Disclosure Quality and Capital Investment

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Abstract

We examine whether disclosure quality affects the link between a firm’s cash flow or asset values and its capital investment. We use a unique setting to examine this issue: a sudden 50% decrease in oil prices in 1986. This setting allows us to examine the effect of disclosure quality immediately prior to an unexpected, exogenous increase in a firm’s capital constraint on the firm’s capital investment immediately following the shock. In contrast to prior research, which examines the association between the level of disclosure and the level of a firm financing attribute (e.g., cost of public equity capital), we examine how the level of disclosure affects the change in firm investment. We find that high quality disclosure mitigates the effect of the oil price shock on investment. In addition, firms that are more capital constrained get a larger benefit from better disclosure, and high disclosure firms have a smaller reduction in long-term external capital following the price shock.

Keywords: Capital constraints, capital investment, cost of capital, disclosure

Classifications: M4, G31
Disclosure Quality and Capital Investment

1. Introduction

Disclosure is a fundamental issue of financial reporting and is critical for the efficient functioning of capital markets (Healy and Palepu 2001). However, the benefits to a firm of increased disclosure remain controversial (Botosan 1997; Larcker and Rusticus 2005). We provide evidence about the benefits of disclosure by examining the effect of disclosure quality on firms’ capital investment expenditures. Models of both adverse selection (e.g., Myers and Majluf 1984) and moral hazard (e.g., Jensen and Meckling 1976) suggest that capital providers will rationally expect managers to exploit their information advantage, and, as a consequence, capital providers limit the amount of capital provided. In such situations, firms face external capital constraints and must finance some investment opportunities by using internal financing from operating cash flows or from capital raised from selling assets. If the internal cash flows and asset values are insufficient, the firm must limit its investment and forgo funding some positive net present value investment opportunities. By reducing the degree of information asymmetry between managers and capital providers, the quality of a firm’s disclosure can mitigate the degree to which the firm faces external capital constraints, and thus affect the level of the firm’s investment expenditures.

One difficulty in examining the effects of disclosure is that disclosure and the variables it is expected to affect, such as capital investment, typically are endogenous. To circumvent this problem, we use a unique setting: the effect of the 1986 negative oil price shock on the change in investments by the non-oil segments of oil-dependent firms. In late 1985 and early 1986, the price of oil unexpectedly decreased by about 50% (Lamont 1997). A large drop in oil prices would generally increase overall economic growth in Western economies, resulting in increased
investment opportunities for non-oil segments and thus an increase in their capital investment. However, Lamont (1997) documents that the non-oil segments significantly decreased their capital investment from 1985 to 1986. He attributes the reduced investment to the negative price shock reducing the operating cash flows and asset values of the oil segments, which in turn increased capital constraints on the non-oil segments through financing interdependencies across segments. The specific research question we address is whether the level of the firms’ disclosure in 1985 (i.e., immediately prior to the negative oil price shock) moderated the decrease in capital investment from 1985 to 1986 by the non-oil segments of the firms. Importantly for our research question, the negative oil price shock was due to unexpected internal political problems in the Organization of Petroleum Exporting Countries (OPEC). It therefore is highly unlikely that the negative oil price shock—and, by extension, the decrease in investment by the non-oil segments—caused the pre-shock level of disclosure. Consistent with this view, firms’ disclosure quality ratings are stable in the five years prior to the shock.

We find a positive effect of the level of pre-shock disclosure quality on the change in capital investment. Specifically, using a measure based on the Association for Investment Management and Research’s (AIMR) disclosure rating as a proxy for disclosure quality, we find that the reduction in non-oil segments’ capital investment from 1985 to 1986 is significantly lower for segments in firms that had good disclosure policy immediately prior to the unexpected oil shock. This result holds after controlling for factors previously suggested as evidence of a firm facing greater capital constraints. In addition, we find that the benefit of higher quality disclosure is greater for segments that generate a lower level of operating cash flows. This suggests that better disclosure has greater benefits for firms that face greater internal capital constraints. Overall, these results suggest that firms that had higher quality disclosure
immediately prior to the negative oil shock experienced a smaller decrease in external capital than did firms with lower pre-shock disclosure quality, resulting in the former having a smaller decrease in capital investment immediately following the price shock. Consistent with this interpretation, we find a positive association between the level of pre-shock disclosure quality and the change in external long-term firm financing from 1985 to 1986.

Our study contributes to the literature in two ways. First, our study complements and extends research that examines the association between disclosure and financing issues such as a firm’s cost of equity capital (e.g., Botosan 1997; Botosan and Plumlee 2002; Cohen 2005) and reliance on external capital (e.g., Lang and Lundholm 1993; Frankel et al. 1995; Francis et al. 2005). The prior research provides mixed evidence about the benefits of disclosure and has been subject to concerns about endogeneity (Cohen 2005; Larcker and Rusticus 2005). Our setting largely circumvents the endogeneity problem, and thus provides a cleaner test of the effects of disclosure. In addition, we examine the effect of disclosure on investment activity, instead of cost of capital. Although one may expect financing issues to affect investment activity, it is difficult to draw direct conclusions for investment from prior cost of capital research for at least three reasons. First, these studies have largely focused on the effect of disclosure on the cost of public financing, but firms may be able to fund investments via private financing arrangements (e.g., operating leases, vendor credit) that may or may not be affected by public disclosure. Second, cost of capital studies typically focus on the cost of just one type of external financing (e.g., the cost of equity). However, the effect of disclosure on the cost of one type of capital is not necessarily indicative of the effect on a firm’s overall cost of capital. Firms may substitute one form of external financing for another, and thereby reduce or even nullify the effect of disclosure on the cost of a particular type of capital. For example, Modigliani and Miller (1958,
1963) show an example where the cost of equity and the cost of debt both increase, but the firm’s overall cost of capital remains constant. Finally, measuring the cost of the different sources of capital is empirically difficult (particularly for equity) and the measurement error could potentially be correlated with measures of disclosure, which would lead to potentially biased results. Examining the effect of disclosure on investment is equivalent to examining the effect of disclosure on the quantity of capital provided (as opposed to the price) while circumventing the problems discussed above.

Second, our study complements and extends two prior studies that examine disclosure and investment. Biddle and Hilary (2006) document that there is a relation between operating cash flows and investment for US firms with low financial transparency, controlling for differences in the firms’ investment opportunities. However, their proxy for firms’ investment opportunities is Tobin’s Q (Tobin 1969), which is notoriously difficult to estimate (e.g., Erickson and Whited 2000). Biddle, Hilary, and Verdi (2009) further show that financial transparency mitigates under-investment in settings where under-investment is likely to occur, and conversely, over-investment in settings where over-investment is likely. However, they treat financial transparency as an exogenous variable with respect to investment behavior. Over an extended horizon though, investment behavior may affect the degree of financial transparency, implying that the latter is endogenous with respect to the former. In contrast, our setting offers a sharp and unexpected shock to the supply of capital, making it highly unlikely that the level of an oil firm’s pre-shock disclosure is correlated with the change in the investment opportunities of its non-oil segments. Thus, not only is our disclosure measure endogenous with respect to our investment measure, but our setting also negates the need to control for firms’ investment opportunities, and thus the need to estimate Tobin’s Q. Our setting, however, is not without drawbacks. Our
sample is small and our sample firms are fairly homogeneous in terms of size, industry, and profitability; these characteristics may reduce the power of our tests. Our firms are also, by construction, conglomerates, which may create issues that are not present in focused firms (we discuss these issues in Section 5.4). Nonetheless, by addressing potential concerns in Biddle and Hilary (2006) and Biddle et al. (2009), our study complements and extends these two studies.

The remainder of the paper is organized as follows. We develop our hypothesis linking disclosure and investment in Section 2. We discuss our empirical setting in Section 3 and our sample in Section 4. Section 5 reports the empirical results, and Section 6 concludes the paper.

2. Hypothesis Development

Absent any frictions in capital markets, a firm that needs capital to fund an investment project can obtain financing at the appropriate price simply by presenting the investment project to capital providers. In this setting, the sole driver of the firm’s investment policy is its investment opportunities, as reflected in Tobin’s Q (Tobin 1969). Information asymmetry between managers and capital providers introduces frictions in the capital markets, which in turn constrain the firm’s access to external capital. For example, adverse selection models (e.g., Myers and Majluf 1984) suggest that if managers are better informed than capital providers about the firm’s prospects, managers may try to exploit their information advantage and issue securities when the market has overpriced the firm’s securities. Capital providers rationally expect such behavior, and, as a consequence, limit the amount of capital provided. Similarly, moral hazard models (e.g., Jensen and Meckling 1976) argue that managers have incentives to invest in projects that reduce shareholder value if those projects provide private benefits to the
managers. Again, shareholders rationally expect such behavior and limit the amount of capital provided.\footnote{As Biddle et al. (2009) note, both adverse selection and moral hazard can generate either over- or under-investment. For example, if firms are successful in raising capital at an overvalued price, they may over-invest these proceeds (e.g., Baker et al., 2003). Similarly, as noted above, the tendency to over-invest \textit{ex post} may lead to \textit{ex ante} capital rationing. Given this uncertainty, we frame our analysis in terms of over/under-investment rather than in terms of adverse selection/moral hazard.}

This discussion suggests that frictions in capital markets caused by information asymmetry between firms and capital providers may cause capital rationing. Disclosure is a mechanism for managers to reduce the degree of information asymmetry between themselves and capital providers (e.g., Jovanovic 1982; Verrecchia 1983). For example, research has documented that greater disclosure is associated with smaller bid-ask spreads (e.g., Welker 1995; Leuz and Verrecchia 2000), higher trading volume (e.g., Leuz and Verrecchia 2000) and lower cost of equity capital (e.g., Botosan 1997; Botosan and Plumlee 2002). This suggests that firms that have higher quality disclosure should experience relatively less capital rationing and thus have more capital to fund available investment opportunities.

However, rather than examine the association between the level of disclosure and the level of investment (as for example, in Biddle et al. (2009)), we consider a corollary. Specifically, for empirical reasons described below, we examine whether the \textit{level} of a firm’s disclosure prior to an exogenous, negative shock to its cash flows and asset values (hereafter, CFAV) affects the \textit{change} in the firm’s investment from before to after the negative shock.

When firms face external capital constraints due to frictions in capital markets, firms must rely on internal financing from operating cash flows or from capital raised by selling assets to fund some attractive investment opportunities. Thus, information asymmetry introduces a link between a firm’s investment and CFAV. Research suggests that CFAV is an important determinant of capital investment (e.g., Fazzari et al. 1988; Lamont 1997). If firms experience
an exogenous, negative shock to their CFAV, firms would have less internal financing available to fund investments, causing a decrease in investment expenditures. However, consistent with the discussion above about the link between disclosure quality and the level of investment, we expect disclosure quality to moderate the decrease in investment expenditures. Specifically, firms that have higher quality disclosure immediately prior to the shock should experience relatively less capital rationing after the shock and thus have more capital to fund available investment opportunities. Our hypothesis is based on this idea.

**H:** The reduction in capital investment by firms that have experienced an exogenous, negative shock to their CFAV is smaller for firms that had higher quality disclosure prior to the shock.

3. **Empirical Setting**

3.1 **The reverse oil shock of 1986**

We use a unique setting to examine our hypothesis: the effect of the 1986 reverse oil shock on the change in investments by the non-oil segments of oil dependent firms. At the end of 1985, the world’s largest producer of oil, Saudi Arabia, unexpectedly increased production, causing oil prices to drop from $26.60 per barrel in December 1985 to $12.67 in April 1986 (Lamont 1997). The negative shock to oil prices should have adversely affected the investment opportunities of oil-related segments of oil dependent firms, but not the investment opportunities of the non-oil segments of those firms. If anything, a decrease in oil prices should have caused an overall increase in economic growth, providing more investment opportunities for the non-oil segments, resulting in increased capital investment by those segments. However, Lamont (1997) finds the opposite. Specifically, he documents a significant 1.5% decrease in the ratio of capital investments to sales (from 8.0% in 1985 to 6.5% in 1986) for the non-oil segments of oil...
dependent firms. He attributes the reduced investment to the negative oil price shock reducing the CFAV of the oil segments, which in turn increased capital constraints on non-oil segments through financing interdependencies across segments. The specific issue we examine is whether the quality of the firms’ disclosure in 1985 moderated the decrease in capital investment from 1985 to 1986 by the non-oil segments of the firms.

Examining the association between the level of disclosure and the change in investment in this setting allows us to circumvent two issues that make it difficult to examine the association between level of disclosure and level of investment. One problem with examining the latter is that level of disclosure and level of investment are endogenous. Failure to control for endogeneity may lead to biased results. For example, Cohen (2004) reports that there is no link between disclosure and cost of publicly traded equity after controlling for the endogeneity of the firm’s disclosure policy. A typical empirical approach to address endogeneity is to use a Two Stage Least Squares (2SLS) specification. However, to be effective, this approach requires finding good instruments, which can be a daunting task. More generally, Larcker and Rusticus (2005) discuss the difficulties of applying this approach to accounting research. In our setting, not only was the negative oil price shock unexpected (Lamont 1997), but it was caused by internal political problems in the Organization of Petroleum Exporting Countries (OPEC), and thus independent of the financial disclosure policies of North American firms. Thus, it is highly unlikely in our setting that the negative oil price shock—and by extension, the decrease in investment by the non-oil segments—caused the pre-shock level of disclosure.

The second problem is that studies that have examined the association between level of disclosure and level of investment typically use a panel of firms from different industries and across different time periods. This approach necessitates controlling for differences in investment
opportunities across both industries and time.\textsuperscript{2} The standard approach is to include Tobin’s Q as a control variable. However, because accurately estimating Q is notoriously difficult (e.g., Erickson and Whited 2000), including it as a control variable may not adequately control for differences in investment opportunities. Controlling for Q would be necessary in our setting only if two conditions held simultaneously. First, the change in investment by the non-oil segments was driven by the change in their investment opportunities. Second, and more importantly, our measure of disclosure is correlated with the change in the investment opportunities for the non-oil segments. The first condition does not appear to hold in our setting. As discussed above, the negative oil price shock most likely increased the investment opportunities of the non-oil segments, yet the negative oil price shock caused a significant decrease in their actual investment.\textsuperscript{3} The second condition implies that the level of a firm’s pre-shock disclosure is correlated with the change in the investment opportunities of its non-oil segments. Not only does it seem implausible that this particular association would hold, but it also seems likely that the oil segments—not the activities of the non-oil segments—would drive the disclosure policies of oil-dependent firms (71\% of the firm cash flows are derived from the oil activities for the firms in our primary sample).

\textbf{3.2 Conglomerates and investment policy}

Our setting necessitates that our sample firms are diversified firms. The prior literature has recognized that corporate diversification has the potential to affect a firm’s investment; however, there is no consensus about what the effects are. On the one hand, some argue that

\textsuperscript{2} The firms in our sample are fairly homogenous in terms of size, industry and profitability. This mitigates the likelihood that the disclosure before the oil shock is driven by these characteristics.

\textsuperscript{3} We do not include the oil segments of oil dependent firms in our sample because they would violate this condition. That is, the negative oil shock would have decreased their investment opportunities, and thus be a potential explanation for a decrease in actual investment. Focusing solely on the non-oil segments, which does not require estimating Q, provides a cleaner test of our hypothesis.
diversification has beneficial effects. Lewellen (1971) and Dimitrov and Tice (2006) posit that diversified firms have greater access to external capital markets (in particular, debt markets) than do single-segment firms. Hovakimian and Hovakimian (2009) note that cash-flow sensitive firms face financial constraints, which lead to over-investment on aggregate. If corporate diversification provides greater access to external capital markets, it may mitigate this tendency to over-invest. In addition, Chandler (1977) suggests that corporate diversification may enhance operating efficiency by increasing economies of scope and managerial coordination. Bens and Monahan (2004) also note that, to the extent divisional managers are able to convey information to headquarters that cannot be credibly communicated to the external capital market, diversification may allow the firm to develop a set of efficient internal capital markets (see also Weston 1970, Stein 1997).

On the other hand, diversification may destroy firm value. For example, the benefits of diversification that Chandler (1977) describes may be offset by costs associated with increased information asymmetry between headquarters and individual divisions (Harris, Kriebel, and Raviv 1982). Relatedly, Meyer, Milgrom, and Roberts (1992) argue that management may use the cash flow generated by healthy segments to subsidize underperforming segments. These phenomena may lead to over-investment, at least in some segments of the conglomerates.

Overall, it is difficult to predict a priori if a given sample of conglomerates over-, optimally or under-invest on average. Consistent with this view, Lang and Stulz (1994) and Berger and Ofek (1995) argue that the typical diversified firm trades at a discount compared to focused firms, but Vilalonga (2004) argues that there is no causal relation between diversification and low market valuation. Absent any strong reasons to think otherwise, our maintained assumption is that the firms in our sample were investing optimally on average.
before the shock.\textsuperscript{4} However, the validity of this assumption is an empirical question, and we empirically revisit this issue in Section 5.

4 Sample

Our sample is the intersection of firms in Lamont’s (1997) sample and firms included in the AIMR disclosure survey for 1985. The main criteria Lamont used to select his sample were as follows.\textsuperscript{5} He first selected all firms that in 1985 had a primary or secondary two-digit SIC code of 13, which is the oil and gas extraction sector. From these firms, he kept only those firms that met both of the following conditions: (1) were oil dependent, which he defined as having more than 25\% of their 1985 operating cash flow from the oil and gas industry and (2) had at least one non-oil segment.\textsuperscript{6} His final sample of firms, therefore, consisted of oil dependent firms that also had non-oil segments. His sample consisted of 26 firms, with a total of 40 non-oil segments. Of these 26 firms, we drop 11 because they do not have an AIMR score for 1985.\textsuperscript{7} Our final sample, therefore, consists of 15 firms, with a total of 23 non-oil segments. We also use an expanded sample that includes two additional firms and three additional non-oil segments. The additional firms in the expanded sample did not have an AIMR score for 1985, but one firm had an AIMR score for 1984 and the other had an AIMR score for 1983.

Although the small sample size may be a concern, it is common in this literature. For example, Blanchard et al. (1994) had a sample of 11 firms, Lamont (1997) had a sample of 26

\textsuperscript{4} More precisely, our assumption is that the degree of over-investment before the shock is uncorrelated with the degree of financial transparency. This would be true, for example, if there was no over-investment in our sample prior to the shock.

\textsuperscript{5} See the Appendix of Lamont (1997) for a more detailed discussion of his selection criteria.

\textsuperscript{6} Lamont (1997) classified as an oil segment any segment whose profitability would be associated (either positively or negatively) with the profitability of oil segments. Examples include segments associated with oil and gas substitutes (e.g., coal or uranium) and segments located predominantly in oil producing regions (e.g., a restaurant company operating near the Gulf of Mexico).

\textsuperscript{7} The firms without AIMR scores were mainly Canadian firms.
firms, and Khanna and Tice (2001) had a sample of 26 firms. More generally, the use of small sample sizes is not limited to the investment literature. For example, cross-country studies that define the country as the unit of observation typically have about 30 observations (e.g., Bhattacharya et al. (2003)). In addition, the small sample size biases against finding support for our hypotheses. That is, a small sample size reduces the statistical power of our tests, but there is no reason to believe this would bias our findings in any direction. The sample size represents a trade-off between having a “cleaner,” less noisy sample and a larger one.

Panel A of Table 1 reports descriptive data for the sample firms, and Panel B reports descriptive data for the sample non-oil segments. All the information reported in Table 1, except for the AIMR score and the corresponding industry classifications, is from Lamont (1997).  

[Insert Table 1 here.]

Untabulated results indicate that compared to the general population of industrial firms, our sample firms were more likely to have their debt rated and to pay a dividend in 1985, reflecting the fact that our sample firms are larger than average. However, our sample firms had a lower Z-score (i.e., higher likelihood of bankruptcy) and a lower cash balance in 1985 than the general population of industrial firms in the same year. In addition, the changes from 1985 to 1986 in Z-score, cash balance, and dividend paid are all worse for our sample firms than for the general population of industrial firms. Overall, these descriptive statistics are inconsistent with our sample firms having easy access to capital markets, and thus inconsistent with them being able to easily raise cheap external capital to offset a strong negative shock to their internal cash

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8 The industry classifications in Panel A of Table 1 are based on the AIMR industry classifications, which are distinct from the SIC classifications. For example, AIMR breaks the oil business into several categories including “Domestic-Petroleum” (industry code of 24), “International-Petroleum” (23), “Petroleum Services” (26), “Contract Drilling-Petroleum” (27), and “Pipeline” (21).

9 Most of the differences between the means of our sample and the general population of industrial firms listed on an organized exchange are not statistically significant.
flows. Also consistent with this idea, Lamont (1998) notes (page 87), “for companies that comprises the dataset, downward revisions of total planned 1986 investment ranged from 20 (Unocal) to 51 percent (Homestake mining company).”

5. Specifications and Results

5.1 Specifications

We use the following regression to test our hypothesis.

\[ \Delta(I/S)_i = \alpha + \beta_1 \text{DISCLOSE}_i + \lambda^k \text{CONTROLS}_i + \delta^j \text{INDUSTRY FIXED EFFECTS}_i + \epsilon_i \] (1)

Our dependent variable is \( \Delta(I/S) \), consistent with Lamont (1997). It is the change from 1985 to 1986 for non-oil segment \( i \) in the ratio of its capital investment expenditures to sales.

DISCLOSE is the normalized summary disclosure rating based on the AIMR 1985 disclosure survey (or the most recent survey prior to 1985 for the two additional firms in our expanded sample) for the firm in which non-oil segment \( i \) belongs. Under the umbrella of the AIMR, a committee of financial analysts that follow a particular industry rates the disclosure practices of firms in that industry. Because a different set of analysts evaluates each industry and the AIMR raw scores are relative rankings within an industry, the raw scores may not be comparable across firms in different industries. To address this issue, we convert each raw disclosure rating to the number of standard deviations that the rating is from its industry mean. Specifically, we subtract the AIMR summary disclosure rating for the firm in which non-oil segment \( i \) belongs from the mean disclosure rating for all firms that AIMR rates in that industry and then divide the resulting difference by the standard deviation of the AIMR summary
disclosure ratings for this industry. These normalized disclosure ratings increase the comparability of DISCLOSE across industries. Consistent with our hypothesis, we expect the coefficient on DISCLOSE to be positive and significant.

CONTROLS is a vector of control variables. We use several different models, and the set of control variables varies across models. In Model 1, we include no control variables. Model 2 is our baseline model, and it includes three control variables: \( \Delta (CF/S) \), SIZE(S), and NON-OIL_SEGMENTS. These three control variables are based on Lamont (1997). \( \Delta (CF/S) \) is the change from 1985 to 1986 for non-oil segment \( i \) in the ratio of its segment cash flow to segment sales, where segment cash flows equal segment pretax profit plus segment depreciation expense. \( \Delta (CF/S) \) proxies for the amount of internally generated cash that segment \( i \) has available to fund investment opportunities. Research documents a positive association between internally generated cash flows and investment (e.g., Fazzari et al. 1988). SIZE(S) equals segment \( i \)'s 1985 sales in millions and is a proxy for segment size. The degree of capital constraint may be inversely related to size (e.g., Fazzari et al. 1988), suggesting a positive association between segment size and investment. NON-OIL_SEGMENTS is the number of non-oil segments the firm had in 1985 and is a proxy for the breadth of the firm’s internal market. Holding everything else constant, more segments implies greater diversification of cash flows, and thus a reduction in the likelihood of being capital constrained. We expect the coefficients on these three control variables to be positive. In Model 3, we add SIZE(F) to our baseline model to assess whether the size of the firm in which segment \( i \) belongs affects our results. SIZE(F) is the firm’s 1985 sales in millions.

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10 For example, consider the two non-oil segments of Unocal. AIMR classifies Unocal in industry 24. We calculate the normalized disclosure ratings for Unocal’s two non-oil segments by subtracting the mean disclosure rating for all firms that AIMR rates in industry 24 from Unocal’s AIMR summary disclosure rating and then divide the resulting difference by the standard deviation of the AIMR summary disclosure ratings for industry 24.
Equation (1) includes industry fixed effects to control for potential differences, such as investment opportunities, that may exist across industries. In our main tests, we define industry based on the AIMR classification of the firm in which non-oil segment \( i \) belongs. Instead of explicitly including industry dummy variables, we use an alternative but equivalent estimation procedure. Specifically, we create industry-adjusted variables by subtracting the sample industry average from each variable. This approach reduces the number of estimated parameters and increases the power of our test, yet yields identical coefficients for DISCLOSE and the control variables.\(^{11}\) In all three models, we control for heteroskedasticity by using the Huber/White/sandwich correction. In addition, we adjust the standard errors for clustering of observations by firm.\(^{12}\)

\[5.2 \textbf{Results}\]

Table 2 presents a correlation table for the different variables. The correlation between DISCLOSE and \( \Delta(I/S) \) is positive (0.12) as expected. The correlations between independent variables are reasonably low, except for SIZE(F) and SIZE(S), suggesting that multi-collinearity is not a major concern in our sample.

Before discussing our regression results, we first provide two preliminary tests. In the first, we test whether our sample replicates Lamont’s (1997) finding that the non-oil segments of oil dependent firms had a significant decrease from 1985 to 1986 in their ratio of capital investment to sales. As reported in Table 1, our sample mean for \( \Delta(I/S) \) is -1.75% and is

\[^{11}\text{In other words, we use an areg procedure in Stata instead of an xi:reg. As discussed in section 4.2, we re-estimate our baseline model with the industry dummy variables instead of using industry-adjusted variables. As expected, our conclusions are not affected.}\]

\[^{12}\text{Clustering by industry (instead of by firm) or ignoring clustering does not affect our results.}\]
significantly less than zero at the 1% level. The median change is -1.19%. Thus, we replicate Lamont’s (1997) finding with our sample.

In the second test, we partition firms based on their disclosure rating relative to the average of sample firms and then perform univariate tests on each sub-sample. These tests reveal a pattern consistent with our hypothesis. For firms whose disclosure rating is less than or equal to the sample average, the mean change in investment is significantly negative (at a p-value slightly more than 2%). In contrast, for firms whose disclosure rating is greater than the sample average, the mean change in investment is indistinguishable from zero. Based on this univariate analysis, the effect of the level of pre-shock disclosure on the change in investment appears to be both economically and statistically significant.

Table 3 presents the results for our three models of the regression in Equation (1). The F-statistic for each model is significant, ranging from a p-value of 2% for Model 3 to 7% for Model 1. With respect to our hypothesis, the coefficient on DISCLOSE is positive and significant, as expected, in our baseline model (i.e., Model 2) at less than the 1% level, as well as in the other two models (significant at less than 5% in Model 3 and less than 7% in Model 1). Firms with a higher level of disclosure quality in 1985 had a smaller decrease from 1985 to 1986 in non-oil segment investments. This result supports our hypothesis.

[Insert Table 3 here.]

As for the control variables, segment cash flows (Δ(CF/S)) and the breadth of internal market (NON-OIL_SEGMENT) are positively associated with the change in investment. Size,

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13 We also partition firms relative to the industry sample mean instead of relative to the entire sample mean. The mean change in investment is significantly negative for the low disclosure firms (at 1% level), but not for the high disclosure firms.
however, is insignificant in our sample, perhaps because of a lack of sufficient cross-sectional variation.

To assess the robustness of our result to our specification of DISCLOSE, we test our models using alternative proxies for DISCLOSE. We first test several alternative proxies that are based on the AIMR disclosure ratings. Specifically, we test the raw AIMR summary disclosure rating, the average normalized disclosure rating for the period 1979 to 1985 (as opposed to the normalized rating for just 1985), and the average raw disclosure rating for the period 1979 to 1985.\footnote{DISCLOSE (untabulated) remains positive and significant for each alternative specification. As an aside, the significance of DISCLOSE in the last two specifications is consistent with firms’ disclosure policies being stable over the period 1979 to 1985. This stability makes it unlikely that firms set their 1985 disclosure policies in anticipation of the negative oil price shock, implying that endogeneity is not driving our results.} DISCLOSE (untabulated) remains positive and significant for each alternative specification. As an aside, the significance of DISCLOSE in the last two specifications is consistent with firms’ disclosure policies being stable over the period 1979 to 1985. This stability makes it unlikely that firms set their 1985 disclosure policies in anticipation of the negative oil price shock, implying that endogeneity is not driving our results.\footnote{We do not test any proxies based on the individual components of the AIMR disclosure ratings because only the AIMR total summary rating is available for a large portion of our sample in our time frame.}

We also test an alternative proxy for DISCLOSE that is not based on the AIMR disclosure ratings. Specifically, we use the probability of informed trading (PIN) (Easley et al. 2002) as a proxy for DISCLOSE.\footnote{As an additional test of the stability of disclosure policies prior to the negative shock, we calculate the annual difference in AIMR scores from 1979 to 1985, as well as the difference between the 1979 and 1985 AIMR scores. None of the differences is statistically different from zero (untabulated results).} As expected, our result holds, provided we control for firm size. Although PIN is an indirect measure of disclosure quality, it provides an additional specification that is comparable across industries and provides assurance that our result is not due to something unique in the AIMR disclosure ratings.\footnote{We obtain the value for PIN from the following site: www.rsmith.umd.edu/finance/faculty/hvidkjaer.html. We control for differences in investment opportunities across the different segments by using 3-digit SIC code dummies.}
Due to concerns that outliers may be driving our result, we follow Lamont (1997) and drop one segment at a time and rerun our baseline model. In the results (untabulated) from each resulting regression, the t-statistics for DISCLOSE range between 1.78 and 4.34. Further, the results for each model reported in Table 3 hold for our expanded sample (untabulated). Our result even holds when we aggregate the non-oil segments by firm and then treat each resulting aggregated entity as the unit of observation.

Several segments in our sample are in the chemical industry, raising a concern that our result is driven by something particular to that industry. To address this concern, we run two modifications of our baseline model. The first excludes all chemical segments, and the second includes a dummy variable that takes the value of one if the segment is in the chemical industry. Our result for DISCLOSE holds for both modifications.

We also use two alternative approaches (untabulated) to control for cross-sectional differences in investment opportunities across industries. In the first, we re-estimate our baseline model using 3-digit SIC classifications (as reported in Lamont 1997) to calculate the industry-adjusted values for our variables, rather than using the AIMR industry classification as we did in Table 3. Our result holds. In the second approach, we re-estimate our baseline model explicitly using industry dummies (based on the AIMR industry classification) instead of industry-adjusted variables. As expected, the magnitude of the coefficient on DISCLOSE is unchanged, but the t-statistic is slightly lower due to the reduced power of the test caused by the increase in estimated parameters. Nonetheless, DISCLOSE remains significant at less than 5%.

Finally, to assess the robustness of our result for DISCLOSE to our choice of control variables, we modify the control variables in our baseline model. Specifically, we substitute SIZE(F) for SIZE(S), include the percentage of total 1985 firm revenues derived from oil,
include the sum of cash and marketable securities (scaled by sales) in 1985, or include the change in disclosure from 1985 to 1986 as control variables.\textsuperscript{17} The coefficient on DISCLOSE (untabulated) remains positive and significant.

5.3 Additional empirical support

In the previous section, we document that firms that had a higher level of disclosure quality prior to the negative oil price shock had a smaller decrease from 1985 to 1986 in their non-oil segments’ ratio of capital investment to sales and that this result is robust across various specifications of disclosure quality and across various specifications of the control variables. We interpret this finding for disclosure as evidence that following an unexpected, exogenous, negative shock to their CFAV, firms with a higher level of pre-shock disclosure quality experience a smaller decrease in external capital than do firms with lower pre-shock disclosure quality. Below we provide additional empirical support for this interpretation.

5.3.1 Benefits of disclosure and degree of capital constraint

Our interpretation of the relation between disclosure quality and investment is based on the existence of liquidity constraints. If our interpretation is valid, firms that face greater internal capital constraints should receive a greater benefit from better disclosure. To test this, we use the regression in Equation (2) below. We use the same three models used to test our hypothesis, with the addition of an interaction term between DISCLOSE and $\Delta(CF/S)$. We expect the coefficient on the interaction term to be negative and significant.

\[
\Delta(I/S)_i = \alpha + \beta_1 \text{DISCLOSE}_i + \beta_2 \text{DISCLOSE}_i \times \Delta(CF/S)_i + \beta_3 \Delta(CF/S)_i + \\
\lambda^k \text{CONTROLS}_i + \delta^k \text{INDUSTRY FIXED EFFECTS}_i + \epsilon_i
\]  

\textsuperscript{17} Our sample size precludes including all the additional control variables at the same time in the regression. Accordingly, we test the effect of each additional control variable one at a time.
Table 4 reports the results for Equation (2). In all three models, DISCLOSE is significantly positive, consistent with the results reported in Table 3. As expected, the coefficient on DISCLOSE \( \times \Delta (\text{CF/S}) \) is negative and significant at less than 5% in Models 1 and 2 and less than 1% in Model 3. This result is consistent with DISCLOSE reducing the negative shift in the supply of external capital. The coefficients on \( \Delta (\text{CF/S}) \) and \( \Delta (\text{CF/S}) \times \text{DISCLOSE} \) each approximately 0.5 (Column 3 of Table 4). The untabulated standard deviation of the normalized disclosure is approximately 1.1. Thus, firms whose normalized disclosure is one standard deviation below the mean had a reduction from 1985 to 1986 in the ratio of their capital investment to sales of approximately 1.

[Insert Table 4 here.]

5.3.2 Disclosure and access to external capital

We consider a corollary to our interpretation that the result for DISCLOSE is due to an asymmetric negative shift in the supply of external capital for high versus low disclosers. Specifically, we use the regression in Equation (3) below to provide evidence on whether high disclosure firms experienced a smaller decrease in post-shock external capital than did low disclosure firms.

\[
\Delta (\text{LTF})_i = \alpha + \beta_1 \text{DISCLOSE}_i + \lambda \text{CONTROLS}_i + \delta \text{INDUSTRY FIXED EFFECTS}_i + \epsilon_i
\]  

(3)

The dependent variable is \( \Delta (\text{LTF}) \), which is a proxy for the change in external capital from 1985 to 1986 for the firm in which segment \( i \) belongs. We measure \( \Delta (\text{LTF}) \) as the percentage change from 1985 to 1986 in the sum of long-term debt, preferred stock, and total
common equity excluding retained earnings. DISCLOSE is the same as in Equation (1). For industry fixed effects, we again use sample industry adjusted variables.

Similar to Equation 1, we use three different models. The set of control variables varies across models and mirrors the estimation procedures in the main tests. In Model 1, we include no control variables. Model 2 includes three control variables: Δ(CF/S)(F), SIZE(F), and NON-OIL_SEGMENTS. Δ(CF/S)(F) proxies for the amount of internally generated cash available to the firm in which segment \( i \) belongs, and it equals the change from 1985 to 1986 in the ratio of firm cash flows to sales. SIZE(F) is a proxy for size and equals the firm’s 1985 sales in millions. NON-OIL_SEGMENTS is the number of non-oil segments the firm had in 1985 and is a proxy for the breadth of the firm’s internal market. In Model 3, we add OILRATIO to Model 2. OILRATIO is the ratio of the sales by oil segments to total firm sales and proxies for the importance of the shock for the firm. The expected signs of the various control variables are ambiguous. On the one hand, firms with more internal cash flows, less revenues from oil, and more non-oil segments may experience less difficulty in obtaining external financing, but, on the other hand, they may also have less need for external financing.\(^{18}\)

Table 5 presents the results for our three models of the regression in Equation (3). The coefficient on DISCLOSE is positive and significant, as expected, in each model, with a significance of less than 1% in all three models. This result is consistent with firms that had high quality disclosure in 1985 having greater access to external capital in 1986 than did firms with low quality disclosure.

[Insert Table 5 here.]

\(^{18}\) In other words, these different variables can affect both the supply and the demand for capital. In contrast, DISCLOSE should only affect the supply of capital. We empirically revisit this point in section 5.4.
5.4 Alternative explanations

In this section, we consider several alternative explanations for our result.

5.4.1 Disclosure and elasticity of demand

An implicit assumption underlying our interpretation of the results is that the demand curves for external capital do not differ systematically between high disclosure firms and low disclosure firms. However, it might be argued, for example, that firms with an inelastic demand curve (i.e., their investment is sticky) may choose a higher disclosure strategy because maintaining ready access to capital in the event of a negative shock to CFAV is more important for such firms.19 From this perspective, our result for disclosure may be documenting that a negative shift in the supply curve of capital has a smaller negative effect on the quantity of capital—and thus a smaller negative effect on the change in investment—for firms with an inelastic demand curve than for firms with an elastic demand curve.

However, it is not obvious a priori that this perspective applies to our sample of non-oil segments. Given that these segments belong to oil dependent firms, it is likely that the oil segments of these firms—not the non-oil segments—drive the firms’ disclosure policies. The nature of the correlation between the firm’s disclosure policy and the non-oil segments’ elasticity of demand is not obvious a priori. For example, to the extent that the firm uses the non-oil

---

19 Consider two firms. Firm A has three independent investment projects, with one planned to be started and completed in year 1 for $40 million, one planned to be started and completed in year 2 for $40 million, and one planned to be started and completed in year 3 for $40 million. Firm B also plans to spend $40 million in each of the next three years on capital investment. However, this $120 million is for only one capital investment project, and the resulting asset will not be useable until it is complete at the end of year 3. Firm B’s investment is sticky compared to Firm A’s because Firm B’s $40 million investment in year 1 implies an additional $40 million investment in both year 2 and year 3. In contrast, because Firm A’s projects are independent, Firm A’s $40 million investment in year 1 does not imply anything about future capital investment.
segments to diversify idiosyncratic risk, the elasticity of the non-oil segments may be negatively correlated (or at least uncorrelated) with the elasticity of the oil segments.²⁰

Nevertheless, we test the possibility that there is a correlation between the inelasticity of demand and disclosure, using three approaches. In the first test, we rerun our baseline model for Equation (1) using only the segments in the chemical sector. Although there may still be some cross-sectional differences within this sector, these segments should have relatively homogenous production functions and elasticities of demand. The coefficient on DISCLOSE is positive and significant for this sub-sample, consistent with the results reported in Table 3.

In the second test, we first calculate the variance of capital expenditures from 1981 to 1989 for each firm and then regress the variance against DISCLOSE. Segments that have “sticky” investment projects (i.e., have an inelastic demand curve) should have lower variance in their capital expenditures. If non-oil segments with inelastic demand are in firms that disclose more, the coefficient on the variance of capital expenditures should be negative and significant. Inconsistent with this, we find no significant association.

In the third test, we examine the association between disclosure and sensitivity of stock returns to investment at the firm level. Specifically, we first estimate the sensitivity of stock returns to investment for the period 1981 to 1989 by regressing individual annual firm returns on market returns and percentage change in investment. Stock returns should be more sensitive to investment for firms whose investment is sticky because the current investment is informative not only about the future returns directly associated with the current investment, but also about future investments and the resulting returns from those future investments. We then regress the sensitivity of returns on DISCLOSE and SIZE(F). Inconsistent with a demand effect, the

²⁰ If the correlation between elasticity of demand and disclosure is negative, this association biases against finding support for our hypothesis.
coefficient on DISCLOSE is not significant. This lack of significance does not appear simply to be a power issue because the coefficient on SIZE(F) is significant.

In summary, it is difficult to completely rule out this alternative explanation. However, we find no empirical support for the idea that our observed effect of disclosure on investment is driven by a correlation between the inelasticity of demand for capital and high disclosure.

5.4.2 Disclosure and marginal investments

Managers may undertake marginal (i.e., negative net present value) projects because they derive private benefits from such projects (e.g., empire building). A second implicit assumption underlying our interpretation of the results is that the propensity to invest in marginal projects does not differ systematically between high disclosure firms and low disclosure firms. However, it might be argued that low disclosure firms are more likely to invest in marginal projects because their lack of transparency makes it more difficult for financial statement users to ascertain such behavior. Consistent with this view, Bens and Monahan (2004) find a positive association between AIMR disclosure ratings and the excess value of diversification as defined by Berger and Ofek (1995). Correspondingly, Hope and Thomas (2008) find that firms that cease to disclose geographical information post-SFAS 131 (their proxy for lower financial reporting quality) experience an abnormal increase in sales and a decrease in firm value (suggesting that these firms over-invest). Bushman, Piotroski, and Smith (2006) find a positive relation between country measures of timely loss recognition and country propensity to liquidate bad projects. These findings suggest that financial transparency may mitigate over-investment.

From this perspective, our result for disclosure may be documenting that the loss of cross subsidy from the oil segments to the non-oil segments following the negative oil price shock had a larger negative effect on the post-shock investment of low disclosure firms because they had a
larger number of marginal projects that they could no longer fund. If this perspective is valid, pursuing fewer marginal projects should cause low disclosure firms to have a greater improvement in cash flows from 1985 to 1986. This interpretation differs from ours in that it implies that the shock caused firms to shift from over-investing to investing closer to the optimal level. In contrast, our interpretation implies that the shock caused firms to shift from investing close to the optimal level to under-investing. Both interpretations are possible and distinguishing between the two is largely an empirical issue.

To investigate this issue, we conduct two analyses. In the first, we test whether low disclosure oil firms have a greater propensity to invest in less profitable non-oil industries. To test this, we regress the profitability of segment $i$’s industry on DISCLOSE and our baseline control variables (i.e., Model 2 in Table 3), using three alternative specifications for industry profitability: median return on assets (ROA), median ratio of cash flows to sales, and median Tobin’s Q. DISCLOSE is not significant for any of the specifications. In the second analysis, we examine whether the change in cash flow of segment $i$ is associated negatively with DISCLOSE. Specifically, we regress $\Delta(CF/S)$ on DISCLOSE. Results (untabulated) indicate there is no association between the two. This result holds if we control for industry fixed effects (based either on the AIMR classification or the 3 digit SIC code) and include SIZE(S), NON-OIL_SEGMENTS and OILRATIO as control variables. Thus, we do not find any empirical support for this alternative explanation.

5.4.3 Disclosure and firm performance

21 Our interpretation is not affected if low disclosure firms were initially under-investing. The discussion in Section 3 suggests that this is a plausible characterization.

22 There is a significant association when we exclude the control variables but include industry fixed-effects based on the AIMR industries. However, this correlation is positive, which is consistent with our interpretation but inconsistent with this alternative explanation.
A third alternative explanation for our result is that the AIMR scores reflect differences in firm profitability, rather than actual disclosure quality. However, contrary to this alternative explanation (and as reported in Section 4.2), our result also holds when we use PIN—rather than the AIMR scores—as the proxy for disclosure quality. Nonetheless, to provide additional evidence about this alternative explanation, we include in our baseline model return on assets (ROA) and return on equity (ROE) for the firm in which segment $i$ belongs. Our result still holds, providing no support for this alternative explanation. This result is consistent with the result in 4.3.3 where we do not find any correlation between disclosure quality and the cash flows of the non-oil segments.

5.4.4 Disclosure and future investment

A fourth potential alternative explanation for our result is that some oil firms were anticipating investment opportunities in 1985 and 1986 that would have required external financing. In anticipation of this, these firms might have increased the quality of their disclosures from 1984 to 1985. To test for this, we modify our baseline model by adding the change from 1984 to 1985 in the quality of the firm’s disclosure, as measured by the change from 1984 to 1985 in the normalized AIMR rating for the firm in which segment $i$ belongs. The coefficient on DISCLOSE remains positive and significant, consistent with the results reported in Table 3.

6. Conclusion

In this study, we examine whether disclosure quality affects the link between a shock to a firm’s CFAV and its capital investment expenditures. We examine this issue in the context of the 1986 reverse oil shock, where the price of oil decreased by about 50% over just a few months.
Because the 1986 reverse oil shock was an unexpected exogenous event, this setting allows us to examine the effect of disclosure quality prior to an increase in a firm’s capital constraint on the firm’s investment in a way that largely circumvents the endogeneity problem common to research on the effects of disclosure. We find that high quality disclosure prior to the negative shock mitigates the effect of the shock on investment. We also find that firms that are more capital constrained get a larger benefit from better disclosure and had a smaller post-shock decrease in long-term external capital. Despite having a small sample size comprising some of the largest firms, which arguably are the least capital constrained firms, these results are robust across various specifications.

Our study contributes to the literature in at least two ways. First, we extend prior research on the link between a firm’s CFAV and capital investment (e.g., Fazzari et al. 1988; Lamont 1997) by documenting that disclosure moderates this link. Although we focus on an oil shock for empirical reasons, our findings should apply to numerous other shocks such as currency revaluations and changes in monetary policy or interest rates. Second, by documenting a positive link between the level of disclosure quality and the reduction in investment, we contribute to the larger research stream on the benefits of disclosure (e.g., Botosan 1997; Botosan and Plumlee 2002; Francis et al. 2005). In addition, contrary to previous studies that examine the benefits of disclosure, we examine a setting that circumvents both the issue of endogeneity and the need to estimate Tobin’s Q as a control variable for differences in investment opportunities.
REFERENCES


Table 1
Descriptive Data for Sample Firms and Sample Non-Oil Segments

Panel A: Descriptive Data By Firm

<table>
<thead>
<tr>
<th>Firm</th>
<th>AIMR INDUSTRY</th>
<th>DISCLOSE</th>
<th>SIZE(F)</th>
<th>NON-OIL SEGMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Sample Firms:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amoco Corp</td>
<td>24</td>
<td>100</td>
<td>26,922</td>
<td>1</td>
</tr>
<tr>
<td>Atlantic Richfield</td>
<td>24</td>
<td>90.91</td>
<td>21,723</td>
<td>1</td>
</tr>
<tr>
<td>Burlington Northern</td>
<td>31</td>
<td>16.67</td>
<td>8,651</td>
<td>2</td>
</tr>
<tr>
<td>Chevron Corp</td>
<td>23</td>
<td>66.67</td>
<td>41,742</td>
<td>1</td>
</tr>
<tr>
<td>Grace (W.R) &amp; Co</td>
<td>35</td>
<td>88.24</td>
<td>5,193</td>
<td>2</td>
</tr>
<tr>
<td>Kerr-McGee Corp</td>
<td>24</td>
<td>27.27</td>
<td>3,345</td>
<td>1</td>
</tr>
<tr>
<td>Mobil Corp</td>
<td>23</td>
<td>33.33</td>
<td>55,960</td>
<td>2</td>
</tr>
<tr>
<td>Occidental Petroleum</td>
<td>24</td>
<td>18.18</td>
<td>14,534</td>
<td>2</td>
</tr>
<tr>
<td>Philips Petroleum</td>
<td>24</td>
<td>45.46</td>
<td>15,636</td>
<td>1</td>
</tr>
<tr>
<td>Royal Dutch / Shell</td>
<td>23</td>
<td>83.33</td>
<td>81,562</td>
<td>1</td>
</tr>
<tr>
<td>Schlumberger Ltd</td>
<td>26</td>
<td>12.50</td>
<td>6,119</td>
<td>1</td>
</tr>
<tr>
<td>Tenneco</td>
<td>21</td>
<td>53.85</td>
<td>15,270</td>
<td>4</td>
</tr>
<tr>
<td>Union Pacific Corp</td>
<td>31</td>
<td>50.00</td>
<td>7,798</td>
<td>1</td>
</tr>
<tr>
<td>Unocal Corp</td>
<td>24</td>
<td>9.09</td>
<td>10,738</td>
<td>2</td>
</tr>
<tr>
<td>Zapata Corp</td>
<td>27</td>
<td>87.50</td>
<td>289</td>
<td>1</td>
</tr>
<tr>
<td><strong>Expanded Sample Firms:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homestake Mining</td>
<td>46</td>
<td>36.36</td>
<td>298</td>
<td>1</td>
</tr>
<tr>
<td>Litton Industries</td>
<td>9</td>
<td>36.36</td>
<td>4,585</td>
<td>2</td>
</tr>
</tbody>
</table>

The primary sample consists of firms (and the associated non-oil segments) that had an Association for Investment Management and Research (AIMR) rating for 1985. The expanded sample firms (and associated non-oil segments) did not have an AIMR rating for 1985, but had a rating for an earlier year. The AIMR rating for Homestake Mining is for 1983, and the rating for Litton Industries is for 1984.

In Panel A, AIMR INDUSTRY is the firm’s industry classification per AIMR. DISCLOSE is the firm’s 1985 AIMR total disclosure score (i.e., the pre-oil shock AIMR score) except for Homestake Mining and Litton Industries. SIZE(F) is firm size, measured as the firm’s 1985 sales in millions. NON-OIL SEGMENTS is the number of non-oil segments in the firm. All amounts reported in Panel A, except for DISCLOSE and AIMR INDUSTRY, are from Table II of Lamont (1997).
### Panel B: Descriptive Data By Non-Oil Segment

<table>
<thead>
<tr>
<th>Non-Oil Segment</th>
<th>Segment SIC</th>
<th>Δ(I/S)</th>
<th>Δ(CF/S)</th>
<th>SIZE(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Sample Segments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amoco Corp 1</td>
<td>2860</td>
<td>3.46</td>
<td>5.88</td>
<td>2,905</td>
</tr>
<tr>
<td>Atlantic Richfield 1</td>
<td>2869</td>
<td>2.38</td>
<td>1.97</td>
<td>2,155</td>
</tr>
<tr>
<td>Burlington Northern 1</td>
<td>2411</td>
<td>-1.60</td>
<td>1.55</td>
<td>258</td>
</tr>
<tr>
<td>Burlington Northern 2</td>
<td>4011</td>
<td>-6.63</td>
<td>-4.27</td>
<td>4,098</td>
</tr>
<tr>
<td>Chevron Corp 1</td>
<td>2869</td>
<td>-1.30</td>
<td>6.05</td>
<td>2,246</td>
</tr>
<tr>
<td>Grace (W.R) &amp; Co 1</td>
<td>2066</td>
<td>-0.91</td>
<td>0.42</td>
<td>787</td>
</tr>
<tr>
<td>Grace (W.R) &amp; Co 2</td>
<td>2800</td>
<td>-1.21</td>
<td>-1.01</td>
<td>2,254</td>
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<tr>
<td>Kerr-McGee Corp 1</td>
<td>2812</td>
<td>-2.33</td>
<td>5.22</td>
<td>483</td>
</tr>
<tr>
<td>Mobil Corp 1</td>
<td>3081</td>
<td>-0.40</td>
<td>4.86</td>
<td>2,266</td>
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<tr>
<td>Mobil Corp 2</td>
<td>5311</td>
<td>-0.88</td>
<td>2.57</td>
<td>6,073</td>
</tr>
<tr>
<td>Occidental Petroleum 1</td>
<td>2011</td>
<td>0.40</td>
<td>0.37</td>
<td>6,510</td>
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<tr>
<td>Occidental Petroleum 2</td>
<td>2812</td>
<td>-1.19</td>
<td>2.87</td>
<td>1,621</td>
</tr>
<tr>
<td>Phillips Petroleum 1</td>
<td>2869</td>
<td>0.72</td>
<td>8.65</td>
<td>2,266</td>
</tr>
<tr>
<td>Royal Dutch / Shell 1</td>
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<td>-1.09</td>
<td>8.52</td>
<td>8,563</td>
</tr>
<tr>
<td>Schlumberger Ltd 1</td>
<td>3820</td>
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</tr>
<tr>
<td>Tenneco 1</td>
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<tr>
<td>Tenneco 2</td>
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<td>2.34</td>
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<td>Tenneco 3</td>
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<td>851</td>
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<tr>
<td>Tenneco 4</td>
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<tr>
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</tr>
<tr>
<td>Unocal Corp 2</td>
<td>1099</td>
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<td>-3.42</td>
<td>129</td>
</tr>
<tr>
<td>Zapata Corp 1</td>
<td>2048</td>
<td>-10.29</td>
<td>16.45</td>
<td>93</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td></td>
<td>-1.75***</td>
<td>2.97***</td>
<td>2,343.30***</td>
</tr>
</tbody>
</table>

| Expanded Sample Segments: |
| Homestake Mining 1 | 1041 | -16.64 | 12.11 | 169 |
| Litton Industries 1 | 3812 | 2.84 | -5.65 | 1,863 |
| Litton Industries 2 | 3731 | -0.32 | 0.05 | 975 |

*** Significantly different from zero at 1% (two-tail)

** Significantly different from zero at 5% (two-tail)

* Significantly different from zero at 10% (two-tail)

In Panel B, Segment SIC is the segment’s primary SIC code. Δ(I/S) is the percentage change from 1985 to 1986 in the ratio of segment capital expenditures to sales. Δ(CF/S) is the percentage change from 1985 to 1986 in the ratio of segment cash flow to sales, where segment cash flow equals segment pretax operating profit plus segment depreciation. SIZE(S) is segment size, measured as the segment’s 1985 sales in millions. All amounts reported in Panel B are from Table III of Lamont (1997).
Table 2
Correlation table

<table>
<thead>
<tr>
<th></th>
<th>Δ(I/S)</th>
<th>DISCLOSE</th>
<th>Δ(CF/S)</th>
<th>NON-OIL_SEGMENTS</th>
<th>SIZE(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISCLOSE</td>
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<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Δ(CF/S)</td>
<td>-0.10</td>
<td>0.27</td>
<td>1.00</td>
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<tr>
<td>NON-OIL_SEGMENTS</td>
<td>0.04</td>
<td>-0.20</td>
<td>-0.46</td>
<td>1.00</td>
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</tr>
<tr>
<td>SIZE(S)</td>
<td>0.23</td>
<td>-0.06</td>
<td>0.08</td>
<td>-0.25</td>
<td>1.00</td>
</tr>
<tr>
<td>SIZE(F)</td>
<td>0.29</td>
<td>-0.08</td>
<td>0.24</td>
<td>-0.13</td>
<td>0.67</td>
</tr>
</tbody>
</table>

Δ(I/S) is the percentage change from 1985 to 1986 in the ratio of segment capital expenditures to sales. DISCLOSE is the firm’s 1985 AIMR total disclosure score (i.e., the pre-oil shock AIMR score). Δ(CF/S) is the percentage change from 1985 to 1986 in the ratio of segment cash flow to sales, where segment cash flow equals segment pretax operating profit plus segment depreciation. NON-OIL_SEGMENTS is the number of non-oil segments in the firm. SIZE(S) is segment size, measured as the segment’s 1985 sales in millions, and SIZE(F) is firm size, measured as the firm’s 1985 sales in millions.
Table 3
Regression Analysis for Test of Main Hypothesis

\[ \Delta(I/S)_i = \alpha + \beta_1 \text{DISCLOSE}_i + \lambda^k \text{CONTROLS}_i + \delta^\i \text{INDUSTRY FIXED EFFECTS}_i + \varepsilon_i \]

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-1.98***</td>
<td>-21.44***</td>
<td>-24.77***</td>
</tr>
<tr>
<td></td>
<td>(-3.96)</td>
<td>(-3.19)</td>
<td>(-3.08)</td>
</tr>
<tr>
<td>DISCLOSE</td>
<td>( + ) 1.81*</td>
<td>4.74***</td>
<td>6.12**</td>
</tr>
<tr>
<td></td>
<td>(2.00)</td>
<td>(2.97)</td>
<td>(2.39)</td>
</tr>
<tr>
<td>CONTROLS</td>
<td>(\Delta(CF/S)) ( + ) 0.70**</td>
<td>0.80**</td>
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<tr>
<td></td>
<td></td>
<td>(2.55)</td>
<td>(2.69)</td>
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<tr>
<td>SIZE(S)</td>
<td>( + ) 0.00</td>
<td>0.00</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>(0.30)</td>
<td>(1.05)</td>
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<tr>
<td>NON-OIL_SEGMENTS</td>
<td>( + ) 8.60**</td>
<td>10.84**</td>
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<tr>
<td></td>
<td></td>
<td>(2.94)</td>
<td>(2.55)</td>
</tr>
<tr>
<td>SIZE(F)</td>
<td>( + ) -0.00</td>
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<td>-0.90</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(R^2)</td>
<td>58.45</td>
<td>76.70</td>
<td>84.22</td>
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<tr>
<td>Number of observations</td>
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</tr>
</tbody>
</table>

***  Significant at 1% (two-tail)
**   Significant at 5% (two-tail)
*    Significant at 10% (two-tail)

The dependent variable is \(\Delta(I/S)\), which is the percentage change from 1985 to 1986 in the ratio of segment capital expenditures to sales. DISCLOSE is the firm’s normalized 1985 Association for Investment Management and Research (AIMR) total disclosure score (i.e., the pre-oil shock AIMR score). \(\Delta(CF/S)\) is the percentage change from 1985 to 1986 in the ratio of segment cash flow to sales, where segment cash flow equals segment pretax operating profit plus segment depreciation. SIZE(S) is segment size, measured as the segment’s 1985 sales in millions, and SIZE(F) is firm size, measured as the firm’s 1985 sales in millions. NON-OIL_SEGMENTS is the number of non-oil segments in the firm. Standard errors are robust and are corrected for clustering of observations by firms.
The dependent variable is $\Delta(I/S)_i$, which is the percentage change from 1985 to 1986 in the ratio of segment capital expenditures to sales. DISCLOSE is the firm’s normalized 1985 Association for Investment Management and Research (AIMR) total disclosure score (i.e., the pre-oil shock AIMR score). $\Delta(I/S)_i$*DISCLOSE is the interaction of $\Delta(I/S)$ and DISCLOSE. $\Delta(CF/S)_i$ is the percentage change from 1985 to 1986 in the ratio of segment cash flow to sales, where segment cash flow equals segment pretax operating profit plus segment depreciation. SIZE(S) is segment size, measured as the segment’s 1985 sales in millions, and SIZE(F) is firm size, measured as the firm’s 1985 sales in millions. NON-OIL_SEGMENTS is the number of non-oil segments in the firm. Standard errors are robust and are corrected for clustering of observations by firms.
Table 5
Regression Analysis for the Amount of External Long Term Financing

\[ \Delta (LTF)_i = \alpha + \beta_1 \text{DISCLOSE}_i + \lambda^k \text{CONTROLS}_i + \delta^l \text{INDUSTRY FIXED EFFECTS}_i + \varepsilon_i \]

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
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<td>-2.11</td>
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<tr>
<td></td>
<td>(-13.36)</td>
<td>(-1.49)</td>
<td>(-0.15)</td>
</tr>
<tr>
<td>DISCLOSE</td>
<td>( + ) 9.88***</td>
<td>64.05***</td>
<td>59.47***</td>
</tr>
<tr>
<td></td>
<td>(4.99)</td>
<td>(4.04)</td>
<td>(4.13)</td>
</tr>
<tr>
<td>CONTROLS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\Delta (CF/S)(F))</td>
<td>(? ) 5.90</td>
<td>2.51</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.35)</td>
<td>(0.88)</td>
<td></td>
</tr>
<tr>
<td>SIZE(F)</td>
<td>(? ) 0.00</td>
<td>-0.00</td>
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</tr>
<tr>
<td></td>
<td>(-1.29)</td>
<td>(-0.71)</td>
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<tr>
<td>NON-OIL_SEGMENTS</td>
<td>(? ) 116.74</td>
<td>73.64</td>
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<td></td>
<td>(1.67)</td>
<td>(1.78)</td>
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</tr>
<tr>
<td>OILRATIO</td>
<td>(? )</td>
<td></td>
<td>-149.39**</td>
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<td></td>
<td>(-2.88)</td>
</tr>
<tr>
<td>(R^2)</td>
<td>68.01</td>
<td>81.77</td>
<td>87.82</td>
</tr>
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</tr>
</tbody>
</table>

*** Significant at 1% (two-tail)

**  Significant at 5% (two-tail)

*   Significant at 10% (two-tail)

The dependent variable is \(\Delta (LTF)\), which is the percentage change from 1985 to 1986 in long term financing. DISCLOSE is the firm’s normalized 1985 Association for Investment Management and Research (AIMR) total disclosure score (i.e., the pre-oil shock AIMR score). \(\Delta (CF/S)(F)\) is the percentage change from 1985 to 1986 in the ratio of firm cash flow to sales, where cash flow equals firm operating profit before firm depreciation., and SIZE(F) is firm size, measured as the firm’s 1985 sales in millions. NON-OIL_SEGMENTS is the number of non-oil segments in the firm. OILRATIO is the ratio of the oil segments sales to total firm sales. Standard errors are robust and are corrected for clustering of observations by industry.