely to predict financial constraints (for instance, Kaplan and Zingales (1997), Gomes (2001) and Eberly, Rebelo, and Vincent (2012)). In contrast though, we find that investment-cash flow sensitivities are increasing in the *opposite* direction of financial constraints.[2]

The previous findings contradict the predictions of recent theoretical models. Alti (2003) argues that because young firms learn about their long-run profitability by observing their own cash flows, these firms' investment decisions should be more sensitive to cash flow shocks. Although we find evidence that current cash flows provide information about future investment opportunities, this information appears more relevant for mature firms than for young firms. One explanation for this result is that the cash flows of mature firms are more autocorrelated, providing better information about future profitability. In addition, in Abel (2016) measurement error in q leads to cash flow sensitivity for the most rapidly growing firms. Although we correct for measurement error in all specifications, we find the highest cash flow sensitivity for the largest and oldest firms in our sample. We conclude that the cash flow sensitivity we document here is due to neither financial constraints nor measurement error.

Our findings also relate to recent work on the role that measurement error plays in investment equations. We employ a number of the most recent measurement error robust estimators and continue to find that cash flow predicts investment for the largest firms. To the extent that recent improvements in methodology address measurement error concerns, our results suggest that cash flow sensitivities remain an important driver of investment decisions

[2] It is important to emphasize that this relationship is not driven by the well-documented measurement error problems in marginal q (see for instance, Erickson and Whited (2000)), since it is robust to firm effects, firm and industry-time effects, the measurement error corrected IV approach of Almeida, et al. (2010), the moment estimator of Erickson and Whited (2012), and the panel cumulant version detailed in Erickson, Jiang, and Whited (2014).

independent of measurement error. Indeed, we show that cash flow appears to be a better predictor of future investment for the big spenders. If current cash flows provide information about future growth options not reflected in noisy estimates of Tobin's *q*, then current cash flows should predict future capital expenditures. We show that realized 10-year future investment rates are more correlated with current cash flows than with proxies for Tobin's *q*. If realized investment is an unbiased proxy for expected investment opportunities in the long run, then cash flow is more informative than current market values for large investors. In an interesting parallel, this argument hearkens back to early accelerator models of investment theory (for instance, the early accelerator models of Fisher (1933), Samuelson (1939), and Clark (1970)), where real investment was assumed to be driven by shocks to output or sales. Caballero and Leahy (1996) also link investment opportunities to cash flows via fixed adjustment costs. Our tests also provide support for the theories in Gomes (2001) and Gala and Gomes (2016) who also argue that cash flows may be less noisy proxies for investment opportunities.

The recurring theme of our paper is that the largest investing firms behave much differently from the median public firm, and that that these firms are the key to understanding aggregate investment. These big spenders are not constrained, but are especially sensitive to cash flow. Moreover, this sensitivity has not declined over time. This collection of results is exactly opposite from what a researcher would conclude by studying the behavior of the average, median, or representative public firm in a cross sectional regression.

These stark differences are not simply the result of computing equal vs. value weighted averages or measurement error in marginal *q*. The actual marginal sensitivities of corporate decisions appear to change across the size distribution. This suggests either large differences in market frictions, incentives, factor prices, or rates of technical substitution. Models of corporate investment and financing decisions based on the behavior of a representative firm will fail to explain variations in macroeconomic outcomes if those models do not predict decisions for the largest firms that matter the most.

Our analysis proceeds as follows. Section 2 establishes the basic facts about cross-sectional and aggregate investment sensitivities and Section 3 shows the extreme concentration and persistence of investment spending by firms, both within the Compustat data and the US economy. Section 4 contains the results of our analysis of the top capital spenders, showing that these firms have substantial cash flow sensitivities and that their investment behavior is structurally different from other, smaller, firms. Section 5 examines the implications of this cash flow sensitivity for aggregate investment spending. In Section 6 we examine whether our main results are driven by financial constraints. Section 7 presents forecasting regressions of long-run investment. Section 8 tests the robustness of our results to measurement errors. Section 9 concludes.

2. Cross-sectional and Aggregate Determinants of Investment

There is a large literature in economics and finance that investigates the relationship between capital investment, corporate profits, and stock market values. A crude summary of these results is simply that in time series regressions of aggregate investment, cash flow dominates Tobin's q as a determinant, whereas in cross-sectional evidence the reverse is true. In Table 1 we present results that confirm these well-known stylized facts.

Panel A presents a time series regression from 1950 to 2015 of aggregate investment on lagged values of cash flow and q where all variables are constructed from sums of firm fundamentals over all Compustat firms (details on sample and variable construction are in an Appendix). The influence of cash flow is dominant; its standardized coefficients in the full sample of 0.376 and 0.504 are both economically and statistically significant. On the other hand, when *q* has a significant effect, it has the "wrong" (negative) sign. At the aggregate level, the market remains a sideshow in explaining total capital investment. Interestingly, the standardized effect of cash flow increases in more recent years showing cash flow's effect in aggregate has not diminished, contradicting the argument in Chen and Chen (2013).

In Panel B we estimate a similar cross section panel regression over the same period using the differenced instrumental variables approach in Almeida et. al (2010) to account for measurement error in *q* at the firm level. Here the story is reversed; Tobin's *q* has a standardized effect nearly 10 times that of cash flow on investment spending in the full sample. This pattern is stable over both recent and earlier subsamples.

The fact that cash flow is an important determinant for aggregate investment, yet unimportant at the firm level, or conversely, that *q* is a robust determinant of firm level investment yet insignificant for aggregate investment, is puzzling. Both facts can be true if investment is highly concentrated among a few firms for whom cash flow is a strong determinant of firm investment.

3. Concentration and Persistence of Investment Spending

In this section we examine the concentration of investment spending in the U.S. to determine whether the investment of large firms plays an important role at the aggregate level. We begin our analysis by computing the total percentage of all capital expenditures in the Compustat database accounted for by the top N investing firms, where N varies from 10 to 200. Figure 1 shows the results from this analysis. It is clear from this figure that real investment is highly concentrated in a small number of companies; the top 200 capital spenders accounted for almost 70% of all real investment by all public companies in nearly all years since 1973, though there was a modest decrease to about 63% over the period 1991-1998. This number understates the true concentration of investment by public companies because even within the top investors, real investment is concentrated in a very small number of firms. For example, the amount of total capital investment accounted for by the largest 10 investors has stayed relatively constant at around 20%.

The concentration in real investment is also surprising because most firms invest each year (at the very least to cover capital depreciation) whereas other corporate finance variables (such as dividends) are more discretionary in nature. While DeAngelo, DeAngelo, and Skinner (2004) document a dramatic and increasing concentration in cash dividend payouts, we show a similar but very persistent concentration in investment. Table 1 shows cumulative and cohort percentages and dollar values (inflation adjusted) of capital expenditures for investment-ranked groups of 100 firms in 1973, 1990, and 2010. In all 3 years, the bulk of investment is concentrated in the top 200 firms that do well over 70% of all capital investment. In actual dollar terms, the top 200 firms in 2010 invested over 3 times as much ($941 billion) as the other 3,400 firms ($301 billion).[3] There appears to be a dip in investment concentration in 1990 (see also Figure 1) but even in that year the top 200 capital spenders generated over 2.5 times the total investment of all other firms combined.

Our analysis not only reveals that real investment is highly concentrated among a small number of firms, but also that these firms are generally the same year after year. Figure 2 shows the persistence of membership in the top ventile (5%) of aggregate investment intensity and the total % of capital expenditures accounted for by those firms. Over half of all firms in the top ventile stay in the same ventile for at least 5 years, and even among the top capital spenders in

[3] Values for all of bottom firms do not sum exactly to the values for the 2000 firms shown in Table 1, due to 5.5 billion dollars of aggregate investment by the smallest 1,600 firms.

this set they are the largest, since the associated percentage of total investment accounted for by the very persistent firms exceeds 50%.[4]

Firms that do the bulk of the investment in the US also account for the majority of earnings and dividends paid. DeAngelo, DeAngelo, and Skinner (2004) note that the top 100 dividend paying firms account for 81.8% of total dividends paid in 2000. In Table 2 we show that not only is there substantial concentration in dividends and investment, in many cases the firms that are driving this concentration are the same firms. In every year since 1974 there have been at least 100 firms that are jointly in the top 5% of real investment, dividends paid, and operating cash flow. Together, these large firms generally supply about half of all investment, pay about 50% of all dividends, and earn 50% of all operating cash flows.[5] To summarize, this section shows that the total investment in Compustat is persistently dominated by a very small number of large firms who not only invest the most, but earn more than half of all earnings and pay over half of all dividends.

The sample of Compustat firms that we study represents a wide cross-section of firms in the U. S., but it is possible that this set of firms may not be representative of total aggregate investment. For instance, Compustat does not report investment data for private firms that are tracked in the official statistics of the United States Government. To address this issue, we plot in Figure 3 the total nonresidential private investment from the NIPA accounts of the US versus two samples of firms derived from Compustat data: all firms in the database (Panel A) and all domestically incorporated firms (Panel B).[6]

[4] Five firms have been in the top 5% every year since 1953: Chevron, DuPont, ExxonMobil, General Electric, and International Business Machines. General Motors would have made this screen, except for the years 2006, 2007, and 2008.
[5] From 1998 to 2003 there is a noticeable drop from the 50% level to about 42%, but then the joint concentration rapidly returns to the 50% level.
[6] It is important to note that the official GDP statistics on private investment compiled by the Bureau of Economic Analysis seek to tabulate all domestic investment that occurs physically in the US, regardless of where the firm making

Panel A of Figure 3 shows that simply summing up all investment expenditures (CapX) of all firms in Compustat results in a series that almost exactly tracks (and occasionally exceeds, especially in the later years) the BEA official GDP estimates of private nonresidential investment. Much more importantly than matching the levels of the GDP series, the Compustat sample tracks the fluctuations in the GDP series almost exactly, confirming that the investment made by the Computstat firms is representative of the patterns of aggregate investment revealed by the US GDP statistics. Panel B shows that this representative pattern holds even when we restrict attention to domestically incorporated public firms, although now the levels of investment are lower as would be expected.

Figure 3 also depicts the total investment for both the top 5% and the top 100 firms of either the all Compustat or domestically incorporated Compustat subsample. The immediate conclusion is that the pattern of aggregate investment in the US is well captured by firms in Compustat, and that real investment in both Compustat and the BEA official statistics is dominated by a small number of firms. In almost all years, the top 100 firms in Compustat contribute over half the total nonresidential private investment in the US, as measured by the official GDP statistics.[7]

4. Investment-Cash Flow Sensitivity of Top Capital Spenders

Since investment spending is so highly concentrated, it is hard to extrapolate results from standard cross-sectional regressions to aggregate investment because they put equal weight on

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the investment is incorporated. Thus the private nonresidential investment series would include (for example) an auto plant in South Carolina built by a German company and exclude investment in Mexico by a US fast food company.

[7] This is not to suggest that there is a one-to-one correspondence between the capital expenditure numbers reported in Compustat and the methodology used by the Bureau of Economic Analysis. Rather, we note that the level and similar dynamics is remarkable given the vastly different sources of the data, and the issues noted above with respect to private firm investment and foreign direct net investment.

each firm. In this section, we test whether standard approaches used in the literature to examine the cross section of investment spending apply to the largest investment spenders. Our tests are designed to focus on whether the largest spenders are fundamentally different or similar to the vast majority of firms that have small levels of investment.

Traditional tests of the q-theory focus on whether Tobin's q is a sufficient statistic to describe the variation in investment spending, or whether other real variables, like cash flows, are also significant drivers (Hayashi, (1982)). The standard approach in the empirical literature, at least historically, is to regress investment spending on Tobin's q and measures of cash flows as in:

$$\frac{I_{it}}{A_{it-1}} = \alpha + \beta_1 Q_{it} + \beta_2 \frac{CF_{it}}{A_{it-1}} + \varepsilon_{it} \tag{1}$$

In this set up, Tobin's Q should explain any nonrandom variation in investment spending while a significant coefficient on cash flows represents a deviation from the q-theory of investment.

In our first set of tests, we estimate regression (1) separately for 20 ventiles of total investment spending. The sample includes all observations between 1964 and 2010 as described in Section 2. Our goal is to test whether the very top investors look different from the rest of the sample and we thus split the sample into 20 sub-samples based on the level of investment spending each year. It is important to emphasize that our sample splits are based on the level of investment (I_{t-1}) and not investment intensity (I_t/K_{t-1}) which enters our regressions as the dependent variable. Splitting the sample based on levels of the dependent variable could result in biases of the type detailed in Koenker and Hallock (2001) but in our case the level of prior period investment are not strongly correlated with current investment intensity. Nevertheless, our results are robust to alternative estimation techniques and residual concerns about the sample splits are not a significant issue in our setting.[8] Later, in a robustness section, we confirm that similar patterns obtain when we use interactions with the level of prior investment, or when we form ventiles by previous period level of assets.

All regressions are estimated correcting for measurement error in Tobin's *q* using the differenced instrumental variables approach in Almeida et. al (2010) and clustering standard errors by firm. This specification includes both firm and year fixed effects. In unreported tests, we have also included time-varying controls for industry level variation and time series trends, but these factors do not have any qualitative effect on our results.[9]

Table 4 presents the results of our estimates of β_1 and β_2 from the cross-sectional regressions of equation (1). The sensitivity of investment to both market prices and cash flows show two clear patterns across investment levels. First, firms that do very little investment show little sensitivity to Tobin's *q*. For investors above the median there is a positive but generally flat correlation between market prices and investment. The second feature of the data is that cash flow sensitivities exhibit a strong nearly monotonic positive relationship with the level of investment. In fact, the largest two ventiles of investment spending show the strongest sensitivity to cash flows with levels nearly twice that of the median spender. For example, consider the standardized coefficient on the 20th Capx ventile which suggests that a one standard deviation increase in cash flows drives a 0.28 standard deviation increase in investment. The standardized coefficients on the largest two ventiles are actually larger in magnitude than the

[8] Computing the simple correlations for each yearly cross-section yields a maximum correlation of 0.25 and an average across years of 0.10. We also address this concern directly by estimating a full factorial design regression specification with quintile dummy variables (or ventile, depending on context) and include all interactions of variables and the intercept with the dummy variables. Our results in this design are qualitatively similar or stronger. Since this bias does not appear relevant in our context, we choose to be conservative and facilitate interpretation by reporting results for our measurement-error-corrected-IV fixed effect regressions for each level quintile (ventile) in the main body of the paper.

[9] We also estimate coefficients and standard errors following the measurement error consistent methodology of Erickson and Whited (2000) and find similar results.

standardized coefficients on *Q*. This feature of the data is directly opposite from the predictions of standard *q*-theory.

Further, these top two ventiles make up more than 77% of investment, 71% of dividends and 73% of total earnings. Variation in the investment spending of firms making the lion's share of aggregate U.S. investment is mainly driven by variation in cash flows.

5. The Influence of Large Firms on Aggregate Investment

To formally test the contribution of the largest top capital spenders on aggregate investment, we regress the change in the log of aggregate net fixed private non-residential investment on the change in the log of the total investment made by the top capital spenders in the U.S. In unreported analysis, we find that the variation in the investment of the top capital spenders explain most of the variation in aggregate investment. The fluctuations in investment of the top 50, 100, and 250, capital spenders explain 58%, 64%, and 66%of the fluctuations in aggregate investment, respectively. These findings highlight the impact of the top capital spenders on aggregate economic activity. Given that the behavior of these firms is significantly different from the average or median Compustat firm, it is unlikely that statistical inference based on equally-weighted cross sectional regressions can be extended to draw implications for aggregate investment.

We also use a VAR model to show directly that changes in cash flow for the top 5% of investing firms are significant predictors of changes in GDP private non-residential investment and that the impact of the median *q* of these large firms is negligible. Figure 4 plots the orthogonalized impulse response functions for differenced log(cash flow) and differenced median *q* on differenced log(investment) from the BEA. Consistent with the results from Table 1, the first lag of cash flow is highly significant, where the effect of *q* is either negative or insignificant. Recall that aggregate investment in the regressions of Table 1 use only Compustat data. That the dynamics of cash flow and q for large firms are similar in both total Compustat and in predicting changes in Bureau of Economic Analysis (BEA)-sourced GDP investment underlines how important a focus on this critical tail of firms is for understanding aggregate investment.

Next, we reexamine the evidence in Chen and Chen (2012) that the investment-cash flow sensitivity of firms in the U.S. has declined over the past four decades and even disappeared in recent years. In fact, they find that investment was insensitive to cash flow shocks during the recent financial crisis of 2007-2009. Here we investigate whether the investment-cash flow sensitivity of the top capital spenders exhibits a similar pattern over time. We present the results from this analysis in Figure 5. Consistent with the evidence in Chen and Chen (2012), the results in Panel A indicate that the cash flow coefficients of the smallest capital spenders have been declining over time. Contrary to their evidence, however, we do not find this pattern for the top capital spenders. Although the investment-cash flow sensitivity of the top capital spenders experienced a modest decline from the period 1977-1986 to the period 1987-1996, it has not disappeared over time. In fact, this sensitivity has remained remarkably stable at around 0.15 over the past 20 years. In Panel B of Figure 5 we examine the time-series behavior of the coefficients of Tobin's q and find that it is similar to the one of cash flows. In general, our results suggest that cash flow shocks still drive the investment decisions of the firms that contribute the lion's share of aggregate investment. While we agree with Chen and Chen's (2012) conclusion that significant cash flow coefficients do not arise from financial constraints, it is for a vastly different reason. It is not that the coefficients decline over time that is probative; rather it is that they are stable through time for the least financially constrained and most important in aggregate firms.

6. The Importance of Equity Dependence and Financial Constraints

Our findings indicate that the largest capital spenders have the highest investment-cash flow sensitivity. Because this sensitivity has been interpreted as a measure of financial constraints, it is important to establish whether this is true for the top capital spenders. In this section we examine a number of proxies for financial constraints and test whether the largest, most cash flow sensitive firms in our sample appear to be financially constrained.

Interpreting the coefficient on cash flow from these regressions is controversial. For example, while early studies by Fazzari, Hubbard, and Peterson (1988, 2000) argue that investment-cash flow sensitivities capture financial constraints, many other studies question this interpretation (see, for example, Kaplan and Zingales (1997, 2000), Erickson and Whited (2000), Alti (2003), and Moyen (2004), Eberly, Rebelo, and Vincent (2013, and Abel (2016)). Gala and Gomes (2016) criticize these regressions on the basis that cash flows can capture shocks to productivity and demand which would naturally mitigate their importance in measuring financial constraints.

In Table 6 we report the characteristics of firms in each investment-level quintile. The evidence clearly indicates that the top capital spenders are unlikely to be financially constrained. Compared to the firms in the other quintiles, the top capital spenders are large, old, highly profitable firms that pay substantial dividends. For example, while the average size (age) of the firms in the highest quintile is $16.6 billion (61 years), it is only $153 million (30 years) for the firms in the lowest quintile. Given this large difference in size and age, it is not surprising that according to the Hadlock and Pierce (2010) index (HP index), the top capital spenders are the least financially constrained firms in our sample. The evidence in Table 6 also indicates that these firms have easy access to the debt market and rely less on equity issues to finance their operations.

To further investigate the role of financial constraints among the top capital spenders, we replicate the analysis in Table 3 by quintiles based on capital expenditures, the Kaplan-Zingales index, and the Hadlock-Pierce index. We report the results from this analysis in Table 7. Consistent with the findings in Table 3, Panel A of Table 7 shows that the firms with the most investment spending have the greatest sensitivity to cash flows. In Panel B, we replicate the analysis of Baker, Stein, and Wurgler (2003) and corroborate their results. When firms are sorted based on the KZ index, constrained firms appear more sensitive to stock prices, but not cash flows. However, when we re-sort the data based on the HP measure of financial constraints, the story reverses and we find that stock price investment sensitivity actually decreases with financial constraints whereas cash flow sensitivity shows no clear pattern. Given that Hadlock and Pierce (2010) show that the KZ index does not capture financial constraints, our results indicate that one needs to be careful interpreting findings based on this measure.

These results speak directly to the theoretical model of Alti (2003) that predicts that investment should be more sensitive to cash flows for young, small firms, with high growth opportunities. However, our results show the opposite relation – large mature stable firms are the most sensitivity to cash flow shocks. It is also difficult to reconcile this pattern with Abel (2016), who shows that in a model with identical marginal and average q, measurement error will lead to positive effects for cash flow for the fastest growing firms. In general, our findings are more consistent with Gala and Gomes (2016) who argue that cash flow may be more closely linked to investment because cash flows are a better predictor of future demand.

7. Forecasting Long-Run Investment

In this section we test whether and to what extent cash flows and market prices predict future long-horizon realized investment. If Tobin's q is a better measure of investment opportunities than cash flows, then this pattern should appear in the data, at least at long horizons.

Since investment is often lumpy and noisy at the firm level, we focus on 10-year horizons. For three 10-year time periods, 1980-1989, 1990-1999, and 2000-2009, we sort firms into terciles based on both cash flow and Tobin's *q* in year *t-1* (1979, 1989, 1999). We then compute the average investment rate (Capx/Assets) over the next 10 years. These sorts are independent. In this simple design, we test whether investment rates over the next 10 years are associated with cash flows and q at the beginning of the period.

Table 8 presents the results of this analysis. Cash flow levels in year *t* explain far more of the variation in future *(t+1,…,t+10)* investment than Tobin's *q*. In all three time periods, investment rates rise monotonically with the level of cash flow. On the other hand, future investment rates appear to have no consistent relationship with *q*. For example, investment rates appear to rise with *q* in the 1980s but show mixed results for the 1990s. Further, investment rates appear to decline with q in the 2000s. Overall, the level of cash flow appears to predict the future investment behavior of firms far better than Tobin's *q*. Again, this finding is consistent with the hypothesis that cash flows are a better predictor of future demand.

In Table 9 we repeat the analysis in Table 8 but split the sample based on the level of capital expenditures to test whether the effect of cash flows on future investment rates is correlated with the level of investment. The results in Table 9 indicate that the predictive power of cash flows is stronger for the largest investors than for the smallest investors. Note that, on average, the investment rates of the top capital spenders increase faster with cash flows than the ones of small capital spenders. In addition to the simple portfolio sorts, we also estimate the following regression:

$$I_{it}^{+10} = \alpha_i + \tau_t + \beta_1 CF_{it} + \beta_2 Q_{it} + \varepsilon_{it}$$

where I_{it}^{+10} is average amount of investment (or the average rate) over the following 10 years for *t=(1979, 1989, 1999)*. We estimate this regression as a panel with firm and year fixed-effects. Our results (not reported) are consistent with the basic portfolio sorts. Cash flows are a much better predictor of future investment than Tobin's *q*.

8. Alternative Methodology

Although we discuss in detail the economic reasons and econometric justification for forming ventiles from previous period levels of investment in Section 4, there may be concern that both investment intensity and previous investment levels are simultaneous "choice" variables for the firm and thus investment levels are not characteristics of the firm in a canonical sense. To mitigate such concerns, we repeat our estimation of the investment regression detailed in Table 3, but form ventiles on lagged asset levels rather than investment levels. Our results are reported in Table 9. These results closely match our findings from Table 3 using the level of investment as the sorting variable. Our main results are virtually unchanged. For interpretation however, we believe that the link between investment levels and investment rates is an important concept for understanding the actual levels of investment in the aggregate economy, and we believe the results presented in the prior sections are more easily linked to GDP aggregate investment levels.

Another alternative to sorting firms into ventiles and estimating regressions conditionally might be to estimate quantile regressions. While this might seem like a natural approach in this setting, the methodology comes with some drawbacks. First, a quantile regression would estimate the kth percentile of investment intensity (I/K), rather than estimating differences in the responsiveness of investment intensity to cash across varying levels of investment. In other words, our ventile linear regression approach is more appropriate to the research question of whether the largest investing firms behave differently, as opposed to determining whether the conditional percentile of investment intensity is different. This is not simply a matter of econometrics because, in our approach, we want to link the level of investment to cash flow sensitivity to facilitate a natural extension to the behavior of aggregate variation in macro investment.

Nevertheless, in unreported analysis, we estimate quantile regressions using the log level of investment as the dependent variable and tests whether cash flows and q predict variation in investment across different quantile levels. Perhaps not surprisingly, these results mirror our main finding and yield similar inference to our cross sectional ventile regressions. We continue to find that the largest quantiles of investment spending are more sensitive to cash flows than firms at lower levels of investment. Overall, our main conclusions are not sensitive to this alternative econometric approach.

9. Conclusion

The investment behavior of the very largest corporations is distinct and important. A small number of firms at the top of the size distribution drive most of the variation in aggregate investment. These firms are cash cows. They earn most of the money, pay the lion's share of dividends and show no signs of being financially constrained. Surprisingly, however, these firms also show the greatest investment sensitivity to cash flows. Further, contrary to previous evidence, this sensitivity has not disappeared over time.

This sensitivity of investment in large firms to cash flow has important implications for aggregate investment. Changes in cashflow in large firms predict aggregate investment whereas changes in their stock prices do not. While there is some evidence that small financially constrained firms with low levels of investment are more sensitive to stock prices, these firms make up less than 1% of aggregate investment. Even if stock market prices are driven by irrational behavioral biases that push prices far away from fundamentals for sustained periods of time, it just would not matter much for aggregate investment.

Our findings suggest that the cash flow sensitivity of the largest firms is robust to corrections for the significant measurement error in estimates of marginal Tobin's q. The fact that large spenders display such a robust relation to cash, suggests that measurement error does not explain all the variation in investment intensity for large firms and may reflect a larger economic role for the importance of cash flow in firms' investment plans.

Indeed, we find that the large investment-cash-flow sensitivity of the biggest investing firms appears to be related to realized future investment opportunities. Cash flows are a strong predictor of future investment over the next 10 years. In our tests, current cash flow is a better measure of investment opportunities than poorly measured proxies for average (not marginal) *q*, which can account for the empirical failure of *q* in explaining aggregate investment. Overall, our results suggest that future theoretical work should explain the behavior of the top capital spenders to get a better understanding of what drives aggregate investment.

Data Appendix

We use a comprehensive sample of Compustat firms from 1950 through 2011, although for some of our analysis we restrict the sample to the period from 1964 onward and use those firms for which we have data on both CRSP and Compustat. We exclude financial firms (SIC codes 6000 through 6999) and utilities (SIC codes 4900 through 4999), firms with assets under $10 million, and firms with negative book or market value or capital expenditures. Generally, our discussion of investment concentration uses the most comprehensive set of firms available (all Compustat firms from 1950 onwards subject to the screens). Following Almeida, Campello, and Galvao (2010), our regressions exclude firms without sufficient lagged values for the instrumental variable estimation. We obtain data on GDP and aggregate investment from the Bureau of Economic Analysis, and age data from Jovanovic and Rousseau (2001) supplemented with data from Fink, Fink, Grullon, and Weston (2011).

Our main investment and cash flow variables are constructed as in Baker, Stein, and Wurgler (2003). Specifically, we define investment as capital expenditures (Compustat item CAPX) at time t scaled by the book value of total assets (item AT) at time t-1, and cash flow as income before extraordinary items (item IB) plus depreciation (item DP) at time t scaled by the book value of total assets at time t-1. Tobin's q is defined as the book value of total assets plus the market value of equity (MV) minus the book value of equity (item CEQ) minus deferred taxes (item TXDB) scaled by the book value of total assets. The market value of equity (MV) is defined as the total number of common shares outstanding (item CSHO) times the closing stock price at the end of the fiscal year (item PRCC_F). Sales is defined as the total sales of the firm (item SALE).

For our primary measure of financial constraints, we construct the Hadlock and Pierce (2010) index as:

$$\text{HP index} = -0.737\times\text{size} + 0.043\times\text{size}^2 - 0.04\times\text{age},$$

where size is the log of the book value of total assets and age is the difference between the sample year and the year of the firm's incorporation or founding. When constructing the HP index, we winsorize each component every year at the 2.5% level.

For consistency with past studies, we also use the four-variable version of the Kaplan and Zingales' (1997) financial constraints index as constructed in Baker, Stein, and Wurgler (2003):

$$\text{KZ index} = -1.002\times\text{cash flow} - 39.38\times\text{dividend rate} - 1.315\times\text{cash rate} + 3.139\times\text{leverage},$$

where cash flow is defined above, the dividend rate is the total amount of dividends declared on common shares (item DVC) plus the total amount of dividends declared on preferred stocks (item DVP) scaled by the book value of total assets at time t-1, cash rate is cash plus short-term investments (item CHE) scaled by the book value of total assets at time t-1, and leverage is the sum of total liabilities (item LT) and total current liabilities (item DLC) scaled by total liabilities plus total current liabilities plus total stockholders'equity (item SEQ).

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Figure 1
The Concentration of Investment Spending in the U.S.

This figure shows the percentage of total capital expenditures accounted for in each year by the largest N spenders, with N = 10, 25, 50, 100, and 200. The sample is the entire set of firms from the Compustat annual file.

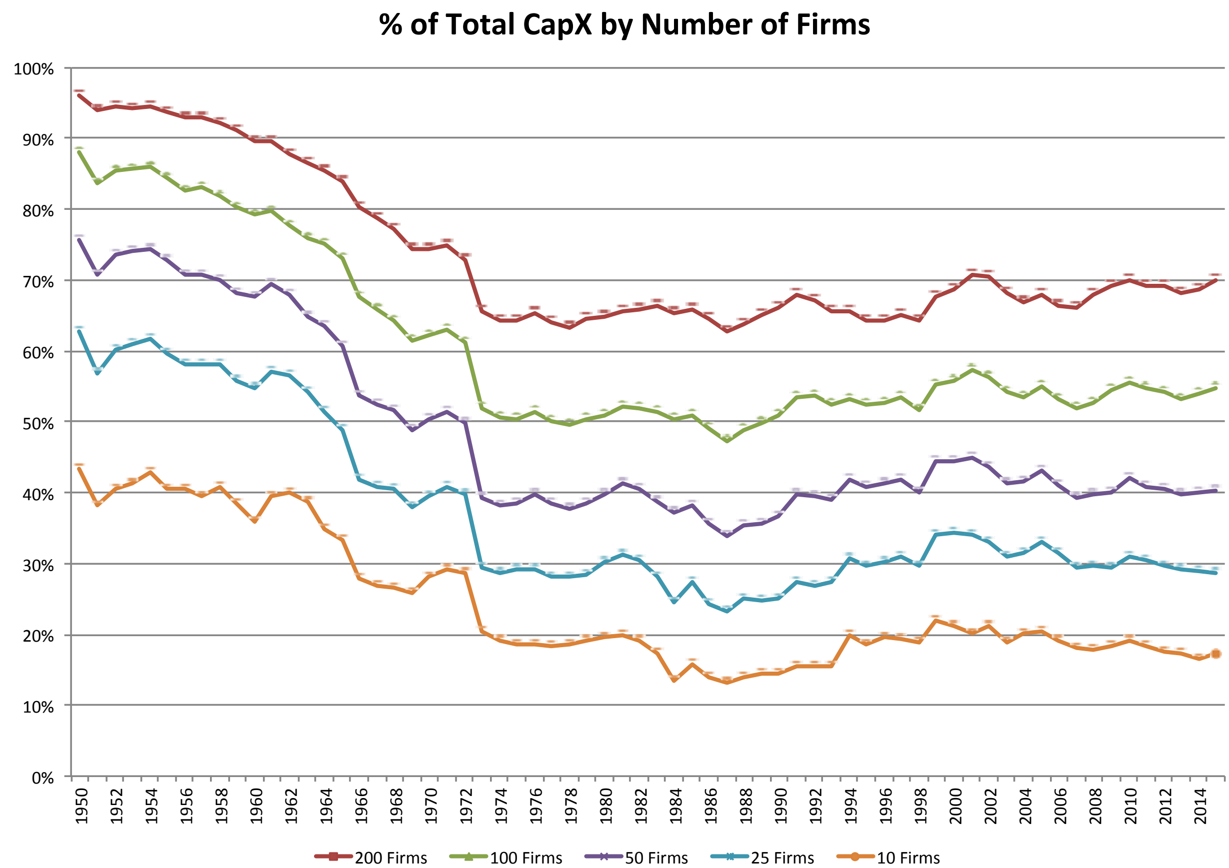


Figure 2
The Persistence over Time of the Top Capital Spenders

This figure shows the persistence of membership in the top ventile of aggregate investment intensity, and the total % of capital expenditures accounted for by those firms. The bars depict the % of aggregate capital expenditure by the firms who are in the top ventile in the current year and those who have been in the top ventile for the past 5 years, respectively. The lines depict the numbers of firms in those two cohorts. The sample includes all firms in Compustat that have data on capital expenditures.

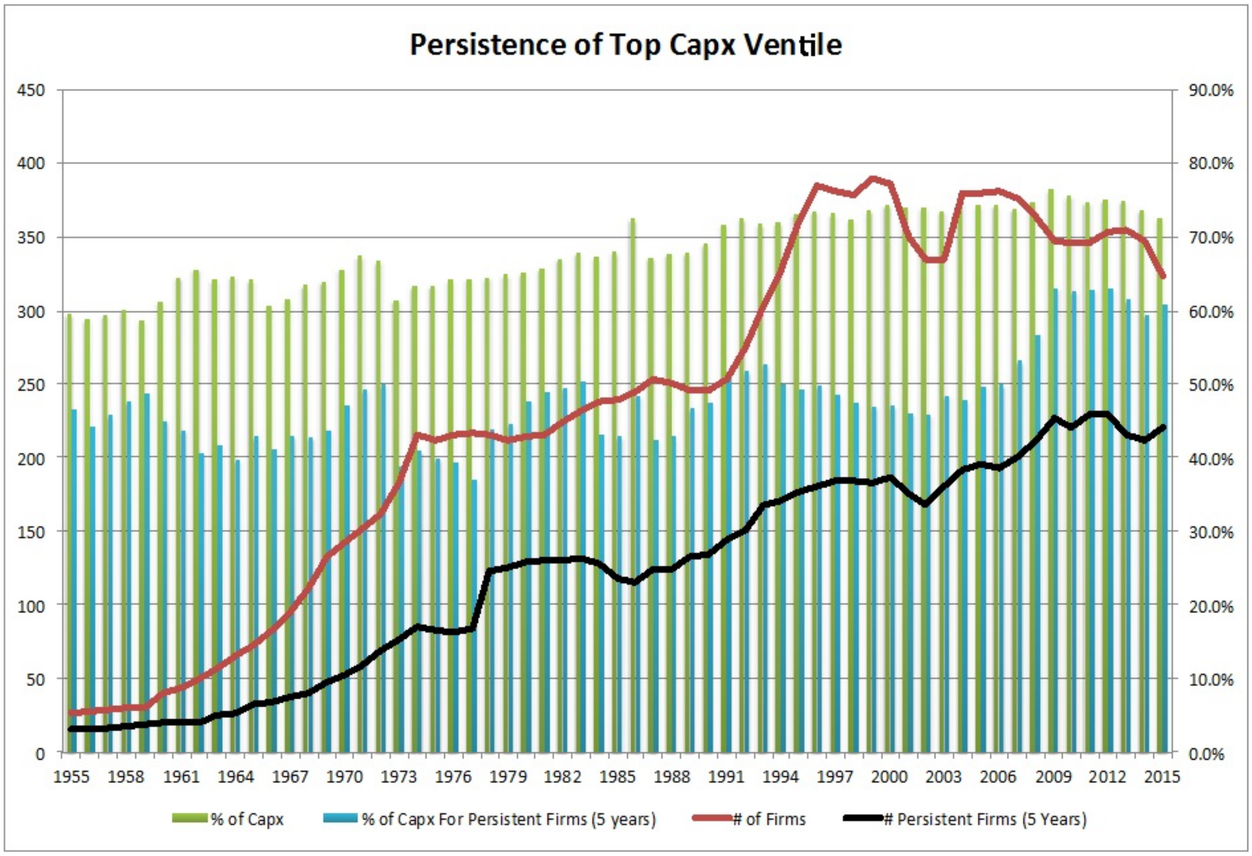
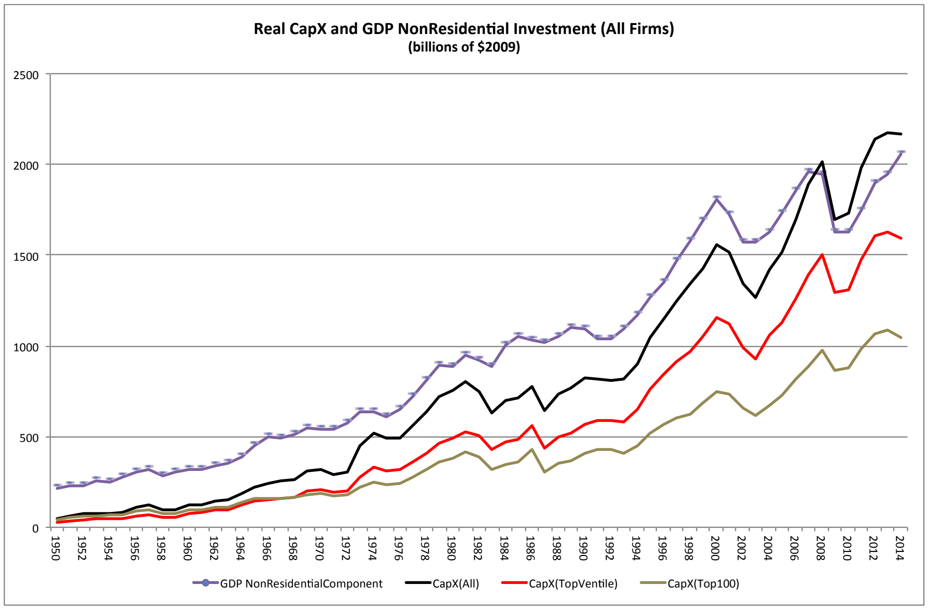


Figure 3
Aggregate Investment in the U.S.

This figure compares non-residential business fixed investment from the Bureau of Economic Analysis GDP tables to the sum of capital expenditures from firms in the Compustat annual file. The four series are, respectively, the Non-Residential Fixed Investment component of the GDP in nominal terms (billions of dollars), the sum of all capital expenditures for all firms in Compustat, the sum of capital expenditures for the largest top 100 spenders each year, and the sum of capital expenditures for the largest 5% of spenders each year. Panel A reports results for all firms in Compustat and Panel B reports results for only domestically incorporated firms.



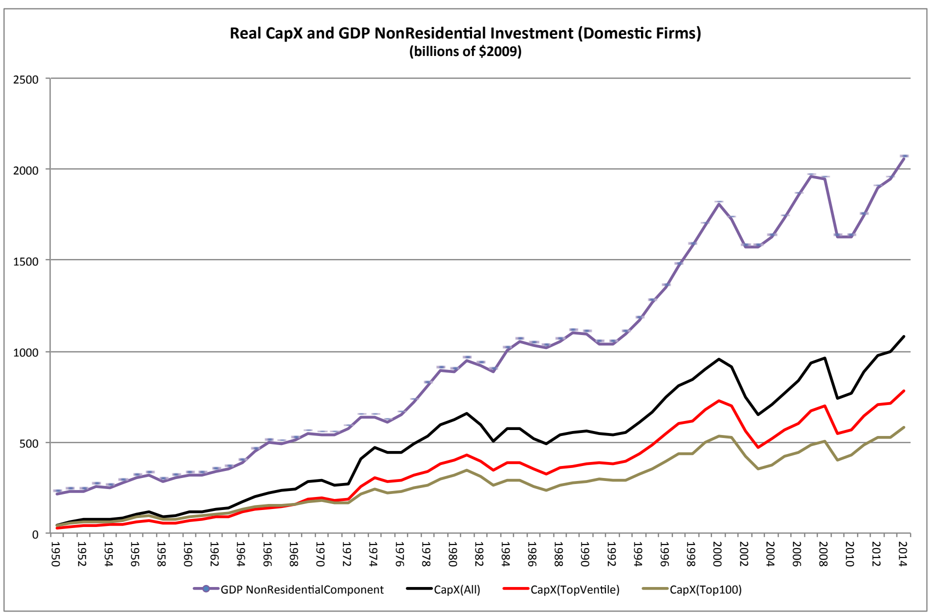


Figure 4
Impulse Response Functions for Q and Cash flow

This figure plots the orthogonalized impulse response functions and confidence intervals for *Q* and cash flow of the top 5% of firms from a VAR on aggregate nonresidential private investment. *Q* (cash flow) are calculated as the median (sum) of the largest 5% investing firms in Compustat from 1950 to 2015 and aggregate investment is from the Bureau of Economic Analysis.

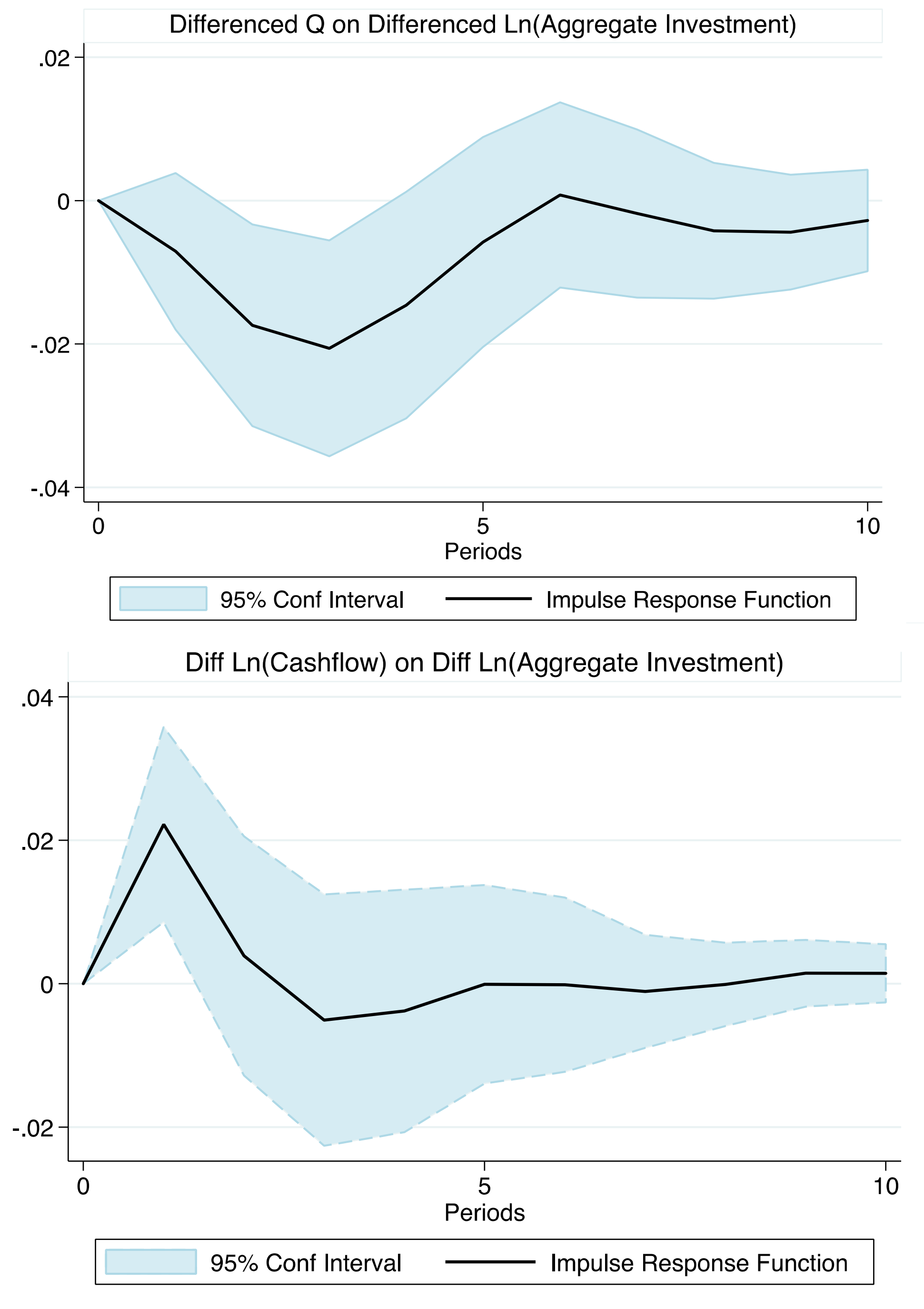
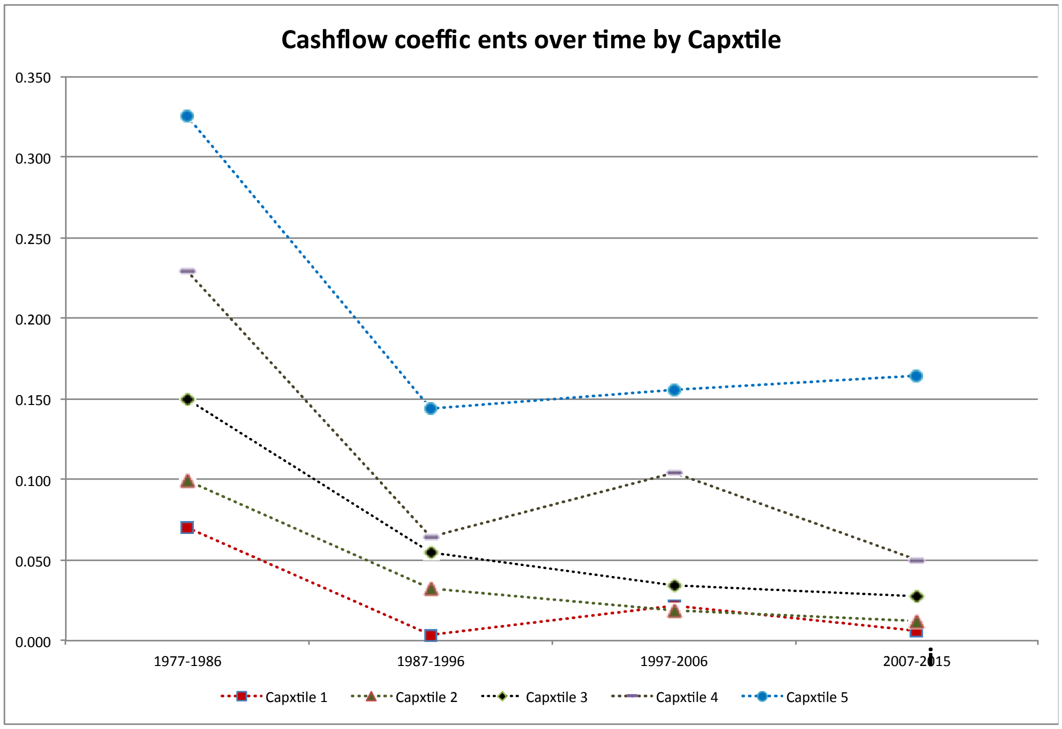


Figure 5
Trends in the Coefficients of Tobin's Q and Cash Flows

This figure shows the trend in the coefficients from regressions of investment rates on lagged Tobin's *q* and operating cash flow rates. All regressions are estimated correcting for measurement error in Tobin's *q* using the differenced instrumental variables approach in Almeida et. al (2010). Regressions are estimated separately by quintiles of aggregate investment intensity (percentage of each year's total capital expenditure).



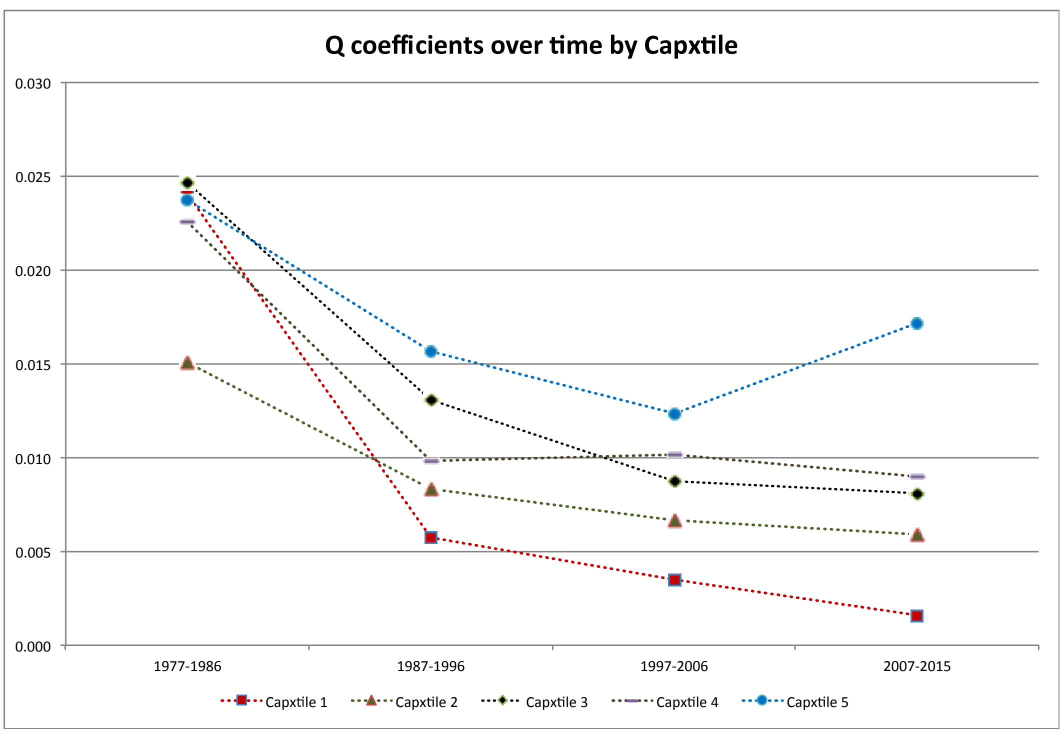


Table 1
Determinants of Aggregate and Cross-Sectional Investment

This table presents regression results from time-series regressions of aggregate investment on Tobin's *q* and cash flow and Almeida, Campello, and Galvao (2010) (ACG) measurement error-corrected IV cross-sectional estimates of investment on Tobin's *q* and cash flow. Aggregate values are computed by summing the individual components of investment intensity, Tobin's *q* and cash flow across all firms in the Compustat universe from 1950-2015. All aggregate variables are in log-differences. Cross-sectional regressions are (ACG) corrected estimates of differenced investment intensity on differenced Tobin's *q* and differenced cash flow variables using lagged levels of q as instruments. OLS cross-sectional estimates are included for comparison on a consistent sample as ACG.

Determinants of Aggregate Investment

	1952-2015		1952-1983		1984-2015	
	coefficient	β	*coefficient*	β	*coefficient*	β
Δ ln (q)	-0.274	-0.292	-0.266	-0.301	-0.183	-0.178
	(3.403)		(2.166)		(1.249)	
Δ ln (q_{-1})	0.120	0.128	0.223	0.250	0.099	0.097
	(1.677)		(1.976)		(0.625)	
Δ ln (q_{-2})	0.118	0.125	0.023	0.025	0.115	0.112
	(1.106)		(0.190)		(0.805)	
Δ ln (cashflow)	0.335	0.376	0.371	0.244	0.291	0.425
	(4.093)		(1.445)		(2.840)	
Δ ln ($cashflow_{-1}$)	0.455	0.504	0.917	0.609	0.371	0.533
	(5.210)		(4.462)		(3.778)	
Δ ln ($cashflow_{-2}$)	0.164	0.182	0.268	0.178	0.145	0.208
	(1.702)		(1.469)		(1.270)	
R^2	48.1%		61.0%		34.8%	

Determinants of Cross-Sectional Investment

	1952-2015		1952-1983		1984-2015	
	coefficient	β	*coefficient*	β	*coefficient*	β
q OLS	0.004	0.057	0.003	0.028	0.005	0.070
	(16.71)		(3.43)		(18.04)	
q OLS (ACG-IV)	0.019	0.207	0.019	0.114	0.017	0.212
	(12.73)		(5.71)		(10.53)	
CF OLS	0.177	0.275	0.468	0.390	0.144	0.250
	(69.89)		(45.71)		(56.03)	
CF OLS (ACG-IV)	0.073	0.108	0.298	0.208	0.059	0.100
	(18.67)		(16.76)		(15.13)	
R2 (OLS)	8.16%		16.20%		7.05%	
R2 (ACG-IV)	4.15%		8.19%		3.90%	
N (consistent sample)	114,036		29,437		84,599	

Table 2
The Distribution of Investment Spending in the U.S.

This table reports the distribution of investment spending in the U.S. Firms are ranked based on their total capital expenditures each year from largest to smallest. The sample includes all (non-financial and non-utilities) firms on Compustat with positive market and book values and with assets greater than $10 million. Values for the top 2,000 firms in 1995 and 2015 are reported, while there are 1,706 firms which make our criteria in 1975. Investment expenditures are adjusted to 2009 dollars using the Consumer Price Index for that year, calculated as the average annualized value throughout that year.

	Percent of total investment (%)			Cumulative % of total investment (%)			Real Investment ($ billions, 2009 dollars)		
	1975	1995	2015	1975	1995	2015	1975	1995	2015
Top 100	61.3	57.7	66.0	61.3	57.7	66.0	213.1	330.3	682.5
101-200	15.1	14.6	14.2	76.4	72.2	80.2	52.5	83.4	147.0
201-300	8.5	8.5	7.3	84.9	80.7	87.4	29.4	48.7	75.1
301-400	5.0	5.3	4.3	89.9	86.0	91.7	17.3	30.2	44.2
401-500	3.3	3.5	2.6	93.1	89.5	94.3	11.3	19.9	27.1
501-600	2.1	2.5	1.7	95.2	92.0	96.0	7.3	14.2	17.7
601-700	1.4	1.9	1.2	96.6	93.8	97.2	4.8	10.6	12.4
701-800	1.0	1.3	0.9	97.6	95.1	98.1	3.4	7.6	8.9
801-900	0.7	1.0	0.6	98.3	96.1	98.7	2.4	5.8	6.3
901-1000	0.5	0.8	0.4	98.8	97.0	99.1	1.8	4.6	4.3
1001-1100	0.4	0.6	0.3	99.2	97.6	99.4	1.3	3.6	3.1
1101-1200	0.3	0.5	0.2	99.5	98.1	99.6	1.0	2.9	2.1
1201-1300	0.2	0.4	0.1	99.7	98.5	99.8	0.7	2.3	1.5
1301-1400	0.1	0.3	<0.1	99.8	98.8	99.9	0.5	1.8	1.0
1401-1500	<0.1	0.3	<0.1	99.9	99.1	99.9	0.3	1.5	0.6
1501-1600	<0.1	0.2	<0.1	100.0	99.3	100.0	0.2	1.2	0.4
1601-1700	<0.1	0.2	<0.1	100.0	99.5	100.0	0.1	0.9	0.2
1701-1800	<0.1	0.1	<0.1	100.0	99.6	100.0	0.0	0.7	0.1
1801-1900		0.1	<0.1	100.0	99.7	100.0	0.0	0.6	0.0
1901-2000		<0.1	<0.1	100.0	99.8	100.0	0.0	0.5	0.0

Table 3
The Concentration of Investment Spending, Operating Cash Flows, and Dividends

This table presents summary statistics on the set of firms jointly in the top ventiles of aggregate investment intensity (percentage of each years total capital expenditures), percentage of positive operating cash flows, and percentage of total dividends paid. The statistics reported are the number of firms in the top 5% of all categories and the cumulative amount of capital expenditures, operating cash flow, and total dividends they accounted for in each year.

Overlapping Top Ventiles of Investment, Dividends, and Earnings

	N	CapX %	Cashflow %	Div %		N	CapX %	Cashflow %	Div %
1950	14	44.05%	43.48%	45.19%	1983	142	52.06%	53.13%	56.15%
1951	16	41.11%	44.20%	43.41%	1984	131	53.84%	54.60%	56.64%
1952	17	46.11%	46.41%	43.46%	1985	128	51.56%	53.57%	55.09%
1953	18	48.56%	48.29%	45.80%	1986	142	41.99%	52.04%	53.89%
1954	17	49.02%	46.78%	45.61%	1987	154	50.73%	53.66%	54.67%
1955	19	48.57%	49.03%	48.90%	1988	144	49.74%	51.73%	49.58%
1956	19	48.58%	47.71%	48.19%	1989	144	49.44%	52.20%	51.04%
1957	19	46.93%	48.69%	48.44%	1990	152	49.17%	52.33%	51.08%
1958	18	45.75%	45.39%	46.79%	1991	142	52.06%	52.15%	52.60%
1959	18	43.72%	42.94%	45.24%	1992	140	53.72%	54.21%	56.94%
1960	25	47.89%	46.89%	47.08%	1993	140	52.40%	53.74%	56.30%
1961	27	51.87%	46.68%	48.51%	1994	142	54.28%	54.00%	58.13%
1962	30	44.83%	47.93%	49.40%	1995	159	55.10%	54.43%	55.70%
1963	35	49.87%	48.95%	51.23%	1996	177	56.10%	56.28%	58.34%
1964	39	49.11%	47.59%	50.60%	1997	190	54.33%	54.21%	60.57%
1965	47	50.40%	49.43%	52.87%	1998	204	48.88%	51.68%	58.61%
1966	52	49.75%	48.59%	51.77%	1999	218	47.01%	47.74%	55.29%
1967	62	51.08%	49.90%	52.36%	2000	211	44.39%	47.75%	55.03%
1968	71	52.30%	51.09%	53.80%	2001	195	43.71%	45.13%	54.07%
1969	88	53.92%	53.56%	57.38%	2002	195	43.01%	45.47%	52.05%
1970	96	55.65%	54.44%	58.62%	2003	185	44.93%	44.06%	55.23%
1971	95	56.77%	54.79%	58.90%	2004	163	49.18%	48.85%	55.21%
1972	108	56.73%	54.66%	62.56%	2005	149	50.73%	50.79%	57.18%
1973	103	48.50%	47.97%	51.15%	2006	160	49.52%	49.78%	54.92%
1974	124	50.25%	49.31%	51.17%	2007	180	46.43%	52.30%	53.86%
1975	137	52.66%	50.21%	53.96%	2008	181	47.18%	54.99%	55.14%
1976	138	53.61%	50.42%	54.74%	2009	182	48.64%	47.20%	57.34%
1977	137	50.85%	49.32%	55.11%	2010	177	46.96%	46.74%	51.80%
1978	134	48.35%	47.81%	53.42%	2011	176	49.75%	49.43%	53.60%
1979	123	46.95%	47.72%	50.72%	2012	165	49.13%	49.60%	52.15%
1980	132	49.40%	49.29%	51.74%	2013	159	50.36%	47.72%	48.71%
1981	131	50.44%	48.84%	51.49%	2014	168	46.78%	44.55%	49.51%
1982	128	50.96%	50.83%	52.28%	2015	166	44.07%	42.98%	45.26%

Table 4
The Effect of Tobin's Q and Cash Flows on Investment Rates

This table presents regression results from regressions of investment rates on lagged Tobin's *q* and operating cash flow rates. Panel A regressions are estimated using OLS with robust standard errors. Panel B regressions are estimated correcting for measurement error in Tobin's *q* using the differenced instrumental variables approach in Almeida et. al (2010) (ACG) and clustering standard errors by firm. Regressions are estimated separately by ventiles of previous period aggregate investment levels. T-statistics test the coefficient's difference from zero and betas are the standardized coefficients for each variable. Columns to the right of the regression coefficients report (respectively) the means over years of the cumulative percentage of capital expenditures, positive operating cash flows, and dividend payouts for each ventile.

Panel A: Investment Concentration and the Link between Investment and Stock Prices: OLS Estimates

		Q_1			*CF/Assets*			*Cum%*	*Cum%*	*Cum%*
CapX 20-tile	*N*	*coef*	*[t-stat]*	*beta*	*coef*	*[t-stat]*	*beta*	*of Invest*	*of Div*	*of Earn*
1	3307	0.00	[3.43]	0.05	0.03	[6.70]	0.13	0.01	0.22	0.17
2	3286	0.00	[4.39]	0.10	0.04	[6.63]	0.14	0.02	0.07	0.06
3	3284	0.00	[3.33]	0.06	0.05	[8.97]	0.16	0.04	0.10	0.07
4	3279	0.01	[4.96]	0.11	0.06	[7.37]	0.16	0.06	0.13	0.10
5	3283	0.01	[5.17]	0.12	0.07	[7.21]	0.17	0.09	0.17	0.14
6	3290	0.01	[5.03]	0.13	0.09	[7.66]	0.19	0.12	0.23	0.16
7	3279	0.01	[4.26]	0.12	0.11	[7.77]	0.19	0.16	0.28	0.21
8	3281	0.00	[3.32]	0.06	0.15	[10.50]	0.25	0.21	0.36	0.26
9	3287	0.00	[1.12]	0.03	0.17	[8.32]	0.26	0.28	0.46	0.33
10	3277	0.00	[0.62]	0.01	0.18	[8.83]	0.27	0.37	0.60	0.45
11	3296	0.00	[0.43]	0.01	0.20	[10.52]	0.27	0.50	0.77	0.67
12	3281	0.00	[1.06]	0.03	0.22	[9.81]	0.28	0.66	1.00	0.76
13	3288	0.00	-[0.62]	-0.02	0.23	[9.35]	0.28	0.89	1.27	0.98
14	3280	0.00	-[0.66]	-0.02	0.31	[11.17]	0.35	1.22	1.70	1.43
15	3283	-0.01	-[3.82]	-0.09	0.36	[12.89]	0.38	1.71	2.35	2.02
16	3285	0.00	-[0.91]	-0.02	0.34	[11.18]	0.33	2.50	3.21	2.82
17	3287	-0.01	-[2.93]	-0.08	0.34	[9.76]	0.33	3.89	4.80	4.13
18	3280	-0.02	-[7.56]	-0.20	0.46	[13.55]	0.45	6.56	7.62	7.46
19	3288	-0.01	-[6.45]	-0.16	0.46	[14.40]	0.43	13.07	14.48	16.73
20	3265	-0.01	-[6.70]	-0.17	0.49	[16.63]	0.49	67.65	60.18	61.04

Panel B: Investment Concentration and the Link between Investment and Stock Prices: ACG-IV Estimates

		Q_1			*CF/Assets*			*Cum%*	*Cum%*	*Cum%*
CapX 20-tile	*N*	*coef*	*[t-stat]*	*beta*	*coef*	*[t-stat]*	*beta*	*of Invest*	*of Div*	*of Earn*
1	3307	0.01	[1.59]	0.30	0.02	[2.58]	0.06	0.01	0.22	0.17
2	3286	-0.01	-[1.05]	-0.27	0.03	[2.54]	0.08	0.02	0.07	0.06
3	3284	0.00	[0.42]	0.08	0.01	[1.77]	0.04	0.04	0.10	0.07
4	3279	-0.01	-[1.21]	-0.23	0.04	[4.82]	0.10	0.06	0.13	0.10
5	3283	0.01	[0.50]	0.08	0.05	[3.63]	0.10	0.09	0.17	0.14
6	3290	-0.02	-[1.09]	-0.24	0.06	[2.82]	0.12	0.12	0.23	0.16
7	3279	-0.01	-[0.35]	-0.09	0.09	[3.59]	0.16	0.16	0.28	0.21
8	3281	0.00	-[0.16]	-0.02	0.07	[4.09]	0.11	0.21	0.36	0.26
9	3287	0.01	[0.98]	0.10	0.08	[4.31]	0.13	0.28	0.46	0.33
10	3277	0.01	[0.69]	0.11	0.11	[5.49]	0.16	0.37	0.60	0.45
11	3296	0.03	[1.61]	0.32	0.05	[2.00]	0.07	0.50	0.77	0.67
12	3281	0.00	[0.18]	0.02	0.10	[5.41]	0.15	0.66	1.00	0.76
13	3288	0.02	[1.61]	0.23	0.08	[2.71]	0.10	0.89	1.27	0.98
14	3280	0.02	[1.68]	0.21	0.10	[3.19]	0.12	1.22	1.70	1.43
15	3283	0.03	[2.79]	0.26	0.15	[5.59]	0.17	1.71	2.35	2.02
16	3285	0.03	[2.84]	0.31	0.11	[4.38]	0.14	2.50	3.21	2.82
17	3287	0.03	[2.70]	0.31	0.13	[3.39]	0.15	3.89	4.80	4.13
18	3280	0.01	[0.93]	0.11	0.21	[5.25]	0.23	6.56	7.62	7.46
19	3288	0.01	[1.90]	0.14	0.19	[7.46]	0.21	13.07	14.48	16.73
20	3265	0.02	[3.74]	0.24	0.24	[7.25]	0.28	67.65	60.18	61.04

Table 5
Summary Statistics by Level of Investment Spending

This table presents summary statistics for each quintile of investment spending. Median values are presented in brackets below sample means. The variables are defined in the Data Appendix of the paper.

	Smallest	Quintile 2	Quintile 3	Quintile 4	Largest	Total
Assets	153	224	591	1,715	16,605	3,853
	[41]	[122]	[309]	[865]	[4,912]	[331]
Age	30	35	42	49	61	43
	[22]	[26]	[31]	[40]	[54]	[31]
Cashflow	4	11	43	144	1,640	368
	[2]	[9]	[25]	[79]	[470]	[25]
CapX	1	6	19	68	1,126	244
	[1]	[5]	[16]	[55]	[355]	[16]
Dividends	1	2	7	26	365	80
	[0]	[0]	[1]	[7]	[62]	[1]
Sales	98	268	684	1,868	13,683	3,317
	[51]	[154]	[399]	[1,040]	[4,848]	[377]
Mkt Val	109	238	657	1,869	12,177	3,007
	[27]	[83]	[226]	[670]	[2,812]	[237]
Q	1.43	1.48	1.57	1.64	1.59	1.54
	[1.07]	[1.16]	[1.26]	[1.34]	[1.30]	[1.23]
CapX/Assets (%)	2.55	5.40	7.22	9.14	10.90	7.04
	[1.90]	[4.11]	[5.42]	[6.79]	[8.61]	[5.00]
Cashflow/Assets (%)	2.22	7.66	9.98	11.40	12.10	8.67
	[5.54]	[8.64]	[10.10]	[11.20]	[11.60]	[9.66]
Div/Assets (%)	0.98	1.19	1.43	1.71	2.17	1.50
	[0.00]	[0.03]	[0.80]	[1.25]	[1.75]	[0.79]
KZ Index	0.71	0.65	0.67	0.66	0.69	0.68
	[0.89]	[0.82]	[0.82]	[0.81]	[0.83]	[0.83]
Hadlock-Pierce	-3.36	-3.94	-4.46	-4.96	-5.53	-4.45
	-[3.12]	-[3.62]	-[4.07]	-[4.57]	-[5.28]	-[3.98]
Net Equity (%)	4.11	1.18	0.24	-0.35	-0.88	0.87
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Net Debt (%)	0.07	1.56	2.94	3.67	3.67	2.38
	-[0.13]	-[0.04]	[0.00]	[0.00]	[0.23]	[0.00]
Fin. Deficit (%)	5.65	3.53	3.50	3.45	2.87	3.80
	-[0.32]	-[0.20]	-[0.09]	[0.00]	[0.20]	-[0.08]

Table 6
Investment Regressions by Quintiles based on Investment Levels and Financial Constraints

This table presents regression results from regressions of investment rates on lagged Tobin's *q* and operating cash flow rates. All regressions are estimated correcting for measurement error Tobin's *q* using the differenced instrumental variables approach in Almeida et. al (2010) and clustering standard errors by firm. We group panels into quintiles based on various measures of investment intensity and financial constraints. Panel A reports coefficients of lagged *q* and cash flow for quintiles formed on the percentage of total capital spending in the previous year. Panel B reports coefficients of lagged *q* and cash flow for quintiles formed on the median KZ index value by firm as in Baker, Stein, & Wurgler (2003). Panel C reports coefficients of lagged q and cash flow for quintiles formed using a measure of financial constraints based on Hadlock and Pierce (2010), where age is calculated using data in Jovanovich & Rousseau (2001), and both size and age variables are winsorized at their 95th percentile in every year. T-statistics test the hypothesis of no difference between the regression coefficients in each quintile and the quintile 1.

Panel A: Capx Quintiles

		Q					CF/A			
Capx		**N**	*b*	*(se)*	[t-stat]	β	*c*	*(se)*	[t-stat]	β
Quintile	**1**	14,117	-0.002	0.005		-0.043	0.024	0.004		0.072
	2	14,095	-0.003	0.006	-[0.10]	-0.039	0.060	0.009	[3.88]	0.115
	3	14,096	0.011	0.006	[1.63]	0.119	0.086	0.011	[5.44]	0.127
	4	14,097	0.026	0.005	[3.75]	0.259	0.108	0.014	[5.92]	0.132
	5	14,077	0.020	0.005	[3.23]	0.193	0.184	0.018	[8.48]	0.212

Panel B: KZ Index Quintiles

		Q					CF/A			
KZ Index		**N**	*b*	*(se)*	[t-stat]	β	*c*	*(se)*	[t-stat]	β
Quintile	**1**	14,102	0.012	0.003		0.215	0.057	0.009		0.101
	2	14,104	0.019	0.003	[1.56]	0.294	0.056	0.008	-[0.06]	0.109
	3	14,096	0.025	0.005	[2.15]	0.303	0.054	0.009	-[0.27]	0.096
	4	14,090	0.038	0.008	[3.12]	0.359	0.060	0.012	[0.17]	0.093
	5	14,090	0.047	0.011	[2.99]	0.318	0.074	0.011	[1.16]	0.107

Panel C: Hadlock-Pierce Index Quintiles

		Q					CF/A			
Hadlock Index		**N**	*b*	*(se)*	[t-stat]	β	*c*	*(se)*	[t-stat]	β
Quintile	**1**	14,106	0.022	0.003		0.255	0.065	0.009		0.113
	2	14,090	0.025	0.004	[0.61]	0.267	0.074	0.011	[0.64]	0.113
	3	14,083	0.015	0.003	-[1.41]	0.183	0.089	0.009	[1.82]	0.139
	4	14,083	0.018	0.004	-[0.61]	0.215	0.080	0.009	[1.17]	0.126
	5	14,067	0.017	0.006	-[0.70]	0.235	0.041	0.006	-[2.23]	0.080

Table 7
The Predictive Power of Cash Flows and Tobin's q

This table presents average investment rates by cash flow and Tobin's *q* terciles. Firms are sorted into terciles at the beginning of each decade, and the average rate and sum of realized capital investment is calculated through the decade. Standard errors are presented under the averages. Cash flow is calculated as income before extraordinary items plus depreciation, and Tobin's *q* is calculated as equity market value plus assets minus book equity divided by assets.

	Average Investment Rate (%)								
	1980-1989			1990-1999			2000-2009		
	Q			***Q***			***Q***		
Cashflow	*Low*	*Mid*	*High*	*Low*	*Mid*	*High*	*Low*	*Mid*	*High*
Low	5.84	7.28	8.75	5.50	5.68	5.82	4.76	4.21	4.14
	(0.10)	*(0.11)*	*(0.38)*	*(0.12)*	*(0.16)*	*(0.21)*	*(0.12)*	*(0.13)*	*(0.18)*
Mid	7.83	8.92	9.18	7.39	7.52	6.39	7.00	5.65	4.73
	(0.13)	*(0.15)*	*(0.19)*	*(0.14)*	*(0.13)*	*(0.13)*	*(0.18)*	*(0.10)*	*(0.16)*
High	9.87	10.53	11.05	11.17	9.54	8.33	9.75	8.27	5.81
	(0.25)	*(0.22)*	*(0.14)*	*(0.42)*	*(0.21)*	*(0.10)*	*(0.51)*	*(0.22)*	*(0.09)*

Table 8
The Predictive Power of Cash Flows and Tobin's *q* by Level of Investment Spending

This table presents average investment rates and total investment by cash flow and Tobin's *q* terciles for firms with low, medium, and high investment. Within each investment tercile, firms are sorted into terciles for cash flow and Tobin's *q* at the beginning of each decade, and the average rate of realized capital investment is calculated through the decade. Cash flow is calculated as income before extraordinary items plus depreciation, and Tobin's *q* is calculated as equity market value plus assets minus book equity divided by assets.

Realized Investment by Cashflow and Q Terciles

Average Investment Rate (%): Low Capital Expenditures

	1980-1989			1990-1999			2000-2009		
	Q			Q			Q		
Cashflow	*Low*	*Mid*	*High*	*Low*	*Mid*	*High*	*Low*	*Mid*	*High*
Low	5.05	4.59	5.43	4.50	4.38	5.69	3.03	3.48	3.34
	(0.22)	*(0.17)*	*(0.37)*	*(0.27)*	*(0.20)*	*(0.55)*	*(0.18)*	*(0.25)*	*(0.22)*
Mid	6.15	5.90	6.76	4.86	4.88	5.21	4.09	3.56	2.95
	(0.21)	*(0.23)*	*(0.27)*	*(0.21)*	*(0.19)*	*(0.31)*	*(0.26)*	*(0.15)*	*(0.18)*
High	7.94	7.23	7.43	7.74	6.66	6.24	5.25	5.02	3.52
	(0.33)	*(0.28)*	*(0.20)*	*(0.52)*	*(0.27)*	*(0.18)*	*(0.43)*	*(0.25)*	*(0.13)*

Average Investment Rate (%): Medium Capital Expenditures

	1980-1989			1990-1999			2000-2009		
	Q			Q			Q		
Cashflow	*Low*	*Mid*	*High*	*Low*	*Mid*	*High*	*Low*	*Mid*	*High*
Low	6.99	8.26	10.69	6.57	6.11	7.86	5.50	4.05	5.02
	(0.17)	*(0.24)*	*(0.92)*	*(0.23)*	*(0.26)*	*(0.46)*	*(0.22)*	*(0.19)*	*(0.42)*
Mid	8.19	9.11	9.39	9.24	7.01	7.12	8.24	5.22	3.86
	(0.24)	*(0.27)*	*(0.34)*	*(0.29)*	*(0.20)*	*(0.28)*	*(0.35)*	*(0.18)*	*(0.20)*
High	10.40	10.08	10.96	11.83	8.93	7.90	13.14	7.47	5.75
	(0.45)	*(0.39)*	*(0.22)*	*(0.73)*	*(0.43)*	*(0.18)*	*(1.04)*	*(0.32)*	*(0.17)*

Average Investment Rate (%): High Capital Expenditures

	1980-1989			1990-1999			2000-2009		
	Q			Q			Q		
Cashflow	*Low*	*Mid*	*High*	*Low*	*Mid*	*High*	*Low*	*Mid*	*High*
Low	8.16	8.65	10.58	6.34	6.70	5.89	6.35	5.97	4.00
	(0.17)	*(0.17)*	*(0.65)*	*(0.14)*	*(0.22)*	*(0.25)*	*(0.16)*	*(0.24)*	*(0.22)*
Mid	9.89	10.35	10.37	8.97	8.77	6.98	9.94	6.71	5.16
	(0.26)	*(0.24)*	*(0.31)*	*(0.29)*	*(0.22)*	*(0.16)*	*(0.38)*	*(0.17)*	*(0.17)*
High	12.98	13.66	13.04	12.66	11.12	9.95	13.82	12.97	6.23
	(0.53)	*(0.46)*	*(0.26)*	*(0.76)*	*(0.37)*	*(0.19)*	*(0.78)*	*(0.53)*	*(0.14)*

Table 9
The Effect of Tobin's Q and Cash Flows on Investment Rates: Asset Sorts

This table presents regression results from regressions of investment rates on lagged Tobin's *q* and operating cash flow rates. Panel A regressions are estimated using OLS with robust standard errors. Panel B regressions are estimated correcting for measurement error in Tobin's *q* using the differenced instrumental variables approach in Almeida et. al (2010) (ACG) and clustering standard errors by firm. Regressions are estimated separately by ventiles of previous period assets. T-statistics test the coefficient's difference from zero and betas are the standardized coefficients for each variable. Columns to the right of the regression coefficients report (respectively) the means over years of the cumulative percentage of capital expenditures, positive operating cash flows, and dividend payouts for each ventile.

Panel A: Investment Concentration and the Link between Investment and Stock Prices. OLS Estimates

		Q_1			*CF/Assets*			*Cum%*	*Cum%*	*Cum%*
Lag Asset 20-ti	*N*	*coef*	*[t-stat]*	*beta*	*coef*	*[t-stat]*	*beta*	*of Invest*	*of Div*	*of Earn*
1	3543	0.01	[6.67]	0.14	0.08	[11.18]	0.22	0.03	0.16	0.12
2	3521	0.01	[7.01]	0.12	0.10	[14.60]	0.26	0.05	0.14	0.11
3	3527	0.01	[6.60]	0.13	0.12	[13.23]	0.27	0.07	0.16	0.13
4	3522	0.00	[3.58]	0.07	0.15	[14.70]	0.28	0.10	0.20	0.15
5	3521	0.01	[5.74]	0.11	0.13	[10.67]	0.24	0.14	0.25	0.19
6	3529	0.01	[4.96]	0.10	0.16	[13.19]	0.28	0.18	0.31	0.23
7	3524	0.01	[2.93]	0.07	0.20	[12.41]	0.29	0.23	0.38	0.29
8	3523	0.00	[0.51]	0.01	0.22	[14.26]	0.32	0.32	0.50	0.39
9	3525	0.00	[2.03]	0.05	0.22	[10.96]	0.30	0.40	0.61	0.48
10	3518	0.00	[2.53]	0.06	0.23	[11.89]	0.30	0.51	0.77	0.61
11	3534	0.00	[1.67]	0.04	0.25	[12.66]	0.30	0.68	0.99	0.80
12	3521	0.00	[0.52]	0.01	0.23	[12.46]	0.31	0.84	1.19	0.97
13	3527	-0.01	-[3.25]	-0.07	0.27	[14.50]	0.36	1.11	1.52	1.27
14	3522	0.00	-[2.85]	-0.06	0.27	[10.78]	0.32	1.54	2.04	1.77
15	3523	-0.01	-[4.35]	-0.12	0.38	[12.60]	0.40	2.14	2.75	2.49
16	3525	0.00	-[3.26]	-0.07	0.29	[11.71]	0.33	2.97	3.67	3.37
17	3526	-0.01	-[5.01]	-0.12	0.33	[13.40]	0.37	4.85	5.61	5.47
18	3525	-0.01	-[5.50]	-0.15	0.38	[14.79]	0.45	9.08	9.73	10.02
19	3525	-0.01	-[9.08]	-0.22	0.43	[17.22]	0.51	21.82	21.12	22.17
20	3501	-0.01	-[9.53]	-0.24	0.45	[18.23]	0.55	52.89	47.83	48.90

Panel B: Investment Concentration and the Link between Investment and Stock Prices. ACG-IV Estimates

		Q_1			*CF/Assets*			*Cum%*	*Cum%*	*Cum%*
Lag Asset 20-ti	*N*	*coef*	*[t-stat]*	*beta*	*coef*	*[t-stat]*	*beta*	*of Invest*	*of Div*	*of Earn*
1	3543	-0.17	-[0.21]	-2.40	0.03	[1.08]	0.07	0.03	0.16	0.12
2	3521	0.01	[0.78]	0.09	0.04	[3.44]	0.08	0.05	0.14	0.11
3	3527	0.01	[0.37]	0.12	0.04	[2.45]	0.08	0.07	0.16	0.13
4	3522	0.01	[0.86]	0.12	0.06	[4.91]	0.11	0.10	0.20	0.15
5	3521	0.03	[1.82]	0.32	0.04	[2.70]	0.07	0.14	0.25	0.19
6	3529	0.01	[1.13]	0.14	0.08	[4.44]	0.13	0.18	0.31	0.23
7	3524	0.03	[2.45]	0.32	0.04	[2.60]	0.07	0.23	0.38	0.29
8	3523	0.02	[1.53]	0.23	0.05	[3.11]	0.08	0.32	0.50	0.39
9	3525	0.00	[0.13]	0.02	0.09	[3.70]	0.14	0.40	0.61	0.48
10	3518	0.02	[2.69]	0.24	0.08	[4.31]	0.12	0.51	0.77	0.61
11	3534	0.02	[2.49]	0.27	0.09	[4.07]	0.14	0.68	0.99	0.80
12	3521	0.03	[1.90]	0.30	0.08	[2.98]	0.12	0.84	1.19	0.97
13	3527	0.03	[2.91]	0.28	0.09	[4.93]	0.13	1.11	1.52	1.27
14	3522	0.02	[1.67]	0.19	0.09	[3.38]	0.13	1.54	2.04	1.77
15	3523	0.02	[2.48]	0.22	0.10	[4.27]	0.14	2.14	2.75	2.49
16	3525	0.02	[3.07]	0.26	0.09	[4.46]	0.13	2.97	3.67	3.37
17	3526	0.02	[2.22]	0.22	0.11	[4.14]	0.16	4.85	5.61	5.47
18	3525	0.02	[2.66]	0.19	0.11	[5.58]	0.18	9.08	9.73	10.02
19	3525	0.01	[1.50]	0.15	0.15	[5.76]	0.24	21.82	21.12	22.17
20	3501	0.02	[5.34]	0.26	0.15	[5.40]	0.24	52.89	47.83	48.90