How is investment efficiency related to investment transparency?

JG Chen*
J.G.Chen@massey.ac.nz

David Smith*
D.J.Smith@massey.ac.nz

Carolyn Wirth*
C.G.Wirth@massey.ac.nz

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*The authors are Senior Lecturers at the School of Economics & Finance, Massey University. The authors gratefully acknowledge the helpful comments received from participants at the Massey University School of Economics and Finance Seminar Series.

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Abstract

The relationship between investment efficiency and investment transparency is investigated using a sample of Australian listed company capital expenditure announcements between 2008 and 2014. We suggest two opposing hypotheses to explain why investment efficiency may influence the imformativeness of investment disclosures, and present evidence that investment transparency is greater for firms that are overinvesting and when sales growth is positive. This evidence is supported by the results from a simultaneous equation regression that considers endogeneity issues. Further evidence reveals that these firms achieve higher profitability and cash flow from operations surrounding the investment announcements, and that high sales growth firms maintain higher debt levels to sustain their investment. Hence the availability of liquid resources appears to support the aggressive investment practices of these firms, and their need for debt financing gives their managers incentives to disclose more financial information in order to 'hype' the stock and reduce the costs of financing. Considering possible reverse causality, the results show that investment transparency does not improve investment efficiency. Our interpretation is that managers' forecasts of project profitability are unsubstantiated and hence in an overinvestment situation are ineffective in reducing information asymmetries.

Keywords: Investment transparency, investment efficiency, information disclosure, capital expenditures

Introduction

There has been considerable agreement among researchers that higher financial reporting quality and company disclosure ratings positively influence investment efficiency by reducing problems of moral hazard and adverse selection (Biddle, Hilary, & Verdi, 2009; Diamond & Verrecchia, 1991; Easley & O'Hara, 2004; Huang & Zhang, 2012). However, the potential impact of investment efficiency on the quality of corporate disclosures has not been well-researched. One possibility is that firms that are investing efficiently in positive NPV projects wish to avoid problems of information asymmetry and agency costs, and therefore communicate more comprehensive corporate disclosures to the financial markets (Healy & Palepu, 2001; Verrecchia, 2001). However, another possibility is that when firms are investing inefficiently due to agency problems, financial constraints or other difficulties, managers may have a strong motivation to 'hype' the desirability of their new investment projects to external resource providers by undertaking greater investment transparency, or improved informativeness of investment disclosures. This study investigates the relationship between project-level investment efficiency and investment transparency, and reveals that abnormal investment levels motivate Australian listed company managers to make more informative investment disclosures. However, in contrast to the accounting literature, we find no evidence to suggest that investment transparency improves investment efficiency.

Recent research examines aspects of the trade-offs between proprietary costs and the benefits of reduced information asymmetry and agency problems that arise from disclosure quality (Guo, Lev, & Zhou, 2004; Hope & Thomas, 2008; Huang & Zhang, 2012). Many of these studies use global measures of firm-level transparency based upon financial report information or independent ratings in order to assess disclosure quality. Yet, as evidenced by Botosan and Plumlee (2002) aggregated measures of firm disclosure lose information because they fail to reflect the range of quality of the numerous types of disclosures made by a given firm. For example, they do not shed light into the reasons why different firms tend to disclose different types of information in their project-level announcements. This can be difficult to study in jurisdictions such as the US that do not require project-by-project disclosures. In such circumstances, researchers are restricted to investigating the characteristics that influence the endogenous firm decision or likelihood of an investment announcement (e.g. Mohamed & Schwienbacher, 2016). Other studies consider the reasons for investment transparency more explicitly by studying project-level announcements (Cannizzaro & Weiner, 2015; Chen, Cheng, Gong, & Tan, 2014), but as with studies that use firm-level disclosure quality, they fail to consider the possible influence of firm-level investment efficiency on disclosure

choice. For example, if agency problems are causing firms to invest inefficiently (i.e. due to empire-building or overconfidence) then two different outcomes are possible. First, managers may choose to disclose less project-level information to the public in order to avoid monitoring by external stakeholders. Second, they may disclose more information in an attempt to justify their inefficient investment behaviour and gain more favourable financing. For example, managers may choose to share their private information about expected investment project profitability to explain their apparent deviation from optimal investment levels.

Another thread of literature has studied the influence of financial statement quality on investment efficiency (e.g. Biddle et al., 2009; Chen, Hope, Li, & Wang, 2011; Cutillas Gomariz & Sánchez Ballesta, 2014; Lai, Liu, & Wang, 2014). The findings are broadly consistent with the view that higher quality of financial reporting improves investment efficiency. Superior financial reporting quality (FRQ) may reduce information asymmetry between firms and suppliers of capital, and/or lessen agency costs by reducing managerial opportunities for expropriating shareholders' wealth. Nevertheless, as these studies use firm-wide measures of disclosure quality, they shed no light on the relationship between project-level investment transparency and investment efficiency.

To overcome the issues raised above, we study one type of disclosure – project-level physical capital expenditure announcements to the Australian Stock Exchange (ASX) by Australian companies from 2008 to 2014. Information is then manually collected on the financial details disclosed in each announcement in order to study the relationship between firm-level investment efficiency and the level of disclosure. Australia provides an ideal jurisdiction for such a study because the ASX continuous disclosure regime requires immediate disclosure of a listed company's decision to undertake a price-sensitive capital expenditure project. Each capital expenditure announcement tends to be a discrete announcement, separate from other announcements of company activities, results, etc. The advantage is that failure to disclose implies that no price-sensitive capital expenditures are planned. Furthermore, we consider potential issues of reverse causality, investigating both the impact of investment efficiency on investment transparency, as well as the influence of investment transparency on investment efficiency. This is important in gaining a better understanding of what motivates firms to increase the amount of information in their investment disclosures. Reducing information asymmetries between firms and capital providers through investment transparency may provide macroeconomic and firm-level benefits by increasing investment efficiency. Accordingly, we predict that firms with greater project-level investment transparency are associated with higher investment efficiency. With respect to the determinants of

investment transparency, we make two alternative predictions. The first is that firms with greater investment efficiency issue more informative capital investment disclosures. The rationale is that firms that invest efficiently may actively mitigate potential agency problems by undertaking greater investment transparency. The alternate prediction is that firms that have lower investment efficiency issue more informative capital investment disclosures. This may arise if managers feel pressured to explain their non-optimal investment by disclosing their private project-level information such as investment cost and forecast profitability.

The findings regarding the impact of investment transparency on investment efficiency run counter to our predictions. There is no evidence to suggest that more informative project announcements by Australian listed companies positively influence investment efficiency. This result is in contrast to the literature on FRQ, but is consistent with models of adverse selection that suggest a potential "lemons" problem whereby investors are unable to distinguish investment quality (Akerlof, 1970). Listed company financial statements are audited by independent auditors, and therefore contain substantiated historical financial information. Hence FRQ improves investment efficiency by reducing information asymmetry between firm insiders and investors (Biddle et al., 2009; Cutillas Gomariz & Sánchez Ballesta, 2014). In contrast, financial forecasts in capital expenditure announcements to the ASX reflect managers' unsubstantiated expectations of future profitability, and as such the integrity of the information can be compromised (Rogers & Stocken, 2005).

Next, our results indicate that firms that have lower investment efficiency undertake greater investment transparency. Specifically, inefficient firms disclose greater quantity and precision (cost and profitability forecasts) of project-level financial information when they are overinvesting and when sales growth is positive. Further evidence suggests that despite maintaining consistently higher profitability and cash flow from operations, firms in this situation have the greatest need for funds, maintaining lower cash levels and relying more heavily on debt to finance their capital expenditures. This is consistent with Jensen's (1986) prediction that high cash flows can lead to agency issues such as overinvestment. The agency cost argument implies that managers may be more inclined to disclose their financial forecasts in order to gain lower costs of external finance in order to maintain their overinvestment. Hence, unlike financial statement disclosures which are important for monitoring managers (Hope & Thomas, 2008), in an overinvestment situation unsubstantiated financial forecasts in capital expenditure announcements may reflect an attempt to satisfy external providers of capital that the manager's aggressive investment behaviour is appropriate. This is consistent with Lang and Lundholm (2000) who suggest that the tendency for

some firms to increase their disclosures considerably prior to seasoned equity offerings reflects an attempt to 'hype' their stock to successfully lower the cost of equity financing. With respect to the finding that inefficient firms disclose more when sales growth is positive, the prospect of good growth opportunities is likely to drive new investment and detailed disclosure of the good news. Furthermore, greater financial disclosures may be needed to reduce potential information asymmetry and allow the firm to raise capital at a lower cost.

This study contributes in several ways to the literature on the factors influencing firm disclosures and the role of investment transparency in improving investment efficiency. First, we present evidence that supports an agency-theoretic view that when managers are overinvesting, they disclose more financial information about their new capital expenditure projects in order to justify their empire building and overinvestment. Previous research investigating reasons for investment transparency fails to consider the possible impact of investment efficiency on managers' motives for disclosure (e.g. Cannizzaro & Weiner, 2015; Mohamed & Schwienbacher, 2016). Second, unlike other studies that use firm-wide and financial reporting measures to study the impact of disclosure quality on investment efficiency (e.g. Biddle et al., 2009; Cutillas Gomariz & Sánchez Ballesta, 2014), we develop a proxy for investment transparency using the financial information and forecasts contained in new capital expenditure announcements. This allows us to more directly investigate the relationship between project-level disclosures and investment efficiency. Our results reveal no evidence that investment disclosure improves investment efficiency. Hence, although FRQ may improve investment efficiency by reducing information asymmetry between firms and external resource providers (Biddle et al., 2009), our results show that this does not hold true for investment transparency, suggesting that not all disclosures are equal. Our explanation is that management disclosures of new capital expenditure projects lack credibility, because unlike accounting information in audited financial reports, they contain private managerial forecasts of project profitability that are not subjected to independent scrutiny. Third, by using an Australian data set of capital expenditure announcements to the stock exchange, we directly investigate the reasons behind differences in the extensiveness of investment announcements. Unlike other markets where the firm decision of whether or not to disclose project information is endogenous, the ASX continuous disclosure requirements reduce the concern that some firms may fail to disclose price-sensitive capital expenditures. Previous Australian studies have investigated motivations for annual report disclosures such as earnings forecasts (Kent & Ung, 2003), intellectual capital (Alexander, Philip, & Mai, 2009), segment information (Mitchell, Chia, & Loh, 1995) and the impact of International Financial Reporting Standards (Palmer, 2008), as well as the informativeness of

Australian announcements to the ASX (Beekes, Brown, & Zhang, 2015). However, our study is unique in investigating the firm characteristics that influence the amount and type of financial information disclosed in physical capital expenditure announcements to the ASX.

The paper is organised as follows. Section 2 reviews the literature on investment efficiency and investment transparency and develops the testable hypotheses. Section 3 describes the research design including the sample, models and variable measurement. Section 4 reports the results and Section 5 contains the main conclusions.

2. Hypothesis development

2.1 Determinants of investment efficiency

The investment opportunities theory suggests that managers are able to maximise the market value of the firm by undertaking positive net present value projects (Miller & Modigliani, 1961). Accordingly, firms invest efficiently by pursuing capital investment opportunities when the marginal $q > 1$ (e.g. Abel, 1983; Hayashi, 1982). Nevertheless, information asymmetries between managers and providers of capital and agency costs may result in deviations from optimal investment levels, namely overinvestment or underinvestment. For example, adverse selection suggests that managers have more information than investors regarding the future prospects of the firm, potentially resulting in a "lemons" problem whereby investors are unable to distinguish between good and bad investment projects (Akerlof, 1970). In such a case, managers may overinvest if investors purchase overpriced securities, or underinvest if suppliers of capital ration funds to underpriced firms. Following from agency theory, models of moral hazard imply that managers may engage in opportunistic behaviours such as empire-building or perquisite consumption that are not necessarily in the best interests of shareholders (Jensen & Meckling, 1976). For example, when firms have excess debt capacity and high free cash flows, managers may be inclined to overinvest by undertaking low or negative NPV investments (Jensen, 1986). Consistent with this, firms with the highest levels of free cash flows have been found to overinvest (Richardson, 2006), and Australian markets react negatively to capital expenditure announcements for low growth firms with high free cash flow (Brailsford & Yeoh, 2004). In conclusion, information asymmetry and agency problems can hamper investment efficiency.

2.2 The influence of transparency on investment efficiency

According to agency theory, effective monitoring of management can restrict managers' perquisite consumption (Jensen & Meckling, 1976). A recent thread of research suggests that firm-level disclosure quality can help to reduce information asymmetry and agency costs, and in doing so, enhance investment efficiency. Studies of independent ratings of firm disclosure have found that opaqueness is associated with value-destroying investments (Huang & Zhang, 2012) while transparency is positively related to investment efficiency (Lai et al., 2014). In the accounting-related literature, FRQ mitigates the overinvestment problem (Cutillas Gomariz & Sánchez Ballesta, 2014) and increases investment in firms that are prone to underinvest (Biddle et al., 2009). Mandatory but not voluntary adoptions of International Financial Reporting Standards enhance investment efficiency, particularly in countries with weaker investor protections (Biddle, Callahan, Hong, & Knowles, 2016).

The above studies use either global measures of firm-level transparency based upon accounting information or independent ratings in order to assess investment efficiency. Yet, as evidenced by Botosan and Plumlee (2002) aggregating different types of disclosures across the entire firm risks the loss of information and potentially erroneous conclusions. For example, they find that the cost of equity capital decreases with the level of annual report disclosure, increases with the level of timely disclosures (such as quarterly reports to shareholders) and is unrelated to the level of investor relations activities. Furthermore, listed company financial reports and firm-level ratings reflect aggregated historical information, some of which has already been transmitted to the market and impounded into security prices (Ball & Brown, 1968; Lev, 1989). The use of independent ratings as a proxy for firm-level disclosure quality also presents limitations. For example, AIMR ratings are industry-based, and are not necessarily indicative of firm-level or project-level transparency. Further, global disclosure ratings are subjectively determined and therefore are more likely to suffer from measurement error.

In contrast, the Australian market provides an opportunity to test the effect of transparency on investment efficiency using project–level data. In 1994, a statutory continuous disclosure regime was implemented, requiring Australian listed companies to immediately disclose price-sensitive information to the public via the ASX. In contrast to U.S. and other markets where capital budget plans are announced periodically, or where investors learn about capital expenditure projects

through the financial statements, Australian listed firms must immediately disclose plans for a price-sensitive capital expenditure project as a separate announcement. Timely, project-level announcements may potentially affect investment efficiency differently relative to broader, historical disclosures. Given the prior evidence, we expect that the transparency of timely, project-level announcements increases investment efficiency by reducing information asymmetries. We test this with Australian project-level investment announcements. Accordingly, the first hypothesis is:

H1 (Investment efficiency): Firms with greater project-level investment transparency are associated with higher investment efficiency.

2.3 Determinants of voluntary disclosure

Much of the research on factors influencing voluntary disclosure has tended to highlight the role of accounting information, which in market economies aids investors to evaluate the potential returns from firm capital investments (the pricing decision) and to monitor firms' use of investors' funds (stewardship) (Beyer, Cohen, Lys, & Walther, 2010). However, managers face a trade-off, whereby they will only disclose financial or other information if the benefits of disclosure exceed the costs (Grossman & Hart, 1980; Verrecchia, 1983).

A key benefit of disclosure is reduced information asymmetry (Healy & Palepu, 2001). To the extent that managers and insiders reveal their information to investors and outsiders, stock liquidity may be improved and potentially, costs of financing reduced (Amihud & Mendelson, 1989; Bushee & Leuz, 2005; Diamond & Verrecchia, 1991; Easley & O'Hara, 2004). This can improve firm growth by enabling the acceptance of profitable investment opportunities (Khurana, Pereira, & Martin, 2006). Lang and Lundholm (2000) produce evidence that firms attempt to reduce information asymmetry and cost of equity capital both by increasing their disclosures prior to seasoned equity offerings and by 'hyping' the stock. Several studies consider how information asymmetry motivates investment transparency. Jones (2007) presents evidence that firms with lower book/market ratios reveal more detailed R&D information, possibly because financial statement values fail to reflect market values. Mohamed & Schwienbacher (2016) find that larger firms and those facing extreme information asymmetry problems are more inclined to publicly announce their corporate venture capital investments. They propose that firms with larger investments in R&D or capital expenditures may possess competitive advantages relative to their rivals, and hence are more likely to publicly

announce their corporate venture capital investments, while firms in high-tech and competitive industries face higher proprietary costs and are less likely to disclose.

Voluntary disclosures can also reduce agency costs when managers have incentives to act in their own interests rather than the interests of shareholders (Jensen & Meckling, 1976). Strong corporate governance and the need to raise external financing have been proposed as monitoring mechanisms that motivate managers to make fuller, truthful disclosures (Healy & Palepu, 2001). Conversely, US multinationals that fail to voluntarily disclose earnings by geographic area have been found to experience greater foreign sales growth, lower foreign profitability, and lower firm value (Hope & Thomas, 2008). This is consistent with an agency cost argument that managers may fail to maximise shareholder wealth when they are not monitored by external stakeholders. However, there may be other agency issues that influence voluntary disclosures. For example, managers have been found to use disclosures opportunistically to reduce the exercise price of stock options prior to awards or to increase the stock price after awards (Aboody & Kaszsnik, 2000).

A major disincentive to voluntary disclosures can arise from proprietary costs. Managers tend to be reluctant to publicly divulge sensitive information which may give an advantage to competitors, particularly when there is strong competition within an industry (Clinch & Verrecchia, 1997; Graham, Harvey, & Rajgopal, 2005; Verrecchia, 1983). Proprietary costs are prevalent in technology-related industries where intangible capital is high (Guo et al., 2004). Some evidence suggests that proprietary costs play an important role in influencing investment transparency. Investigating capital budget announcements, Beyer et al. (2015) find that managers are less likely to disclose their capital expenditures in disaggregated form when proprietary costs are high. Studying the impact of product market competition on voluntary management forecasts of the aggregate value of capital expenditures, Li (2010) presents evidence that disclosure quantity is greater when a firm is faced with competition from potential entrants and that disclosure quality is enhanced by new and existing competition. Hence, the nature of competition (i.e. from new versus existing rivals) appears to influence the relationship between proprietary costs and disclosure.

A minority of research evidence has directly studied the motivations for investment transparency using project-level evidence, and has found in favour of investment asymmetries over agency-theoretic motivations. Studying multinational petroleum reserve investment announcements in the petroleum industry, Cannizzaro and Weiner (2015) find that institutional and informational factors

influence investment transparency. Using Australian investment announcements, Harford and Powell (2015) find that subsequent to stricter enforcement of Australian stock exchange continuous disclosure requirements, the likelihood of firm disclosures of R&D investments is less relative to capital expenditures and IT investments, consistent with the notion that proprietary costs are higher for R&D. Using Chinese data, Chen et al (2014) present evidence that firms with better guanxi (relationship) networks have less informative disclosures regarding new investment plans. They argue that higher corruption amongst these firms reflect proprietary costs and exacerbate information asymmetries that discourage investment transparency.

Our main interest in this paper is to consider the determinants of investment disclosure. In particular, we seek to determine the direction of the relationship between investment efficiency and investment transparency. The existing literature suggests that disclosure quality influences investment efficiency, but provides no insights into the mechanisms of any possible reverse causality. One possibility is that firms that invest efficiently tend to issue informative disclosures in order to reduce information asymmetry and reduce costs of equity financing. In this case, a positive relationship between investment efficiency and investment transparency would be expected. Alternatively, there are circumstances when the opposite may be observed. Australian stock market regulations require managers to make announcements of price-sensitive news. When a firm is investing optimally, there is no pressure from either regulators or investors for managers to divulge sensitive details concerning the new investment. There is merely a duty to disclose the nature of the proposed investment. However, now consider the situation when a firm is not investing optimally. In such a case, it is likely that the manager will feel pressure to disclose more detailed information. For example, if managers are overinvesting due to empire-building, over-confidence or the desire to take advantage of overpriced securities, then they may feel compelled to disclose more information in order to legitimise the investment to existing and potential investors. Another possibility is that managers may be overinvesting relative to current sales growth in rational response to future growth opportunities of which the market is unaware. In both cases, investment transparency will be beneficial as it may increase access to capital and/or reduce the cost of capital. On the other hand, consider the scenario where firms have good investment opportunities but are underinvesting due to capital rationing or high costs of capital. These firms may issue more extensive capital expenditure disclosures in an attempt to gain more favourable terms, lower costs, and better access to external capital. In these cases, investment efficiency would be expected to be negatively associated with investment transparency. Given the contrasting possibilities, two alternate hypotheses are proposed:

H2a (Investment transparency): Firms with greater investment efficiency issue more informative capital investment disclosures.

H2b (Investment transparency): Firms with lower investment efficiency issue more informative capital investment disclosures.

3. Research design

3.1 Sample

To test the hypotheses, announcements from 2008 to 2014 of new capital expenditure projects by companies listed on the ASX are collected from the SIRCA database. Pursuant to the 1994 ASX continuous disclosure listing rules, companies must immediately disclose to the ASX any "market sensitive" information ("ASX Listing Rules Guidance Note 8," 2013). Such announcements are directed to be stand-alone, and not combined with other announcements. These include material acquisitions and transactions that can have a significant impact on the nature or scale of the company's operations. Endogeneity issues regarding sample selection bias are minimised because the requirement to disclose is mandatory. Nevertheless, managers have considerable discretion in the type of investment information they disclose, resulting in different degrees of informativeness. A range of disclosure is possible, from the minimum required by regulation, to extensive voluntary disclosures including cost, profitability and other financial information. This makes the Australian listed company investment environment ideal for the study of investment transparency and investment efficiency.

Consistent with Brailsford and Yeoh (2004), projects eligible for inclusion in the sample are narrowly defined as price-sensitive plans for the purchase or construction of new plant and equipment, or the upgrade of existing physical capital assets. Mergers and acquisitions and the purchase or development of intangible assets are excluded as the nature of information typically disclosed may be substantively different from announcements of physical capital expenditures. To avoid potential bias caused by exceptionally large investments, projects costing greater than 5 times total firm assets are excluded. Also excluded from the sample are firms in the extractive industries (drilling, mining and exploration) due to their prescriptive ASX disclosure requirements, and in the banking sector due to their different financial structure. The search of ASX announcements initially yielded

2,674 potential announcements, but the above exclusions reduced this considerably to 318 new investment announcements by 186 companies.

The financial variables in the study were obtained from the Worldscope database, while stock returns were calculated from the Thomson Reuters Datastream database. All variables are winsorised at the 1st and 99th percentiles to reduce the influence of outliers.

3.2 Investment efficiency model

To test hypothesis 1 on the influence of the informativeness of project-level announcements on firm investment efficiency, the following model is defined:

$$InvEff_{i,t} = \beta_0 + \beta_1 DQ_{j,i,t} + \beta_2 LnAssets_{i,t-1} + \beta_2 MB_{i,t-1} + \beta_3 SD\_CFO_{i,t-1} + \beta_4 SD\_Sales_{i,t-1} + \beta_5 SD\_Inv_{i,t-1} + \beta_6 Z_{i,t-1} + \beta_7 Tangy_{i,t-1} + \beta_8 KStruct_{i,t-1} + \beta_9 LnCFO_{i,t-1} + \beta_{10} Cash_{i,t-1} + \beta_{11} Div_{i,t-1} + \beta_{12} LnAge_{i,t} + \beta_{13} OpCycle_{i,t-1} + \beta_{14} Loss_{i,t-1} + \sum_k \beta_k Industry\ dummies + \sum_t \beta_t Year\ dummies + \varepsilon_{i,t} \quad (1)$$

where *InvEff* denotes investment efficiency and the main variable of interest, *DQ* is a measure of investment transparency, representing the amount of financial information disclosed in project-level announcements (see details below). The remaining variables control for other possible influences that have been identified in the literature (Biddle et al., 2009; Cutillas Gomariz & Sánchez Ballesta, 2014): size, market to book ratio, standard deviation of cash flow from operations, standard deviation of sales, standard deviation of capital investment, Altman's Z-score, tangibility of assets, debt level, cash flow from operations, cash holdings, payment of dividends, age, length of operating cycle, incurring losses, industry dummies and year dummies. All financial variables are lagged. The t-statistics used to evaluate the model are based on robust standard errors clustered by firm to correct for heteroskedasticity (Petersen, 2009).

3.2.1 Investment efficiency measure

To measure investment efficiency, we define a model predicting the expected level of investment based on growth opportunities (proxied by sales growth) introduced by Chen et al. (2011). The model accommodates different relationships between sales growth and investment depending upon positive or negative growth. This is necessary because the sample period in this study includes periods of negative sales growth, such as during the global financial crisis and the downturn in the Australian resource sector. The investment model is estimated separately for each industry-year, using all firms (excluding extractive and banking industries) across the entire ASX market. The

residuals from the model represent deviations from expected investment levels, and for each of our sample firms, the absolute value of the residuals is an estimate of investment inefficiency.

$$Investment_{i,t} = \beta_0 + \beta_1 Neg_{i,t-1} + \beta_2 SalesGrowth_{i,t-1} + \beta_3 Neg_{i,t-1} * SalesGrowth_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

We define *Investment* for firm *i* in year *t* as capital expenditures minus sales of property, plant and equipment, scaled by lagged total assets.[1] *Neg* is a dummy variable equal to one if sales growth is negative in the year prior to investment, and zero otherwise. *Sales growth* is the percentage growth in sales for firm *i* from *t-2 to t-1. Neg * SalesGrowth* is an interaction term allowing for the slope of the investment equation to be different following negative growth. For the residuals ε, positive values represent excess firm investment relative to that predicted by the model, and proxy for overinvestment, while negative values represent actual firm investments lower than predicted, and proxy for underinvestment. Following Cutillas Gomariz and Sanchez-Ballesta (2014), we next transform the residuals from a measure of investment inefficiency to a measure of investment efficiency by multiplying the absolute value of the sample-firm residuals by -1. These firm-specific proxies for investment efficiency are then used as the dependent variable in equation 1. Hence in equation 1, a positive coefficient for *DQ* denotes that greater disclosure is associated with greater investment efficiency. For tests distinguishing between overinvestment and underinvestment, overinvestment is defined as the positive residuals multiplied by -1, so that a positive coefficient on *DQ* indicates that more extensive disclosures are associated with greater investment efficiency due to less overinvestment. Similarly, with respect to underinvestment, a positive coefficient on *DQ* indicates that greater investment transparency is associated with greater investment efficiency due to less underinvestment.

3.2.2 Explanatory variables

To test hypothesis one regarding the effect of investment transparency on investment efficiency, our main variable of interest in equation 1 is the quantity of financial information in project-level disclosures, *DQ*. *DQ* is measured as the total number of quantitative measures regarding the profitability, cost and horizon of the project disclosed in the new capital expenditure announcement. Therefore high values of *DQ* represent greater investment transparency. The *DQ* measure reflects the nature of the quantitative information most commonly disclosed by firms and used by investors to forecast the effect of the project on future firm cash flows and the value of the firm's shares, and does not require subjective judgements of disclosure quality by the researchers. The sample

[1] Our sample announcements are limited to investments in tangible assets, so we exclude R&D and acquisitions.

distribution of *DQ* by industry is presented in Table 1.[2] Investment announcements in the oil and gas industry have the highest investment transparency (mean=3.17), while those in the technology industry are the least informative (mean=1.63). Financials make up the largest group of announcements (N=83; 26.1%), while industrials disclose the widest range of quantitative information (0 to 6). Hypothesis one predicts that *DQ* positively influences firm-level investment efficiency.

The control variables for the investment efficiency regression are based upon those that are commonly employed in earlier studies (Biddle et al., 2009; Cutillas Gomariz & Sánchez Ballesta, 2014). All financial variables are measured at the beginning of the fiscal year. Firm size is measured as the natural logarithm of total assets (*LnAssets*), and firm growth opportunities are proxied by the market to book ratio computed as the book value of assets less the book value of ordinary share equity plus the market value of ordinary share equity, all divided by the book value of assets (*MB*). Business uncertainty can negatively affect investment efficiency, so this is proxied by three variables: volatility of cash flows is the standard deviation of cash flow from operating activities scaled by average total assets from t-5 to t-1 (*SD_CFO*); volatility of sales is the standard deviation of net sales scaled by average total assets from t-5 to t-1 (*SD_Sales*); and volatility of investment is the standard deviation of capital expenditures less disposals of fixed assets, scaled by average total assets from t-5 to t-1 (*SD_Inv*). The financial condition of the firm (*Z*) is based upon Altman's Z-score (1968); tangibility of firm assets is net property, plant and equity scaled by total assets (*Tangy*); and indebtedness is measured as long-term debt divided by the sum of long-term debt and market value of equity (*KStruct*). Insufficient liquidity can constrain a firm's ability to undertake new investments, and excess liquidity can allow wasteful spending, so we have three proxies for liquidity. Liquidity generated from internal operations is a logarithmic transformation of cash flow from operating activities divided by total sales (*LnCFO*); liquidity of assets is measured as cash holdings divided by total assets (*Cash*), and the ability to pay dividends is a dummy variable equal to one if a dividend was paid in the prior year, and zero otherwise (*Div*). To control for life cycle and other operational characteristics that may affect firm investment, we also include the natural logarithm of firm age (*LnAge*); the length of the firm's operating cycle measured as the natural logarithm of 365 times the sum of receivables turnover plus inventory turnover (*OpCycle*); a dummy variable equal to 1 if earnings before extraordinary items is negative, and zero otherwise (*Loss*); and industry dummies. The potential influence of time-related factors is controlled by year dummies. Appendix 1 gives details of the variable definitions.

[2]The financial industry includes real estate investment trusts, real estate services and asset management, but excludes banks and other deposit-taking financial institutions.

3.3 Investment transparency model

The next investigation tests the second hypothesis that a firm's level of investment efficiency influences project-level investment transparency using the following ordinary least squares model:

$$DQ_{j,i,t} = \beta_0 + \beta_1 InvEff_{i,t} + \beta_2 PropIntang_{i,t-1} + \beta_3 SDEarnings_{i,t-1} + \beta_4 MB_{i,t-1} + \beta_5 LnAnalysts_{i,t} + \beta_6 RetVol_{i,t-1} + \beta_7 ClSh_{i,t} + \beta_8 LnAssets_{i,t-1} + \sum_k \beta_k Industry\ dummies + \sum_t \beta_t Year\ dummies + \varepsilon_{i,t} \quad (3)$$

where *DQ* denotes disclosure quantity, representing the investment transparency of project *j* for firm *i* at time *t,* as described in connection with equation 1 above. The main variable of interest is *InvEff*, which is predicted by hypothesis two to influence investment transparency. Managers may wish to avoid the disclosure of sensitive information which may benefit their rivals, so two variables proxy for proprietary costs. First, intangible assets can represent a substantial source of proprietary costs, accordingly *PropIntang* reflects potential proprietary costs of disclosure (Ellis, Fee, & Thomas, 2012). Second, technology-based firms can face greater product market competition which reduces their disclosure quality (Ettredge, Guo, Lisic, & Tseng, 2016), so we expect firms in the technology industry (i.e. one of our industry dummies) to have lower investment transparency. We also include several proxies for business uncertainty and information asymmetry. Greater earnings volatility may motivate managers to make more informative project announcements in order to reduce investors' estimation risk with respect to future firm cash flows. Hence *SDEarnings* represents the standard deviation of earnings before extraordinary items scaled by total assets, over the past five years (Ali, Klasa, & Yeung, 2014; Li, 2010). Forecasting future cash flows can be problematic for firms experiencing higher growth, so the market to book value of assets (*MB*) controls for growth opportunities (Li, 2010). Analysts may require firms to communicate more information (Huang & Zhang, 2012), so *LnAnalysts* represents the number of analysts following the firm. When investors are uncertain of managers' information endowment, managers may choose to partially withhold their information (Dye, 1985; Jung & Kwon, 1988), so *RetVol* represents stock return volatility over the previous fiscal year. Firms with a greater proportion of closely held shares have less information asymmetry and therefore may disclose less; hence *ClSh* measures the proportion of shares held by insiders. Large firms may make fuller project disclosures, so *LnAssets* controls for potential size effects (Chen et al., 2014). Additionally, industry and year effects are controlled by dummy variables. All financial variables are measured at the beginning of the fiscal year. Variable definitions are detailed in Appendix 1.

Equations 1 and 3 have opposite causal implications between investment transparency and investment efficiency, accordingly endogeneity concerns are addressed by combining the two equations using three stage least squares regression.

4. Results

4.1 Descriptive statistics

Table 2 presents the descriptive statistics of the variables tested in connection with the investment transparency and investment efficiency models. The mean (median) of -0.098 (-0.032) for investment efficiency, -0.163 (-0.072) for overinvestment, and -0.036 (-0.024) for underinvestment are similar to those of Cutillas Gomarez & Sanchez Ballesta (2014). The disclosure quantity measure (DQ) indicates that the mean (median) number of quantitative disclosures regarding the profitability, cost and horizon within the sample announcements is 2.487 (2), with the 10^{th} and 90^{th} percentiles values equal to 1 and 4, respectively.

The Pearson correlation matrices for the investment efficiency and investment transparency variables are presented in Panel A and B respectively of Table 3. The negative correlation between investment efficiency and disclosure quantity of -0.072 is statistically insignificant, but suggests that higher (lower) investment efficiency may be associated with lower (higher) disclosure quantity. The testing of the hypotheses will shed light on the direction of the causality between these variables. The correlations between the explanatory variables are not excessive, so multicollinearity is not expected to be an issue.

4.2 Investment efficiency regression results

Table 4 reports the equation 1 results of the ordinary least squares regression of the determinants of investment efficiency using the total sample (1) and four subsamples: positive sales growth (2), negative sales growth (3), positive residuals or overinvestment (4) and negative residuals or underinvestment (5). All regressions include industry (based on Datastream Industry Classification 2) and year dummies and employ clustered standard errors at the firm level (Petersen, 2009). For all five samples, a positive coefficient on *DQ* indicates that greater investment transparency is associated with greater investment efficiency. Overinvestment is defined as the positive residuals multiplied by -1, so that a positive coefficient on *DQ* indicates that more extensive disclosures are associated with greater investment efficiency due to less overinvestment. Similarly, for

underinvestment, a positive coefficient on *DQ* indicates that greater investment transparency is associated with greater investment efficiency due to less underinvestment.

The coefficient on *DQ* is significantly negative in the positive sales growth and underinvestment samples. This is counter to our hypothesis one prediction that firms with higher project-level investment disclosure display greater investment efficiency. This issue will be further investigated below using three stage least squares.

For the control variables, most of the coefficient signs are consistent with expectations, although not all are significant in all subsamples. Large firms (*LnAssets*) are more efficient in their investment if they have experienced negative sales growth in the prior year, while for the full and overinvestment samples, greater growth opportunities are associated with greater investment efficiency. The predominantly negative coefficients for the three variables for business uncertainty (*SD_CFO, SD_Sales, SD_INV*) suggest that business volatility can hamper investment efficiency. Greater financial strength (*Z*) positively affects investment efficiency in the positive sales growth and overinvestment subsamples, while higher debt (*KStruct*) is associated with lower investment efficiency for firms that have experienced negative sales growth. Higher cash flow from operating activities (*LnCFO*) has a positive impact on investment efficiency in the full, negative sales growth and overinvestment samples, while higher levels of cash have a negative association with investment efficiency in the full and negative sales growth samples. Incurring a prior year loss appears to exert a disciplinary effect on firms suffering from prior year negative sales growth, as they subsequently achieve greater investment efficiency.

4.3 Investment transparency regression results

Table 5 reports the equation 3 results of the ordinary least squares regression of the determinants of investment transparency using the total sample (1) and four subsamples (2-5). The regressions include industry (based on Datastream Industry Classification 2) and year dummies and employ clustered standard errors at the firm level (Petersen, 2009).

In the full, positive sales growth and overinvestment samples, investment efficiency is significantly negatively related to investment transparency. This is consistent with hypothesis H2b which posits that firms with lower investment efficiency issue more informative capital investment disclosures. This may arise if managers feel compelled to justify their deviation from optimal investment, or if

managers wish to divulge private information regarding predictions of future firm prospects. However, there is no evidence that investment efficiency affects investment transparency when sales growth is negative or when firms are underinvesting.

The coefficients for most of the control variables are as expected. The notable exception is proprietary costs (*PropIntang*), for which the coefficients are insignificant. The coefficient for *SDEarnings* is significantly positive in most samples, consistent with a view that managers in firms with greater business risk reveal more financial information in order to reduce information asymmetry. The significantly negative coefficients for *MB* in all samples are consistent with past findings that firms with greater growth opportunities display lower disclosure quality due to forecasting difficulties (Li, 2010). Higher analyst coverage is associated with greater investment transparency in the full, positive sales growth and overinvestment samples, while the negative coefficient of *RetVol* in the full, negative sales growth and overinvestment samples is consistent with the suggestion that investor uncertainty concerning managers' information endowment may lead managers to withhold private information (Dye, 1985; Jung & Kwon, 1988). The negative coefficient on *ClSh* in the negative sales growth sample suggests a reduced need for disclosure when insiders hold a larger proportion of firm shares. The coefficient for firm size (*LnAssets*), is significant across three of the five samples. Firms in the technology industry are not represented in all samples, but the coefficients are significantly negative in the full and underinvestment samples, consistent with the notion that high proprietary costs inhibit disclosure.

4.4 Endogeneity issues

By combining the investment efficiency (1) and investment transparency (3) equations, a more robust test using three stage least squares (3SLS) is undertaken to address potential endogeneity concerns. To gain convergence, reduced versions of equations 1 and 3 are tested using the significant variables (p-value<5%) from the full sample of the first stage regressions. Panels A and B of Table 6 present the investment efficiency and investment transparency results, respectively. The underinvestment sample model failed to converge, and therefore no results are presented.

As shown in Panel A, and counter to our hypothesis one prediction, the coefficient for DQ is insignificant in all samples, indicating that investment transparency has no impact upon investment efficiency in our sample of Australian investment announcements. This runs counter to previous research suggesting that greater FRQ mitigates overinvestment by reducing information asymmetry between firm insiders and investors (Biddle et al., 2009; Cutillas Gomariz & Sánchez Ballesta, 2014).

A notable difference between our investment announcements to the ASX and listed company financial statements is that the latter are audited by independent auditors, and therefore contain substantiated historical financial information. In contrast, financial forecasts in capital expenditure announcements represent managers' unsubstantiated expectations of future profitability, and as such the information may be perceived by investors as less than reliable. For example, Rogers and Stocken (2005) find that biases in management earnings forecasts are more likely when the chance of detection of the misrepresentation is low, but investors are able to filter out predicted biases. Our results also show that larger firms and those with lower volatility of investment (full, positive sales growth and overinvestment samples) display greater investment efficiency.

The Panel B 3SLS results in Table 6 are consistent with the Table 5 OLS results showing that investment efficiency negatively influences investment transparency in the full, positive sales growth and overinvestment samples. This supports hypothesis 2b that firms with lower investment efficiency issue more informative capital investment disclosures. Specifically, positive sales growth may provide a strong impetus for firms to invest, but greater disclosure to explain deviations from optimal investment may be necessary to gain more favourable financing rates. For firms that are overinvesting, greater disclosure of project financial projections may be needed to avoid the impression that managers are satisfying their own motivations above those of investors. Alternatively, overinvesting managers may simply be 'hyping' the stock as in Lang and Lundholm (2000) in an attempt to reduce the cost of capital. For the control variables, the positive relation between earnings volatility and investment transparency in the full and positive sales growth samples is consistent with the Table results suggesting that investment transparency is used to reduce information asymmetry when earnings are volatile.

Overall, the 3SLS results suggest that endogeneity may not be an important issue in the separate regressions. Investment efficiency appears to negatively influence investment transparency, but there is no evidence of reverse causality. Given our small sample size, and given that endogeneity is not a problem, OLS regression is normally preferred (Tables 4 and 5), as it allows more extensive controls for additional explanatory variables, industry, year, clustered standard errors and heteroskedasticity. Hence there is no evidence that investment transparency enhances investment efficiency in our sample of Australian firm capital investment announcements, but rather, investment inefficiency motivates managers to undertake greater investment transparency, particularly when sales growth is positive and when firms are overinvesting.

4. 5 Analysis extension

Figures 1 A to F present the times series of values for various financial ratios from two years prior to the announcement to one year after, categorised by the four sample groups. Using the Wilcoxon two-sample test to evaluate the significance, some differences and trends are evident. Comparing the overinvestment and underinvestment subsamples over the period from t_{-2} to t_0, overinvesting firms have greater investment opportunities relative to underinvesting firms (p-value= 0.008) as measured by the median market to book ratio,. This is not explained by GDP growth, which is approximately equal for the two groups around the time of the announcements. Over the entire period, overinvesting firms achieve consistently higher median profitability (return on sales, p-value = 0.001) and higher median cash flow from operations (p-value = 0.001) relative to underinvesting firms. Relative to those that underinvest, overinvesting firms appear to have a greater need for funds during years t_0 and t_{+1}. Nevertheless, the median debt levels for the two groups are not statistically different.

Comparing the positive and negative sales growth subsamples, over the entire period, firms experiencing positive pre-announcement sales growth (from t_{-2} to t_{-1}) have superior investment opportunities (median MB) relative to firms with negative pre-announcement sales growth (p-value = 0.001). Over the entire period, the positive sales growth firms also display greater median profitability (return on sales, p-value < 0.0001) and higher median cash flow from operations (p=value = < 0.0001) compared with firms with negative sales growth. Relative to firms experiencing negative sales growth, firms with positive sales growth have the greatest need for funds, displaying higher median debt levels during years t_O and t_{+1} (p-value= 0.047) and lower median holdings of cash over the entire period (p-value = 0.033). This is consistent with an explanation that positive sales growth firms undertake greater disclosure in order to reduce the cost of financing their aggressive investment practices, particularly when their investment is deviating from optimal levels.

Overall, these results suggest that the availability of liquid resources may assist the aggressive investment practices of overinvesting and positive sales growth firms, while the need for debt to finance positive sales growth and investment opportunities may give managers strong incentives for disclosure.

4.6 Robustness checks

4.6.1 Alternative measure of investment transparency

The main measure of investment transparency is *DQ*, denoting the level (or quantity) of disclosure, calculated as the total number of quantitative profitability, cost and horizon disclosures in each capital expenditure announcement. For robustness, a measure of the precision of each announcement is also constructed, as theoretical research suggests that the strategic disclosure or withholding of investment information and the precision of such disclosures can influence market valuation and the efficiency of investments (Wen, 2013). Accordingly, *DP* is a dummy variable equal to one if the announcement contains both project cost information and at least one profitability forecast, and zero otherwise. The (untabulated) results from replacing DQ with DP in the full sample regressions using 3SLS and full-information maximum likelihood estimations indicate that investment efficiency negatively influences disclosure precision, but that reverse causality does not hold.

4.6.2 Additional control variables

To check the robustness of our OLS investment transparency results, the effect of adding additional control variables to equation 3 is tested. The Herfindahl index is included as a measure of industry concentration. For other potential information asymmetry effects, Altman's (1968) Z score, new equity issuances, and firm age are tested. The proportion of debt in the capital structure, cash as a percentage of total assets, and cash flow from operations are included to test for agency problems. The effect of capital intensity and project cost allow for other possible scale effects. The inclusion of these variables has no material effect on our conclusion that firms that are investing inefficiently make fuller disclosures.

4.6.3 Test of FRQ

Our equation 1 investment efficiency results differ considerably from previous research that suggests that by reducing information asymmetries through greater FRQ, investment efficiency can be increased. We have conjectured that the information disclosed in our sample investment announcements may not be perceived by investors as sufficiently reliable to increase investment efficiency. Alternatively, systematic differences in the Australian environment relative to other countries may weaken the relationship between disclosure quality and investment efficiency. Accordingly, we also test the relation between FRQ and investment efficiency for the Australian

market (excluding extractive and banking industries).[3] Our measure of FRQ is based upon discretionary revenues following McNichols and Stubben (2008), and our Australian results are consistent with prior findings that firms with higher FRQ have greater investment efficiency. Accordingly, it is unlikely that country factors are influencing our results.

4.6.3 Sample composition

The full sample was divided into two sets of two groups according to sales growth and investment efficiency. Given that the two sets are not mutually exclusive, it is possible that some groups are redundant (if, for example no overinvesting firms experience negative sales growth), or that some groups merely reflect a single industry. Figure 2 depicts the four possible combinations of investment efficiency and sales growth by industry. Both underinvesting and overinvesting firms have a tendency to be experiencing positive rather than negative sales growth. However all industries are represented across most of the groups, hence it is unlikely that the sample composition and industry distributions are distorting the results.

5. Conclusions

Using a sample of Australian physical capital expenditure announcements to the ASX between 2008 and 2014, this study investigates the relationship between investment efficiency and investment transparency. The results reveal that lower investment efficiency increases the quantity and precision of financial information disclosed in project-level announcements. This situation arises when firms are overinvesting and when firms are experiencing positive sales growth. Further evidence reveals that these firms achieve higher profitability and cash flow from operations before and after the investment announcements. Positive sales growth firms also have the greatest funding needs, maintaining higher debt levels to sustain their investment. Hence the availability of liquid resources appears to support the aggressive investment practices of overinvesting and positive sales growth firms, and their greater need for debt financing gives their managers incentives to disclose more financial information in order to 'hype' the stock and reduce their costs of financing. In contrast, there is no evidence that investment efficiency influences investment transparency for underinvesting firms and those experiencing negative sales growth, possibly because there is less need for extensive disclosure when external financing requirements are low. This is consistent with

[3] We test the Australian market rather than our sample because our sample size is too small to allow the FRQ model to be estimated in the cross-section for each year and industry.

Mohamed and Schwienbacher (2016), who find that venture capital investment disclosure is less likely when leverage is low.

Considering potential reverse causality, this study also reveals that investment transparency of a sample of Australian investment announcements does not enhance investment efficiency. This is contrary to previous research indicating that greater FRQ mitigates overinvestment by reducing information asymmetry between firm insiders and suppliers of capital (Biddle et al., 2009; Cutillas Gomariz & Sánchez Ballesta, 2014). Our interpretation is that unlike audited financial statements, managers' forecasts of project profitability are unsubstantiated and hence are less effective in reducing information asymmetries.

This study contributes to the literature that supports agency theoretic explanations of firm-level disclosures, presenting evidence consistent with a view that managers who are investing inefficiently disclose more financial information about their new capital expenditure projects in order to justify their empire building and deviations from optimal investment. In contrast, when managers are investing optimally, there may be less pressure from regulators or investors for managers to reveal their proprietary information. This is important because investors partially rely on information disclosed by managers to assess the future prospects and value of the firm. We also contribute to the investment efficiency literature, finding no evidence to suggest that investment transparency positively influences investment efficiency. Rather, opaque disclosure does not necessarily imply investment inefficiency, while more extensive disclosures may be used by managers in an attempt to talk-up the stock price. This highlights the importance of distinguishing between types of disclosures, suggesting that not all disclosures are equal. Hence investors need to consider the source of a disclosure and its credibility before relying on it for investment decision-making.

There are some limitations to our study. First, although we collect information on all known Australian physical capital expenditure announcements outside of the resource and banking sectors during the sample period, the sample size is small, which limits the number of explanatory variables in the 3SLS analysis. To test the veracity of our results, it would be useful to replicate the study in a larger jurisdiction where continuous disclosure rules apply. Second, although our investment efficiency proxy has the advantage of comparability with previous research, it is subject to measurement error. Third, although we study project-level announcements, in the absence of actual project-level outcomes we are unable to assess the forecasting accuracy of the sample investment announcements. For example, we cannot determine whether or not firm overinvestment eventually

pays off. Finally, our finding that investment transparency does not enhance investment efficiency reflects the Australian information environment and is specific to physical capital expenditure announcements to the ASX. Indeed, an important point that we raise is that unlike audited annual reports, these managerial disclosures are not substantiated in any way. It would be helpful for researchers to continue to explore the investment efficiency implications of different types of investment disclosures to the public.

Appendix: Variable Definitions

$InvEff_{i,t}$	Absolute value of residuals from equation (3) investment model multiplied by -1
Overinvest	Positive residuals from equation (3) investment model multiplied by -1.
Underinvest	Negative residuals from equation (3) investment model.
$DQ_{j,i,t}$	The total number of quantitative measures regarding the profitability, cost and horizon of project j disclosed in a new capital expenditure announcement for firm i in year t.
$LnAssets_{i,t-1}$	Log of lagged total assets.
$MB_{i,t-1}$	Lagged value of (market value of equity plus total assets – book value of equity)/total assets.
$SD\_CFO_{i,t-1}$	Standard deviation of cash flow from operating activities divided by average total assets from years t-5 to t-1.
$SD\_Sales_{i,t-1}$	Standard deviation of sales divided by average total assets from years t-5 to t-1.
$SD\_Inv_{i,t-1}$	Standard deviation of capital expenditures minus sales of property, plant and equipment, divided by average total assets from years t-5 to t-1.
$Z_{i,t-1}$	Financial strength based on Altman's (1968) Z-score: Lagged value of (0.012 × working capital + 0.014 × retained earnings + 0.033 × earnings before interest and taxes + 0.999 × sales)/total assets + (0.006 × market value of equity/book value of total debt).
$Tangy_{i,t-1}$	Lagged value of net property, plant and equipment divided by total assets.
$KStruct_{i,t-1}$	Lagged value of long-term debt divided by the sum of long-term debt and market value of equity.
$LnCFO_{i,t-1}$	CFO = Cash flow from operating activities divided by total sales. If lagged value of CFO > 0, *LnCFO* = log(1 + lagCFO); If lagged value of CFO < 0, *LnCFO* = -log(1 - lagCFO).
$Cash_{i,t-1}$	Lagged value of cash and short-term investments divided by total assets.
$Div_{i,t-1}$	One if a dividend was paid in year t-1, and zero otherwise.
$LnAge_{i,t}$	Log of number of years that firm i has been in the Worldscope database.
$OpCycle_{i,t-1}$	Log of lagged value of receivables divided by sales plus inventory divided by cost of goods sold multiplied by 365.
$Loss_{i,t-1}$	One if net income before extraordinary items and preferred dividends in year t-1 is negative, and zero otherwise.
$Investment_{i,t}$	Capital expenditures minus sales of property, plant and equipment in year t, divided by lagged total assets.

$Neg_{i,t-1}$	One if sales growth from years t-2 to t-1 is negative, and zero otherwise.
$SalesGrowth_{i,t-1}$	Rate of change in sales from years t-2 to t-1.
$PropIntang_{i,t-1}$	Lagged value of intangible assets excluding goodwill, divided by total assets.
$SDEarnings_{i,t-1}$	Standard deviation of earnings before extraordinary items divided by total assets from years t-5 to t-1.
$LnAnalysts_{i,t}$	Log of one plus analysts following.
$RetVol_{i,t-1}$	Standard deviation of monthly stock returns over the previous fiscal year.
$ClSh_{i,t}$	Number of shares held by insiders divided by ordinary shares outstanding * 100.

References

Abel, A. B. (1983). Optimal investment under uncertainty. *American Economic Review, 73*(1), 228-233.

Aboody, D., & Kaszsnik, R. (2000). CEO stock option awards and the timing of corporate voluntary disclosures. *Journal of Accounting & Economics, 29*(1), 73-100.

Akerlof, G. A. (1970). Market for 'lemons': Quality uncertainty and market mechanism. *Quarterly Journal of Economics, 84*(3), 488-500. doi:10.2307/1879431

Alexander, B., Philip, V., & Mai, D. (2009). Determinants of intellectual capital disclosure: evidence from Australia. *Management Decision*(2), 233. doi:10.1108/00251740910938894

Ali, A., Klasa, S., & Yeung, E. (2014). Industry concentration and corporate disclosure policy. *Journal of Accounting and Economics, 58*(2-3), 240-264. doi:10.1016/j.jacceco.2014.08.004

Altman, E. I. (1968). Financial ratios, discriminant analyis and prediction of corporate bankruptcy. *Journal of Finance, 23*(4), 589-609. doi:10.2307/2978933

Amihud, Y., & Mendelson, H. (1989). The Effects of beta, bid-ask spread, residual risk, and size on stock returns. *Journal of Finance, 44*(2), 479-486.

ASX Listing Rules Guidance Note 8, (2013).

Ball, R., & Brown, P. (1968). Empirical evaluation of accounting income numbers. *Journal of Accounting Research, 6*(2), 159-178.

Beekes, W., Brown, P., & Zhang, Q. (2015). Corporate governance and the informativeness of disclosures in Australia: A re-examination. *Accounting and Finance, 55*(4), 931-963. doi:10.1111/acfi.12088

Beyer, A., Cohen, D. A., Lys, T. Z., & Walther, B. R. (2010). The financial reporting environment: Review of the recent literature. *Journal of Accounting and Economics, 50*(2-3), 296-343. doi:10.1016/j.jacceco.2010.10.003

Beyer, B., Herrmann, D., & Rapley, E. T. (2015). *Disaggregated capital expenditures*. Available at SSRN: http://ssrn.com/abstract=2587124 or http://dx.doi.org/10.2139/ssrn.2587124

Biddle, G. C., Callahan, C. M., Hong, H. A., & Knowles, R. L. (2016). *Do adoptions of International Financial Reporting Standards enhance capital investment efficiency?* Available at SSRN: http://ssrn.com/abstract=2353693

Biddle, G. C., Hilary, G., & Verdi, R. S. (2009). How does financial reporting quality relate to investment efficiency? *Journal of Accounting and Economics, 48*(2-3), 112-131. doi:10.1016/j.jacceco.2009.09.001

Botosan, C. A., & Plumlee, M. A. (2002). A re-examination of disclosure level and the expected cost of equity capital. *Journal of Accounting Research, 40*(1), 21-40.

Brailsford, T. J., & Yeoh, D. (2004). Agency problems and capital expenditure announcements. *Journal of Business, 77*(2), 223-256.

Bushee, B. J., & Leuz, C. (2005). Economic consequences of SEC disclosure regulation: evidence from the OTC bulletin board. *Journal of Accounting & Economics, 39*(2), 233-264. doi:10.1016/j.jacceco.2004.04.002

Cannizzaro, A. P., & Weiner, R. J. (2015). Multinational investment and voluntary disclosure: Project-level evidence from the petroleum industry. *Accounting, Organizations and Society, 42*, 32-47. doi:10.1016/j.aos.2015.01.002

Chen, F., Hope, O. K., Li, Q. Y., & Wang, X. (2011). Financial reporting quality and investment efficiency of private firms in emerging markets. *The Accounting Review, 86*(4), 1255-1288. doi:10.2308/accr-10040

Chen, J. J., Cheng, X., Gong, S. X., & Tan, Y. (2014). Do higher value firms voluntarily disclose more information? Evidence from China. *British Accounting Review, 46*(1), 18-32. doi:10.1016/j.bar.2013.06.003

Clinch, G., & Verrecchia, R. E. (1997). Competitive disadvantage and discretionary disclosure in industries. *Australian Journal of Management, 22*(2), 125-137.
Cutillas Gomariz, M. F., & Sánchez Ballesta, J. P. (2014). Financial reporting quality, debt maturity and investment efficiency. *Journal of Banking and Finance, 40*(1), 494-506. doi:10.1016/j.jbankfin.2013.07.013
Diamond, D. W., & Verrecchia, R. E. (1991). Disclosure, liquidity, and the cost of capital. *Journal of Finance, 46*(4), 1325-1359.
Dye, R. A. (1985). Disclosure of nonproprietary information. *Journal of Accounting Research, 23*(1), 123-145.
Easley, D., & O'Hara, M. (2004). Information and the cost of capital. *Journal of Finance, 59*(4), 1553-1583. doi:10.1111/j.1540-6261.2004.00672.x
Ellis, J. A., Fee, C. E., & Thomas, S. E. (2012). Proprietary costs and the disclosure of information about customers. *Journal of Accounting Research, 50*(3), 685-727. doi:10.1111/j.1475-679X.2012.00441.x
Ettredge, M., Guo, F., Lisic, L. L., & Tseng, K. (2016). *Technological competition and redacted disclosure*. Available at SSRN: http://ssrn.com/abstract=2727933
Graham, J. R., Harvey, C. R., & Rajgopal, S. (2005). The economic implications of corporate financial reporting. *Journal of Accounting & Economics, 40*(1-3), 3-73.
Grossman, S. J., & Hart, O. D. (1980). Disclosure laws and takeover bids. *Journal of Finance, 35*(2), 323-334.
Guo, R.-J., Lev, B., & Zhou, N. (2004). Competitive costs of disclosure by Biotech IPOs. *Journal of Accounting Research, 42*(2), 319-355.
Harford, J., & Powell, R. (2015). *Measuring the Effectiveness of Australia's statutory-backed continuous disclosure policy on 'innovative' investment disclosures* (51/2015). Available at SSRN: http://ssrn.com/abstract=2549383
Hayashi, F. (1982). Tobin's marginal q and average q: A neoclassical interpretation. *Econometrica, 50*(1), 213-224. doi:10.2307/1912538
Healy, P. M., & Palepu, K. G. (2001). Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature. *Journal of Accounting & Economics, 31*(1-3), 405-440.
Hope, O. K., & Thomas, W. B. (2008). Managerial empire building and firm disclosure. *Journal of Accounting Research, 46*(3), 591-626. doi:10.1111/j.1475-679X.2008.00289.x
Huang, P., & Zhang, Y. (2012). Does enhanced disclosure really reduce agency costs? Evidence from the diversion of corporate resources. *Accounting Review, 87*(1), 199-229. doi:10.2308/accr-10160
Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *American Economic Review, 76*(2), 323-329.
Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305-360.
Jones, D. A. (2007). Voluntary disclosure in R&D-intensive industries. *Contemporary Accounting Research, 24*(2), 487-522.
Jung, W.-O., & Kwon, Y. K. (1988). Disclosure when the market Is unsure of information endowment of managers. *Journal of Accounting Research, 26*(1), 146-153.
Kent, P., & Ung, K. (2003). Voluntary disclosure of forward-looking earnings information in Australia. *Australian Journal of Management (University of New South Wales), 28*(3), 273-285.
Khurana, I. K., Pereira, R., & Martin, X. (2006). Firm growth and disclosure: An empirical analysis. *Journal of Financial and Quantitative Analysis, 41*(2), 357-380.
Lai, S. M., Liu, C. L., & Wang, T. (2014). Increased disclosure and investment efficiency. *Asia-Pacific Journal of Accounting and Economics, 21*(3), 308-327. doi:10.1080/16081625.2012.741791

Lang, M. H., & Lundholm, R. J. (2000). Voluntary disclosure and equity offerings: Reducing information asymmetry or hyping the stock? *Contemporary Accounting Research, 17*(4), 623-662.

Lev, B. (1989). On the usefulness of earnings and earnings research: Lessons and directions from 2 decades of empirical research. *Journal of Accounting Research, 27*, 153-192. doi:10.2307/2491070

Li, X. (2010). The impacts of product market competition on the quantity and quality of voluntary disclosures. *Review of Accounting Studies, 15*(3), 663-711. doi:10.1007/s11142-010-9129-0

McNichols, M. F., & Stubben, S. R. (2008). Does earnings management affect firms' investment decisions? *Accounting Review, 83*(6), 1571-1603. doi:10.2308/accr.2008.83.6.1571

Miller, M. H., & Modigliani, F. (1961). Dividend policy, growth, and the valuation of shares. *Journal of Business, 34*(4), 411-433.

Mitchell, J. D., Chia, C. W. L., & Loh, A. S. (1995). Voluntary disclosure of segment information: Further Australian evidence. *Accounting & Finance, 35*(2), 1-16. doi:10.1111/j.1467-629X.1995.tb00283.x

Mohamed, A., & Schwienbacher, A. (2016). Voluntary disclosure of corporate venture capital investments. *Journal of Banking & Finance, 68*, 69-83. doi:10.1016/j.jbankfin.2016.03.001

Palmer, P. D. (2008). Disclosure of the impacts of adopting Australian equivalents of International Financial Reporting Standards. *Accounting & Finance, 48*(5), 847-870. doi:10.1111/j.1467-629X.2008.00262.x

Petersen, M. A. (2009). Estimating standard errors in finance panel data sets: Comparing approaches. *The Review of Financial Studies, 22*(1), 435-480. doi:hhn053

Richardson, S. (2006). Over-investment of free cash flow. *Review of Accounting Studies, 11*(2-3), 159-189. doi:10.1007/s11142-006-9012-1

Rogers, J. L., & Stocken, P. C. (2005). Credibility of management forecasts. *Accounting Review, 80*(4), 1233-1260.

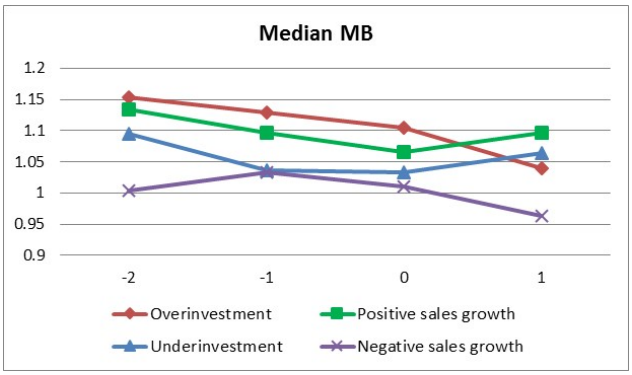
Verrecchia, R. E. (1983). Discretionary disclosure. *Journal of Accounting & Economics, 5*(3), 179-194. doi:10.1016/0165-4101(83)90011-3

Verrecchia, R. E. (2001). Essays on disclosure. *Journal of Accounting & Economics, 32*(1-3), 97-180.

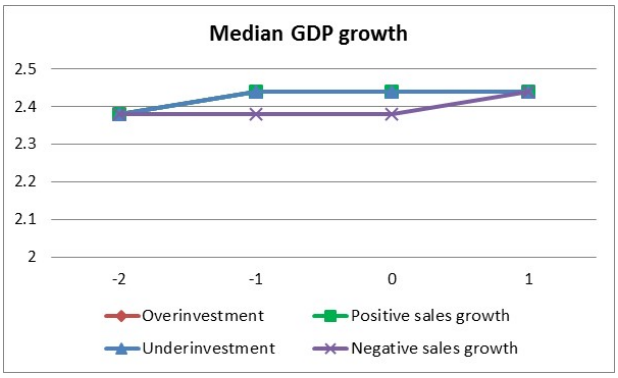
Wen, X. (2013). Voluntary disclosure and investment. *Contemporary Accounting Research, 30*(2), 677-696. doi:10.1111/j.1911-3846.2012.01169.x

Figure 1 Financial ratio values in the years around investment announcements across sample groups

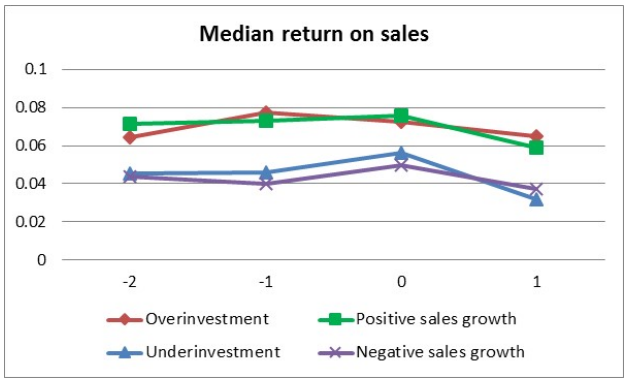
A



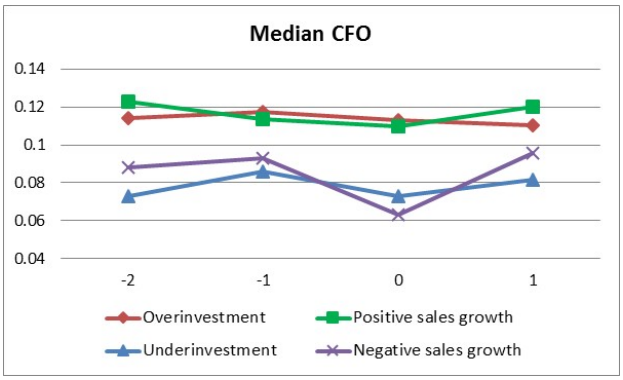
B



C



D



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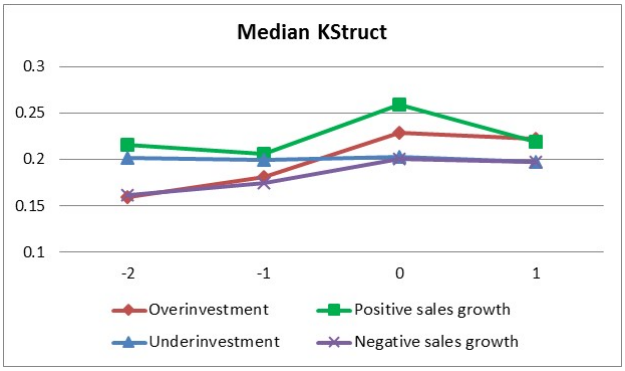

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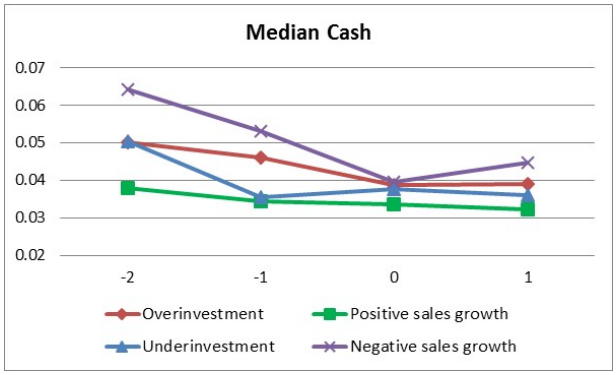
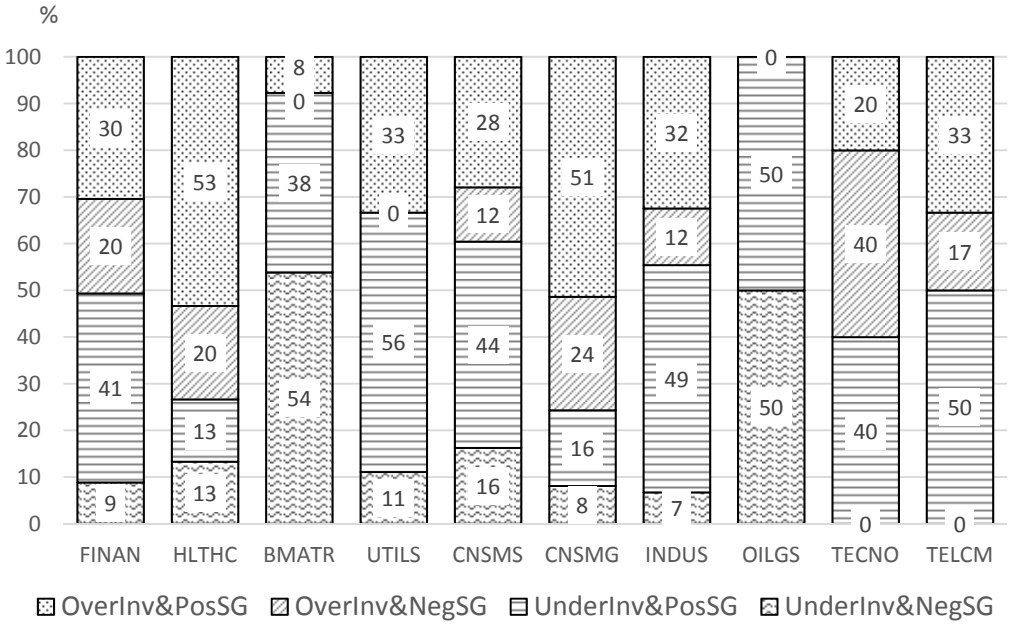


Figure 2. Sample composition: Investment efficiency and sales growth by industry



Industry composition by investment efficiency (overinvestment or underinvestment) and sales growth (positive or negative).

Table 1 Sample distribution and descriptive statistics of disclosure quality (*DQ*) by industry.

Industry	N	%	Mean	Median	Standard deviation	Min	Max
Basic materials	24	7.55	2.04	2	0.95	1	5
Consumer goods	41	12.89	2.56	3	1.16	0	4
Consumer services	48	15.09	2.71	3	1.09	1	5
Financial	83	26.10	2.75	3	0.91	1	5
Healthcare	16	5.03	2.44	2	1.09	1	5
Industrial	77	24.21	2.29	2	1.05	0	6
Oil and gas	6	1.89	3.17	3	1.17	2	5
Technology	8	2.52	1.63	2	0.74	1	3
Telecommunications	6	1.89	2.50	2	0.84	2	4
Utilities	9	2.83	1.89	2	0.60	1	3
Total	318	100.00	2.49	2	1.04	0	6

This table presents the industry distribution of sample capital expenditure announcements by Australian listed companies from 2008 to 2014. Industry classification is from Industry Classification Level 2 of Datastream. *DQ* is the main measure of investment transparency, and is the total number of quantitative measures regarding the profitability, cost and horizon of the project disclosed in the new capital expenditure announcement.

Table 2 Descriptive statistics.

	N	Mean	Median	Std. Dev.	Perc. 10	Perc. 90
(A) Continuous variables						
InvEff	285	-0.098	-0.032	0.195	-0.200	-0.006
Overinvest	139	-0.163	-0.072	0.262	-0.492	-0.006
Underinvest	146	-0.036	-0.024	0.037	-0.086	-0.004
DQ	318	2.487	2.000	1.044	1.000	4.000
LnAssets	313	12.454	12.490	2.359	9.572	15.678
MB	308	1.674	1.081	2.626	0.768	2.623
SD_CFO	311	0.060	0.029	0.079	0.007	0.158
SD_Sales	301	0.261	0.140	0.322	0.017	0.569
SD_Inv	261	0.076	0.026	0.173	0.007	0.121
Z	301	0.700	0.613	1.356	0.079	1.863
Tangy	313	0.314	0.217	0.295	0.006	0.776
KStruct	304	0.238	0.187	0.223	0.000	0.551
LnCFO	304	-0.008	0.092	0.621	-0.163	0.379
Cash	311	0.122	0.041	0.190	0.009	0.413
LnAge	302	2.067	2.079	0.583	1.386	2.708
OpCycle	289	4.648	4.707	1.138	3.293	5.791
PropIntang	297	0.063	0.003	0.138	0.000	0.171
SDEarnings	301	0.107	0.055	0.169	0.014	0.231
LnAnalysts	226	1.473	1.609	0.951	0.000	2.639
RetVol	314	0.114	0.086	0.086	0.035	0.232
ClSh	276	40.376	39.790	26.617	1.330	74.160
(B) Dichotomous variables		0 (N, %)			1 (N, %)	
Div	317	91	28.71%		226	71.29%
Loss	317	252	79.50%		65	20.50%

InvEff is the absolute value of residuals from the investment model multiplied by -1; *Overinvest* is the positive residuals from the investment model multiplied by -1; *Underinvest* is the negative residuals from the investment model; *DQ* is the sum of quantitative measures regarding the profitability, cost and horizon of project j disclosed in a new capital expenditure announcement for firm i in year t; *LnAssets* is the log of total assets; *MB* is the market value of equity plus total assets minus the book value of equity divided by total assets; *SD_CFO* is the standard deviation of cash flow from operating activities divided by average total assets from t-5 to t-1; *SD_Sales* is the standard deviation of sales divided by average total assets from t-5 to t-1; *SD_Inv* is the standard deviation of capital expenditures minus sales of property, plant and equipment, divided by average total assets from t-5 to t-1; *Z* measures financial strength; *Tangy* is net property, plant and equipment divided by total assets; *Kstruct* is long-term debt divided by the sum of long-term debt and market value of equity; *LnCFO* is a logarithmic transformation of cash flow from operating activities divided by total sales; *Cash* is cash and short-term investments divided by total assets; *LnAge* is the log of firm age in the Worldscope database; *OpCycle* is the log of receivables divided by sales plus inventory divided by cost of goods sold multiplied by 365; *PropIntang* is intangible assets excluding goodwill, divided by total assets; *SDEarnings* is the standard deviation of earnings before extraordinary items divided by total assets from t-5 to t-1; *LnAnalysts* is the log of one plus analysts following; *RetVol* is the standard deviation of monthly stock returns over the previous fiscal year, *ClSh* is the percentage of shares held by insiders divided by ordinary shares outstanding; *Div* is a dummy variable equal to one if a dividend was paid in year t-1, and zero otherwise; *Loss* is a dummy variable equal to one if net income before extraordinary items and preferred dividends in year t-1 is negative, and zero

otherwise. All financial variables are at the beginning of the fiscal year. All variables are winsorised at 1% and 99%.

Table 3

Panel A: Pearson correlation matrix for investment efficiency

	InvEff	DQ	LnAssets	MB	SD_CFO	SD_Sales	SD_Inv	Z	Tangy	Kstruct	LnCFO	Cash	Div	LnAge	OpCycle
InvEff	1														
DQ	-0.072	1													
LnAssets	0.287***	0.109*	1												
MB	0.024	-0.125**	-0.335***	1											
SD_CFO	0.052	-0.070	-0.484***	0.390***	1										
SD_Sales	0.061	-0.061	-0.387***	0.070	0.400***	1									
SD_Inv	-0.607***	0.204***	-0.232***	0.024	-0.089	-0.123**	1								
Z	0.099	0.078	0.047	-0.300***	0.074	0.372***	-0.172***	1							
Tangy	-0.184***	0.072	0.230***	-0.101*	-0.229***	-0.292***	0.333***	-0.151***	1						
KStruct	-0.088	0.075	0.333***	-0.214***	-0.260***	-0.251***	0.283***	-0.103*	0.402***	1					
LnCFO	0.198***	0.127**	0.487***	-0.404***	-0.346***	0.021	-0.017	0.218***	0.196***	0.175***	1				
Cash	-0.029	-0.181***	-0.416***	0.371***	0.501***	0.160***	-0.078	-0.098*	-0.274***	-0.369***	-0.336***	1			
Div	0.117**	0.204***	0.579***	-0.208***	-0.426***	-0.238***	0.053	0.097*	0.208***	0.287***	0.477***	-0.454***	1		
LnAge	0.150**	0.064	0.301***	0.021	-0.052	-0.136**	-0.236	0.082	-0.098*	-0.116**	0.079	-0.049	0.123**	1	
OpCycle	-0.088	-0.060	-0.100*	0.007	-0.020	-0.119**	0.158**	-0.119**	-0.087	-0.029	-0.158***	-0.027	-0.022	-0.060	1
Loss	-0.005	-0.096*	-0.308***	0.243***	0.260***	0.073	-0.071	-0.206***	-0.133**	-0.097*	-0.474***	0.259***	-0.489***	-0.080	-0.007

Panel B: Pearson correlation matrix for investment transparency

	DQ	InvEff	PropIntang	SDEarnings	MB	lnAnalysts	RetVol	ClSh	LnAssets
DQ	1								
InvEff	-0.072	1							
PropIntang	-0.056	-0.129**	1						
SDEarnings	0.002	-0.028	0.049	1					
MB	-0.125**	0.024	-0.027	0.478***	1				
lnAnalysts	-0.031	0.355***	0.045	-0.295***	-0.048	1			
RetVol	-0.190***	-0.194***	0.175***	0.210***	0.218***	-0.391***	1		
ClSh	-0.057	-0.033	-0.059	0.016	-0.064	-0.474***	0.000	1	
LnAssets	0.109*	0.287***	-0.088	-0.547***	-0.335***	0.751***	-0.430***	-0.342***	1

See Appendix for variable definitions. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 4 The effect of investment transparency on investment efficiency

	(1) InvEff	(2) PosSGrowth	(3) NegSGrowth	(4) OverInvest	(5) UnderInvest
DQ	-0.005	-2.158***	-1.374	-1.016	-0.930*
	(-0.68)	(-2.75)	(-1.54)	(-1.18)	(-1.70)
LnAssets	0.010	0.705	1.882**	0.780	-0.025
	(1.63)	(1.17)	(2.11)	(0.83)	(-0.07)
MB	0.022**	1.296	0.581	2.630*	-0.340
	(2.47)	(1.23)	(1.15)	(1.71)	(-1.52)
SD_CFO	0.022	-45.563**	53.550	-18.222	-1.457
	(0.89)	(-2.28)	(1.59)	(-0.74)	(-0.16)
SD_Sales	-0.005	-8.854**	-16.803**	-30.419***	-2.340
	(-0.14)	(-2.23)	(-2.34)	(-5.55)	(-1.16)
SD_Inv	-0.572***	-35.834***	98.692***	-44.771***	-9.983*
	(-4.99)	(-4.23)	(2.99)	(-6.75)	(-1.71)
Z	-0.015	4.195***	-1.118	9.397***	0.383
	(-1.15)	(3.56)	(-1.11)	(5.93)	(0.68)
Tangy	-0.080	-2.040	-10.221	-1.305	-7.139
	(-1.64)	(-0.45)	(-1.19)	(-0.20)	(-1.50)
KStruct	-0.027	2.939	-16.979**	-0.033	6.096
	(-0.49)	(0.40)	(-2.05)	(0.00)	(0.96)
LnCFO	0.165**	2.432	9.709**	20.833***	-1.763
	(2.54)	(0.74)	(2.30)	(4.83)	(-0.86)
Cash	-0.130*	4.215	-20.824*	-3.230	6.943
	(-1.83)	(0.97)	(-1.97)	(-0.36)	(1.52)
Div	-0.015	-4.174	6.385	-5.929	5.889
	(-0.58)	(-1.64)	(1.60)	(-1.28)	(1.61)
LnAge	0.018	-2.373	-0.395	-1.021	2.717
	(0.64)	(-0.74)	(-0.14)	(-0.25)	(1.11)
OpCycle	0.002	-0.525	-2.025	0.141	0.981
	(0.28)	(-0.90)	(-1.44)	(0.10)	(1.22)
Loss	0.033	-1.679	5.878**	4.743	2.544
	(1.22)	(-0.70)	(2.09)	(1.47)	(1.06)
Intercept	-0.231***	-5.273	-11.411	-20.917*	-20.192*
	(-2.69)	(-0.78)	(-1.01)	(-1.71)	(-1.67)
Industry dummies	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Adj R^2	0.547	0.559	0.523	0.684	0.164
F	10.37	8.06	3.37	9.25	1.85
p>F	0.000	0.000	0.000	0.000	0.013
Obs	234	168	66	108	131

See Appendix 1 for variable definitions. Coefficient estimates are from OLS cross-sectional regressions, with t-statistics clustered at the firm level and robust to heteroskedasticity in parentheses below. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 5 Determinants of investment transparency

	(1) DQ	(2) PosSGrowth	(3) NegSGrowth	(4) OverInvest	(5) UnderInvest
InvEff	-0.705**	-1.092***	-0.110	-1.454**	0.381
	(-2.02)	(-3.34)	(-0.05)	(-2.56)	(0.10)
PropIntang	-0.263	-0.154	-0.417	-0.005	-0.113
	(-0.68)	(-0.20)	(-1.07)	(-0.00)	(-0.36)
SDEarnings	3.268***	3.717***	3.985*	2.798	2.451**
	(2.87)	(3.50)	(1.70)	(1.13)	(2.06)
MB	-0.136***	-0.218**	-0.134***	-0.237*	-0.124***
	(-3.33)	(-2.19)	(-2.92)	(-1.76)	(-4.10)
LnAnalysts	0.245**	0.265*	0.271	0.351**	0.181
	(2.32)	(1.70)	(1.25)	(2.29)	(1.33)
RetVol	-4.080**	-1.005	-9.427***	-5.459*	-2.767
	(-2.38)	(-0.49)	(-2.78)	(-1.85)	(-1.24)
ClSh	-0.003	0.004	-0.018*	-0.005	0.000
	(-0.77)	(0.94)	(-2.01)	(-0.94)	(0.01)
LnAssets	-0.130**	-0.093	-0.206*	-0.094	-0.177**
	(-1.99)	(-1.07)	(-1.86)	(-0.87)	(-2.54)
Tech Industry	-0.755***	-0.403			-0.976***
	(-3.37)	(-1.57)			(-4.07)
Intercept	4.438***	3.363***	6.792***	3.984**	5.097***
	(4.37)	(2.64)	(4.35)	(2.29)	(4.26)
Industry dummies	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Adj R^2	0.108	0.122	0.339	0.1376	0.063
F	3.31	2.99	3.67	2.67	1.65
p>F	0.000	0.002	0.002	0.009	0.107
Obs	192	144	48	95	97

See Appendix 1 for variable definitions. Coefficient estimates are from OLS cross-sectional regressions, with t-statistics clustered at the firm level and robust to heteroskedasticity in parentheses below. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 6 Three-stage least squares regression

	(1) All	(2) PosSGrowth	(3) NegSGrowth	(4) OverInvest
Panel A: Investment efficiency				
DQ	-0.002	0.000	0.020	0.014
	(-0.08)	(0.00)	(0.78)	(0.38)
LnAssets	0.017***	0.013**	0.023***	0.027***
	(3.70)	(2.25)	(3.03)	(3.38)
MB	0.002	-0.008	0.007	0.016
	(0.37)	(-0.57)	(1.20)	(1.13)
SD_Inv	-0.678***	-0.705***	0.413	-0.767***
	(-11.86)	(-10.48)	(1.14)	(-9.01)
LnCFO	-0.015	-0.024	-0.032	-0.071
	(-0.55)	(-0.70)	(-0.53)	(-0.99)
Intercept	-0.261***	-0.202	-0.450***	-0.480***
	(-2.66)	(-1.14)	(-4.47)	(-4.25)
Panel B: Investment transparency				
InvEff	-1.649***	-1.378**	5.186	-2.096***
	(-2.73)	(-2.25)	(0.74)	(-2.91)
SDEarnings	2.684***	2.452**	5.236	3.079
	(2.89)	(2.41)	(1.63)	(1.39)
MB	-0.102*	-0.186*	-0.140*	-0.186
	(-1.86)	(-1.76)	(-1.78)	(-1.43)
LnAnalysts	0.199	0.169	0.387**	0.415**
	(1.59)	(0.92)	(2.20)	(2.11)
RetVol	-2.556	-1.389	-6.502	-4.277
	(-1.45)	(-0.66)	(-0.91)	(-1.42)
LnAssets	-0.011	-0.069	-0.074	0.018
	(-0.15)	(-0.70)	(-0.70)	(0.16)
Tech Industry	-0.666	-0.587		
	(-0.65)	(-0.56)		
Intercept	2.600***	3.43***	3.999***	1.976
	(2.73)	(2.65)	(2.81)	(1.23)
Industry dummies	No	No	No	No
Year dummies	No	No	No	No
Weighted R^2	0.505	0.552	0.371	0.659
Degrees of freedom	369	265	90	168

See Appendix 1 for variable definitions. Coefficient estimates are from three-stage least squares regressions. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.