Executive Compensation, Hubris, Corporate Governance: Impact on Managerial Risk Taking and Value Creation in UK High-tech and Low-tech Acquisitions

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ABSTRACT

While the traditional agency model assumes managerial risk aversion and under-investment in high tech opportunities, the behavioural agency model allows for risk seeking by managers leading possibly to over-risky investment. Corporate governance mechanisms can correct both under- and over- risky investment thereby ensuring value enhancing high tech acquisitions. Our study builds an empirical optimal risk model to identify the drivers of managerial risk taking by comparing UK high-tech and low-tech acquisitions. We then classify actual acquisitions into optimal risk, over-risk and under-risk acquisitions. We test whether under-risk and over-risk acquisitions underperform optimal-risk acquisitions in terms of 3-year post-acquisition shareholder wealth gains. Our main results demonstrate that none of the compensation contracts has any impact on managerial risk preferences in acquisitions while LTIP share award may discourage managers from high-tech acquisitions. Good past performance, stock market glamour status and flattering media profile that enhance managerial hubris make acquirer managers risk-seekers in favour of high-tech acquisitions. Corporate governance structure does not have a material impact on managers’ acquisition risk preferences. High-tech acquisitions as well as low-tech acquisitions destroy shareholder value but there is little difference between them. We find no major performance difference between acquisitions in optimal and suboptimal risk groups. We offer possible reasons for this result.

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1. Introduction

In the traditional agency model of a firm, managers as agents of shareholders may make investment and financing decisions that serve their own interests to the detriment of shareholder interests. Shareholders rely on a range of corporate control devices to promote alignment of their interests and those of managers. Among these are the executive compensation contracts, independent board of directors, external audit etc. Executive compensation contracts may be designed to provide pecuniary incentives for managers to pursue value maximising investment and financing policies. Compensation contracts by themselves may not resolve all the conflicts between managers and shareholders.

One source of conflict arises from the different risk preferences of shareholders and managers in making investment and financing choices. Shareholders by holding their wealth in well diversified portfolios diversify away firm-specific risk and are therefore specific risk-neutral. On the other hand managers whose human capital is invested in their own firm hold an undiversified portfolio. When their money capital is invested in their company's stock, the degree of non-diversification is accentuated. Such a portfolio exposes managers to a high level of both systematic and firm specific risk (Jin, 2002). This induces managers to be risk averse. A consequence of such risk aversion is that managers may pass up valuable, but high risk, investment opportunities thereby causing shareholders opportunity losses (Guay, 1999).

A compensation package that enhances the managers' pay in line with increase in corporate performance or the firm's stock value i.e. with a high pay-to-performance sensitivity has generally been thought of as a solution to the problem of managerial self-interest pursuit. Cash bonus, long term incentive plans (LTIPS) that reward managers when they achieve pre-determined performance benchmarks over a pre-determined period are designed to achieve this objective. In the 1990s, many companies especially in sectors with high but uncertain levels of anticipated growth and value gains e.g. Internet, included stock options among the compensation components. An important characteristic of stock options is their value is sensitive not only to the price of the firm stock but also to the volatility of that price. Another is that managers face no downside risk when the stock price falls below the benchmark performance level (the exercise price) but can reap enormous payoffs when performance far exceeds that benchmark. Stock options are thus intended to encourage managers to make high risk investment and financing decisions thereby offsetting their risk aversion due to their undiversified wealth portfolio.

Recent executive compensation literature has raised intriguing questions about the risk incentive effects of different compensation components. These may be broadly divided into: fixed salary and cash bonus, stock grants through LTIPs and stock options ('stocks' and 'shares' used interchangeably hereafter). It has been argued that fixed compensation inclines managers to avoid risk. Similarly, stock grants may also induce risk aversion even though they may enhance pay-to-performance sensitivity. On the other hand, stock options promote risk taking. An important consideration here is whether stock options encourage managers to seek excessive risk i.e. indulge in inordinate gambles. Such excessive risk taking may lead to investment and financing decisions that are too speculative and end up destroying value.

Even without the inducement of stock options managers may be risk-seekers rather than risk-avoiders as postulated by the traditional agency model. According to the behavioural agency school, managers are prone to biases such as hubris, overoptimism and overconfidence (Wiseman and Gomez-Mejia, 1998). These may be manifested in high risk and speculative investments with managers underestimating their risk. Thus either due to the risk incentives of options or behavioural proclivities, manager may choose high risk financing and investment policies. How do shareholders ensure that the above mix of managerial risk incentives and biases leads to neither too much risk taking nor too little? Corporate governance mechanisms through their monitoring role can steer managers towards 'optimal' risk and avoid value destroying risk-deficit or risk-excess on the part of their managers.

In this paper we empirically test the impact of compensation contracts and behavioural biases on managerial risk preferences. We hypothesise that this impact will be mediated and moderated by a variety of corporate governance devices. We choose the acquisition decision as the appropriate context since an acquisition is a visible and relatively large investment decision with an observable impact on the risk profile of acquirers. We classify a sample of UK acquisitions in terms of their risk profile – over-risky, under-risky or optimally risky investments conditional upon the acquirer's executive compensation arrangements, scope for acquirer executives' behavioural bias and the firm's corporate governance structure. We measure the impact of the risk profile of acquisitions on long term post-acquisition shareholder wealth gains.

We focus on high-tech and low-tech target acquisitions in the 1990s. High-tech sectors include telecommunications, computers, the Internet, biotechnology, etc. Many of the acquisitions were driven by the vision of technology convergence among these sectors. Value creation logic of these high-tech acquisitions rests on new growth opportunities as well as revenue enhancements through, say, cross-selling of the merging partners' products and services. By contrast, low-tech acquisitions happen in industries with a low level of technology and intellectual assets such as food, retail, and publishing industries. Value gains[1] of these acquisitions rely less on growth opportunities but more on cost reduction and revenue enhancement that exploit established products and established markets. Given the dominance of new growth opportunities as a source of value gains in high-tech mergers and acquisitions (M&As), the scope for valuation errors for such acquisitions is greater than for low-tech acquisitions. Thus high-tech acquisitions are likely to be considerably more risky than low-tech acquisitions.

Our results with a sample of about 900 acquisitions of both high-tech and low-tech targets in the UK during the 1990s show that, apart from LTIP shares,

[1] Sudarsanam (2003) identifies three broad sources of value: revenue enhancement, cost savings and real options that create valuable growth opportunities. Their importance differs in different types of acquisitions: cost savings in mergers in mature industries, revenue enhancement in mergers driven by enhanced market power or sharing of marketing capabilities, and real options in mergers of firms that share resources and capabilities e.g. R & D, intellectual assets in high-tech sectors. These sources also differ in acquirer's ability to value the acquisition (valuation risk) and post-acquisition integration.

compensation components such as fixed salary and bonus, LTIP cash grants, stock options have little impact on the riskiness of the acquisitions. We identify significant determinants of the acquisition probability of high tech, high risk targets relative to low-tech, low risk targets. LTIP shares make managers choose under-risky acquisitions. Managerial wealth in the form of their shareholding in their companies has no impact. Behavioural bias reflecting hubris and high media profile of the top management significantly induce them to accept over-risky acquisitions. Similarly, acquirers with glamour rating in the stock market tend to make more risky acquisitions. The presence of a remuneration committee of the board encourages more risky acquisitions. Acquirers in high risk industries also tend to make riskier acquisitions. These results are not fully replicated when we redefine risk in terms of the high-risk versus low-risk of both acquirer and target firms but the impact of behavioural variables remains. Other monitoring mechanisms generally do not have much impact on managers' risk preferences in acquisitions.

On the basis of our empirical risk model, we identify a substantial number of acquisitions whose risk profile is over-risky or under-risky. We estimate the 3-year abnormal returns to acquirers using three different benchmarks. While these returns are generally negative, consistent with earlier evidence of post-acquisition performance, there is no significant or consistent evidence that high risk, high-tech acquisitions destroy more value than low risk, low-tech acquisitions. We find evidence that under-risky acquisitions generate less shareholder gains than optimal-risk acquisitions but over-risky acquisitions generate more value. This result is however period-sensitive. In 1998-2000, the peak of the 1990s merger wave, it is under-risky investment that creates more value. These results concerning the impact of sub-optimal risk acquisitions on value creation are counter-intuitive.

The paper is organised as follows. Section 2 sets out the theoretical framework Section 3 describes the methodology for identifying under-risky and over-risky acquisitions and for estimating the post-acquisition shareholder value gains. It also describes the sampling and variable definitions and data sources. Results are presented and discussed in Section 4. The last section summarises the study, discussed the results and sets out the lines of future research.

2. Theoretical framework

In this section we develop a framework for analysing the impact of executive compensation and other relevant factors on the riskiness of acquisitions. We draw upon the traditional agency model, the behaviourist extension of that model, the role of executive compensation contracts in aligning shareholders' and managers' interests and the corporate governance-based monitoring mechanisms that promote such alignment. We build an empirical model of optimal acquisition risk and estimate the extent of shareholder value loss in suboptimally risky acquisitions. The framework is outlined in Figure 1 and developed in detail below.

Figure 1 here

2.1 Managerial risk aversion in traditional agency model of the firm

Shareholders of a firm are exposed to both market (systematic) risk and firm-specific risk but can eliminate the latter by investing their wealth in a well-diversified portfolio of stocks and securities. As a result they may be risk-neutral as regards firm-specific risk. Managers, as agents, are still considered to be risk averse since their employment security and income are tied to one firm (Fama,1980, Kroll et al, 1993). They may also be holding shares in their companies thereby accentuating the concentration of their human and money capital in one firm. This division of risk attitudes can give rise to risk-related agency problems (Smith and Stulz, 1985; Guay, 1999).

Shareholders would like managers to invest in all positive net present value (NPV) projects, irrespective of their risk. Managers, however, may choose not to accept some positive NPV projects that would increase firm risk. By doing so, managers secure their job, income and other pecuniary returns. The value foregone due to such risk avoidance is a risk-related agency cost to shareholders (Guay, 1999). Persistent under-investing in risky projects would make those firms gradually lose competitive advantage. This problem is likely to be most severe in firms with abundant growth opportunities e.g. high tech industries (Milgrom and Roberts, 1992, ch. 3).

Compensation contract, equity ownership and managerial risk incentives

Due to information asymmetry, shareholders' ability to monitor whether a project chosen by managers is optimal or suboptimal as regards its risk level is limited. It is thus in the interests of shareholders to design appropriate corporate control mechanisms to drive managers to select value enhancing risky projects (Jensen and Meckling, 1976; Fama and Jensen, 1983). Compensation contracts that link a portion of compensation to firm performance is one of the key corporate control devices. (Barber et al, 1996; Core et al., 2003). However, not all compensation contracts may be equally effective in aligning both parties' risk preferences. For example, managerial stock ownership increases the proportion of their wealth invested in their own firms and does not reduce the degree of non-diversification of their portfolios. Thus stock ownership *per se* may not encourage managers to become risk-seekers. Stock options on the other hand may encourage risk preference since the negative payoffs from options are limited unlike in the case of stocks.

2.2 Compensation components and risk incentives

There are mainly three types of compensation contracts:

(1) fixed pay, i.e. any contractually guaranteed pay, such as basic salary, fees paid to non-executive directors, pension contributions and related benefits;

(2) short-term incentive plan, i.e. annual bonus which is tied to yearly accounting performance;

(3) long-term incentive plan LTIP, including (cash or share awards) and share options. In the UK, LTIPs typically are tied to multi-year performance, either accounting-based or market-based.

Both short-term and long-term incentive plans offer variable remuneration that links executive compensation to firm performance.

Risk incentives from short term performance related compensation

Fixed compensation has few incentive components (Gray and Cannella, 1997). Its pay-to-performance sensitivity is negligible. Fixed compensation could help protect executives from factors beyond their control, such as poor *ex post* outcomes from strategies that, *ex ante*, appeared promising. A high level of such compensation creates the incentive for managers to avoid risk and protect their existing income. Short-term bonus often ties managers' remuneration to yearly accounting numbers, such as profit, return on capital employed and EPS. Managerial decisions may be heavily influenced by the effects of their investment decisions on annual bonuses. Narayanan (1985) demonstrates that managers select projects yielding short-term profits and that cash only incentive contracts, i.e. fixed compensation or annual bonus result in underinvestment in long-term projects. Short term performance focus thus encourages managers to forego investments whose payoffs are long term and more risky.

Risk incentives from long term-performance related compensation

Theoretically, LTIPs better align managerial and shareholder interests by redirecting managerial decision-making toward long-term performance. LTIPs are typically awards or grants of shares that become vested, i.e. ownership is transferred to directors, only upon attainment of certain performance objectives over a period of time, generally 3 years. LTIPs can also be awarded in cash. Stock option is the right to purchase stock at a pre-specified exercise price for a pre-specified term conditional upon certain pre-determined performance benchmarks being achieved.

However, it is not universally agreed that equity-based compensation and managerial equity ownership are effective in alleviating the risk-related agency conflicts (Core et al, 2003). Researchers who consider long-term incentive plans ineffective argue that such plans intensify concentration of managers' wealth in their own firms and consequently reduce their tolerance for additional risk (Lambert, 1986; Hambrick and Mason 1984; Wiseman and Gomez-Mejia, 1998)[2]. Where *ex post* managerial performance measure is noisy, managers avoid investing in risky projects because of their expectation that their effort may not be rewarded properly (Jenter, 2002). Ross (2004), based on his theoretical model, concludes that no incentive scheme could make managers more or less risk averse since their attitude also depends upon their personal utility functions at different wealth levels.

Payoff structure of equity-based compensation and risk incentive

Stock grants as well as stock options are equity-based arrangements in which managers receive or invest in their company's stock. The payoff structure of stock grant and stock option are however different. With a stock grant, with every $ increase (decrease) in the value of the firm stock, managerial wealth increases (decreases) by $1. This linear payoff, by not limiting the downside risk, increases

[2] If managers can hedge this increased risk through short sales of their company stock and increase investment in other securities in the market they can achieve greater diversification of their personal portfolio. However, managers may be subject to restrictions on market trading of their firm stock for a number of reasons. (Jin, 2002; Jenter, 2002))

managerial risk aversion. On the other hand, with a stock option, above the exercise price, a $ increase (decrease) in firm stock value increases (decreases) managerial wealth by a $ but below the exercise price, a fall in the firm stock value does not reduce managerial wealth. Thus stock option has an asymmetric, convex payoff structure.

A measure of the incentive effect of stock grant is the sensitivity, called ***delta***, of the value of managerial stock holding to a $ change in the underlying firm stock value. The higher the delta, the greater is the pay-to-performance sensitivity of the compensation scheme. In the case of stock option, there are two corresponding sensitivities – delta and ***vega***, the variation in the $ value of the managerial stock options when the variability (variance or standard deviation) of the firm stock returns changes by 1%. Vega is a measure of the sensitivity of managerial compensation to the volatility i.e. risk of the firm stock value and therefore to the riskiness of the investment decisions made by the managers. Investment decisions that seek to capitalise on real options with high payoff uncertainties (Copeland and Tufano, 2004) will have high vega. Empirical studies have employed both delta and vega (on how these are calculated see below) to measure the impact of managerial compensation contracts on performance as well as risk taking behaviour.

Studies on LTIPs generally show that such plans are not effective (Bryan et al, 2000)[3]; Ryan and Wiggins, 2002). Although subject to performance criteria, LTIP share award has a linear payoff. Thus directors receiving share awards in the meantime bear the potential wealth loss from risky investment projects. Unless paid an adequate premium for this added risk, directors are likely to forego value-increasing risky projects, resulting in the underinvestment problem (Smith and Stulz, 1985)[4].

Managerial equity holding may have been accumulated through realised LTIP stock grants or exercised stock options in the past. Whatever the source of such accumulation, equity ownership has the same linear payoff function as LTIP share

[3] Conyon and Murphy (2000) report that LTIP shares are only 9% of the whole CEO compensation for 510 largest UK companies in 1997, while 77% are in salaries and bonuses. This small percentage of LTIP shares in the whole CEO's wealth portfolio is not able to outweigh the risk-averse effect from the fixed compensation and bonuses.

awards made in the current fiscal period. Empirically, there is mixed evidence for the impact of ordinary share holding on managerial risk taking. Some studies e.g. Kohers and Kohers (2001) do not find an explicit relationship between these two. Others find that a higher ordinary share holding results in management entrenchment (Stulz, 1988; McConnell and Servaes, 1990; Morck et al, 1988) thereby reducing the incentive for excessive risk taking and endangering their position (Wright et al, 1996).

There is more consensus regarding the risk-taking incentive from stock options. Managers are more likely to undertake risky investments or acquisitions (Bryan et al, 2000; Datta et al, 2001; Ryan and Wiggins, 2002). Guay (1999) finds that in firms with high growth options, stock options are used to encourage managers to invest in risky projects when the potential loss from forgoing valuable risk-increasing projects is great. Rajgopal and Shevlin (2002) find that stock options drive managers in oil & gas industries to take on riskier exploration projects aimed at increasing firm risk, but reduce the hedging of oil & gas risk exposure. Rogers (2002) finds that risk-taking incentives from options are negatively related to corporate derivative holdings which are used for reducing firm risk exposure. Coles et al (2004) report that higher vega is associated with riskier policy choices including more investment in R & D and higher leverage. In these studies, there is a strong positive correlation between vega and the riskiness of managerial decisions.

2.3 Compensation components and riskiness of investments – case of acquisitions

While many previous studies have examined the impact of compensation contracts and their components on the riskiness of corporate investment decisions such as R & D, or hedging decisions, we focus on the acquisition decision. Acquisitions are large and visible corporate investments that can alter the risk profile of the acquirer. Diversifying acquisitions are thought to be driven by managerial preference for risk reduction (Amihud an Lev, 1981). On the other hand, acquisitions of targets rich in intangible assets such patents or in real option type growth opportunities e.g. R & D, obviously ratchet up the riskiness of the acquirer.

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[4] Nevertheless, Richardson and Waegelein (2003) find that following the adoption of LTIPs, firms increase their investment in R&D, a risky corporate action. It is not clear which component of LTIP brings this about.

There is extensive evidence that acquirer firm shareholders do not gain from acquisitions in the short term and experience value losses in the longer term (Sudarsanam, 2003, ch.4 for a review of the US and European evidence; Moeller, et al, 2003). Whether such value losses are due to skewed risk incentives that managerial compensation contracts provide is an interesting question to resolve empirically. We therefore consider acquisition as an appropriate corporate decision context in which to explore the relation among compensation, investment risk profile and shareholder value gains.

From the foregoing review of the compensation and risk incentives literature, we expect a negative relationship between acquisition riskiness and the following managerial compensation components:

- *the level of fixed compensation and annual bonuses*
- *the level of LTIPs (cash and shares)the delta of LTIP shares*
- *delta of LTIP shares*
- *delta of stock options*
- *Managerial stock holding*

We expect a positive relation between acquisition riskiness and the following:

- *the value of executive option holding*
- *the vega of the stock options*

2.4 Managerial risk seeking in behavioural agency model of the firm

Recent papers in behavioural agency model argue that managerial risk taking is not a mere deviation from traditional agency assumption of rational risk aversion (MacCrimmon and Wehrung, 1990; Sitkin and Pablo, 1992; Kahneman and Lado, 1993; Wiseman and Gomez-Mejia, 1998; and Wright et al 2001)[5]. These authors criticize the risk aversion assumption as being too restrictive and unrealistic about human behaviour. Instead, they argue that managers may be "irrational" and, under psychological influences, exhibit different risk attitudes in different situations. Therefore, incentive alignment mechanisms, designed on the assumption that managers are rational and risk averse, are unlikely to have much of an effect on irrational and risk-seeking managers. "These managers *think* that they are

[5] Other relevant studies include Child (1974), Hambrick and Mason (1984), March and Shapira (1987) and Eisenhardt (1989)

maximizing firm value, even if in reality, they are not. Since they think that they are already doing the right thing, stock options or debt are unlikely to change their behaviour." (Barberis and Thaler, 2002). Such managerial attitude may be due less to a fraudulent intent than to overconfidence and overoptimism.

Managers may undertake risky projects because they overoptimistically underestimate the risk (March and Shapira, 1987; Kahneman and Lado, 1993), or because their past performance makes them overconfident and they believe that they can 'handle' the risk (Bromiley, 1991; Sitkin and Pablo, 1992; Simon et al, 2003). March and Shapira (1987) find that managers view risk as controllable and modifiable and they themselves are able to clearly distinguish between gambling (where the chances of win or loss are uncontrollable) and risk taking (where uncertainty can be reduced by skill or information). This is shown in the words by a president of a successful high technology company: "In starting my company I didn't gamble; I was confident we were going to succeed." ((March and Shapira, 1987, p.1410). Kahneman and Lado (1993) state managers willingly expose themselves to a substantial degree of risk because they misjudge the odds based on an "overly optimistic forecast".

Roll (1986) formulates a hubris hypothesis that is further developed and tested by Hayward and Hambrick (1997). Hubris is exaggerated pride or self-confidence. When managers consider taking over another firm, they conduct a valuation analysis of that firm. When managers are overconfident about the accuracy of their analysis and are overly optimistic about the control they will have over the merged firm, they will launch a bid if their valuation exceeds the market price of the target. This overconfidence and over-optimism cause many managers to underestimate the risks inherent in M&As and lead them to pay excessive takeover premium, and consequently value destruction for acquirer shareholders.

With the above perspective on managerial risk preferences being determined by top management biases, we expect that

- *managerial hubris/ overconfidence/ overoptimism increases the riskiness of acquisitions.*

These behavioural concepts are by no means easy to capture leave alone quantify for empirical purposes. We use several proxies that, we believe, adequately capture the essence of these nebulous conceptual variables. These are described in Section 3 on Methodology and Data.

2.5 Corporate governance structure, monitoring and managerial risk incentives

Managerial compensation is an indirect lever for influencing managerial behaviour and decision making, which delivers shareholder value. We have seen in Section 2.2 that certain compensation components can induce risk aversion while others can encourage risk seeking. Moreover, managerial biases can also encourage managers to indulge in excessively risky investments and these biases may be reinforced by compensation elements such as stock options. Thus, risk incentives from compensation contracts coupled with managerial biases may result in inadequate risk or excessive risk taking by managers. Therefore, shareholders may need other levers to ensure that managers accept neither too little nor too much risk.

Monitoring is one of the key corporate control devices and is a function of the corporate governance structure of the acquirer firm. Optimal monitoring will curb suboptimal risk avoidance as well as excessive risk preference among managers. In the case of high-tech acquisitions, the latter problem is more serious. If so, robust governance will drive the suboptimal overinvestment in risky acquisitions to the optimal level and this correction will be associated with value creation in high risk, high-tech acquisitions.

Corporate governance structure components

Drawing upon the extensive literature on corporate governance structure and performance, we find several components of that structure likely to impact on managerial compensation as well as managerial risk preferences in the acquisition context. ***External block (share) holders*** have strong economic incentives to undertake effective monitoring because they are able to capture a large fraction of the wealth gains from the corporate value enhancement (Shleifer and Vishny, 1986)[6]. External blockholders can force acquirer managers to examine carefully their acquisition strategies and reduce the scope for suboptimal risk avoidance or risk seeking.

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[6] Empirical evidence on the effectiveness of external block holder monitoring is mixed. Some existing studies report that they have a posiitve impact on corporate performance (McConnell and Servaes, 1990; Martin, 1996). However, other studies find them ineffective (Wright et al 1996;, Sudarsanam et al 1996; Weir et al 2002).

Another corporate control mechanism is the ***independence of the board*** of directors, (Fama and Jensen, 1983). Successive UK corporate governance regimes from the Cadbury Report in 1992 to the most recent Higgs Report in 2003 have emphasised the critical role of non-executive directors and laid down guidelines for ensuring their independence. However, the board may be little more than a 'rubber stamp' which serves only to legitimize executive management decisions. (Pfeffer, 1972) and outside directors, many of whom are executive directors of other firms, are busy people and unlikely to become intimately involved in the affairs of the host company (Mace, 1971). Therefore, the ability of the board to act as a guardian of stockholder welfare is a function of board composition (Mizruchi, 1983).

Non-executive directors can monitor managers' tendency towards over- or under-investment arising from their risk attitudes and compensation incentives. A board with a high degree of directorial independence is likely to monitor acquisitions robustly and ensure that they create shareholder value[7]. Direct empirical evidence for the impact of board independence on the risk profile of corporate acquisitions and on the risk-return trade-off in such investments is scarce. Hayward and Hambrick (1997) found that board vigilance - when the board has a low proportion of inside directors and when the CEO is not the board chair - weaken the relationship between CEO hubris and premiums.

Duality refers to the CEO also holding the chair of the board (COB) position thereby diluting the monitoring and oversight function of the board (Fama and Jensen, 1983; Morck et al, 1987). In the UK, the Cadbury Committee (1992) on corporate governance has advocated separation of the two roles. Duality impairs the ability of the board to ensure that the firm pursues goals consistent with shareholder value enhancement. Dominant CEOs represented by duality may also be prone to

[7] The empirical findings about the impact of non-executive directors on firm performance are inconsistent. Franks, Mayer and Renneboog (2001) find positive impact of percentage of non-executives on firm performance by using UK data. Yermack (1996) with US data and Weir, Laing and Mcknight (2002) with UK data do not find significant positive relationship from the proportion of non-executive directors and firm performance. Weir (1997) and Weir and Laing (2000) again with UK data find negative relationship.

the behavioural frailties such as hubris, overconfidence and overoptimism, unchecked by a weak and subservient board[8].

A ***remuneration committee*** exercises its corporate control functions by determining, on behalf of the board and the shareholders, the company's policy on executive remuneration and specific remuneration packages for each of the executive directors (Greenbury, 1995 and Hampel Report, 1998). It prevents the tendency of executive management to 'grow' its compensation and designs compensation contracts that misalign the interests of managers with shareholders. An ***audit committee*** of the board has a similar oversight function that can monitor whether managers' risk preferences are suboptimal from the shareholder's point of view.

Overview of corporate governance structure impact on risk incentives

From the above review, we expect that robust corporate governance structure – high external block ownership, high proportion of independent directors, presence of remuneration/ audit committee of the boards and separation of the CEO and COB roles will have a positive impact on aligning shareholder and managerial risk preferences. These characteristics are likely to discourage suboptimal risk taking and thereby ensure that acquisitions have an optimal risk profile that enhances shareholder value.

2.6 Compensation, managerial bias, corporate governance and acquisition risk

Summarizing above discussions regarding managerial risk incentive drivers, we formulate the following conceptual model of managerial risk taking:

Acquisition risk = f (Executive compensation, Behavioural biases, Corporate governance structure) **(1)**

where *Acquisition risk* is the riskiness of an acquisition; *Executive compensation* is the bundle of various compensation contracts and managerial ordinary share holdings; *Behavioural biases* include hubris, overoptimism and overconfidence; *Corporate governance structure* includes external block shareholding, proportion of independent directors, duality and the presence of remuneration/ audit committee of the board.

[8] Research on the duality-performance relationship, however, appears to show that the combination of the positions of CEO and chairman has no impact on corporate performance (Brickley et al, 1997; Weir et al, 2002; Dahya, 2003).

2.7 Suboptimal risk investment and shareholder wealth

Model (1) allows us to build an *empirical* model of optimal risk as a function of the determinants we have identified. It allows us to identify those actual acquisitions that are suboptimal, i.e. they deviate from the optimal risk profile indicated by (1). In the case of under-risky investment (i.e. inadequate investment in high risk projects caused by managers' preference for a lower risk project), managers pass up the opportunities of investing in a more profitable positive NPV project. Persistently passing up risky acquisitions would make those firms gradually lose competitive advantage to their competitors. Over the long run, these firms will have poor profitability and underperformance. Evidence of value destruction from low risk diversifying acquisitions is consistent with this argument (Amihud and Lev, 1981; Rajan et al, 2000; and Graham et al, 2002).

Over-risky investment (i.e. excessive investment in risky projects) is like a gamble. While high return projects are likely to be risky, the converse is not true, particularly when the excessive risk taking is due to managers' underestimation of acquisition risk. Roll (1986), Berkovitch and Narayanan (1993), Hayward and Hambrick (1997) and Rau and Vermaelen (1998) find that acquisitions that are driven by managerial hubris substantially destroy shareholder value. Using a sample of large acquisitions, Hayward and Hambrick (1997) find that hubris is significantly negatively related to one-year post-acquisition CARs. Kohers and Kohers (2001) find managerial hubris is particularly prominent in high-tech industries and contributes to their significantly negative post-acquisition performance. Hietala, Kaplan and Robinson (2003) analyse Viacom's takeover contest for Paramount in 1994 and trace hubris in Viacom's CEO. Viacom performs poorly relative to S&P and its three primary competitors after the acquisition.

We therefore expect both types of suboptimal risk investment will lead to negative post-acquisition performance and underperform the optimal risk investment group as shown in equation (2)

Long term post-acquisition shareholder wealth gains = f (Optimal risk (+),
Under-risk (-)
Over-risk (-)) (2)

The signs indicate that optimal risk acquisitions are value enhancing whereas both over-risky and under-risky acquisitions are value decreasing.

3. Methodology

3.1 Four-stage analysis of impact of acquisition risk on shareholder value

We conduct a four-stage analysis:

1. build an empirical optimal acquisition risk model
2. identify optimally risky, over-risky and under-risky acquisitions
3. estimate the long run (3 year) post-acquisition wealth gains to acquirer shareholders and
4. estimate the impact of optimal and suboptimal acquisition risk on shareholder wealth gains

In stage 1, we classify acquisitions into high risk and low risk categories using either the target industry's technology level alone or the relative technology levels of acquirer and target as a risk proxy. A high-technology target enhances risk to the acquirer whereas a low-technology target diminishes risk. We then run a logistic regression with empirical proxies for wealth incentive, behavioural biases and corporate governance structure set out in Equation (1) above. The resulting model is our optimal risk model. In stage 2, we classify the sample acquisitions using the optimal risk model into three categories. The classification is done using the Lachenbruch holdout procedure[9].

The risk group that has the highest probability is the predicted risk group for that acquisition, $\overline{Risk_i}$. If the actual risk group, $Risk_i$, is different from the predicted risk group of the acquisition, $\overline{Risk_i}$, the acquisition is considered to be at a 'suboptimal ' risk level. Otherwise it is 'optimal'. The following equation is applied to determine different types of acquisition risk:

[9] A model such as our optimal risk model, when used for prediction of membership of the category to which a sample firm should be classified, tends to bias upwards the model's classificatory accuracy since the test sample and the prediction sample are the same. One way to minimise this bias and enhance classificatory accuracy is to build the model with the test sample and then classify a different hold-out sample. This increases the sampling requirement. An alternative and efficient procedure is the Lachenbruch hold-out procedure that estimates the logistic model using the test sample minus one observation which is then classified. This procedure is iterated by holding out one observation at a time, re-estimating the model and then using the model for classification. The classificatory rate is now free of the upward bias. The procedure estimates the probability of the held-out observation belonging to one of the groups and then classifies it to the group with the highest probability.

$$Investment\ type = UNDINV,\ if\ Risk_i < \overline{Risk_i} \quad (3)$$

$$OPTINV,\ if\ Risk_i = \overline{Risk_i}$$

$$OVEINV,\ if\ Risk_i > \overline{Risk_i}$$

An acquisition is considered an UNDINV when its actual risk group is lower than the predicted group. An acquisition is considered an OPTINV when its actual risk group is equal to the predicted risk group. An acquisition is considered an OVEINV when its actual risk group is higher than the predicted risk group.

At stage 3, we estimate the acquirer shareholder wealth gains over three post-acquisition years following acquisition using the standard event study methodology but with three alternative benchmark models. At stage 4 we carry out univariate and mutivariate regression analyses of the differences in wealth gains among the three categories of acquisition risk. This stage empirically implements equation (2) above.

3.2 Empirical models and variables

Based on the conceptual models in Equations (1) and (2), the empirically estimated equations are as follows:

$$\begin{aligned} Risk_i &= \alpha_0 + \alpha_1 FAB_i + \alpha_2 LCA_i + \alpha_3 LSH + \alpha_4 OPT_i + \alpha_5 MANSHR_i \\ &+ \alpha_6 PAST_i + \alpha_7 MED_i \\ &+ \alpha_8 LARSHR_i + \alpha_9 NEXE_i + \alpha_{10} DUAL_i + \alpha_{11} REM_i \\ &+ \alpha_{12} BEME + \alpha_{13} LEV_i + \alpha_{14} BETA_i + \mu_i \end{aligned} \quad (1')$$

$$AR_i = \beta_0 + \beta_1 UNDINV_i + \beta_2 OVEINV_i + \beta_3 RELSIZ_i + \beta_4 NONCASH_i + \varepsilon_i \quad (2')$$

$Risk_i$ is the risk group of acquisition *i* and is measured in two ways. The first measure is target industry's technology level based on SDC high-tech industry classification. High-tech target (THI) thus is coded 1 and low-tech target (TLO) is coded 0. Acquirers in the high-tech (low tech) sample, THI, are called high-tech (low-tech) acquirers.

The second measure is acquirer's as well as target's industry technology level based on SDC high-tech industry classification, i.e. whether acquirers or targets are in high-tech industries. This measure generates four risk groups:

- low-tech acquirers and high-tech targets (ALOTHI) (coded 3),
- high-tech acquirers and high-tech targets (AHITHI) (coded 2),
- low-tech acquirers and low-tech targets (ALOTLO) (coded 1),

- high-tech acquirers and low-tech targets (AHITLO) (coded 0).

ALOTHI group is the most risky group because it represents acquisitions by acquirers who have low technology capabilities but acquire firms with high technology capabilities. Acquirers' relative lack of expertise in managing and valuing high technology growth businesses exposes them to a high risk of acquisition failure. AHITHI group is less risky than ALOTHI group because acquirers in the former group have the capability and experience in managing high tech firms. This reduces the scope for valuation error and integration difficulties, and increases the chance of successful acquisitions[10]. ALOTLO includes acquisitions where low-tech acquirers buy low-tech targets. AHITLO group is less risky than ALOTHI group and AHITHI group because the former are low-tech acquisitions while latter two are both high-tech acquisitions[11].

Explanatory variables in the empirical models

In model (1'), top managers' wealth and current compensation are captured by FAB, LCA, LSH, OPT and MANSHR. FAB is fixed salary, perquisites and annual bonus. LCA is LTIP award in cash. LSH is the value of the LTIP award in shares. OPT is the Black-Schole value of the options held by top managers of the acquirer. MANSHR is the value of the shares held by the directors. We use PAST, MED and BEME, representing respectively past acquirer performance, media profile of the directors and glamour status of the acquirer in the stock market as proxies for behavioural biases arising from hubris, overconfidence and overoptimism.

NEXE, DUAL, REM, representing the proportion of non-executive directors on the board, CEO-cum-COB duality and presence of a remuneration committee, are corporate governance structure variables[12]. We introduce two control variables, LEV the financial leverage ratio, and BETA, the acquirer's systematic risk to indicate the acquirer's risk profile prior to the acquisition. Less risk-averse managers may self-select into high-risk firms and undertake risky project (Rogers, 2002). Risky firms

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[10] It may be argued that AHITHI by combining two high-tech firms compounds risk and therefore is more risky than ALOTHI.

[11] It is arguable whether AHITLO acquisitions are less risky than ALOTLO acquisitions. The difference between these two groups is that AHITLO acquisitions involve risk diversification across different technology levels.

thus are more likely to undertake risky projects [13]. Hence, we include acquirer risk level as a control variable. Lenders may also monitor the riskiness of investments made by the acquirers[14].

In model (2'), AR_i is abnormal return to acquirer i over the relevant post-acquisition period. RELSIZ is the relative size of acquirer to target and NONCASH is a dummy variable coded 1 for noncash method of payment for the acquisition and 0 for other cash since earlier studies provide evidence that smaller targets and cash consideration create more value than larger acquisitions or noncash consideration. The explanatory variables in models (1') and (2') are listed and defined in Table 1.

[Insert Table 1 here]

3.3 Estimating long-run shareholder wealth gains - event-study methodology

The event window in this study is 36 months after acquisition effective month (month 0). BHARs are calculated over this period[15]. Portfolio BHAR is the equally weighted BHAR of each acquirer in the portfolio. We use the following bench mark models:

- Industry-matched control portfolio,
- Size and BEME (book value of equity to market value of equity) matched control portfolio,
- Industry, size, BEME and momentum matched firm.

The universe of firms to construct the benchmarks is all the Datastream firms, both UK and International firms listed on London Stock Exchange.

Several constraints determine whether a firm is included in the benchmark portfolio or considered as a matching firm. It should have 1) valid characteristics data in the effective month of acquisition[16]. 2) return data in the effective month of

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[12] Almost every acquirer in our sample with a remuneration committee also has an audit committee. Since the paper focuses on remuneration we retain remuneration committee as the relevant variable.

[13] The opposite argument is that managers in risky firms are more cautious to risky projects in order to reduce their risk exposure (Aggarwal and Samwick, 1999; Jin, 2002).

[14] An alternative perspective is that managers may accept high risk projects after selling debt since some of the costs of that risk will be borne by lenders to the benefit of shareholders (Harris and Raviv (1991) and Leland (1998). Rajagopal and Shevlin (2002) find highly levered firms take on greater exploration risk in oil & gas industry.

[15] We prefer BHAR because it gives an unbiased estimate of the holding period return that an investor can expect (Roll (1983), Barber and Lyon (1997)).

[16] Negative book value firms are not included in the samples of Fama and French 1992, Fama and French 1993. The reason is that the interpretation of negative BEME is problematic. For the same

the acquisition. Further a firm that is already in the sample and has an acquisition between month -36 and month +36 of the effective month of the examined acquisition is not considered.

For industry matched control portfolios we use the narrowest industry group, IND6, in Datastream industry classification. Datastream industrial classifications exist at six levels. 83 portfolios are formed. Each sample firm is allocated to a benchmark industry portfolio in its acquisition effective month. There are 2 firms in the high-tech sample matched on INDC4. The benchmark portfolio is rebalanced once a year for each sample firm[17].

Size and BEME-matched control portfolio approach is similar to that in previous studies e.g. Kothari and Warner (1997), Lyon et al (1999). Specifically, we form 5 size quintiles at the end of every month on the basis of the ranked market value of equity of the universe firms. Each size quintile is then broken down into book-to-market quintiles, resulting in 25 size and BEME control portfolios. This procedure is repeated every month between January 1993 and December 2000. 25 portfolio returns are then estimated every month by averaging the monthly returns for the firms in each of the portfolio. To obtain the acquirer's abnormal return, each sample firm is matched to its appropriate portfolio. These returns are then used as benchmarks to calculate the abnormal performance. For each sample firm, the benchmark portfolio is rebalanced once a year[18].

We adjust for the momentum in stock returns in our third benchmark model (Carhart, 1997). Kohers and Kohers (2000) find evidence of momentum in the returns of high-tech acquirers. Following Jegadeesh (2000), we use a distance metric that incorporates all four matching characteristics: industry, size, book-to-market, and momentum[19]. The industry classification is based on INDC4[20]. Following

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market value, higher BE signifies a lack of growth opportunities but it is impossible to impose the same interpretation on the BEME ratio when the BE is negative.

[17] The average size of the benchmark portfolio is 33 firms in the high-tech sample, a minimum of 1 firm and a maximum of 105 firms, and 36 firms in the low-tech sample, a minimum of 1 firm and a maximum of 93 firms.

[18] The average size of the benchmark portfolio is 42 firms in high-tech sample. The minimum is 39 firms and the maximum is 47 firms. In the low-tech sample, those numbers are 40, 38, 45 respectively.

[19] Specifically, the distance metric is calculated as:

Carhart (1997), the price momentum is calculated as the 11-month average monthly returns lagged one month (-12 month to -2 month). We use announcement month as month 0 for the sample firms and effective month as month 0 for the universe firms. For each sample firm, the matching firm is re-identified once a year[21].

3.4 Sample selection

From the Security Data Company (SDC) M & A database, we identify all the UK domestic M&As during 1993-2000. This sample period follows the publication of the Cadbury Report in 1992 that introduced a rigorous corporate governance regime. Acquisitions meeting the following criteria are included in the sample: 1) announced and completed within our sample period; 2) acquirers listed companies with stock price data available in Datastream and 3) neither acquirers nor targets in regulated "financial industry" or "utility industry" 3) acquirers bought more than 50% stake of targets[22]. There are 459 acquisitions whose targets are in the high-tech industries defined by Thomson Financial SDC database, and there are 3243 low-tech acquisitions. The 459 acquisitions form our initial high-tech sample.

We then match each high-tech acquisition with a low-tech acquisition using five criteria. 1) Target firms have the same public status. 2) Acquiring firms are in the same industry as defined by Datastream INDC4. 3) Acquiring firms are roughly similar sized. If the closest size of the low-tech acquirer is not within the size filter of 70% and 130% of the high-tech acquirer, then industry filter is relaxed to Datastream INDC3. If a matching low-tech acquirer is still not found, then industry

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$$Distance_i = \sum_{i=1}^{N} \frac{\left| X_{sample}(i) - X_j(i) \right|}{\sigma_i}$$

where N is the total number of matching characteristics, $X_{sample}(i)$ is the sample firm value of the characteristics i, $X_j(i)$ is the value of the characteristic i of firm j (one of the universe firm), and σ_i is the cross-sectional standard deviation of characteristics i.

[20] If industry classification is based on INDC6 or INDC5, there aren't be many firms left in some sectors to choose from after the industry filter. This will make size, BEME and momentum filter invalid for many sample firms. Therefore, we use more general industry classification INDC4.

[21] For all the three benchmark approaches, when there are missing returns in the benchmark portfolio/firm, the returns of FTSE all share index (Datastream code: FTALLSH) of the same time period are used to replace the missing returns. When there are missing returns for the sample firm, we replace them by the returns of its benchmark.

[22] Although effective control may be achieved through a holding of less than 50% of a firm's issuing shares, the constraint set will ensure that bids examined are only those where it is unambiguously clear that control of the target has passed to the acquirer.

filer is relaxed to all industries except financial and utility industry. Size is measured by the month end market capitalisation of the acquirer at month -2 prior to announcement month. 4) No other low-tech acquisitions in the low-tech sample. 5) Acquirers of the low-tech targets did not conduct a high-tech acquisition 3 years prior to or after the matching high-tech acquirer.

Given that there are 5 high-tech acquirers without market capitalisation data, the low-tech sample consists of 453 acquisitions. Among these 453 low-tech acquisitions, 185 acquisitions are matched on INDC4, 70 matched on INDC3 and 188 on all industry except financial and utility industries. Size filter is not imposed on 10 acquirers. They are matched only on target public status and closest acquirer size. 7 acquirers have no return data on the effective day, the final size of the control sample is 446 acquisitions.

3.5 Data – variables, proxies and data sources

A measure of managerial hubris requires data that disclose each manager's psychology. Given the obvious difficulty of collecting such data, we choose three indirect measures that are considered relatively robust: firm's good past performance, media praise for firm's senior management and stock market glamour rating[23]. Successful past performance as a proxy for hubris is used by Hayward and Hambrick (1997) and Kohers and Kohers (2001). Successful managers may convince themselves of being the architects of the firm's success even if it could more objectively be attributed to other factors. Such managers tend to develop too much faith in the efficacy of their leadership and overestimate their own ability to manage an acquisition. Moreover, success reinforces managers' authority in the company and their decisions remain unchallenged[24]. Such managers have an

[23] Hayward and Hambrick (1997) also use self-importance as a proxy for hubris. We agree with them that CEOs with strong self-importance may be infected with hubris. But we don't agree that CEO pay is an appropriate proxy for self-importance in this setting. As argued by many studies in traditional agency theory, CEOs with high income tied to one company are more cautious about the choice of investment. They will be more risk averse because aggressiveness will make them lose their current status and income. This argument is not only supported by many empirical studies, but also the theoretical models. By contrast, the use of CEO pay as a measure of CEO self-importance is only supported by Hayward and Hambrick (1997) in their sample of 106 acquisitions.

[24] Applying the case of takeover contest for Paramount in 1994 in the theoretical model, Hietala et al (2003) find that Viacom overpaid by more than $2 billion. They find the existence of hubris in Summer Redstone, the CEO of Viacom, which might have followed from the great success he and Viacom had enjoyed prior to that acquisition.

incentive to exploit their superior managerial magic in more challenging businesses. High tech acquisitions provide this challenge[25].

A similar ego-boosting effect may be produced by the glamour rating of a firm in the stock market. Rau and Vermaelen (1998) investigating the post-acquisition performance of glamour versus value acquirers find that investors may extrapolate the glamour status in assessing the post acquisition benefits. Mahate and Sudarsanam (2003) report broadly similar results for the UK. In both studies, the glamour status is proxied by book value of equity to the market value as a negative proxy (BEME). We, therefore, use this variable as an additional measure of managerial overconfidence[26].

Top managers' ego may also be massaged and inflated by their high and flattering media profile. Media tend to attribute firm performance to directors particularly CEOs (Hayward and Hambrick, 1997). They favour successful directors and often portray them as "heroic" and larger than life. "Heroic" media portrayal in turn may influence the directors' self-image, fostering the impression that those directors are in control, or they are miracle workers. Due to the advertising effect of media, not only employees, but also a large audience outside the firm tend to believe in the directors' managerial magic. This then reinforces the directors' inter- and intra-organizational power, enhancing their perceptions of self-importance and self-esteem. The speculative nature of high tech acquisitions and the glamour associated with operating in high-tech businesses are likely to appeal to those managers. We develop, MED, as a measure of media profile of acquirers' directors in the run-up to the sampled acquisitions.

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[25] The case of Vivendi under Jean-Marie Messier illustrates such adventurous tendencies. Under him the firm, originally in the water supply and sewage treatment business in France, was first turned around and then proceeded to build a diversified international portfolio of businesses including fibre optic cable, cable television, mobile telephony and movie studios. Messier's ambition was to transform the company from its humble, down-to-earth origins into a high-tech conglomerate (Johnson and Orange, 2003).

[26] BEME is often used as an inverse measure of growth opportunities. Some researchers have argued that risk-related agency problem is likely to be most severe in firms with substantial investment opportunities (Milgrom and Roberts (1992)). Shareholders in those firms bear more risk-related agency costs as managers pass up risky NPV projects (Smith and Watts, 1992; Gaver and Gaver, 1993; Barber et al, 1997; Guay, 1999; Rajgopal and Shevlin, 2002). However, we use BEME as a proxy for glamour status rather than as a measure of growth opportunities.

Data sources

The stock return data and accounting data are collected from DataStream. When there is missing accounting data in DataStream, Company Analysis is used. SDC doesn't provide information about firm's name after acquisitions. To match these two databases, Fame and Hydra are tracked for firms' name changing history. Ownership structure and corporate governance data are extracted from PWC Corporate Register (published by Hemmington Scott). However, Corporate Register has incomplete board sub-committee data, especially prior to 1996. Hence, Thomson Research which provides company annual accounts is used as the reference database. Executive compensation data are extracted from company annual accounts. Media praise for directors is from newspaper articles provided by Factiva.

All the compensation and ownership structure data are based on the fiscal year end prior to the acquisition announcement. We use board of directors to proxy for top management. FAB_i is the sum of fixed compensation and annual bonus in £m (millions) for board of directors of acquirer *i*. LCA_i is LTIP cash awards in £m. LSH_i is LTIP share awards. We use two proxies for LSH_i. The first is the value in £m, VAL_L_i. Following Conyon and Murphy (2000), the value of LTIP share is 80% of the share value. The 20% discount reflects the performance contingency of LTIP awards. The stock price is that at end of month –2 prior to acquisition announcement month, 0. The second is the delta of LTIP share awards, DEL_L_i. Calculating LTIPs share delta is complicated. LTIP shares are not equivalent to ordinary shares owned, because they maybe forfeited if certain employment and performance objectives are not achieved. Hence the sensitivity of LTIP shares to ordinary shares could range from 1 to 0 depending on the chance that directors will remain employed long enough for all time-related restrictions to lapse and the chance that directors could pass all the performance threshold. Following Conyon and Murphy (2000), Bryan et al (2000), Rogers (2002) and Coles et al (2004), we assume the sensitivity of LTIP shares to ordinary shares as 1. Delta for LTIP shares (DEL_L_i) is then 1 times share price divided by 100[27].

[27] Guay (1999) adopts a complicated approach to estimate the vega value of LTIPs share awards and ordinary shares. He applies Black-Schole 1973 model to re-estimate the firm value and include corporate bonds in the calculation. He also makes many assumptions in order to make the model

OPT_i is the sum of all tranches of options held by acquirer's directors. We use three proxies for OPT_i. The first is the option value, VAL_O_i. The second is delta value of options, DEL_O_i . Delta of options measures the sensitivity of option value to 1% change in the underlying stock price[28]. The other popular measure is vega of options, VEG_O_i. Option vega measures the sensitivity of option value to 1% change in stock volatility. The details regarding the calculating of the value of stock options, delta and vega are in Appendix 1.

$MANSHR_i$ is the percentage of ordinary shareholdings (beneficial and non-beneficial) by board of directors of acquirer *i*. We also use share delta, DEL_S_i . It's calculated the same way as LTIP share delta. $PAST_i$ is 11 month[29] average monthly stock returns for acquirer *i* from month –12 to month –2 prior to acquisition announcement month, 0[30]. MED_i is media praise in key UK newspapers for board of directors from month –37 to month –2 month prior to acquisition announcement. Detailed description of the construction of this variable is in Appendix 2.

$LARSHR_i$ is percentage of ordinary shareholdings, beneficial and non-beneficial, greater than 3%, held by non-management shareholders. $NEXE_i$ is percentage of non-executive directors on the board. $DUAL_i$ a dummy variable indicates the existence of duality in acquirer *i*. REM_i is a dummy variable indicates the existence of audit committee in acquirer *i*. These board structure variables are calculated based on a maximum of 3 months[31] prior to acquisition announcement date.

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valid. He finds that vegas for LTIP and ordinary shares are insignificant compared to option vega. For simplicity, studies such as Roger (2002), Coles et al (2003) assume LTIP vega and ordinary share vega as 0. Following these studies, we also assume them as 0.

[28] It is used to measure option incentives in many studies such as Guay (1999), Bryan et al (2000), Rogers (2002), Rajgopal and Shevlin (2002) and Coles et al (2004).

[29] If firms do not have return data for the whole 11 months, such as companies that are listed for less than 11 months, we only include those months that have return data available in the calculation.

[30] Hayward and Hambrick (1997) calculate the stock returns by dividing the stock price at the month which is considered devoid of acquisition rumour by the stock price 12 months prior to that month. We consider the fluctuation of the stock price over the whole year has impact on managerial hubris. A good performance may enhance managerial confidence. But a bad performance in the following month may weaken the confidence gained before. Hence we take the average of the whole year's performance.

[31] The reason why it is 3 months is because PWC Corporate Register is compiled once a quarter.

$BEME_i$ is book value of equity to market value of equity for the acquirer *i*. Both market value of equity (Datastream code MV) and stock price (Datastream code UP) refer to the month end value of month -2 prior to the acquisition announcement month. Book value of equity is shareholders' funds less preference shares as reported in the company annual report. Five month accounting lag between accounting data and market data is considered when calculating BEME. LEV_i refers to firm leverage and is calculated as the percentage of total liability over total assets (Datastream code 392) for acquirer *i* in the fiscal year prior to announcement. $BETA_i$ is Datastream beta (Datastream code 897E) and it is a proxy for acquirer's systematic risk level.

In equation (2'), AR_i is three-year buy-and-hold abnormal returns for acquirer *i*. $UNDINV_i$ and $OVEINV_i$ are underinvestment and overinvestment respectively. $RELSIZ_i$ is the ratio of the size of acquirer *i* to the size of target *i*. The size of acquirers and listed targets is measured by their market capitalisation at the end of month –2 prior to announcement month. For unlisted targets, the acquisition transaction value is used as proxy for target size. $NONCASH_i$ is a dummy variable for payment method. It equals 1 if payment involves stock and 0 otherwise.

4. Results

4.1 Sample characteristics

Table 2 shows the distribution of M&As for the high-tech sample and the matching low-tech sample over 1993-2000. The high-tech sample consists of 459 observations and the low-tech sample has 446 acquisitions. High-tech acquisitions mostly cluster between 1997 and 2000 (73.58% of the sample). There are only 21 acquisitions (4.59% of the sample) taking place in 1993, but 143 (31% of the sample) in 2000. In contrast, low-tech sample is relatively evenly distributed.

[Insert table 2 here]

Table 3 presents summary statistics for high-tech and low-tech samples. The average high-tech acquisition size (TV) is approximately £65 million and the median is £4.5 million. Low-tech acquisitions are smaller than high-tech acquisitions both at mean and median level. Although acquirer size (MV) is one of the matching criteria for identifying low-tech acquisitions, we still find significant difference in both samples. The average high-tech acquirer market capitalisation (MV) is £1.09 billion, around £400 million larger (significant at 10% level) than that of the low-tech acquirers. In the high-tech sample, relative size of acquirers to targets (RELSIZ) on average is about 194 (median 24). The ratio drops to 39 and 5.2 respectively in the low-tech sample. The differences are statistically significant at 5% and 1% level.

[Insert Table 3 here]

There are 127 acquisitions in ALOTHI, the group that has the highest acquisition risk level and 70 acquisitions in AHITLO, the group that involves acquisition risk diversification. 332 acquisitions are in AHITHI group and 376 in ALOTLO group. These indicate that a majority of acquirers undertake acquisitions in industries of similar risk.

Pure cash financing (CASH) is used less frequently (29% of cases) in the high-tech acquisitions than in low-tech acquisitions (43%). This is consistent with Martin's (1996) argument that managers tend to pay with stocks when they are buying targets with high growth opportunities. Around 67% of the target firms in the high-tech sample are private firms (TARPRI), 26% subsidiaries (TARSUB) and only 7.4% public firms (TARPUB). Low-tech sample has similar composition as target public or non-public status is one of the criteria for identifying matching low-tech acquisitions.

4.2 Descriptive for risk incentive drivers

Wealth incentives

Table 4 presents the descriptive statistics on the managerial wealth and compensation of acquirers. The overall compensation level is higher in the high-tech sample than in the low-tech sample in both 1993-2000 and 1998-2000 which includes options data not available earlier. In 1993-2000 (Panel A), fixed compensation and annual bonus (FAB) is £1.53m for high-tech acquires, about £0.46k (thousand) higher than low-tech acquirers. But the median is £60k higher (significant at 1% level) for low-tech acquirers. On average fixed compensation and annual bonus take a higher weight in directors' total wealth in low-tech sample (around 26%) than in high-tech sample (around 18%).

[Insert Table 4 here]

There are only 47 acquirers that have LTIPs share awards in the high-tech sample. Among them, 8 also have LTIPs cash awards. There is one acquirer having LTIPs cash award only. 62 acquirers have LTIPs share awards in the low-tech sample. 9 acquirers have LTIPs cash award among these 62 acquirers. 12 acquirers have only LTIPs cash award. The average LTIP cash award is £20k in the high-tech sample and £30k in the low-tech sample but there is no significant difference between them. The average LTIP share award is £170k in the high-tech sample, £710k (significant at 5%) less than the low-tech sample. The average value of ordinary share holdings is approximately £33m (median about £8m) in the high-tech sample. On average, the value of ordinary share holding for high-tech acquirer executives is about £6m higher than in low-tech acquirers. The median difference between them is £3.29m, significant at 1% level. In addition, high-tech acquirer executives have higher ordinary share ownership (about 81%) in their wealth portfolio than low-tech acquirers' executives (around 71%). Similar patterns emerge regarding fixed compensation and annual bonus, LTIP cash and share award, ordinary share holding in 1998-2000 subsample in Panel B.

The average value of stock options (VAL_O) is £4.1m (median £0.67m) for high-tech acquirers as compared to £1.4m (median £0.38m) for low-tech acquirers. Both mean and median differences are significant. In the high-tech sample, option holdings is around 14% of the total wealth of directors, the second highest after ordinary shares. It ranks the third (12.1% of the total wealth) after shares and fixed compensation in the low-tech sample. The average option delta (DEL_O) is £50k for high-tech acquirers and £20k for low-tech acquirers. The average option vega (VEG_O) is £100k for high-tech acquirers and only half for low-tech acquirers. Both differences are significant at 1% level. These indicate that option value is more sensitive to stock price change or the change of stock volatility for high-tech acquirers than for low-tech acquirers. High-tech acquirers thus should have higher incentives to increase the stock price or the volatility of stock returns than low-tech acquirers.

Hubris

Table 5 presents the descriptive statistics on hubris and monitoring variables. High-tech acquirers have significantly better stock performance prior to acquisitions than low-tech acquirers . The average one year stock performance (PAST) for high-tech acquirers is 6.28% (median 3.25%) versus 2.24% (median 1.76%) for low-tech acquirers. MED, media praise, shows that media comment on directors is skewed to the right, i.e. more positive comment than negative comment[32]. The weighted average score for all high-tech acquirers is 0.91 (median 1) and for low-tech acquirers 0.78 (median 1). The mean and median differences between these two samples are significant at 5% and 10% level respectively. Average BEME ratio for high-tech acquirers is around 32% (median around 10%) and 37% (median about 29%) for low-tech acquirers. The median difference is significant at 1% level. This indicates that high-tech acquirers have glamour rating relative to low-tech acquirers.

[Table 5 here]

Monitoring mechanisms

The average external blockholdings (LARSHR) is around 28% for high-tech acquirers and about 31% for low-tech acquirers . The medians are 26% and 29% respectively. The differences in mean and median value are significant at 1%. This indicates that there is more external shareholder control in low-tech acquirers than in high-tech acquirers. Both samples have the same board independence (NEXE) ratio, i.e.. around 43% and remuneration committee (REM) ratio, i.e. 88%. 23% of the high-tech acquirers have dual CEO-cum-Chairman (DUAL) and 20% in the low-tech sample.

Other drivers

The leverage ratios for both types of acquirers are similar, both around 62% (median 59%). The mean BETA is 1.04 (median 0.79) for high-tech acquirers and 0.65 (median 0.69) for low-tech acquirers, both significant at 1%. This suggests that high-tech acquires are riskier firms than low-tech acquirers.

[32] Among the 1,273 relevant articles for high-tech acquirer directors, 402 articles are 100% positive, 215 articles have slightly negative tones, 477 neutral, 107 articles are mainly negative but with some positive opinions, and only 72 are totally negative about the directors. There is no relevant article for 181 acquirers. For low-tech acquirers, 877 articles are identified as relevant articles in the low-tech sample. Among them, 250 articles are coded 3, 88 coded 2, 460 coded 1, 48 coded -1 and only 31 coded as -2.

4.3 Logistic regression of acquisition risk

Logistic regression is sensitive to extremely high correlations among predictor variables. A non-parametric correlation test[33] is conducted to test if there is any multicollinearity between any two predictor variables in equation (1'). In unreported analysis, we find high correlation exist between the value of LTIP shares (VAL_L) and LTIP share delta (DEL_L), among option value (VAL_O) and option delta (DEL_O), and option vega (VEG_O). The Spearman's correlation coefficients are above 96% (significant at 1%). None of the remaining correlations is above 50%.

2-group analysis based on target technology status

Table 6 reports results for binary logistic regression where the dependent variable, *Risk,* is divided into 2 risk groups: high-tech acquisitions (THI) and low-tech acquisitions (TLO). THI the riskier group is coded 1 and TLO is coded 0. Models 1 and 2 in Table 6 cover the sample period from 1993 to 2000 and models 3, 4 and 5 cover 1998 to 2000.

[Insert Table 6 here]

FAB is insignificant across all the models, indicating that fixed compensation and annual bonus have no impact on managerial decisions to undertake acquisitions that increase or decrease firm risk. This is consistent with the argument by Gray and Cannella (1997) and Narayanan (1996) that fixed compensation and annual bonus do not influence long-term acquisition risk profile..

Similarly, LCA is insignificant across all the models. This shows that LTIP cash award is not an effective incentive driver. But the reason could be that only 30 acquisitions out of all 905 observations have LTIP cash awards. Two proxies for LTIP share incentives, share value (VAL_L) and LTIP delta (DEL_L) are both significantly negative in binary logistic regressions. This implies that a higher level of LTIP share rewards discourages managers from making risky acquisitions. This is consistent with our expectation (see Section 2.3 above) but contrary to the findings by Richardson and Waegelein (2003). It is also different from the conclusions of Bryan et al (2000) and Ryan Jr and Wiggins III (2002) who find LTIP shares ineffective. MANSHR is insignificant in binary logistic regressions. DEL_S, the other proxy for share incentives, is insignificant in all models. Therefore, we conclude that ordinary share holding has no strong impact on encouraging or discouraging managers to take more risks.

Stock options, the value (VAL_O), the sensitivities (DEL_O, VEG_O), are insignificant across all the models, even though they are all positive, indicating that they may encourage managers to take more risky acquisitions. Above results regarding the equity-based incentives do not support the traditional agency prediction and is not consistent with the empirical evidence by Guay (1999), Datta, Iskandar-Datta and Raman (2001), Rajgopal and Shevlin (2002) and Rogers (2002) and Coles et al (2004). Overall, our results show that none of the wealth incentives is effective in encouraging managers to take more risks. In fact, LTIP shares even discourage managerial risk taking.

Impact of behavioural variables

Models 1 to 5 report the coefficients of past stock performance (PAST) as either 0.08 or 0.09 and they are all significant at 1% level. This indicates that good past performance increases the probability that managers would buy target firms with risk-enhancing growth options. The coefficients of media praise (MED) range from 0.16 to 0.26, all significant at 5%. Our results indicate that media praise drives managers to take more risks. The coefficients of BEME are around -0.01 and significant between 10% and 1% in model 1 to model 5. This shows that acquirers with glamour rating in the stock market make more risky acquisitions.

Therefore, we find strong evidence that acquirer's past performance, glamour status and high media profile encourage managerial risk taking. Our results support the argument by Rau and Vermaelen (1998) and Hayward and Hambrick (1997). This implies that studies that try to predict the optimal risk management in the traditional agency framework, such as Rajgopal and Shevlin (2002), Rogers (2002), Coles et al (2004), may be subject to model misspecification problems.

Impact of corporate governance structure

LARSHR is -0.01 and significant at or above 10% level in models 1 to 5. It means that large external blockholders discourage managers from high-tech acquisitions. They may consider such acquisitions too risky. Board independence measured by percentage of non-executive directors on the board (NEXE) is

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[33] Normality tests show that none of the distribution of these independent variables follows normal

insignificant in all models. Duality (DUAL) is insignificant across all models Therefore, we do not find evidence that duality impacts on managerial risk preference. This parallels the findings by (Brickley, Coles and Jarrell (1997), Coles and Jarrell (1997), Weir et al (2002), Dahya (2003)) that duality has little impact on firm performance.

The coefficients for remuneration committee (REM) are insignificant in all models. Therefore, we conclude that REM generally has no impact on managerial risk taking. Monitoring mechanisms in general do not have much impact on disciplining managers on their acquisition risk choices. We only find weak evidence that that external blockholders may curb excessive managerial risk taking.

Leverage (LEV) is insignificant in all models, indicating that financial leverage does not create incentives for managers to assume excessively risky projects to transfer the wealth from debtholders to shareholders. Our result does not support the conclusion by Rajgopal and Shevlin (2002). BETA is between 0.22 to 0.41 and significant at 5% or 10% level in models 1 to 5. It means that riskier firms which attract risk prone managers are more likely to take risks, consistent with the findings by Rogers (2002).

Multigroup analysis based on acquirer and target technology status

Table 7 reports results for multinomial logistic regression where the dependent variable, *Risk,* is classified into 4 risk groups (coding), ALOTHI (3), AHITHI (2), ALOTLO (1) group, AHITLO (0), the reference group in the multinomial regressions. Models 1’ and 2’ cover the sample period from 1993 to 2000 and models 3’, 4’ and 5’ cover 1998 to 2000.

Table 7 here

In differentiating between ALOTHI and AHITLO, none of the compensation variables is significant. The three behavioural variables, PAST, MED and BEME, are significant at 5% as in the 2-group models. They encourage managers to choose high risk acquisitions. But they lose their significance in 1998-2000 models. Presence of a remuneration committee has a similar risk increasing effect.

In the models that differentiate between AHITHI and AHITLO, the three behavioural variables maintain their significance in models 1’ and 2’ for 1993-00.

distribution. Hence, non-parametric tests is used instead of parametric tests.

MED is also positively but weakly significant in models 3’ and 5’ for 1998-00. Thus behavioural variables continue to show they have a risk-augmenting impact. DEL_L, MANSHR, REM and NEXE show some weakly significant effect but not consistently across the five models.

In the models that differentiate between ALOTLO and AHITLO, PAST has a negative impact during 1998-00 contrary to its positive impact in the previous two sets of models[34]. None of the behavioural variables is significant during 1993-00. Duality encourages risk avoidance during 1998-00 but has no impact during 1993-00. MANSHR and LARSHR have a risk increasing impact but it is only significant in model 1’.

Overall, the results from the 4 group analysis yield relatively strong evidence only in favour of the behavioural factors, consistent with the 2-group analysis. Compensation contracts have mostly little impact on managerial risk preferences. Corporate governance variables also have a similarly weak and inconsistent impact across the models.

Overview of logistic model results

Our results demonstrate that none of the compensation contracts or ordinary share holdings is effective in encouraging managers to take more risks, while LTIP shares may even discourage managerial risk taking. We find strong evidence that past performance, glamour status and high media profile drive managers to undertake high-risk, high-tech acquisitions. There exists weak evidence that external blockholders curb managers’ choice of high-tech acquisitions. The other monitoring mechanisms do not have much impact on disciplining managers on their acquisition risk choice. Financial leverage does not create incentives for managers to take more risks or discourage them from excessive risk taking.

4.4 Optimal/suboptimal risk investment

Table 8 reports the distribution of three levels of investment risk calculated by applying Lachenbruch holdout procedure in 10 logistic regression models. Two group category is based on binary logistic regressions reported in Table 6 and four group category is based on multinomial logistic regressions reported in Table 7.

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[34] We noted earlier, see footnote 11, *ante* that the distinction between these two groups is not as clear cut as between the other pairwise groups. The contrary result may be due to this.

Models 1 to 5 refer to models in Table 6 and models 1' to 5' refer to models in Table 7.

[Insert Table 8 here]

Acquisitions are more evenly distributed across investment types based on 4 group models than those based on 2 group models and there is distribution difference between two sample periods. Around 61% of acquisitions belong to optimal investment (OPTINV) category when an investment type is based on 2 risk groups. About 12% acquisitions are in the underinvestment category (UNDINV) and 27% in the overinvestment category (OVEINV) over the sample period 1993-2000. On the contrary, underinvestment category (UNDINV) contains approximately 28% acquisitions and overinvestment category has around 11% over the sample period 1998-2000.

Optimal risk investment (OPTINV) decreases to 49% over the sample period 1993-2000 when investment type is calculated based on 4 group models. Underinvestment type (UNDINV) increases to 18% and overinvestment type (OVEINV) rises to 33%. Similar pattern is also identified in the sample 1998-2000. Optimal risk investment (OPTINV) drops to around 48%, 33% and 36 % for investment types derived from model 3', model 4' and model 5'. Underinvestment type (UNDINV) increases to 42%, 37% and 39%, and overinvestment type (OVEINV) to 20%, 30% and 25% respectively.

4.5 Long-term post-acquisition performance

The three-year BHARs for acquirers are presented in Table 9 for 1993-2000 and Table 10 for 1998-2000. Sample sizes are different when applying different benchmark approaches due to incomplete data for relevant variables.

[Insert Tables 9 & 10 here]

Specifically, benchmarked against industry-matched control portfolios, the average three-year post-acquisition returns for the high-tech sample are insignificantly different from 0 but the median is –17.88% (significant at 1%) for the sample over 1993-2000. The median value is similar to the value reported by Kohers and Kohers (2001), who report mean value of industry-adjusted BHAR as -17.5% and median value -17.4%. Against the size and book-to-market matched control portfolios, the average three-year post-acquisition performance is –24.15%

(significant at 1%) and the median is -73.91% (significant at 1%). Kohers and Kohers (2001) report mean value of -13.81%, median value of -22.12% by applying the same benchmark. However, their sample is US high-tech mergers from 1984-1995 while our high-tech sample is UK high-tech acquisitions from 1993-2000, covering the dotcom bubble period. When compared with industry, size, BEME, and momentum matched firms, the average three-year post-acquisition performance is insignificantly different from 0 and the median -6.45% is insignificant for sign test but at 10% significant level for Wilcoxon signed rank test. Whatever the benchmark is, the return distributions are skewed to the right, indicating that some acquirers perform well after acquisitions.

3-year BHARs for low-tech acquisitions are more consistent across the models. All the mean and median value are significantly negative. The average 3 year industry-adjusted BHARs of high-tech acquisitions are 26.9% and significantly higher than that of the low-tech acquisitions. There is no significant difference in the median value. The average 3 year size and book-to-market adjusted BHARs for hig-tech acquirers are statistically indifferent from that of the low-tech acquirers, but the median value is 31.06% (significant at 1% level) lower. When using industry, size, BEME and momentum matched firm as the benchmark, high-tech acquirers neither underperform nor overperform low-tech acquirers.

For the sample period 1998-2000, the average high-tech acquirer performance relative to industry peers is -12.35% (significant at 5%) and its median value is -20.13% (significant at 1%). Such acquirers performed especially badly when compared with firms with similar size and BEME ratio. The mean is -77.42% and median -109.22, both significant at 1%. When industry, size, BEME and price momentum are included in the matching characteristics, the average 3 year BHARs is -18.13% (significant at 10%) and the median is -9.49% (significant at 1%). Therefore, high-tech acquirers experienced significant value destruction for conducting M&A activities during the internet boom period.

In comparison, low-tech acquirers have no value loss three years after acquisitions when using the industry-matched control portfolio and industry, size, BEME and momentum matched firm as benchmarks. The average 3 year size and BEME adjusted BHARs is -44.17% (significant at 1%) and median is -

61.83%(significant at 1%). Nevertheless, high-tech acquirers on average underperform low-tech acquirers by 33.24% (significant at 1%). The median difference is -47.39% (significant at 1%). High-tech acquirers also appear to underperform low-tech acquirers as regards the median value of industry-adjusted 3 year BHARs by 13.38% (significant at 1%).

A growing literature e.g. Chang (1998) and Fuller et al (2002) reports that acquirers experience positive returns when buying non-public targets. More then 90% of our sample are non-public targets. However, none of the subsamples have significantly positive 3-year post-acquisition returns for all of the three benchmark we apply.

Overall, high-tech acquirers either have significantly negative performance 3 years after acquisitions or their performance is insignificantly differently from 0. This seems to indicate that the expected growth options do not materialise. High-tech acquirers, in general, either significantly underperform low-tech acquirers or they have similar performance.

4.6 Univariate analysis of 3-year BHARs on types of risk investment

Table 11 reports the 3-year median BHARs of three risk investment groups generated based on 5 models in Table 6 and Table 7[35]. The output for 2 risk group (model 2) is similar to 2 risk group (model 1). The results for 4 risk group model 2 is nearly the same as the results for 4 risk group (model 1'). The BHARs for 2 risk group (model 4 and model 5) are close to 2 risk group (model 3). The BHARs for 4 risk group (model 5') are similar to BHARs for 4 risk group (model 3'). Therefore, we only reports the output for 5 models. Table 12 shows median differences of these three groups and their significance level.

[Insert Table 11 and Table 12 here]

When industry matched control portfolio is used as the benchmark, the median 3 year BHARs of underinvestment group (UNDINV) and overinvestment group (OVEINV) are either significantly negative or statistically insignificantly different from 0. The median value for the optimal risk investment group (OPTINV) is insignificantly different from 0 or significantly negative in some models. We find the same pattern when industry, size, BEME and momentum matched firm is used as the benchmark. When size and BEME control portfolio is used as the benchmark, underinvestment group (UNDINV) is significantly negative across all the models. So does optimal risk investment group (OPTINV). The overinvestment group (OVEINV) calculated based on 2 risk group (model 1) and 4 risk group (model 1') has 3 year median BHARs insignificantly different from 0 or significantly negative. The rest are all zero or significantly negative.

When comparing the 3 year BHARs of the investment groups, we find that both underinvestment risky group (UNDINV) and overinvestment group are generally insignificantly different from optimal risk investment group (OPTINV). However, they may also underperform or outperform optimal risk investment group depending on the benchmark model or sample period.

Taken together, optimal groups seem not perform any better than suboptimal groups such as underinvestment group or overinvestment group. All the three groups either underperform industry peers, firms with similar size and BEME ratio, and industry peers that have similar size, BEME and stock price momentum, or have BHARs insignificantly different from 0.

4.7 Multivariate model of long run post-acquisition value gains

Table 13 and Table 14 report the OLS regression results on 3-year BHARs for acquisitions over 1993-2000 and over 1998-2000 respectively. Underinvestment (UNDINV) and overinvestment (OVEINV) is calculated based on binary logistic regressions as reported in Table 6 and multinomial logistic regression reported in Table 7.

[Insert Table 13 and Table 14 here]

For the sample over 1993-2000, coefficients for underinvestment group (UNDINV) are generally insignificantly different from 0 except the one based on 4 group (model 1') and industry-matched. It is -20.22 and significant at 5% level. For the sample over 1998-2000, the coefficients are insignificantly different from 0, excluding those whose dependent variables are size and BEME adjusted BHARs. Those models reports that underinvestment group can create value for acquirer shareholders 3 years after acquisitions. Overinvestment group (OVEINV) has significantly positive coefficients when the dependent variables are size and BEME

[35] For brevity we report only the medians in Tables 11 and 12. The results are similar based on

adjusted BHARs or industry, size BEME and momentum adjusted BHARs for the 1993-2000 sample. However, the sample over 1998-2000 tells a different story. The coefficients for OVEINV are generally insignificantly different from 0. Hence, we conclude that there are no performance differences among the risk groups predicted by our optimal risk prediction models.

Similarly, we can not draw a positive or negative conclusion for relative size of acquirers to targets (RELSIZ) and stock payment (NONCASH) since their coefficients are generally insignificantly different from 0 although some models do reports significantly negative results. Hence, our results do not support the argument by Sudarsanam, Holl and Salami (1996) as regards to relative size, and the argument by Loughran and Vijh (1997), Rau and Vermaelen (1998) and Sudarsanam and Mahate (2003) as regards stock payment.

4.8 Additional test

Institutional blockholders are one type of external blockholders[36]. They play an active and important role in disciplining management and enhance shareholder value (see, Brickley, Lease and Smith (Jr) (1988), McConnell and Servaes (1990), Martin (1996), Kohers and Kohers (2001)). They perform quality research in order to identify efficient firms for investing their funds (Duggal and Millar (1999)). Some institutional shareholders communicate directly with senior managers and thus may influence the terms of acquisition bids. Hence we include institutional investors in the logistic regressions. However, our results show that institutional ownership has no impact on managerial choice of acquisitions across all the models.

5. Conclusions and limitations

Our study aims to identify managerial risk incentive drivers by comparing UK high-tech and low-tech acquisitions over the period 1993-2000. In addition, we also try to predict optimal risk investment based on these incentive drivers and compare the performance of the predicted optimal and suboptimal risk investment groups in order to test the reliability of the model prediction.

Our study mainly differs from prior research in that we incorporate both traditional agency view that assumes managerial risk aversion and behavioural

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means.

[36] There are mainly three types of large external shareholders: individual investors, institutional investors and other corporate investors.

agency view that allows for risk seeking in modelling managerial risk choices. Consistent with the behavioural agency model, we find fairly strong evidence that good recent performance, glamour rating by the stock market and high and flattering media profile enhance managerial hubris or overconfidence and make managers prefer risky high-tech acquisitions.

Different compensation types except stock grants from long term incentive plans and managerial wealth in the form of shareholdings have little impact on managerial risk taking. LTIP stock award seems to discourage managers from high-tech acquisitions. This conclusion is robust across two proxies for shares (share value and delta value) and three proxies for options (option value, delta value and vega value). The general lack of impact of compensation on managerial risk preferences is consistent with Ross's (2004) argument for lack of such impact although this may be due to our empirical test design weakness (see below).

There is weak evidence that external blockholders discourage managers from high risk acquisitions, possibly because they consider such acquisitions as being too risky and potentially value destroying. However, we do not find same result with institutional blockholders. Other monitoring mechanisms generally do not have much impact on managers' decision of acquisitions. Corporate governance structure variables such as board independence, separation of CEO from COB positions and the existence of board committees have no impact on managerial risk preferences in acquisitions. Riskier firms that may attract risk prone managers are more likely to take high-tech acquisitions.

High-tech acquisitions in the UK during the 1990s destroy value for shareholders three years after acquisition. However, we find no strong or consistent evidence across different benchmarks that high risk, high-tech acquisitions destroy more value than low risk, low-tech acquisitions. We also find no significant relationship between suboptimally risky acquisitions and value destruction. Acquisitions that we identify as optimally risky perform no better in terms of shareholder value creation than suboptimal acquisitions.

There could be many reasons for why the predicted optimal risk investment does not outperform the suboptimal investments. It could be that our prediction models, the risk models, are misspecified and give us the wrong prediction although our logistic models have very significant explanatory power. It could also be that our measure of acquisition risk i.e. high-tech equates to high risk is a noisy measure. The solution to this would be to use difference proxies for risk projects. It might be that the long-run post-acquisition abnormal returns are a noisy performance measure.

APPENDIX 1: CALUCLATION OF THE VALUE OF STOCK OPTIONS, OPTION DELTA AND OPTION VEGA

In valuing stock options, we measure expected value at the month end of -2 month prior to the acquisition announcement month by using Black and Scholes (1973) formula for European call options, adjusted for continuously paid dividends (Merton (1973)). Black and Scholes (1973) formula has been widely used by academic researchers to measure executive option value. The formula is:

$$C = Pe^{-\ln(1+d)T} N(z) - Xe^{-\ln(1+r)T} N(z - \sigma\sqrt{T})$$

$$z = \frac{\ln(P/X) + [\ln(1+r) - \ln(1+d) + \sigma^2/2]T}{\sigma\sqrt{T}}$$

option delta is calculated as:

$$Delta = \frac{\partial C}{\partial P} * \frac{P}{100}$$

$$= \quad e^{-dT} N(Z) \frac{P}{100}$$

and option vega is calculated as:

$$Vega = \frac{\partial C}{\partial \sigma} * 0.01$$

$$= \quad e^{-dT} N(Z) PT^{(1/2)} * 0.01$$

where,

P = the month end stock price (Datastream code UP[37]) at -2 month prior to the acquisition announcement month.

X = exercise price of the option

T = remaining time to maturity of the option, in years. It is measured by dividing number of days[38] from the month end of -2 month prior to the acquisition announcement day to expiry day of the stock option by 365.

[37] This is the closing price which has not been historically adjusted for bonus and rights issues. This figure therefore represents actual or ‘raw’ prices as recorded on the day.

[38] Some annual reports only disclose the expiry month and year of the options. In this case, last day of that month is assumed as expiry day. Since the unit of *T* is in years, this assumption does not have major impact on option value.

d = annualised dividend yield of the stock. Dividend yields (Datastream code DY) are calculated as the average of the prior 47 monthly[39] observations on percentage of gross dividend (including tax credits) per share[40].

σ = expected annualised stock return volatility over the life of the option. It is estimated as the standard deviation of monthly continuously compounded returns[41] over prior 47 months , multiplied by $12^{(1/2)}$[42].

r = risk free discount rate. It is either the middle price of UK Treasury Bill or average redemption yield of UK gilts depending on the remaining life of the stock option[43].

N( ) = cumulative normal distribution

[39] -48 month to -2 month prior to the acquisition announcement month. We use month end value. this is consistent with other stock related variables.

[40] Following Conyon and Murphy 2000, dividend yields above 5% are 'trimmed' to 5%. This is because abnormal historical dividend yields are poor predictors of yields over the term of the option.

[41] The monthly continuously compounded returns are calculated as $r = ln(1+R)$, where r is monthly continuously compounded return and R is the discrete monthly return.

[42] Following Conyon and Murphy (2000), volatilities are trimmed to lie in the range 20% to 60%. This is because abnormal historical volatilities yields are poor predictors of yields over the term of the option.

[43] If an option matures no more than 2.5 month, the 1 month T-bill rate is used as the risk free rate. If an option matures between 2.5 months and 1 year and 3.5 month (included), the 3 month T-bill rate is used as the risk free rate. If between 1 year and 3.5 month and 2.5 years (included), the average redemption yield of 2 year gilts is used as the risk free rate. If between 2.5 years to 4 years, the average redemption yield of 3 year gilts is used as the risk free rate. If between 4 years to 6 years (included), the average redemption yield of 5 year gilts is used as the risk free rate. If between 6 years to 8.5 years, the average redemption yield of 7 year gilts is used as the risk free rate. If between 8.5 years to 12.5 years, the average redemption yield of 10 year gilts is used as the risk free rate. The maximum time to maturity period in our sample is 12 years. The rate on the day that is the same day of the stock price is considered, i.e. month end of -2 month prior to the announcement month.

APPENDIX 2: DATA COLLECTION FOR MEDIA PROFILE VARIABLE

Following the approach by Hayward and Hambrick (1997), directors' media profile is determined through content analysis of major, nationally distributed newspaper articles about the directors for the three years leading to the acquisition announcement. We use only articles specifically attributing a firm-related outcome to board of directors or otherwise commenting on directors' performance. Firstly, to obtain newspaper articles, we set the following search criteria in Factiva:

- Source of information includes key newspapers with significant business coverage e.g. Financial Times, Sunday Times, the Times, Wall street Journal Europe.
- Articles about acquirers from months -37 -2 to acquisition announcement month.
- Article subjects as: analysis[44], commentary/opinion[45] , people profile[46], interview[47], survey/poll[48], management issues[49], output/production[50], performance[51], and profiles of companies[52].
- Articles text contains phrases: executive*[53] or director* or CEO or chairman or board and company name.

Factiva generates 10238 articles. Those articles are then read to produce a shortlist after excluding articles that contain no commentary likely to induce hubris:

- Quote from (direct or indirect) directors without any comment or opinion.
- Share reaction to a new director without describing the directors' performance
- Anything regarding future plan since it is yet unrealised.
- Naming a director without describing his/her past experience.

1273 articles are in the shortlist and are coded by using the following scale:

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[44] An in-depth examination of the issues within a news item by the writer, including incorporation of comment from recognized experts. Does not include the personal opinion of columnists expressed in their regular columns or the editorial standpoint of a publication.

[45] Writings which express the personal point of view of the writer. Includes regular columns and guest columnists. Excludes editorials and letters to the editor.

[46] Biographical profiles of people in the news, including key management personnel.

[47] Article based predominantly on an interview with a person or persons, or article presented in question and answer format.

[48] A story that reports, or is primarily based on the results of a survey, poll or questionnaire. Surveys of analysts and economists, public opinion polls, employee and employer surveys etc.

[49] Management philosophy and techniques, executive compensation and bonuses, corporate governance

50 Stories about the output of a company or industry, including production figures

51 Corporate and industrial performance

[52] Stories containing historical information about a company, including an in-depth description of its products and markets. Includes stories providing an overview of a company's management, competitors and financials.

- 3 points: the article was unequivocally favourable to the directors;
- 2 points: the article was on balance favourable to the directors but did contain some critical marks;
- 1 point, the article was on balance neither positive nor negative about the director;
- -1 point, the article was on balance negative about the director but did contain some positive comments;
- -2 points, the article was unequivocally negative about the directors.
- 0 points were given for those who have no relevant articles.

Table A1 and A2 describe the criteria for positive or negative comment. Following this approach, 402 articles are coded 3, 215 coded 2, 477 coded 1, 107 coded -1 and 72 coded -2 and 181 acquirers have no relevant articles. Then for each acquisition, we take the weighted sum of scale points. The weight is determined by the ratio of the number of articles in each scale versus total articles identified relevant for this acquisition. The weighted value enables us to make the data distribution of the data less skewed.

The drawback of this content analysis is high subjectivity. Hayward and Hambrick (1997) use 2 researchers independently read and coded each of the 138 articles. Any disagreement about the coding is discussed and agreement reached. Due to our large sample size (we have 10238 articles in total and 1273 need to be carefully read and coded), we are unable to follow Hayward and Hambrick (1997).

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[53] "*"means word starting with executive, such as executives.

Table A1 Association of company outcome with directors.

	Description of Company Outcome	Association of directors with firm outcome
Positive	• Any combination of words that describe the accounting performance improved such as “up”, “success”, “perfect”, “boost”, “perfect”, etc. • Any statistics shows the value of the company increases. • Any words that describes the good impact that a corporate event such as listing and M&A, may have or have had on company, such as “revitalise”, “remarkable recovery”, “improved”, “achievement”, “event of the period”, etc	• Directors photograph on the newspaper • Any words that shows the influence of the directors on the corporate performance or events, such as lead by, driven by, found by, under, etc
Negative	• Any combination of words that describes bad firm performance such as “fall”, “plunge”, “lose”, “down”, “backward”, “profit warning”, “weak”, “underperformance”, “disappoint its investors”, “never quite live up to expectations”, “struggle”, “far less well”, “crisis”, etc. • Doubt from analyst or investors such as “doubt”, “upset investor”.	• Any word describing directors leave the job, such as “be ousted”, “resignation” or “ departure after profit warning”

Table A2 comments on directors’ profile and performance

Positive	• Comments such as “expertise”, “successful”, “be credited”, “bring a wealth of …”, “confident”, “talented”, “clear view”, “play a key role”, “legend” , “highly regarded”, “best”, “famous”, “heavyweight”, “super”, “top”, “greatest”, “transformed…into one of the most efficient…”. • Any word that shows the director is an expertise or pioneer in his area such as “UK’s first…” “create”, “found”, architect, • Reporting that the directors have won some awards, • Interview to describe the directors’ success story, how they founded the company, turned around the company, etc • Comments on the director’s contribution regarding a certain strategy, such as “enhance competitiveness”.
Negative	• Negative words such as “lose”, “arrogant”, “easy to get rid of people”, “a difficult person to work with”, “not appreciate his critics”, “…if so his best work has been done from the stands, not the dugout”, etc. • Doubt from investors or analysts, such as “unease among investors and analysts”, “yet to be convinced”, “whether… can maintain growth”, “scepticism”, “discontent”, “less confident”, etc. • Words that associate directors with the company’s failure, such as “damage”.
Neutral	• Naming a new director with introduction of his/her past experience such as job title, but without commenting on their performance • Interview to ask some general question about the directors such as what is your best moment in your management? What is your favourite city? • Interview about his comment about the development of the industry

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Figure 1: Impact of managerial compensation, behavioural bias and corporate governance on acquisition risk profile

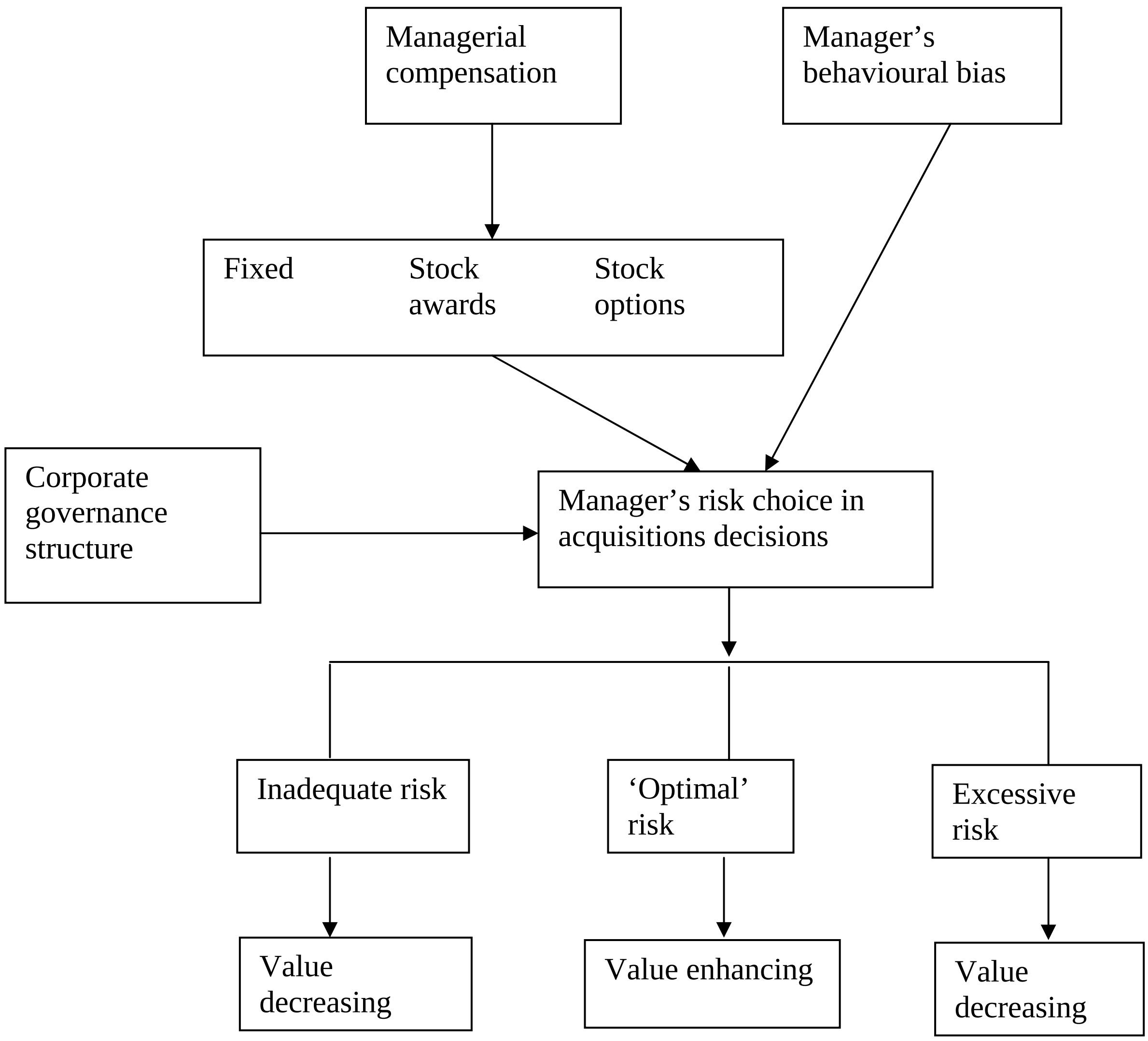

Table 1: Explanatory Variables - Definitions

Variable	Description	Proxy for:
Risk model (equation (1')):		
FAB	The sum of fixed compensation and annual bonuses for acquirer board of directors	Managerial risk incentive from fixed and short-term compensation
LCA	LTIP cash awards	Managerial risk incentive from LTIP cash compensation
LSH	1. The value of LTIP share awards held by acquirer board of directors, VAL_L 2. Delta value of LTIP share awards held by board of directors, DEL_L	Managerial risk incentive from LTIP share compensation
OPT	1. The value of options held by acquirer board of directors, VAL_O 2. Delta value of options held by acquirer board of directors, DEL_O 3. Vega value of options held by acquirer board of directors, VEG_O	Managerial risk incentive from option compensation
MANSHR	1. % of ordinary shareholdings (beneficial and non-beneficial) by acquirer board of directors, MANSHR 2. Delta value of ordinary shares, DEL_S	Managerial risk incentive from ordinary share holdings
PAST	Acquirer's 11 month average monthly stock returns from -12 month to -2 month prior to acquisition announcement month, 0	Managerial hubris
MED	Media praise in UK key newspapers for acquirer board of directors from -37 month to -2 month prior to acquisition announcement month	Managerial hubris
LARSHR	% of ordinary shareholdings (beneficial and non-beneficial), greater than 3%, held by non-board members and institutions	Monitoring and control of managers
NEXE	% of non-executive directors on the acquirer board	Monitoring and control of executive directors
DUAL	Combined role of acquirer CEO and chairman	Weak monitoring of executives
REM	Existence of remuneration committee on acquirer's board	Monitoring and control of managers
BEME	Acquirer book value of equity to market value of equity	Acquirer glamour status in stock market (negative proxy)
LEV	% of acquirer total liability to total asset	Lender monitoring
BETA	Acquirer beta	Acquirer systematic risk level
Performance model (equation (2')):		
AR	Acquirer 3-year buy-and-hold abnormal returns	Acquirer post-acquisition performance
UNDINV	Acquirer actual risk group lower than predicted risk group	Underinvestment in risky project
OPTINV	Acquirer actual risk group equal to predicted risk group	Optimal investment in risky project
OVEINV	Acquirer actual risk group higher than predicted risk group	Overinvestment in risky project
RELSIZ	Acquirer size relative to target size	Ease of post-acquisition integration of target; tendency for higher premium
NONCASH	Equals 1 if payment involves stock	Signaling; reduction in valuation risk

Table 2: Sample distributions by calendar year, 1993-2000

High-tech sample includes UK domestic high-tech M&As during the period 1993-2000 in SDC database. High-tech M&As refer to acquisitions whose targets in high-tech industry as defined by SDC. Low-tech sample consists of acquisitions selected from 3243 low-tech M&As. Low-tech M&As refer to acquisitions whose targets are not in the high-tech industry as defined by SDC.

Year	High-tech sample		Low-tech sample	
	N	% of sample	N	% of sample
1993	21	4.59	35	7.85
1994	40	8.73	62	13.90
1995	24	5.24	40	8.97
1996	36	7.86	48	10.76
1997	64	13.97	72	16.14
1998	59	12.88	74	16.59
1999	72	15.72	60	13.45
2000	143	31.00	55	12.33
Total	459	100	446	100

Table 3: Summary descriptive statistics for high-tech and low-tech acquisitions over 1993-2000

This table shows the descriptive statistics for both high-tech and low-tech acquisitions over 1993-2000. MV= acquirer market value of equity in £bil. TV = transaction value of the acquisition in £mil. LEV = % of acquirer total liability over total assets. BETA = acquirer beta ratio at –2 month prior to the announcement month. RELSIZ = acquirer size relative to target size. TARPUB = targets public companies group. TARPRI = targets private companies group. TARSUB = targets subsidiaries group. CASH = cash payment group. STOCK = stock payment group. MIX = mixed payment group. ALOTHI = acquirer in low-tech industry and target in high-tech industry group. AHITHI = acquirer in high-tech industry and target in high-tech industry. ALOTLO = acquirer in low-tech industry and target in low-tech industry group. AHITLO = acquirer in high-tech industry and target in low-tech industry group. Wilcoxon rank sum test is used to compare group difference. ***, **,* indicate the significance at 1%, 5% and 10% level respectively.

	High-tech sample			**Low-tech sample**			**Group difference**	
	Mean	**Median**	**N**	**Mean**	**Median**	**N**	**Mean difference**	**Median difference**
MV	1.09	0.09	453	0.70	0.09	446	0.39 (1.90)*	0.00 (0.02)
TV	64.41	4.50	406	56.08	3.66	394	8.33 (0.23)	0.84 (0.88)
LEV	62.40	58.87	448	61.84	58.45	443	0.57 (0.20)	0.42(0.02)
BETA	1.04	0.79	436	0.65	0.69	446	0.40(3.46)***	0.1(2.52)***
RELSIZ	193.51	23.69	402	38.97	5.20	446	154.5 (1.93)**	18.49 (9.50)***
	N	**Sample size**	**% of sample**	**N**	**Sample size**	**% of sample**		
TARPUB	34	459	7.41	34	446	7.62		
TARPRI	306	459	66.67	293	446	65.70		
TARSUB	119	459	25.93	119	446	26.68		
CASH	128	459	28.89	188	446	42.15		
STOCK	51	459	11.51	29	446	6.50		
MIX	264	459	59.59	229	446	51.35		
ALOTHI	127	459	27.67					
AHITHI	332	459	72.33					
ALOTLO				376	446	84.30		
AHITLO				70	446	15.70		

Table 4: Summary descriptive statistics for the wealth portfolio of board of directors

FIX=fixed compensation. AB=annual bonus. FAB=fixed compensation and annual bonus. LCA=LTIP cash awards. VAL_L=the value of LTIP share awards. VAL_S=the value of ordinary shares. VAL_O=the value of options. WEALTH=the value of total compensation plus ordinary shares. WEALTH doesn't include options in panel A. DEL_L=delta value of LTIP shares. DEL_S=delta value of ordinary shares. DEL_O=delta value of options. VEGA_O=vega value of options. In parentheses are the t statistic and Wilcoxon rank sum test statistic. ***, **,* indicate the significance at 1%, 5% and 10% level respectively

	High-tech sample					Low-tech sample					Group difference	
	Value (£mil)		% of wealth			Value (£mil)		% of wealth			value (£mil)	
	Mean	Median	Mean	Median	N	Mean	Median	Mean	Median	n	Mean difference	Median difference
	Panel A: acquisition over 1993-2000											
FIX	0.62	0.45	12.69	4.35	406	0.81	0.54	22.68	11.23	436	-0.19 (-3.77)***	-0.09(-4.14)***
AB	1.06	0.08	2.46	0.56	357	0.26	0.07	3.76	1.00	432	0.80 (1.02)	0.01(1.07)
FAB	1.53	0.56	18.06	6.29	437	1.07	0.61	26.28	13.59	439	0.46 (0.71)	-0.05(-3.00)***
LCA	0.02	0	0.21	0	435	0.05	0.00	0.25	0.00	439	-0.03(-1.27)	0(-2.21)**
VAL_L	0.17	0	1.72	0	435	0.88	0.00	2.46	0.00	439	-0.71(-2.18)**	0(-1.61)
VAL_S	31.73	7.60	81.04	93.70	438	25.52	3.99	71.40	85.73	446	6.21 (0.69)	3.61(4.17)***
WEALTH	33.36	8.68	-	-	439	27.54	5.39	-	-	445	5.82 (0.64)	3.29(3.47)***
DEL_L	0.002	0	-	-	435	0.01	0	-	-	439	-0.01(-2.24)**	0(-2.36)**
DEL_S	0.32	0.08	-	-	438	0.26	0.04	-	-	446	0.06(0.69)	0.04(4.17)***
	Panel B: acquisitions over1998-2000											
FIX	0.71	0.51	8.93	3.13	246	0.89	0.58	17.16	7.71	186	-0.18(-2.46)***	-0.07(-2.42)**
AB	1.54	0.10	1.76	0.34	236	0.45	0.10	4.28	1.41	185	1.09(0.92)	0(-1.75)*
FAB	2.13	0.60	11.27	4.09	257	1.34	0.72	21.29	10.05	188	0.79(0.72)	-0.12(-2.60)***
LCA	0.03	0.00	0.20	0.00	257	0.09	0.00	0.21	0.00	188	-0.06(1.34)	0(-2.33)**
VAL_L	0.27	0.00	1.92	0.00	257	1.93	0.00	3.98	0.00	188	-1.66(-2.21)**	0(-2.84)***
VAL_S	45.59	9.64	72.32	86.01	262	42.11	4.16	64.40	76.45	189	3.48(0.18)	5.48(3.56)***
VAL_O	4.10	0.67	13.85	4.31	249	1.43	0.38	12.10	4.96	160	2.67(3.33)***	0.29(1.84)*
WEALTH	52.41	13.91	-	-	262	46.66	7.75	-	-	189	5.76(0.29)	6.16(3.70)***
DEL_L	0.002	0.00	-	-	257	0.02	0	-	-	188	-0.02(-2.25)**	0(-3.38)***
DEL_S	0.46	0.10	-	-	262	0.42	0.04	-	-	189	0.03(0.18)	0.06(3.55)***
DEL_O	0.05	0.01	-	-	249	0.02	0.01	-	-	160	0.03(2.92)***	0(0.97)
VEG_O	0.10	0.02	-	-	249	0.05	0.02	-	-	160	0.05(3.02)***	0(1.05)

Table 5: Summary descriptive statistics for hubris and corporate governance variables for high-tech and low-tech acquisitions over 1993-2000

PAST = the average of acquirer stock returns in % between –12 month and –2 month prior to announcement month. MED = weighted sum of the points for newspaper articles that commented on the performance of acquirer directors from –37 month to –2 month prior to announcement month. LARSHR = external blockholdings of acquirer. NEXE = % of acquirer non-executive directors on the board. BEME= acquirer book value of equity relative to market value of equity. LEV = % of acquirer total liability over total assets. DUAL = duality group. REM = remuneration committee group. Wilcoxon rank sum test is used to compare group difference. In parentheses are the t statistic and Wilcoxon rank sum test statistic. ***, **,* indicate the significance at 1%, 5% and 10% level respectively

	High-tech sample			Low-tech sample			Group difference	
	Mean	**Median**	**N**	**Mean**	**Median**	**N**	**Mean difference**	**Median difference**
PAST	6.28	3.25	450	2.24	1.76	446	4.04 (5.87)***	1.49(5.65)***
MED	0.91	1.00	458	0.78	1.00	446	0.13 (1.95)**	0.00(1.83)*
LARSHR	27.88	26.11	450	31.39	29.42	446	-3.51(-2.70)***	-3.31 (-2.65)***
NEXE	42.70	42.86	450	43.48	42.86	446	-0.78 (-0.79)	0.00(-0.59)
BEME	32.32	9.90	432	37.00	29.18	444	-4.68 (-0.59)	-19.28(-9.92)***
	N	**Sample size**	**% of sample**	**N**	**Sample size**	**% of sample**		
DUAL	105	447	23.49	87	446	19.51		
REM	392	443	88.49	383	433	88.45		

Table 6: Binary logistic regressions on high-tech and low-tech acquisitions

In the binary logistic regression, dependent variable has two categories, high-tech acquisitions (THI) and low-tech acquisition (TLO). THI = targets in high-tech industry. It is coded as 1. TLO=targets in low-tech industries, coded as 0. FAB=fixed compensation and annual bonus. LCA=LTIPs cash awards. VAL_L=the value of LTIPs share awards. VAL_S=the value of ordinary shares. VAL_O=the value of options. MANSHR=managerial ordinary share ownership. DEL_L= delta value of LTIP shares. DEL_S=delta value of ordinary shares. DEL_O=option delta. VEG_O=option vega. PAST = average acquirer stock returns between –12 month and –2 month prior to announcement month. MED = media praise for acquirers 3 years prior to acquisition announcement. LARSHR =external blockholdings. NEXE = % of non-executive directors on the board. DUAL = duality group. REM = remuneration committee group. BEME = acquirer book value of equity to acquirer market value of equity. LEV=acquirer leverage ratio. BETA = acquirer beta ratio at –2 month prior to the announcement month. Numbers in parentheses are Wald statistics[2]. ***,**,* indicate significance level at 1%, 5% and 10% respectively.

	93-00		98-00		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Intercept	-0.36 (0.98)	-0.30(0.85)	-0.22(0.13)	-0.25(0.21)	-0.26(0.23)
FAB	-0.02 (0.31)	-0.03(0.44)	0.01(0.04)	0.01(0.04)	0.01(0.04)
LCA	-0.85 (1.19)	-1.00(1.68)	-0.26(0.10)	-0.54(0.41)	-0.53(0.40)
VAL_L	-0.16(5.14)**		-0.19(6.86)***		
DEL_L		-14.95(6.41)***		-16.50(7.37)***	-16.47(7.40)***
MANSHR	0.002(0.23)		0.000(0.002)		
DEL_S		0.15(1.06)		0.05(0.15)	0.05(0.16)
VAL_O			0.02(0.49)		
DEL_O				0.48(0.03)	
VEG_O					0.06(0.002)
PAST	0.08 (28.75)***	0.08(28.17)***	0.09(18.54)***	0.09(20.09)***	0.09(20.20)***
MEDIA	0.16 (4.35)**	0.15(3.89)**	0.25(4.48)**	0.25(4.52)**	0.25(4.57)**
BEME	-0.01(8.47)***	-0.01(8.21)***	-0.004(3.47)*	-0.003(3.37)*	-0.004(3.39)*
LARSHR	-0.01(5.34)**	-0.01(6.34)***	-0.01(2.70)*	-0.01(3.17)*	-0.01(3.19)*
NEXE	0.003(0.41)	0.003(0.33)	0.01(2.25)	0.01(2.38)	0.01(2.45)
DUAL	0.03 (0.10)	0.03(0.11)	0.10(0.38)	0.10(0.38)	0.10(0.38)
REM	0.15 (1.39)	0.14(1.22)	-0.28(0.90)	-0.29(0.91)	-0.29(0.92)
LEV	-0.001(0.09)	-0.001(0.07)	-0.002(0.19)	-0.002(0.11)	-0.001(0.10)
BETA	0.22 (5.36)**	0.22(5.30)**	0.37(4.61)**	0.39(5.24)**	0.39(5.33)**
N	835	835	400	400	400
Log likelihood	94.43***	97.16***	74.90***	75.94***	75.90***

Table 7: Multinomial logistic regressions on acquisitions of four risk groups

In the multinomial logistic regression, dependent variable has four categories based on acquirer and target high-tech industry status, i.e. ALOTHI, AHITHI, ALOTLO, AHITHI. ALOTHI = acquirer in low-tech industry and target in high-tech industry group, the riskiest group. AHITHI = acquirer in high-tech industry and target in high-tech industry, the second risky group. ALOTLO = acquirer in low-tech industry and target in low-tech industry group. AHITLO = acquirer in high-tech industry and target in low-tech industry group. This group contains acquirer risk diversification via acquisitions. The reference group is AHITLO group, coded as 0. FAB=fixed compensation and annual bonus. LCA=LTIPs cash awards. VAL_L=the value of LTIPs share awards. VAL_S=the value of ordinary shares. VAL_O=the value of options. MANSHR=managerial ordinary share ownership. DEL_L= delta value of LTIP shares. DEL_S=delta value of ordinary shares. DEL_O=option delta. VEG_O=option Vega. PAST = average acquirer stock returns between –12 month and –2 month prior to announcement month. MED = media praise for acquirers 3 years prior to acquisition announcement. LARSHR =external blockholdings. NEXE = % of non-executive directors on the board. DUAL = duality group. REM = remuneration committee group. BEME = acquirer book value of equity to acquirer market value of equity. LEV=acquirer leverage ratio. BETA = acquirer beta ratio at –2 month prior to the announcement month. Numbers in parentheses are Wald statistics^2.

		93-00		**98-00**		
Risk group		**Model 1'**	**Model 2'**	**Model 3'**	**Model 4'**	**Model 5'**
ALOTHI	**Intercept**	-0.25 (0.10)	0.10(0.02)	-0.10(0.01)	0.31(0.06)	0.28(0.05)
VS	**FAB**	-0.20 (1.27)	-0.17(1.19)	-0.31(0.50)	-0.31(0.94)	-0.29(0.73)
AHITLO	**LCA**	1.55 (0.74)	1.30(0.53)	1.04(0.15)	0.54(0.04)	0.42(0.03)
	VAL_L	-0.14(0.11)		-0.18(0.72)		
	DEL_L		-12.72(1.81)		-14.48(0.77)	-13.77(0.71)
	MANSHR	0.01(1.45)		0.01(0.36)		
	DEL_S		0.15(0.11)		-0.09(0.03)	-0.09(0.03)
	VAL_O			0.55(2.43)		
	DEL_O				33.49(1.95)	
	VEG_O					14.21(1.86)
	PAST	0.06 (4.85)**	0.07(5.88)**	0.03(0.63)	0.04(1.25)	0.04(1.29)
	MEDIA	0.40 (5.21)**	0.37(4.61)**	0.46(2.35)	0.49(2.62)	0.49(2.61)
	BEME	-0.01(4.95)**	-0.01(4.84)**	-0.003(0.65)	-0.003(0.72)	-0.004(0.73)
	LARSHR	0.00(0.00)	-0.003(0.10)	-0.01(0.14)	-0.01(0.54)	-0.01(0.52)
	NEXE	-0.01(0.42)	-0.01(0.56)	0.02(0.73)	0.02(0.54)	0.02(0.58)
	DUAL	-0.02 (0.01)	-0.01(0.00)	-0.40(1.74)	-0.38(1.64)	-0.39(1.65)
	REM	0.66 (5.36)**	0.60(4.67)**	-0.37(0.30)	-0.29(0.20)	-0.29(0.19)
	LEV	0.002(0.12)	0.002(0.15)	0.003(0.06)	0.002(0.04)	0.002(0.03)
	BETA	0.10 (0.24)	0.05(0.06)	0.14(0.15)	0.15(0.19)	0.16(0.21)

Table 7: Multinomial logistic regressions on acquisitions of four risk groups (contd)

Risk group		Model 1'	Model 2'	Model 3'	Model 4'	Model 5'
AHITHI	**Intercept**	0.55 (0.67)	1.27(4.38)**	0.06(0.00)	0.71(0.34)	0.69(0.32)
VS	**FAB**	0.05 (0.19)	-0.01(0.02)	0.19(0.24)	0.11(0.19)	0.11(0.18)
AHITLO	**LCA**	-0.14 (0.01)	-0.45(0.07)	-1.30(0.23)	-1.79(0.44)	-1.90(0.52)
	VAL_L	-0.18(2.21)		-1.20(0.95)		
	DEL_L		-16.66(2.99)*		-15.24(0.93)	-14.36(0.85)
	MANSHR	0.03(5.62)**		0.02(0.98)		
	DEL_S		0.45(1.24)		0.12(0.06)	0.11(0.05)
	VAL_O			0.57(2.57)		
	DEL_O				34.35(2.07)	
	VEG_O					14.87(2.05)
	PAST	0.05 (3.16)*	0.05(4.03)**	0.02(0.31)	0.03(0.80)	0.03(0.79)
	MEDIA	0.36(5.46)**	0.31(4.05)**	0.52(3.16)*	0.53(3.25)*	0.52(3.20)*
	BEME	-0.01(3.77)**	-0.01(3.32)**	-0.004(0.69)	-0.004(0.75)	-0.003(0.73)
	LARSHR	0.001(0.03)	-0.004(0.32)	-0.01(0.13)	-0.01(0.77)	-0.01(0.73)
	NEXE	-0.002(0.04)	-0.005(0.23)	0.03(2.64)*	0.03(2.20)	0.03(2.27)
	DUAL	-0.02 (0.01)	-0.004(0.00)	-0.45(2.33)	-0.42(2.20)	-0.43(2.26)
	REM	0.38 (3.06)*	0.27(1.66)	-0.61(0.88)	-0.55(0.78)	-0.56(0.78)
	LEV	-0.002(0.25)	-0.002(0.15)	-0.01(0.61)	-0.01(0.69)	-0.01(0.71)
	BETA	0.32 (3.13)*	0.25(2.06)	0.49(1.82)	0.48(2.07)	0.49(2.06)
ALOTLO	**Intercept**	0.96 (2.18)	1.65(7.96)***	0.51(0.14)	1.21(1.00)	1.20(0.99)
VS	**FAB**	0.05 (0.23)	-0.000(0.00)	0.17(0.17)	0.08(0.10)	0.09(0.11)
AHITLO	**LCA**	1.39 (0.77)	1.23(0.62)	-0.17(0.00)	-0.40(0.03)	-0.53(0.05)
	VAL_L	-0.01(0.02)		0.003(0.00)		
	DEL_L		-1.89(0.06)		1.21(0.01)	2.05(0.02)
	MANSHR	0.02(5.17)**		0.02(1.00)		
	DEL_S		0.27(0.43)		0.02(0.00)	0.01(0.00)
	VAL_O			0.55(2.41)		
	DEL_O				34.02(2.03)	
	VEG_O					14.87(2.05)
	PAST	-0.03 (1.23)	-0.02(0.66)	-0.08(4.37)**	-0.07(3.06)*	-0.07(3.06)*
	MEDIA	0.25(2.57)	0.21(1.82)	0.29(0.97)	0.30(1.08)	0.30(1.04)
	BEME	-0.001(0.18)	-0.001(0.12)	0.000(0.00)	0.00(0.00)	0.00(0.00)
	LARSHR	0.01(2.78)*	0.01(1.00)	0.01(0.19)	0.00(0.00)	0.000(0.00)
	NEXE	-0.01(0.66)	-0.01(1.14)	0.02(0.67)	0.01(0.40)	0.01(0.42)
	DUAL	-0.06 (0.11)	-0.04(0.06)	-0.62(4.41)**	-0.60(4.33)**	-0.60(4.39)**
	REM	0.34 (2.66)*	0.25(1.47)	-0.31(0.22)	-0.24(0.14)	-0.24(0.14)
	LEV	-0.001(0.02)	-0.000(0.00)	-0.005(0.17)	-0.01(0.23)	-0.01(0.25)
	BETA	0.05 (0.07)	-0.02(0.02)	0.01(0.00)	-0.02(0.00)	-0.02(0.00)
N		835	835	400	400	400
Log likelihood		1867.48 (p=1)	1870.41(p=1)	839.21(p=1)	839.65(p=1)	839.48(p=1)

Table 8 Distributions of investment types based on the predictions of logistic regression models

2 risk group classification is based on binary logistic regression reported in Table 6. 4 risk group classification is based on multinomial logistic regression reported in Table 7. UNDINV = actual risk group is lower than predicted risk group, i.e. underinvestment in risky projects. OPTINV = actual risk group is the same as predicted risk level, i.e. optimal investment in risky projects. OVEINV = actual risk group is higher than predicted risk group, i.e. overinvestment in risky projects.

		Acquisitions over 1993-2000				Acquisitions over 1998-2000		
		n	**Sample size**	**% of sample**		**N**	**Sample size**	**% of sample**
UNDINV	**2 risk group (Model 1)**	109	905	12.06	**2 risk group (Model 3)**	128	463	27.65
OPTINV		549	905	60.66		286	463	61.77
OVEINV		247	905	27.29		49	463	10.58
UNDINV	**2 risk group (Model 2)**	116	905	12.82	**2 risk group (Model 4)**	129	463	27.86
OPTINV		544	905	60.11		288	463	62.20
OVEINV		245	905	27.07		46	463	9.94
UNDINV					**4 risk group (model 5)**	129	463	27.86
OPTINV						287	463	61.99
OVEINV						47	463	10.15
UNDINV	**4 risk group (model 1')**	147	835	17.60	**4 risk group (model 3')**	183	433	42.26
OPTINV		426	835	48.62		164	433	37.88
OVEINV		282	835	33.77		86	433	19.86
UNDINV	**4 risk group (model 2')**	152	835	18.20	**4 risk group (model 4')**	149	403	36.97
OPTINV		411	835	49.22		133	403	33.00
OVEINV		272	835	32.57		121	403	30.02
UNDINV					**4 risk group (model 5')**	166	428	38.79
OPTINV						154	428	35.98
OVEINV						10	428	25.23

Table 9 Three-year BHARs of acquirers in the sample over 1993-2000

This table reports BHARs of acquirers over 1993-2000. Three benchmarks are used: industry matched control portfolio, size and BEME matched control portfolios, and industry, size, BEME and price momentum matched firm. Student's t test is used to determine whether the mean values are significantly different from zero. Fisher's sign test and Wilcoxon signed-rank test are used to test whether the median values are significantly different from zero. We report the lower test statistics between Fisher's sign test and Wilcoxon signed-rank test. If one test shows significant result while the other not, we put the sign for the test that generates significant results behind the test statistic. s represents for Fisher's sign test, w represents for Wilcoxon signed-rank test. ***, ** and * represent for 1%,, 5% and 10% respectively.

	High-tech sample			**Low-tech sample**			**Group difference**		
	Industry-adjusted	**Size and BEME-adjusted**	**Industry, size, BEME and mom'-adjusted**	**Industry-adjusted**	**Size and BEME-adjusted**	**Industry, size, BEME and mom'- adjusted**	**Industry-adjusted**	**Size and BEME-adjusted**	**Industry, size, BEME and mom'-adjusted**
N	459	371	332	446	422	399			
1-12 months:									
Mean	-5.22(-1.31)	-7.43(-1.64)*	-1.72(-0.34)	-3.67(-1.37)	-7.68(-3.02)***	-5.72(-1.55)	-1.55(-0.32)	0.25(0.05)	3.99(0.64)
Median	-9.15(-2.93)***	-15.96(-4.13)***	-9.59(-1.37)	-5.15(-2.91)***	-9.58(-4.33)***	-5.49(-1.91)*	-4.00(-0.45)	-6.38(-1.76)*	-4.10(-0.15)
1-24 months:									
Mean	7.12(0.99)	-5.10(-0.64)	-4.84(-0.28)	-12.26(-3.17)***	-15.59(-3.96)***	-5.61(-1.02)	19.37(2.36)**	10.5(1.18)	0.77(0.04)
Median	-15.32(-2.16)**	-35.77(-4.95)***	-8.09(-0.85)	-13.88(-4.60)***	-26.45(-6.28)***	-4.91(-0.80)w	-1.44(-1.33)	-9.32(-2.26)**	-3.18(-0.31)
1-36 months:									
Mean	11.58(1.27)	-24.15(-2.82)***	-2.29(-0.14)	-15.32(-2.78)***	-27.83(-6.18)***	-19.40(-2.94)***	26.9(2.53)***	3.69(0.38)	17.11(0.94)
Median	-17.88(-2.78)***	-73.91(-7.13) ***	-6.45(-1.01)w	-20.15(-5.34)***	-42.85(-8.23) ***	-10.31(-2.00)**	2.27(0.65)	-31.06(-3.95)***	3.86(0.92)

Table 10 Three-year BHARs of acquirers in the sample over 1998-2000

This table reports BHARs of acquirers over 1998-2000. Three benchmarks are used: industry matched control portfolio, size and BEME matched control portfolios, and industry, size, BEME and price momentum matched firm. Student's t test is used to determine whether the mean values are significantly different from zero. Fisher's sign test and Wilcoxon signed-rank test are used to test whether the median values are significantly different from zero. We report the lower test statistics between Fisher's sign test and Wilcoxon signed-rank test. If one test shows significant result while the other not, we put the sign for the test that generates significant results behind the test statistic. s represents for Fisher's sign test, w represents for Wilcoxon signed-rank test. ***, ** and * represent for 1%,, 5% and 10% respectively.

	High-tech sample			**Low-tech sample**			**Group difference**		
	Industry-adjusted	**Size and BEME-adjusted**	**Industry, size, BEME and mom'- adjusted**	**Industry-adjusted**	**Size and BEME-adjusted**	**Industry, size, BEME and mom'-adjusted**	**Industry-adjusted**	**Size and BEME-adjusted**	**Industry, size, BEME and mom'- adjusted**
N	274	225	191	189	180	171			
1-12 months:									
Mean	-13.18(-2.25)**	-17.02(-2.51)***	-0.92(-0.13)	-4.31(-0.82)	-12.43(-2.67)***	-9.38(-1.41)	-8.87(-1.13)	-4.60(-0.56)	3.46(0.87)
Median	-16.61(-4.95)***	-38.92(-5.10)***	-14.74(-1.85)*	-7.61(-1.60)w	-21.10(-4.52)***	-8.59(-1.99)**	-9.00(-1.37)	-17.82(-2.90)***	-6.15(-0.06)
1-24 months:									
Mean	0.59(0.07)	-31.32(-3.02)***	0.55(0.05)	-17.24(-2.55)***	-25.18(-3.88)***	-5.69(-0.63)	17.82(1.66)*	-6.14(-0.47)	6.24(0.45)
Median	-17.72(-4.43)**	-80.68(-7.14)***	-15.47(-2.67)***	-13.86(-2.76)***	-40.43(-5.14)***	-8.08(-1.22)w	-3.86(-0.12)	-40.25(-4.14)***	-7.39(-0.72)
1-36 months:									
Mean	-12.35(-2.00)**	-77.42(-9.91)***	-18.13(-1.97)*	-4.07(-0.77)	-44.17(-7.15)***	-12.69(-1.36)	-8.27(-1.02)	-33.24(-3.22)***	-5.45(-0.41)
Median	-20.13(-6.50)***	-109.22(-10.25) ***	-9.49(-3.54)***	-6.75(-1.46)	-61.83(-5.74) ***	-12.29(-1.07)	-13.38(-2.61)***	-47.39(-5.97)***	2.8(0.88)

Table 11 Acquirer 3-year BHARs on types of risk investment

This table shows the median BHARs of each types of risk investment calculated based on the binary logistic regressions reported in table 6 and multinomial logistic regressions reported in table 7. UNDINV = underinvestment in risky projects. OPTINV = optimal investment in risky projects. OVEINV = overinvestment in risky projects. BHARs of investment types based on 2 risk group (model 2) is similar as that on 2 risk group (model 1). BHARs of investment types based on 4 risk group (model 2') is nearly the same as the that on 4 risk group (model 1'). Similarly, the output for the 2 risk group (model 4 and model 5) is close to the output for the 2 risk group (model 3), and the output for the 4 risk group (model 5') is similar as the output for the 4 risk group (model 3'). Hence we only report the results for 5 models. We report the lower test statistics between Fisher's sign test and Wilcoxon signed-rank test. If one test shows significant result while the other not, we put the sign for the test that generates significant results behind the test statistic. s represents for Fisher's sign test, w represents for Wilcoxon signed-rank test. ***, ** and * represent for 1%,, 5% and 10% respectively

Benchmark model =			**n**	*Industry-adjusted BHARs*	**n**	*Size and BEME-adjusted BHARs*	**N**	*Industry, size, BEME and mom'tum- adjusted BHARs*
				Acquisitions 1993-2000				
2 risk group (model 1)	UNDINV	Median	109	-18.38(-2.37)**		-57.63(-3.98)***		-17.76(-1.84)*
	OPTINV	Median	549	-20.51(-6.25)***		-60.33(-10.30)***		-9.25(-2.70)***
	OVEINV	Median	247	-11.97(-1.85)*		-41.70(-2.98)***		5.51(0.91)
4 risk group (model 1')	UNDINV	Median	147	-26.27(-3.79)***		-57.63(-4.58)***		-16.92(-1.87)**
	OPTINV	Median	406	-18.49(-4.31)***		-57.72(-8.83)***		-8.58(-2.24)**
	OVEINV	Median	282	-14.75(-2.62)***		-47.59(-4.07)***		-1.59(-0.13)
				Acquisitions 1998-2000				
2 risk group (model 3)	UNDINV	Median	128	-6.28(-1.15)		-66.01(-5.16)***		-14.12(-1.22)w
	OPTINV	Median	286	-18.53(-5.83)***		-106.52(-10.23)***		-9.73(-2.95)***
	OVEINV	Median	49	-21.30(-1.87)*		-82.05(-2.09)**		-1.59(-0.39)
4 risk group (model 3')	UNDINV	Median	183	-6.97(-1.42)		-59.85(-5.50)***		-11.78(-0.93)
	OPTINV	Median	164	-15.16(-3.31)***		-109.43(-8.19)***		-10.56(-2.55)***
	OVEINV	Median	86	-25.63(-5.23)***		-111.28(-5.38)***		-9.05(-2.50)***
4 risk group (model 4')	UNDINV	Median	149	-5.60(-0.98)		-60.31(-5.52)***		-12.29(-1.03)w
	OPTINV	Median	133	-13.24(-2.93)***		-109.22(-7.02)***		-10.40(-2.10)**
	OVEINV	Median	121	-22.70(-3.55)***		-80.99(-4.62)***		-5.62(-0.89)

Table 12: Group differences of median 3-year BHARs

This table shows group difference in median 3-year BHARs. Investment types are calculated based binary logistic regression reported in table 6, i.e. 2 risk group models, or multinomial logistic regressions reported in table 7, i.e. 4 risk group models. UNDINV = underinvestment in risky projects. OPTINV = optimal investment in risky projects. OVEINV = overinvestment in risky projects. Student's t test is used to test mean difference. Wilcoxon rank sum test is used to test median difference. We report the lower test statistics between Fisher's sign test and Wilcoxon signed-rank test. If one test shows significant result while the other not, we put the sign for the test that generates significant results behind the test statistic. s represents for Fisher's sign test, w represents for Wilcoxon signed-rank test. ***, ** and * represent for 1%,, 5% and 10% respectively.

	Benchmark model =		Industry-adjusted BHARs	Size and BEME-adjusted BHARs	Industry, size, BEME and mom'- adjusted BHARs
Panel A: acquisitions over 1993-2000					
2 risk group (Model 1)	UNDINV vs OPTINV	Median difference	2.13 (0.11)	2.70 (1.25)	-8.51 (-0.86)
	OVEINV vs OPTINV	Median difference	8.54 (1.19)	18.63 (2.60)***	14.76 (2.19)**
4 risk group (Model 1')	UNDINV vs OPTINV	Median difference	-7.78 (-1.49)	-0.21 (-0.63)	-8.34 (-0.67)
	OVEINV vs OPTINV	Median difference	3.74 (0.38)	9.83 (1.09)	6.99 (1.78)*
Panel B: Acquisitions over 1998-2000					
2 risk group (Model 3)	UNDINV vs OPTINV	Median difference	12.25 (2.28)**	40.51 (4.30)***	-4.39 (-0.09)
	OVEINV vs OPTINV	Median difference	-2.77 (-0.02)	24.47 (2.32)***	8.14 (0.35)
4 risk group (Model 3')	UNDINV vs OPTINV	Median difference	8.19 (1.24)	49.58 (5.49)***	-1.22 (-0.77)
	OVEINV vs OPTINV	Median difference	-10.47 (-1.94)**	-1.85 (-0.11)	1.51 (0.21)
4 risk group (Model 4')	UNDINV vs OPTINV	Median difference	7.64 (1.30)	48.91 (4.86)***	-1.89 (-0.16)
	OVEINV vs OPTINV	Median difference	-9.46 (-1.17)	28.23 (1.97)**	4.78 (0.72)

Table 13 OLS regressions on acquirer 3-year BHARs on acquisitions over 1993-2000

This table shows results for OLD regression on acquirer 3-year BHARs on acquisitions over 1993-2000. UNDINV = underinvestment in risky projects. OPTINV = optimal investment in risky projects. OVEINV = overinvestment in risky projects. They are calculated based on the binary logistic regression models reported in table 6, i.e. 2 risk group model (model 1), or the multinomial logistic regressions reported in table 7, i.e. 4 risk group (model 1'). RELSIZ = acquirer size relative target size. NONCASH is a dummy variable that indicates the payment involves stocks. This indicates that the model is adjusted for White noise. *** represents for 1% significance level, ** 5% and * 10%.

	2 risk group (model 1)			4 risk group (model 1')		
	Industry-matched	**Size, BEME adjusted**	**Industry, size, BEME and mom' adjusted**	**Industry-matched**	**Size, BEME adjusted**	**Industry, size, BEME and mom' adjusted**
Intercept	-4.79 (-0.63)	-23.21 (-3.30)***	2.93 (0.28)	0.79 (0.09)	-21.40 (-2.85)***	2.78 (0.25)
UNDINV	0.30 (0.03)	1.44 (0.14)	-21.18 (-1.21)	-20.22 (-1.94)**	0.04 (0.00)	-16.38 (-1.04)
OVINV	15.49 (1.35)	31.89 (2.91)***	29.80 (2.15)**	9.15 (0.85)	23.51 (2.25)**	30.15 (2.25)**
RELSIZ	0.002 (0.38)	-0.03 (-2.37)**	-0.02 (-1.00)	0.00 (0.11)	-0.03 (-2.44)***	-0.02 (-1.06)
NONCASH	-11.10 (-1.27)	-19.09 (-2.34)**	-18.90 (-1.60)	-12.92 (-1.44)	-19.93 (-2.38)**	-21.98 (-1.83)*
F-statistic	1.05a	4.90***a	2.67**	1.83a	3.65***a	3.00**
Adjusted R^2	0.000	0.02	0.01	0.004	0.01	0.01
N	848	751	691	791	722	675

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Table 14 OLS regressions on acquirer 3-year BHARs on acquisitions over 1998-2000

This table shows results for OLD regression on acquirer 3-year BHARs on acquisitions over 1998-2000. UNDINV = underinvestment in risky projects. OPTINV = optimal investment in risky projects. OVEINV = overinvestment in risky projects. They are calculated based on the binary logistic regression models reported in table 6, i.e. 2 risk group model (model 1), or the multinomial logistic regressions reported in table 7, i.e. 4 risk group (model 1'). RELSIZ = acquirer size relative target size. NONCASH is a dummy variable that indicates the payment involves stocks. This indicates that the model is adjusted for White noise. *** represents for 1% significance level, ** 5% and * 10%.

	2 risk group (model 3)			**4 risk group(model 3')**			**4 risk group (model 4')**		
	Industry-matched	**Size, BEME adjusted**	**Industry, size, BEME and mom' adjusted**	**Industry-matched**	**Size, BEME adjusted**	**Industry, size, BEME and mom' adjusted**	**Industry-matched**	**Size, BEME adjusted**	**Industry, size, BEME and mom' adjusted**
Intercept	-14.48 (-1.66)*	-59.87 (-6.52)***	-6.96 (-0.56)	-13.44 (-1.17)	-72.02 (-6.70)***	-9.16 (-0.61)	-13.33 (-1.07)	-67.09 (-5.83)***	-7.15 (-0.45)
UNDINV	6.13 (0.81)	16.36 (1.66)*	-11.83 (-0.88)	5.20 (0.55)	33.07 (3.27)***	-1.83 (-0.13)	4.22 (0.40)	25.77 (2.27)**	-10.00 (-0.64)
OVINV	1.01 (0.07)	30.01 (1.75)*	2.16 (0.09)	-16.94 (-1.83)*	-8.41 (-0.63)	-17.10 (-0.91)	-5.24 (-0.48)	14.94 (1.21)	2.67 (0.16)
RELSIZ	0.01 (0.85)	-0.01 (-0.93)	-0.01 (-0.56)	0.01 (0.78)	-0.01 (-0.49)	-0.01 (-0.42)	0.01 (0.62)	-0.01 (-0.62)	-0.01 (-0.70)
NONCASH	2.65 (0.32)	-15.59 (-1.64)*	-4.22 (-0.32)	6.92 (0.78)	-8.37 (-0.87)	-1.57 (-0.12)	7.56 (0.85)	-8.61 (-0.87)	-0.49 (-0.04)
F-statistic	0.23a	2.47**	0.26	1.43a	4.96***	0.28	0.48a	1.95*	0.29
Adjusted R^2	-0.01	0.02	-0.01	0.004	0.04	-0.01	-0.01	0.01	-0.01
N	425	378	337	403	364	335	376	340	319