Takeover Regulation and Firm Investment Performance: A Comparison between the U.S. and the U.K.

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Abstract

This paper employs a combined Transaction Cost Economics (TCE)–firm lifecycle theory of the relationship between corporate governance and firm performance to examine the impact that differences in takeover regulation between the U.S. and the U.K. have on the investment decisions taken by managements of firms incorporated in these two countries. While for the case of the U.S. the possibility that anti-takeover provisions may be deployed by firm directors is contemplated in the theory, for the case of the U.K., in contrast, the deployment of anti-takeover provisions is not considered for the reason that anti-takeover provisions are prohibited by U.K. takeover regulation.

The combined TCE–firm lifecycle theory predicts that the managements of financially autonomous firms who are also entrenched using anti-takeover provisions will over-invest substantially. On the other hand, it predicts that the managements of financially autonomous firms that are not also entrenched using anti-takeover provisions will over-invest moderately due to the threat of takeover.

The theory is then tested for empirical validity. To do this, a new measurement of firm financial autonomy is developed, an entrenchment index currently available in the literature is employed, and firm investment performance is measured by employing the marginal q technique. Substantial evidence in favour of the theory’s predictions is found.

Keywords: Corporate governance, firm performance, entrenched managers, firm financial autonomy, overinvestment problems.

JEL Classification: G34, L21, L22

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This paper employs a combined Transaction Cost Economics (TCE)–firm lifecycle theory of the relationship between corporate governance and firm performance (Saravia and Chen, 2008) to examine the impact that differences in takeover regulation between the U.S. and the U.K. have on the investment decisions taken by managements of firms incorporated in these two countries.

From the perspective of economics and finance, corporate governance refers to the set of constraints and controls which protect shareholders interests from potential managerial discretion. Since the managements of large publicly held corporations, if left unconstrained, would likely advance their own interests (which are not always aligned with those of shareholders) firm performance should be related to the effectiveness of these constraints. Modern financial economics theory suggests that the checks on managerial discretion include a variety of governance mechanisms such as: incentive alignment arrangements e.g. managerial ownership of stock, monitoring by the corporation’s board of directors, and institutional constraints such as legal shareholder protection and the threat of takeover (also known as “the market for corporate control”), among others.

While most of the firm-level constraints on managerial discretion both in the U.S. and the U.K. are comparable and most institutional constraints are similarly effective, there is, however, an important difference at the institutional-level which has received very little attention in the corporate governance literature. In particular, in a recent article, Armour and Skeel (2007) examine the essential differences in takeover regulation between the U.S. and the U.K. They find that the main difference between the two systems is that, while in the U.S. firm managements can deploy a wide range of anti-takeover provisions, in the U.K., in contrast, any frustrating actions on the part of management to prevent a takeover bid, including the deployment of anti-takeover provisions, are prohibited.

Moreover, Armour and Skeel (2007) find that an important gap in corporate governance and firm performance literature is that the available evidence does not allow them to establish “emphatically” the “normative question” of which system is “preferable.” Although they strongly suggest on a priori grounds that the U.K. system seems preferable to that in the U.S. from the perspective of utility-maximizing rational shareholders, they do not perform an empirical study to test their analysis. In view of this gap in the literature, the objective of the present paper is to provide
evidence concerning which regulatory system may be more effective at constraining managerial discretion.

As mentioned above, this paper employs the combined TCE–firm lifecycle theoretical framework developed by Saravia and Chen (2008) to study corporate governance and firm investment performance both in the U.S. and the U.K. Importantly, while in the U.S. version of the model anti-takeover provisions are contemplated, in the U.K. version, in contrast, the deployment of anti-takeover provisions is not considered. The combined TCE–firm lifecycle approach describes how corporate governance develops through the various stages of the lifecycle of U.S. and U.K. firms. Furthermore, the theory predicts that the managements of financially autonomous firms who are also entrenched using anti-takeover provisions will over-invest substantially, while on the other hand, it predicts that the managements of financially autonomous firms that are not also entrenched will over-invest moderately due to the takeover constraint. This paper then tests both the U.S. and the U.K. models for empirical validity. To do this, a new measurement of firm financial autonomy is developed, an entrenchment index currently available in the literature is employed, and firm investment performance is measured by employing “marginal q” (Mueller and Reardon, 1993). Substantial evidence in favour of the predictions derived from the models regarding overinvestment problems is found. Thus, the results suggest that while in the U.S. the managements of financially autonomous firms who are also entrenched over-invest substantially, in the U.K., in contrast, overinvestment on the part of managements of financially autonomous firms is moderated by the threat of takeover for the reason that anti-takeover provisions are prohibited by U.K. takeover regulation.

The remainder of the paper is organized as follows. Section I discusses the combined TCE–firm lifecycle theory of the relationship between corporate governance and firm performance developed by Saravia and Chen (2008) and its application to the U.S. and the UK. Section II describes the data employed in the empirical sections. Section IV presents the paper’s results. Section V concludes.

I. A combined TCE–firm lifecycle theory

Scientific theories can be regarded as consisting in two parts: firstly, there is a system of “interrelated mental constructs” or “conceptual world” which must be logically consistent, and secondly, there is an empirical component that must be tested
using factual evidence (Friedman, 1953; Machlup, 1978). Since the conceptual component of the combined TCE–firm lifecycle theory to be used in this paper has been discussed at length elsewhere (Saravia and Chen, 2008) the first half of this section will only be concerned with its essentials. However, the second half of this section will discuss at some length the empirical component of the theory, since it was not examined in the paper by Saravia and Chen (2008).

A. The conceptual world

The starting point of the combined TCE–firm lifecycle theory is Williamson’s (1988) treatment of debt and equity as alternative governance structures. In that paper Williamson argues that while debt is used to finance redeployable assets (i.e. those with low asset specificity), equity, on the other hand, is used to finance non-redeployable assets (i.e. those assets with high specificity). Saravia and Chen (2008), however, note that throughout his paper Williamson assumes that there exists bilateral dependency between equity-holders and the corporation, and hence explore the implications of relaxing this assumption.

In particular, Saravia and Chen (2008) examine the assumption of bilateral dependency using, to guide their inquiry, insights provided by Mueller’s (1969) lifecycle theory of the firm. They note that the analysis in Mueller’s (1969) paper clearly suggests that while a condition of bilateral dependency between equity-holders and the firm is likely to occur for fast-growing young firms with cash flows that are insufficient to finance all profitable investments in specific assets on a continuing basis (and are therefore dependent on their on shareholders to finance these projects), for the case of slow-growth mature firms, on the other hand, the assumption of bilateral dependency between equity-holders and the firm is untenable. The reason is that mature firms usually have cash flows which are sufficient to finance all profitable investments on specific assets and simultaneously issue dividends and/or repurchase stock on a continuing basis. Hence, mature firms are unlikely to depend on their shareholders to finance their investments in specific assets, and consequently can be generally regarded as being financially autonomous from their shareholders.

In contrast, however, the shareholders of mature firms as a group (just as those of young firms) will remain dependent on their corporations. This is because, as Williamson (1985, p. 304) argues, while individual equity-holders can terminate their relationship with any given corporation by selling their shares, shareholders taken as a
group cannot do so: as long as the corporation does not buy back its own equity the investing public taken as a group will have to hold it.

A.1. The U.S. version of the model

Based on these insights, Saravia and Chen (2008) argue that, in addition to Williamson’s (1988) contractual equilibrium, there are three other important equilibria for the equity governance structure in the context of U.S. institutions. The four equilibria are depicted in Fig. 1 and are labelled system states 1 to 4 in order to denote that they take place sequentially as firms mature.

Before we discuss these four equilibria, however, a few remarks concerning the “mental constructs” that constitute the theory are in order. Specifically, it is important to mention that the theory is constructed using four key theoretical variables all of which are derived from TCE: (a) the level of bilateral dependency between the parties involved (or the lack of it i.e. firm financial autonomy from shareholders), (b) the effectiveness of firm-level contractual safeguards mainly in the form of a board of directors, (c) the level of opportunism with which the theoretical actors conduct themselves, and (d) the level of institutional protection for the parties involved. On the other hand, the behavioural assumptions –which act as theoretical links between the variables above– are those used in standard TCE: actors are assumed to be limited in their knowledge about future events (bounded rationality, so that all complex contracts are incomplete) and to have an inclination to behave opportunistically. In addition, however, the managers in the model are assumed to derive utility from firm growth (i.e. they obtain pecuniary and non-pecuniary benefits from firm growth), and to value job security (so that if the market valuation of their firms is too low they become concerned due to the increased probability of a hostile takeover).

Now we are ready to discuss the four system states in Fig. 1. Note that for ease of exposition, the theoretical variable ‘bilateral dependency’ is represented by its opposite ‘firm financial autonomy from shareholders’ in that figure. In addition, note that ‘overall corporate governance effectiveness’ refers to both the effectiveness of
both firm-level (e.g. the board of directors) and institutional corporate governance effectiveness (e.g. the threat of takeover).

**System state 1.** This state corresponds to the case of Williamson’s ‘equity contractual equilibrium’ and to that of Mueller’s young firms. As can be seen, state 1 is depicted at the top left corner of Fig. 1, where bilateral dependency is high between the firm’s management and its shareholders (i.e. lack of firm financial autonomy), overall corporate governance is highly effective (i.e. both good firm-level and institutional corporate governance) and opportunism is low.

As mentioned earlier, shareholders are always dependent on the firm and its management (Williamson, 1985). On the other hand, young firms (in state 1) depend on shareholders to fund investment in specific assets since, according to the lifecycle theory of the firm, managements wish to maximize growth, and firms resort to external equity most heavily when they are young given an abundance of good investment opportunities. Hence, we have a condition of bilateral dependency in state 1. In addition, according to TCE equity becomes less costly when safeguards are effective and contractual hazards are mitigated. Since good corporate governance is mutually beneficial, as it can reduce the cost of equity and protect shareholder’s assets, overall corporate governance should be highly effective in state 1 (an effective board of directors). Finally, when overall corporate governance is effective, TCE informs us that opportunistic behaviour is constrained, hence in state 1 the level of opportunism is low. Since at these magnitudes the interrelated variables are mutually compatible, state 1 is said to constitute an equilibrium.

**System state 2.** According to Mueller’s (1969) lifecycle theory, as firms mature their cash flows become consistently larger than the quantities required to finance all profitable investment opportunities. Clearly, since at this point the management can finance all investments in specific assets from the company’s internal cash flows, it is evident that the date on which the managers start expecting that shareholders will no longer be needed as sources of equity capital will mark the end of the ‘bilateral dependency’ condition. On account of the assumption of managerial opportunism, and given that the board of directors is usually under the influence of management, it can be expected that at this point the management will weaken the effectiveness of the board of directors as a contractual safeguard. For example, the management can alter the composition of the board of directors, the composition of its committees, or its size, thus weakening this control mechanism so that thereafter it favours their interests
at the expense of those of shareholders. Furthermore, since in the case of equity the contract lasts for the entire life of the public corporation, shareholders as a group have no chance to renegotiate terms of their contracts and protect themselves from opportunism.

Nevertheless, in state 2 the managers will continue to be somewhat responsive to the interests of the shareholders. This is due to the threat of hostile takeover: if shareholders become discontent with management, the firm’s share price may plunge, which in turn would increase the likelihood of a hostile takeover taking place. Thus, state 2 refers to a stage of the lifecycle of the firm where the firm is financially autonomous from shareholders, firm-level corporate governance is weakened by the management of the financially autonomous firm, but opportunism is moderated by institutional forces, namely, the takeover constraint works as indicated by Mueller (1969, 2003). This state is depicted at the middle-right section of Fig. 1.

**System state 3.** In order to overcome the institutional constraints on opportunism so that growth can continue at a higher rate, or, perhaps more importantly, to avoid retrenchment (Mueller, 2003), one action U.S. managements can take, once firm-level governance structures are weakened, is to have the board of directors approve anti-takeover provisions to make their firms less vulnerable to hostile takeover.

Evidently, if the board approves anti-takeover provisions the managements of financially autonomous firms will have the required leeway to diverge from shareholder wealth maximization policies and instead substantially over-invest in expansion of market share or diversification, or both. Hence, system state 3 is depicted at the bottom-right section of Fig. 1, where corporate governance is at its weakest and opportunism is high.

It is worth mentioning that an important institutional constraint that managements of U.S. firms in state 3 should not be able to overcome is related to the level of institutional shareholder protection enforced in the country, specifically: legal shareholder protection and monitoring by the financial press. Unfortunately for shareholders, however, although these institutional constraints are likely to be effective against stealing on the part of firm managements, they are unlikely to be effective against overinvestment decisions. This is because the courts are unlikely to second guess manager’s business decisions such as those involved in investment choices (Shleifer and Vishny, 1997).
**System state 4.** From a contractual perspective, firms in this state seem unconventional: they are financially dependent yet they have entrenched managements.

Given that previous work, such as that of Field and Karpoff (2002), finds that IPO firms deploy significantly less anti-takeover provisions than older firms, one likely explanation on how firms reach state 4 is related to the possibility that some mature firms may lose their financial autonomy. If so, we could then distinguish between ‘fortunate’ and ‘unfortunate’ ways in which mature firms may lose their financial autonomy. An example of a ‘fortunate’ way is that, due to some events (e.g. changes in consumer preferences, successful R&D, innovation, growing demand for certain products), a mature firm’s cash flows become insufficient to fund all profitable investments in specific assets, and consequently the firm has to turn to outside equity to take advantage of the new opportunities. Conversely, an ‘unfortunate’ possibility is that a firm’s products become standardized or displaced by new ones and competition (e.g. from younger firms, firms abroad, etc.) reduces its cash flows.

In both cases, however, if a firm in state 4 wishes to reduce the cost of the new equity it requires it would have to improve the credibility of its corporate governance. Hence, the combined model indicates that in this state overall corporate governance is moderately effective as shown in Fig. 1.

However, despite the return to financial dependency in state 4, it seems unlikely that corporate governance effectiveness would return to the high levels of state 1. Consider the case of a ‘fortunate’ firm, if the company had been previously over-investing, its stock price would have been low even before the loss of financial autonomy (e.g. companies in state 3 in Fig. 1). Specifically, if prior to the loss of financial autonomy, the management of the mature firm had been building an unwieldy conglomerate composed of unrelated businesses, improved efficiency could be attained by dismantling the firm (Mueller, 1972). In such a case, if the firm is to remain in one piece, the management would need to have anti-takeover provisions in place in order to reduce the risk of a hostile takeover bid. On the other hand, regarding the case of an ‘unfortunate’ firm, if the firm takes a hit in its income generating capacity (e.g. due to competition), its stock price would likely be affected as well, which in turn, would increase the probability of a hostile takeover bid. In such a case, the management would prefer to have anti-takeover defences ready. Therefore, in both
cases, it seems reasonable to expect that the management of a firm which loses its financial autonomy would be interested in keeping anti-takeover provisions in place.

A.2. The U.K. version of the model

As mentioned above the discussion so far has been conducted in the context of U.S. institutions. How can we apply the combined TCE–firm lifecycle model to the case of the U.K.? Clearly, since previous work, e.g. Armour and Skeel (2007), informs us that anti-takeover provisions are prohibited by U.K. takeover regulation, the equilibria represented in Fig. 1 as system states 3 and 4 do not apply to British firms. Hence, we can conclude that for the case of the U.K. there will be only two equilibria: those corresponding to system states 1 and 2.

A.3. Propositions

One key objective of this paper is to predict in which circumstances opportunistic activities will likely surface, and how they will manifest themselves. Concerning the circumstances, as we have seen, the level of opportunism is expected to be particularly high in system state 3. On the other hand, in relation to the ways in which opportunism will occur, the literature on corporate governance and firm performance suggests that opportunism can be of two kinds: (1) hold-up opportunism i.e. instead of paying out dividends managers invest these funds below the cost of capital (“the agency costs of free cash flows”) and (2) moral hazard opportunism i.e. extraction of shareholder wealth (“stealing”). When institutions are strong (such as in the U.S. and the U.K.), however, managers may overcome institutional safeguards against overinvestment by deploying anti-takeover provisions, but may not be so successful in getting away with stealing. Hence, in this paper we will concentrate on the problem of hold-up opportunism. With these considerations in mind, our first proposition is:

Proposition 1: The managements of financially autonomous firms who are also entrenched using anti-takeover provisions (i.e. in state 3) will tend to over-invest substantially.

As we have discussed earlier, however, anti-takeover provisions are prohibited in the U.K. and hence system state 3 does not apply to British firms. Consequently, the level of over-investment undertaken by the management of financially autonomous
British firms (in system state 2) should be constrained by the threat of takeover: if over-investment is excessive the probability of a hostile takeover taking place increases accordingly. Clearly, a similar prediction can be made for financially autonomous firms in the U.S. which are not also entrenched (also in system state 2). Hence, our second proposition is:

Proposition 2: The managements of financially autonomous firms who are not also entrenched using anti-takeover provisions (i.e. in state 2) will tend to over-invest moderately.

B. Matching the conceptual with the empirical world

This section is concerned with bridging the gap between conceptual and the empirical world. While the previous section was exclusively concerned with mental constructs, the objective of this section is to put us in a position to test the propositions of the model for empirical accuracy. This involves (a) the selection or creation of appropriate empirical indicators (also known as empirical variables) and (b) the conversion of the propositional statements into testable hypotheses (Dubin, 1978).

B.1. Empirical indicators

Empirical indicators are the result of the operations that researchers perform in order to obtain measurements of the values of a theoretical unit (Dubin, 1978). As can be inferred from the propositions, in our case measurements for the following theoretical variables are needed in order to test the theory empirically: (a) firm financial autonomy from shareholders, (b) managerial entrenchment through the use of anti-takeover provisions, and (c) opportunism (in its hold-up variety i.e. overinvestment).

The purpose of this section is to describe the empirical indicators to be used in this paper. Please refer to the appendix for a discussion on how the necessary data were obtained and a brief discussion on how the data are organized to provide measurements of the values of the theoretical variables.

B.1.1. Firm financial autonomy from shareholders and the “A-index”

The empirical indicator proposed in this section in order to measure firm financial autonomy is one of the original contributions of this paper. In the spirit of this paper,
it is motivated by observations from the lifecycle theory of the firm, and is complemented with insights from TCE.

According to Mueller’s (1969) firm lifecycle theory, the cash flows of young firms are usually smaller than the amounts of funds they require to invest at their optimal levels. Therefore, young firms can be said to be dependent on their outside sources of finance to fully exploit their investment opportunities. In contrast, according that theory, the cash flows of mature firms are generally greater than the amounts of cash required to achieve optimal investment. Thus, mature firms are autonomous in the sense that they can fund all their investments and at the same time return part of that cash to investors in the form of dividends and/or stock repurchases. Consequently, following this line of reasoning, it would seem logical to suggest that financially dependent firms are those that on most occasions have smaller cash flows than their optimal level of investments, while on the other hand it would seem equally reasonable to put forward that financially autonomous firms are those that on most occasions have cash flows which are greater than their optimal level of investments.

Nevertheless, empirical indicators of financial autonomy based on this criterion would not match the combined TCE–firm lifecycle model’s requirements. As it was discussed previously, TCE indicates that firms (i.e. their managements) depend on shareholders for the financing of specific assets only. Thus, firms do not depend on shareholders for the financing of the whole investment expense since non-specific assets can be financed by debt.

Accordingly, it can be concluded that firms are financially dependent on shareholders (the type of dependence about which the combined model refers) when on most occasions their cash flows are smaller than their investments in specific assets. Conversely, it can be concluded that firms are financially autonomous from shareholders when on most occasions their cash flows are greater than their levels of investments in specific assets.

With these reasons in mind, an “autonomy index” or “A-index” to stand for financial autonomy can be constructed as follows: for a given company in a given year, over a number of past years (immediately preceding the year in question), add up the number of times a given company has cash flows which are greater than its investments in specific assets. The idea is that financially autonomous firms in the

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1 Investments in specific assets will be measured as that part of the firms’ investments financed by ploughed back cash flows plus net new equity. Please consult the appendix for details.
sense indicated above will obtain a higher score in this index relative to financially
dependent firms.

Having established the basic criteria, a practical problem arises as to how many
years to use in order to create the A-index. Graham (1973, p. 319) suggests that in
analyzing firm financial statements one should use a fairly long period in the past: 7 to
10 years “in order to iron out the frequent ups and downs of the business cycle”… and
to get “a better idea of the company’s earning power.” Hence, the “A-index” for a
given company in a given year will be created by adding one point for each year in
which a company has greater cash flows than investments in specific assets during the
previous 7 years. Thus, the A-index ranges from 0 to 7.

B.1.2. Institutional corporate governance and the “E-index”

As it has been previously discussed, managers can insulate themselves to a certain
extent from the institutional environment by entrenching themselves at the helm of
their companies. Thus, although the institutional environment is essentially the same
for all firms in a given country, managements can reduce their exposure to
institutional forces such as the treat of takeover by having their boards of directors
deploy anti-takeover provisions. For this reason, what a researcher needs to measure
in order to asses the effectiveness of institutional corporate governance, i.e. the threat
of takeover, in constraining opportunism is the level of managerial entrenchment as
measured by an index of anti-takeover provisions.

At present there are at least 4 indices of corporate governance provisions for the
U.S. in the literature: (a) the “G-index” developed by Gompers et al. (2003), (b) the
“E-index” developed by Bebchuk et al. (2004), (c) “Gov-Score” developed by Brown

Of these, at the time of data collection for the present work, Brown and Caylor’s
indices only covered up to 3 years data, while Gompers et al.’s (2003) G-index
comprised too many corporate provisions (24 in all) so that “innocuous” provisions
may be included thus underweighting the provisions that really matter (Bebchuk et al.,
2004). This leaves us with Bebchuk et al.’s (2004) E-index as the most promising
measure of entrenchment.

The E-index (i.e. Entrenchment index) is the outcome of Bebchuk et al. (2004)’s
effort to identify a group of key governance provisions among the 24 governance
provisions used by Gompers et al. (2003) to create their G-index. Based on
discussions with lawyers, their own personal analysis, and examination of provisions which attract opposition from institutional investors, the researchers were able to identify a collection of six key governance provisions. The six governance provisions thus identified are: staggered boards, limits to amend by-laws, poison pills, golden parachutes, supermajority requirements for mergers, and supermajority requirements for charter amendments. The E-index is created for a given firm in a given year by assigning a point for each of the six key provisions that the firm has. Thus, the E-index ranges from 0 to 6. In this paper this empirical indicator will be used to measure entrenchment.

B.1.3. The “marginal q” method and opportunism

To test the propositions in the model, a method to measure deviations from shareholder wealth maximization as a consequence of overinvestment is needed. This subsection argues that the interesting method first proposed by Mueller and Reardon (1993) can be helpful in this regard.

Mueller and Reardon (1993) (henceforth M&R) start by defining $I_t$ as the investment of a firm in period $t$, $CF_{t+j}$ as the cash flow that the investment generates in $t+j$, and $i_t$ as the firm’s discount rate in $t$. Thus, the present value of the investment, $PV_t$, can be expressed as follows:

$$PV_t = \sum_{j=t}^{\infty} \frac{CF_{t+j}}{(1+i_t)^j}$$  \hspace{1cm} (1)

Then, M&R take the $PV_t$ from Eq. (1) and the investment $I_t$, and calculate the ratio of “the pseudo permanent return $r_t$ to $i_t$,” (Gugler et al., 2003, p. F522) a ratio usually labelled $q_{mt}$ or “marginal q.”

$$PV_t = \frac{r_t I_t}{i_t} = q_{mt} I_t$$  \hspace{1cm} (2)

That is, M&R argue that if the company had invested $I_t$ in a project that generated a permanent return $r_t$, this project would have produced the same $PV_t$ as in Eq. (1). The ‘$q_{mt}$’ ratio is the key statistic in M&R’s analysis; it can measure hold-up opportunism.

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2 In conformity with the extant literature this paper also calls this ratio “marginal q” throughout. It should be noted that according to Mueller and Yurtoglu (2000, p. 207) estimates of $q_{mt} = r_t/i_t$ should be interpreted as estimates of average return on investment as opposed to estimates of marginal return on investment. We shall return to this point in more detail in Section III.
problems of the type where free cash flows are retained and invested in negative net present value projects. As M&R argue, no firm that maximizes shareholder wealth would undertake an investment for which the $q_{mt}$ is less than unity (Gugler et al. 2004, p. 598). Then, M&R define the market value of the firm $M_t$ as

$$M_t = M_{t-1} + PV_t - \delta_t M_{t-1} + \mu_t$$  \hspace{1cm} (3)$$

Where, $\delta_t$ is defined as the depreciation rate that the capital market appraises for the firm’s total capital, and $\mu_t$ is the error of the market in evaluating the market value of the firm. M&R explain that under the market efficiency assumption the error term $\mu_t$ has an expected value of zero. M&R then subtract $M_{t-1}$ from both sides of the last equation, replace $PV_t$ with $q_{mt} I_t$, and finally divide both sides by $M_{t-1}$ and obtain:

$$\frac{M_t - M_{t-1}}{M_{t-1}} = -\delta_t + q_{mt} \frac{I_t}{M_{t-1}} + \frac{\mu_t}{M_{t-1}}$$  \hspace{1cm} (4)$$

M&R then argue that Eq. (4) can be used to estimate $\delta_t$ and $q_{mt}$ using OLS under the assumption of market efficiency.\(^3\) It is worth noting that, according to Gugler et al. (2003, p. F523), although both $M_t$ and $I_t$ carry the same subscript, Eq. (4) “does not suffer from a simultaneous equation bias. $M_t$ is a company’s market value at the end of year t, while $I_t$ is the investment flow over year t.” Thus, $I_t$ takes place before $M_t$ and it is exogenous.

To estimate Eq. (4) M&R utilize data on the market value of each firm and its investments. They define $M_t$ as the sum of the market value outstanding shares of a company plus the market value of its outstanding debt. And they define investment as

$$I = CF - Dividends + \Delta D + \Delta E + R & D + ADV$$  \hspace{1cm} (5)$$

Where $CF$ are the cash flows of the firm defined as the sum of income before extraordinary items and depreciation, and $\Delta D$ and $\Delta E$ are defined as net additions to investment funds from changes in outstanding debt and equity respectively. Moreover, the researchers argue that although $R&D$ and advertising expenditures ($ADV$) are charged to expenses (as opposed to be treated as investments in the

\(^3\) Note, however, that Gugler et al. (2004, pp. 623-627) have argued that results obtained using the M&R method and a sample of firms with long time series of observations can rest on the weaker assumption that the stock market is efficient over the long run.
company accounts) they are also forms of investment that can produce “intangible capital” which contributes to a firm’s market value, and that for this reason they add them to their measure of total investment.

Fig. 2 below exemplifies how the M&R method works and how it may be useful for measuring hold-up opportunism. As it was mentioned previously, hold-up opportunism occurs when the controlling party of the firm takes advantage of the poor safeguard intensity conditions, refuses to pay out at least some of the “free cash flows” to shareholders, and uses these funds to invest in negative net present value projects, while the shareholders lack the means to have the “control” of the corporation disgorge the cash.

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Insert Fig. 2 about here

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A marginal q which is smaller than one indicates that managements are investing below the firm’s cost of capital. In such a case shareholders would clearly prefer to receive the cash in the form of dividends or stock repurchases rather than seeing it reinvested. If managements are able to repeatedly invest below the firm’s cost of capital, this would evidence of investor’s inability to force the managements to pay out the free cash flows i.e. a hold-up situation.

B.2. Hypotheses

Testable hypotheses are “predictions about values of units of a theory [i.e. theoretical variables] in which empirical indicators are employed for the named units in each proposition” (Dubin, 1978, p. 206). Hence, by inserting the empirical indicators just discussed into proposition 1 above we obtain the first testable hypothesis as follows:

H10: The managements of financially autonomous firms as measured by the A-index who are also entrenched using anti-takeover provisions as measured by the E-index (i.e. in state 3) will not tend to over-invest substantially as measured by marginal q.

With the alternative hypothesis:
H1: The managements of financially autonomous firms as measured by the A-index who are also entrenched using anti-takeover provisions as measured by the E-index (i.e. in state 3) will tend to over-invest substantially as measured by marginal q.

Moreover, the second testable hypothesis can be enunciated as follows:

H2: The managements of financially autonomous firms as measured by the A-index who are not also entrenched using anti-takeover provisions as measured by the E-index (i.e. in state 2) will not tend to over-invest as measured by marginal q.

With the alternative:

H2*: The managements of financially autonomous firms as measured by the A-index who are not also entrenched using anti-takeover provisions as measured by the E-index (i.e. in system state 2) will tend to over-invest moderately as measured by marginal q.

II. Data

This section discusses the steps taken to select the samples and collect the data needed to test the paper’s hypotheses. For clarity of exposition the discussion in this section is organized in two parts. After discussing how the collection of data for the U.S was conducted, the subsequent subsection examines how the collection of data for the case of the U.K. was implemented. Each subsection below also presents summary statistics for each of the samples.

A. U.S. data

The starting point of the data collection procedure in this paper for the case of the U.S. is the information contained in Bebchuk et al.’s (2004) E-index database. As mentioned earlier, the E-index is a measure of managerial entrenchment. This index is updated every two or three years. At the time of the data collection for this paper, the database contained information for the years 1990, 1993, 1995, 1998, 2000, 2002 and 2004. Since the E-index is built from data contained in the publications of the Investor Responsibility Research Centre (IRRC), Bebchuk et al.’s database contains information on firms that are relevant from IRRC’s perspective, namely those in the Standard & Poor’s (S&P) 500 as well as the annual lists of the largest corporations in the publications of Fortune, Forbes, and Businessweek. Therefore, the sample in this
paper is one of large U.S. publicly held corporations, which is precisely what is needed in order to appropriately test the combined TCE–firm lifecycle theory.

From the firms included in Bebchuk et al.’s database⁴ 586 companies that had non-missing values for the years 1990 and 2004 were identified. Given that some of the companies changed names and ticker symbols, the information in the two years was matched using 8 digit CUSIPs⁵ also provided in the database in order to make sure that the data referred to the same company. Then a search for these 586 firms was performed using the Datastream database and 556 firms were found. Moreover, following Gugler et al. (2003, p. F524), banks, financial companies and certain service industries (SICs 6000 to 6999 and above 8100) were excluded “because the nature of capital and investment in these industries is not comparable to those of non-financial firms.” This reduced the sample further by 81 companies from 556 to 475.

For this final sample of 475 firms the usual practice of researchers who utilize corporate governance provision indices (e.g. Gompers et al., 2003; Bebchuk et al., 2004) was followed and the observations for the years in which IRRC does not publish governance provisions data were filled in by assuming that the provisions remain unchanged in the period between IRRC publications. In this way it was possible to assign values of the 475 firm’s E-indices for a period of 16 years, comprising the years from 1990 to 2005. Market prices and accounting data for these companies was obtained from the Datastream database.

Table 1 below provides summary statistics of the variables needed to estimate the M&R investment performance regression equations. After constructing these variables, the procedure in Mueller and Yurtoglu (2000) was followed and ‘leverage versus-residual squared plots’ (i.e. graphs of leverage vs. normalized residuals squared) were utilized to identify influential observations. Observations with substantial leverage were checked for consistency in data collection by looking at the percentage change in the variables between years. Observations which are considerably inconsistent with the data on each firm were excluded. With this procedure 6 observations were excluded in total. It should also be noted that in

⁴ Note that Bebchuk et al.’s database contains two sub-samples, a “no dual class” stock sub-sample and a “dual class” stock sub-sample. Since Bebchuk et al. (2004) exclude “dual class” stock from their sample for the reason that in those companies “the superior voting rights may be sufficient to provide incumbents with a powerful entrenchment mechanism that renders the other entrenchment provisions relatively unimportant” (Bebchuk et al., 2004, p. 16), the present work also excludes dual class stocks.

⁵ CUSIP is an acronym that refers to the 8 character alphanumerical security identifier distributed by the Committee on Uniform Security Identification Procedures.
addition to the exclusion of the 6 influential observations, the number of observations (N) in Panels A and B of Table 1 also differs from 7600 (475 firms x 16 years) due to 187 observations with missing values for the A-index, $\frac{(M_t - M_{t-1})}{M_{t-1}}$ and/or $\frac{I_t}{M_{t-1}}$ variables.

As discussed previously, firms in the different system states for the case of the U.S. possess the following special characteristics: (1) financially dependent with un-entrenched managements, (2) financially autonomous with un-entrenched managements, (3) financially autonomous with entrenched managements, and (4) financially dependent with entrenched managements. In order to identify in which system state a given firm may be at a given point in time, the following definitions are utilized. Firms with un-entrenched managements are defined as those with an E-index below the median for that variable i.e. 0, 1 and 2; and similarly firms with entrenched managements are defined as those with equal to or above median E-index values i.e. 3, 4, 5 and 6. Moreover, financially dependent firms are defined as those with an A-index below the median for that variable i.e. 0, 1, 2, 3, 4 and 5, and financially autonomous firms are defined as those with values equal or higher than the median A-index i.e. 6 and 7. Using these definitions firms were grouped according to their system states. Summary statistics regarding the A-index and the E-index for the four system states are provided in Table 1 Panel B.

Table 1 Panel C also presents correlations between the variables. It is interesting to note that firms in states 1 and 4 have positive and significant correlations with both $\frac{(M_t - M_{t-1})}{M_{t-1}}$ and $\frac{I_t}{M_{t-1}}$, while on the other hand, firms in states 2 and 3 have significantly negative correlations with these variables. This suggests that firms in states 1 and 4 invest more and their market values increase faster when compared to firms in states 2 and 3, which in turn invest comparatively less and have market values which increase comparatively more slowly over time.

**B. U.K. data**

Since a key purpose of this paper is to compare the U.K. system of corporate governance with that in the U.S. it is important that the databases for the two countries
are comparable. That is, that the time period and the type of firms in the databases for the two countries are similar. Hence, to build the U.K. database, the first step in this subsection was to collect data for all British firms in the Datastream database which were (a) active during the entire 1990-2005 period, that (b) do not have dual class stocks (c) are not financial firms (SIC code 6000-6999), and (d) do not belong to some service sectors (SIC codes 8100 and above). This process yielded a total of 402 firms. Unfortunately, however, the Datastream database for U.K. firms is not as good as that for U.S. firms in that a substantial number of observations mainly needed for the calculation of the A-index were found to be missing. This reduced the number of firms in the U.K. sample to 391 firms.

Table 2 below presents summary statistics and correlations for the key variables to be used in the M&R investment performance regression equations for the U.K. After constructing these variables, the procedure in Mueller and Yurtoglu (2000) was also followed in this subsection and ‘leverage versus residual squared plots’ (i.e. graphs of leverage vs. normalized residuals squared) were utilized to identify influential observations. Observations with substantial leverage were checked for consistency in data collection by looking at the percentage change in the variables between years. Observations which are considerably inconsistent with the data on each firm were excluded. With this procedure 7 observations were excluded in total.

It should be noted that in addition to the exclusion of the 7 influential observations, the number of observations (N) in Table 2 also differs from the number of observations in a balanced panel dataset i.e. 6256 firm-years (391 firms x 16 years) due to missing values for the A-index, \((M_t-M_{t-1})/M_{t-1}\) and \(I_t/M_{t-1}\) variables. The main reason, however, is that there are about 1000 observations missing for the A-index due to incomplete data in the Datastream database. The A-index is constructed for a particular firm in given year with information from the 7 previous years, since there

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Recall that for the case of the U.S. sample, following Bebchuk et al. (2004), dual class stocks were excluded. Moreover, following Gugler et al. (2003) banks, financial companies and some service industries (SICs 6000 to 6999 and above 8100) were also excluded because the nature of capital and investment in these industries is not comparable to those of non-financial firms.

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are missing observations for U.K. firms, especially during the 1980s, this reflects in
missing values for the A-index during the early part of the 1990s.

As discussed earlier, firms in the two system states in the U.K. model possess the
following characteristics: (1) financially dependent, (2) financially autonomous. In
order to identify in which system state a given firm may be, and also to make the
classifications comparable to those in the U.S. the following definition is employed:
financially dependent firms are defined as those with an A-index below the median
for the U.S. database i.e. 0, 1, 2, 3, 4 and 5, and financially autonomous firms are
defined as those with values equal or higher than the median A-index for the U.S.
database i.e. 6 and 7. Using these definitions firms were grouped according to their
system states.

Finally, correlations between the key variables are shown in Table 2 Panel B. It is
interesting to note that firms in state 1 have a positive significant correlation with both
\((M_t-M_{t-1})/M_{t-1}\) and \(I_t/M_{t-1}\) which suggests that firms in state 1 invest more and their
market values increase faster when compared to firms in state 2. While firms in state 2
have significantly negative correlations with these variables, which suggest that these
invest comparatively less and that their market value increases more slowly over time.

III. Empirical results

This section presents the empirical results of the present study. In what follows, the
dummy variable approach is used in conjunction with the M&R method to test the
hypotheses of the combined TCE–firm lifecycle theory.

Firstly, for the case of U.S. firms, equation (4) is rewritten as follows:

\[
\frac{M_{ij}}{M_{ij-1}} - \frac{M_{ij}}{M_{ij-1}} = -\beta_0 + \beta_1 (\text{state1}_{ij}) \frac{I_{ij}}{M_{ij-1}} + \beta_2 (\text{state2}_{ij}) \frac{I_{ij}}{M_{ij-1}} + \beta_3 (\text{state3}_{ij}) \frac{I_{ij}}{M_{ij-1}} + \beta_4 (\text{state4}_{ij}) \frac{I_{ij}}{M_{ij-1}} + \sum_{i=1}^{F} \theta_i \text{Time}_i + \sum_{j=1}^{J} \lambda_j \text{Industry}_{ij} + \frac{H_{ij}}{M_{ij-1}}
\]

Where, state1, state2, state3, and state4 are system state dummy variables created
by grouping firms in each year in the sample (1990-2005) according to their E-index
and A-index characteristics, the coefficients \(\beta_1, \beta_2, \beta_3, \text{ and } \beta_4\) refer to the marginal q

\[7\] The dummy variables take the value of 1 if a firm is in a given system state and zero otherwise. Hence, for example, the dummy variable labelled state1 takes the value of one if a given firm is in state 1 in a given year and zero otherwise (the empirical definitions of the states are given in Section II).
statistics for each system state respectively, and $\beta_0$ is the intercept for the benchmark category. In addition, $Time_t, t = 1,\ldots, T-1$ are time dummy variables, and $industry_{ij}, j = 1,\ldots, J-1$ are industry dummy variables.

Since the attention in this section centres in investigating whether overinvestment occurs in a particular system state and not in studying the differences between the marginal $q$ coefficients, the slopes of each state are allowed to be different by introducing a slope dummy variable for each state. The idea is that after estimation t-tests can be implemented to investigate whether each of the marginal $q$ coefficients are significantly smaller than 1. If an estimate is significantly smaller than 1 then there will be evidence of substantial overinvestment. Conversely, if the estimate is not significantly smaller than 1 there will be no evidence of substantial overinvestment taking place. Moreover, as it can be seen, two additional adjustments are made to Eq. (6). Given that the sample covers 16 years (1990-2005), year dummy variables are added in order to pick up common movements in stock market values (Mueller and Reardon, 1993; Mueller and Yun, 1998). Moreover, since depreciation rates can be expected to vary across companies depending on their investments in capital assets each company in the sample is assigned a two digit SIC industry code and, in this way, industry dummy variables are included (Mueller and Yurtoglu, 2000).

Secondly, for the case of U.K. firms, Eq. (4) is also rewritten in an equivalent way to Eq. (6) except that this time there are only two system state dummy variables in the model. Specifically, to examine the investment performance of U.K firms, the following equation will be estimated:

$$
\frac{M_{i,j} - M_{i,j-1}}{M_{i,j-1}} = -\delta_0 + \delta_1 (state_{1,j}) \frac{I_{i,j}}{M_{i,j-1}} + \delta_2 (state_{2,i,j}) \frac{I_{i,j}}{M_{i,j-1}} + \sum_{i=1}^{T-1} \tau_i Time_i + \sum_{j=1}^{J-1} \eta_j Industry_{ij} + \frac{\mu_{i,j}}{M_{i,j-1}}
$$

(7)

Where the coefficients $\delta_1$ and $\delta_2$ are the marginal $q$ statistics for each system state, and $\delta_0$ is the intercept for the benchmark category. In addition, $Time_t, t = 1,\ldots, T-1$ are time dummy variables, and $industry_{ij,j} = 1,\ldots, J-1$ are industry dummy variables.

Table 3 presents the key results for the investment performance regression equations. As it can be seen, financially dependent firms (i.e. in states 1 and 4 for the case of the U.S., and firms in state 1 for the case of the U.K.) have coefficients which
are greater than 1. In addition, one tailed t-tests reveal that the estimates are significantly greater than 1 (t-tests not reported).

This result can be best interpreted with the aid of Fig. 3 below. According to Mueller and Yurtoglu (2000) marginal q equals the area under the marginal rate of return schedule (mrr) between 0 and the level of investments divided by the area under the cost of capital (i) between 0 and the level of investments. Thus, an estimated marginal q that is greater than one is consistent with the interpretation that firms are maximizing shareholder value by equalizing their marginal rates of returns to their marginal cost of capital.

For example, as shown in Fig. 3, if firms in states 1 and 4 invested $I_1$ they would equalize their marginal rates of return ‘mrr’ and their marginal cost of capital ‘i’, and their marginal q would equal the area under mrr from 0 to $I_1$, that is ‘a + b,’ divided by the area under the marginal cost of capital curve, namely ‘b’, which is clearly greater than one. Thus, an estimated $q_{mt} > 1$ can be consistent with a marginal return on investment which is equal to the firm’s cost of capital.

Turning to financially autonomous firms, Table 3 shows that the estimated marginal q for firms in state 2, both in the U.S. and in the U.K., is also greater than 1. However, t-tests reveal that the estimates are insignificantly greater than one (t-test not reported). Following Mueller and Yurtoglu’s (2000) interpretation of marginal q, an estimated $q_{mi}$ which is close to 1 can be interpreted as an indication of some overinvestment taking place. To see this suppose that firms in state 2 invested $I_2$ as shown in Fig. 3, and moreover assume that the areas labelled ‘a’ and ‘e’ in the figure are approximately equal. In this case, marginal q would equal the area under mrr, that is ‘a + b + c + d’, divided by the area under the cost of capital curve, i.e. ‘b + c + d + e’. Given that ‘a’ and ‘e’ have approximately equal areas, marginal q approximately
equals 1 and, as the figure shows, there is overinvestment taking place as the marginal investment project has a rate of return that is below its cost of capital.

Therefore, under the plausible assumption put forward in Mueller’s lifecycle theory of the firm, that marginal rate of return curves are downward sloping, estimates presented in Table 3 are consistent with the hypothesis that firms in state 2 over-invest moderately, and that the extent of this opportunistic activity is constrained by the threat of takeover which is depicted in Fig. 3 by curve mc\_M. Hence, it can be concluded that there is evidence against the null hypothesis H2\_0 and in favour of alternative hypothesis H2\_1 that the managements of financially autonomous firms as measured by the A-index who are not also entrenched using anti-takeover provisions as measured by the E-index (i.e. in state 2) will tend to over-invest moderately as measured by marginal q.

Finally, the results shown in Table 3 indicate that there is strong evidence of overinvestment for U.S. firms in state 3. As reported in the table, a one tailed t-test shows that the estimate is significantly smaller than 1 at the 1% level. From the discussion in the previous paragraphs it is clear that no firm that maximizes shareholder wealth would undertake investment for which q\_mt = r/L < 1, for this unequivocally implies evidence of substantial overinvestment. As shown in Table 3, the regression estimates indicate that on average for every dollar that firms in state 3 invested during the period 1990-2005, the market value of these firms increased by about $0.89 only (or $0.87, depending on the regression equation).

Therefore, this section concludes that there is significant evidence in favour of the hypothesis that the managements of financially autonomous firms as measured by the A-index who are also entrenched as measured by the E-index tend to over-invest substantially as measured by marginal q, that is, consistent with the alternative hypothesis H1\_1 as opposed to the null hypothesis H1\_0. Thus, the results in this section are consistent with the predictions of the combined TCE–firm lifecycle theory.

IV. Conclusion

The results of the present paper indicate that there is substantial evidence in favour of the proposition that there actually is a significant relationship between corporate

\footnote{Curve mc\_M, represents the “marginal psychological cost of investing beyond [I\_1] from the perception of higher probabilities of takeover” (Mueller, 2003, pp. 80-81). That is, if the managers of the firm maximize shareholder wealth and invest at the optimal level, I\_1, the threat of takeover due to overinvestment problems is zero, but this threat rises if managers invest beyond that level.}
governance and firm performance. Particularly, the results for the case of U.S. firms suggest that when “institutional corporate governance” in the form of a takeover threat is neutralized through the issuance of anti-takeover provisions (as measured by the E-index), then if the firms in question also receive abundant cash flows from their operations on a continuing basis, i.e. in excess of the amounts needed to fund all positive net present value projects (as measured by the A-index), the managements of those corporations will tend to over-invest substantially. The latter is reflected in poor firm investment performance (as measured by marginal q). Further, it is important to note that, for the case of U.S. firms, the failure of “institutional corporate governance” i.e. the takeover threat in constraining over-investment requires as a pre-requisite the failure of “firm-level corporate governance” i.e. the board of directors in constraining managerial opportunism, since it is the board of directors that approves the anti-takeover provisions.

On the other hand, for the case of U.K. firms, this paper also presents results which suggest that when British corporations receive substantial cash flows from their operations on a continuing basis, i.e. in excess of the amounts necessary to fund all positive net present value projects (as measured by the A-index), “firm-level corporate governance” in the form of the board of directors is unable to constrain a moderate level of overinvestment taking place, rather it is the “institutional corporate governance” in the form of a takeover threat, and the regulatory prohibition to issue anti-takeover provisions, that constrains over-investment to a moderate level.

Taking together the evidence concerning the investment performance of U.K. corporations vs. that of U.S. corporations, the results in this paper strongly suggest that the U.K. regulatory system is more effective at constraining overinvestment than that in the U.S. Thus, in presenting these results, this paper represents a contribution which helps to fill in the gap pointed out by Armour and Skeel (2007) concerning the lack of evidence in the literature about which of these two regulatory systems may be better at constraining opportunism.
Appendix: data sources

Table A.1 lists the main sources of data used in this paper. The first column of the table displays the data items used, while the second column presents the data sources. As can be seen in the table, the main data source is Datastream.

Panel A presents the data needed to compute the market value of a given firm at the end of year $t$ ($M_t$), which in turn is required to implement the Mueller and Reardon (1993) method. Specifically, the table shows that $M_t$ is computed by adding\(^9\) the market value of common stock ($wc05301 \times P$) plus the book value of total debt ($wc03255$) and preferred stock ($wc03451$). Where the market value common stock is calculated by multiplying the end of fiscal year number of shares ($wc0531$) times the end of fiscal year price per share ($P$).

On the other hand, Panel B lists the data needed to calculate the investment of a firm over year $t$ ($I_t$) which is also necessary to implement the M&R method. In particular, $I_t$ is calculated by first subtracting dividends ($wc04551$) from cash flows ($wc04201$) and then adding net new equity (the change in the number of shares $wc05301$ times average share price $P$ over year $t$), net new debt (the change in total debt $wc03255$ over year $t$), R&D expenditures ($wc01201$), and advertising expenses (estimated by multiplying total sales $wc01001$ and advertising to sales ratios taken from IRS reports on corporation returns, see Mueller and Yurtoglu, 2000, p. 218).

Panel C lists the sources of data for Bebchuk et al.’s (2004) E-index, as well as other important items used in this paper such as industry SIC codes.

-----------------------------
Insert Table A.1 about here
-----------------------------

The financial data utilized to compute the firm financial autonomy index (A-index) is also taken from Table A.1. As mentioned in the text, the A-index is calculated by adding one point for each year in which a company has greater cash flows than investments in specific assets during the previous 7 years. Investments in specific assets ($I_k$) are measured as follows:

$$I_k = CF - Dividends + \Delta E$$  \hspace{1cm} (A.1)

\(^9\) Datastream datatypes are presented in parenthesis.
Where $CF$ is the cash flow of the firm (wc04201), *Dividends* are taken from Datastream (wc04551) and $\Delta E$ stands for net new equity (the change in the number of shares wc05301 times average share price $P$ over year $t$).

Two observations on the calculation of $I_k$ are in order. First, since both advertising and R&D expenditures are charged to expenses, these are not included in Eq. (A.1) for this would involve double counting (see Eq. A.2 below). Second, net new debt is not included because the A-index is concerned with the measurement of financing available for (non-redeployable) specific assets only and according to TCE debt is better suited to finance investment in redeployable assets.

Therefore, when calculating the A-index for a given firm in year $t$, 1 point is added for every year (from $t$-7 to $t$-1) in which:

$$CF + ADV + R \& D > I_k + ADV + R \& D$$

$$CF > I_k \quad (A.2)$$

Finally, it should be noted that prior to the calculations all data items were deflated using the CPI (2000=1) of the appropriate country. The CPIs for the U.S. and the U.K. were obtained from the World Bank, World Development Indicators, ESDS International, University of Manchester.
References


Table 1. Summary Statistics – U.S. sample

This table shows summary statistics of the variables needed to estimate the M&R investment performance regression equations for the U.S. E-index is the entrenchment index created by Bebchuk et al. (2004). A-index is a firm-level index of financial autonomy computed by adding one point for every year, in the previous 7 years, in which a given firm’s cash flows are greater than its investment in specific assets. \((M_t - M_{t-1})/M_{t-1}\) is the percentage change in the market value of the firm between the end of year t-1 and the end of year t. \(I/M_{t-1}\) is the investment undertaken by a given firm during year t divided by the market value of the firm at the end of year t-1. System states 1, 2, 3 and 4 are dummy variables created by grouping firms in each year from 1990 to 2005 according to their E-index and A-index characteristics. * and ** indicates that a correlation is significant at the 1% and 5% level respectively.

### Panel A. Summary statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-index</td>
<td>7407</td>
<td>2.537</td>
<td>1.319</td>
<td>3</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>A-index</td>
<td>7407</td>
<td>5.068</td>
<td>2.160</td>
<td>6</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>((M_t - M_{t-1})/M_{t-1})</td>
<td>7407</td>
<td>9.81%</td>
<td>34.81%</td>
<td>3.95%</td>
<td>-83.63%</td>
<td>450.65%</td>
</tr>
<tr>
<td>(I/M_{t-1})</td>
<td>7407</td>
<td>12.96%</td>
<td>16.02%</td>
<td>9.70%</td>
<td>-66.17%</td>
<td>192.74%</td>
</tr>
</tbody>
</table>

### Panel B. Summary statistics for the system states

<table>
<thead>
<tr>
<th>System state</th>
<th>N</th>
<th>A-index</th>
<th>E-index</th>
<th>(M_t - M_{t-1})/M_{t-1}</th>
<th>I/M_{t-1}</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>Median</td>
<td>Std. Dev.</td>
<td>Mean</td>
</tr>
<tr>
<td>state1</td>
<td>1499</td>
<td>2.641</td>
<td>3</td>
<td>1.783</td>
<td>1.346</td>
</tr>
<tr>
<td>state2</td>
<td>1922</td>
<td>6.660</td>
<td>7</td>
<td>0.474</td>
<td>1.329</td>
</tr>
<tr>
<td>state3</td>
<td>2309</td>
<td>6.590</td>
<td>7</td>
<td>0.492</td>
<td>3.579</td>
</tr>
<tr>
<td>state4</td>
<td>1677</td>
<td>3.315</td>
<td>4</td>
<td>1.657</td>
<td>3.550</td>
</tr>
</tbody>
</table>

### Panel C. Correlation matrix

<table>
<thead>
<tr>
<th>Variable</th>
<th>A-index</th>
<th>E-index</th>
<th>((M_t - M_{t-1})/M_{t-1})</th>
<th>(I/M_{t-1})</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-index</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-index</td>
<td>0.070*</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>((M_t - M_{t-1})/M_{t-1})</td>
<td>-0.146*</td>
<td>-0.036*</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>(I/M_{t-1})</td>
<td>-0.149*</td>
<td>0.023</td>
<td>0.522*</td>
<td>1.000</td>
</tr>
<tr>
<td>state1</td>
<td>-0.566*</td>
<td>-0.455*</td>
<td>0.100*</td>
<td>0.096*</td>
</tr>
<tr>
<td>state2</td>
<td>0.436*</td>
<td>-0.542*</td>
<td>-0.061*</td>
<td>-0.098*</td>
</tr>
<tr>
<td>state3</td>
<td>0.474*</td>
<td>0.532*</td>
<td>-0.066*</td>
<td>-0.042*</td>
</tr>
<tr>
<td>state4</td>
<td>-0.439*</td>
<td>0.416*</td>
<td>0.041*</td>
<td>0.057*</td>
</tr>
</tbody>
</table>
Table 2. Summary Statistics– U.K. sample
This table shows summary statistics of the variables needed to estimate the M&R investment performance regression equations for the U.K. A-index is a firm-level index of financial autonomy computed by adding one point for every year, in the previous 7 years, in which a given firm’s cash flows are greater than its investment in specific assets. \( \frac{(M_t-M_{t-1})}{M_{t-1}} \) is the percentage change in the market value of the firm between the end of year t-1 and the end of year t. \( \frac{I_t}{M_{t-1}} \) is the investment undertaken by a given firm during year t divided by the market value of the firm at the end of year t-1. System states 1 and 2 are dummy variables created by grouping firms in each year from 1990 to 2005 according to their A-index characteristics. * and ** indicates that a correlation is significant at the 1% and 5% level respectively.

### Panel A. Summary statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-index</td>
<td>4996</td>
<td>4.623</td>
<td>2.226</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>( \frac{(M_t-M_{t-1})}{M_{t-1}} )</td>
<td>4996</td>
<td>11.6%</td>
<td>55.8%</td>
<td>-91.9%</td>
<td>931.3%</td>
</tr>
<tr>
<td>( \frac{I_t}{M_{t-1}} )</td>
<td>4996</td>
<td>16.5%</td>
<td>29.0%</td>
<td>-112.2%</td>
<td>466.2%</td>
</tr>
<tr>
<td>state1</td>
<td>4996</td>
<td>0.545</td>
<td>0.498</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>state2</td>
<td>4996</td>
<td>0.455</td>
<td>0.498</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

### Panel B. Correlation matrix

<table>
<thead>
<tr>
<th>Variable</th>
<th>A-index</th>
<th>( \frac{(M_t-M_{t-1})}{M_{t-1}} )</th>
<th>( \frac{I_t}{M_{t-1}} )</th>
<th>state1</th>
<th>state2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-index</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \frac{(M_t-M_{t-1})}{M_{t-1}} )</td>
<td>-0.070*</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \frac{I_t}{M_{t-1}} )</td>
<td>-0.073*</td>
<td>0.608*</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>state1</td>
<td>-0.801*</td>
<td>0.061*</td>
<td>0.048*</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>state2</td>
<td>0.801*</td>
<td>-0.061*</td>
<td>-0.048*</td>
<td>-1.000</td>
<td>1.000</td>
</tr>
</tbody>
</table>
This table presents estimates of 'marginal q' for firms, in this paper's U.S. and U.K. samples, grouped each year from 1990 to 2005 according to their system states. The technique employed was originally developed by Mueller and Reardon (1993). The estimation method is OLS. The dependent variable is $(M_t - M_{t-1})/M_{t-1}$, which is the percentage change in the market value of the firm between the end of year $t-1$ and the end of year $t$. $I_t/M_{t-1}$ is the investment undertaken by a given firm during year $t$ divided by the market value of the firm at the end of year $t-1$. System states 1, 2, 3 and 4 are dummy variables created by grouping firms in each year from 1990 to 2005 according to their E-index and A-index characteristics. The regression equations include year dummy variables to pick up movements in stock market values which are common to all firms. Moreover, each company is assigned to a two digit SIC industry code and industry dummy variables are also included. *, **, indicates that the coefficient is significant at the 1% and 5% level respectively. †, ††, indicates that the coefficient is significantly smaller than 1 at the 1% and 5% level respectively (one tailed t-test). Heteroskedasticity-robust White standard errors are reported in parentheses.

<table>
<thead>
<tr>
<th>Variable</th>
<th>U.K.</th>
<th>U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>(state1) $I_t/M_{t-1}$</td>
<td>1.204* (0.072)</td>
<td>1.201* (0.071)</td>
</tr>
<tr>
<td>(state2) $I_t/M_{t-1}$</td>
<td>1.039* (0.045)</td>
<td>1.046* (0.045)</td>
</tr>
<tr>
<td>(state3) $I_t/M_{t-1}$</td>
<td>0.874*† (0.035)</td>
<td>0.890*† (0.036)</td>
</tr>
<tr>
<td>(state4) $I_t/M_{t-1}$</td>
<td>1.164* (0.045)</td>
<td>1.165* (0.045)</td>
</tr>
<tr>
<td>Industry dummy variables?</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Time dummy variables?</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.405</td>
<td>0.406</td>
</tr>
<tr>
<td>Number of observations</td>
<td>4996</td>
<td>4996</td>
</tr>
</tbody>
</table>
Table A.1. Data sources
This table lists the main sources of data used in this paper. Panel A shows the data items needed to compute the market value of a given firm at the end of year \( t \). Panel B lists the data items needed to calculate the investment of a firm over year \( t \). Panel C lists the sources of data for additional items used.

### Panel A. Firm market value \((M_t)\)

<table>
<thead>
<tr>
<th>Data item</th>
<th>Datastream datatype</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market value of common stock</td>
<td>(wc05301 x P)</td>
</tr>
<tr>
<td>End of fiscal year number of shares</td>
<td>wc05301</td>
</tr>
<tr>
<td>End of fiscal year price per share</td>
<td>P</td>
</tr>
<tr>
<td>Book value of total debt</td>
<td>wc03255</td>
</tr>
<tr>
<td>Preferred stock</td>
<td>wc03451</td>
</tr>
</tbody>
</table>

### Panel B. Investment \((I_t)\)

<table>
<thead>
<tr>
<th>Data item</th>
<th>Datastream datatype/ other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash flow</td>
<td>wc04201</td>
</tr>
<tr>
<td>Dividends</td>
<td>wc04551</td>
</tr>
<tr>
<td>Net new debt = change in total debt during year</td>
<td>change in wc03255</td>
</tr>
<tr>
<td>Net new equity = change in number of common shares outstanding x average share price over year ( t )</td>
<td>change in wc05301 x average P</td>
</tr>
<tr>
<td>R&amp;D expenditures</td>
<td>wc01201</td>
</tr>
<tr>
<td>Advertising expenses</td>
<td>IRS reports on corporation returns. Table 6: Balance sheets, income statements, tax and selected other items. See Mueller and Yurtoglu (2000, pp. 216-218)</td>
</tr>
<tr>
<td>Total sales</td>
<td>wc01001</td>
</tr>
</tbody>
</table>

### Panel C. Other

<table>
<thead>
<tr>
<th>Data item</th>
<th>Datastream datatype/ other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of fiscal period end</td>
<td>wc05350</td>
</tr>
<tr>
<td>Consumer price index (CPI)</td>
<td>World bank - world development indicators</td>
</tr>
<tr>
<td>Entrenchment index (E-index)</td>
<td>Available from Bebchuk’s webpage at <a href="http://www.law.harvard.edu/faculty/bebchuk/">http://www.law.harvard.edu/faculty/bebchuk/</a></td>
</tr>
<tr>
<td>Industry SIC codes</td>
<td>‘Eqy Sic Code’ (Bloomberg ‘table wizzard’)</td>
</tr>
</tbody>
</table>


Overall corporate governance effectiveness

Firm financial autonomy from shareholders

<table>
<thead>
<tr>
<th></th>
<th>low</th>
<th>intermediate</th>
<th>high</th>
</tr>
</thead>
<tbody>
<tr>
<td>low</td>
<td>low</td>
<td>intermediate</td>
<td>high</td>
</tr>
<tr>
<td>intermediate</td>
<td>low</td>
<td>moderate</td>
<td>high</td>
</tr>
<tr>
<td>high</td>
<td>low</td>
<td>low</td>
<td>high</td>
</tr>
</tbody>
</table>

State 1 (low opportunism)
State 2 (moderate opportunism)
State 4 (moderate opportunism)
State 3 (high opportunism)

Fig. 1. System states
Fig. 2. The M&R model—an example of an overinvestment situation.

Source: Adapted from Mueller and Reardon (1993, p. 445)
Fig. 3. Interpretation of marginal q results.
Source: Adapted from Mueller (2003, p. 80)