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The Performance of Reverse Leveraged Buyouts - An Agency Perspective

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Executive summary

Although buyouts have been widespread since the early 1980's, relatively little attention in systematic studies has been paid to the long term performance of LBOs after the buyout funds exit their investments. When buyout funds initiates exit through an IPO the ownership structure is again dispersed, and the performance gains, which have frequently been suggested to be associated with the ability of buyout fund ownership to mitigate agency costs, could be reversed. That is, if agency costs were mitigated during buyout fund ownership, then they could be expected to reappear following an IPO, as ownership is again dispersed.

Using a sample of 103 RLBOs from 2000 to 2007, the ex post IPO performance is examined and the explanatory power of the agency perspective is assessed. Investigating the development in ownership structure, leverage and accounting performance following the IPO show a pattern of convergence between the levels of the RLBO sample and those of a sample of IPOs matched on industry affiliation and pre-event size and performance. That is, in the areas in which the RLBOs are distinct due to their previous buyout fund ownership, i.e. leverage, the levels approach those of the matched sample following the IPO. Agency theory, following Jensen (1989), suggests ownership structure and leverage as determinants of performance. Following the IPO, the median ownership structure RLBOs, measured as the percentage holdings of the largest shareholders and the difference in voting power between these shareholders, approaches that of the matched sample. Similar patterns are found for the developments in leverage, net working capital, CAPEX and free cash flow. These patterns could indicate an increased agency presence, as the relative incentive for management to divert funds ex post IPO are increased, as the incentive and ability of the buyout fund to monitor and correct managerial behavior is reduced as a result of control being relinquished.

Cross-sectional regression analysis shows a significant (though weak) negative association between ownership concentration and stock performance, which could indicate that following the IPO, the negative effects associated with entrenchment amongst shareholders dominate the anticipated positive effects of having large shareholders with the ability and incentive to monitor and correct managerial behavior. The agency perspective can thus be applied to explain the ex post IPO performance of RLBOs but the dominant agency problem following the IPO appears to be that of entrenchment.

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Introduction

The impact of buyouts has been a topic of great discussion since the 1980's when going-private transactions really started to take off. In line with the fluctuations of the market and the success of the buyout funds, these have often received plenty of attention primarily when large acquisitions or exits were on the horizon. Typically, buyout fund ownership has been associated with scenarios of mass lay-offs, divestments, gearing, high dividends, minimal transparency and short term investment horizons, that is, a perceived negative impact of buyout fund ownership. This orientation is also partially reflected in the academic literature where several studies have attempted to determine whether buyout funds transfer wealth (from employees, bondholders, tax authorities etc.), actually creates it or simply exploits information asymmetries. Although the literature contains some conflicting views on the actual value creation, the consensus appears to be that buyout fund ownership is associated with improved performance. An interesting aspect of these going-private transactions is then what happens to the efficiencies gained and value created in the portfolio companies when the buyout funds exit the investments. Although buyouts have been widespread phenomena since the early 1980's, relatively little attention in systematic studies has been paid to the long term performance of acquisitions after the buyout funds exit their investments. Much effort has instead been directed towards the historical determinants of the LBO, the investigation of whether value is created or transferred, the existence of information asymmetries and on the LBO as a viable organizational form. Compared to these topics, the long term performance of reverse leveraged buyouts (RLBOs) and its determinants are a relatively unexplored field. The existing literature has either primarily been focused at explaining the pricing of the IPOs and the subsequent return development, or at relating operational performance to agency theory and information asymmetries. This is understandable from the point of view that the existence of information asymmetries has been a common starting point for understanding the pricing of IPOs and their long term performance. However, given the devotion to the agency perspective in studies of value creation during the holding period, it seems surprising that this approach hasn't been applied more extensively to explain the ex post IPO period. The agency perspective has typically been applied to explain changes in operating performance during buyout fund ownership, based on the assumed benefits of realigned incentives and control opportunities. Thus, it would be logical that, if the changes observed could be attributed to such explanatory factors, then the ex post IPO performance would also be associated with these. That is, if agency costs were mitigated during buyout fund ownership, then they could be expected to reappear following an IPO as ownership is again dispersed.

Problem statement

“Are the adverse effects of returning to dispersed ownership, as hypothesized by agency theory, reflected in the ex post IPO performance of reversed leveraged buyouts”

Assumptions and implications

The problem statement reflects the assumption that there are adverse effects associated with a corporation having dispersed ownership and that these adverse effects manifest themselves as agency costs which should be reflected by performance measures. Specifically it is implied that dispersion of ownership (from a state where a buyout fund is an active controlling owner) leads to agency costs which decrease the performance and value of the corporation.

Definitions/delimitations

Buyout fund

A buyout fund is defined as the party which conducts the LBO, through which it acquires a controlling stake in a portfolio company. Buyout funds are organized as limited partnerships where the institutional investors are the limited partners and the investment managers are general partners. The limited partners are passive investors while the general partners are active investors who specialize in identifying, structuring and managing buyout investments. The limited partnerships have a contractually fixed lifetime with provisions to be extended, but the buyout funds typically need the approval of their investors before reinvestments can be made. Buyout funds are generally compensated by receiving a 2% fee of the funds under management and an additional 20% of the value created in the portfolio companies. So, the compensation structure provides a clear incentive to maximize the value of their holdings and not just collect fees.¹

Reversed leveraged buyout (RLBO)

A reversed leveraged buyout (RLBO) is defined as a company which has gone through the process of a leveraged buyout (LBO) followed by an initial public offering (IPO). In the context of this study, the LBO is defined by a buyout fund assuming a controlling stake in the acquired company, and partially financing the transaction through debt.

Adverse effects / agency theory

Adverse effects relates to the concept of agency costs which is hypothesized to be closely related to ownership structure. Due to the separation of ownership and control in the public corporation, owners do not manage the short term allocation of resources. These decisions are

¹ Prowse (1996)

handled by the management which carry out their fiduciary duty by acting in the owner's best interest (exert value maximizing behavior). However, as the management and shareholder interests cannot be completely aligned, costs will arise from diverging decisions, monitoring, enforcement, contractual safeguards etc. Such expenses can be characterized as agency costs. Also, just as management will have an incentive to expropriate the shareholders, controlling shareholders will also have an incentive to expropriate minority shareholders. To mitigate this type of opportunistic behavior, the minority shareholders will monitor the controlling shareholder and attempt to prevent diversion of profits. The cost of the associated actions can also be characterized as agency costs.

Dispersed ownership

Dispersion of ownership refers to the process which occurs when a company goes from having a controlling shareholder (buyout fund(s)) to having multiple large shareholders with the opportunity to form controlling coalitions. This is assumed to be the typical process which takes place when a buyout fund exits its investment (LBO) through an IPO.

Performance

Performance relates to the results achieved by a firm. It can be measured in several ways, though it is typical to distinguish between the operating performance (accounting variables measures) and the stock performance (return measures)

Methodology

The purpose of this section is to outline the choice of the methodological approach, its implications and the overall structure of the thesis.

Within social sciences there are a wide range of paradigms which differ significantly from conception of reality and science to data collection, understanding of theory and its purpose, and application of specific techniques. According to Törnebohm (1974) a paradigm consists of 4 main elements: Conception of reality, conception of science, scientific ideals and ethical & aesthetic aspects. Moreover, within a paradigm there is a coherence between these elements, which means that if the researcher perceives reality as a social construction, then he'll find certain ideals, methods and techniques for conducting research appropriate while others flawed or obsolete. If scaled on perception of reality, there is an outer bound in the objectivist-rationalistic perception which is contrasted by a subjectivist-relativistic perception.² The point here is not to present a mutually exclusive characterization of every paradigm but to emphasize that there are path dependences within paradigms and that the choice of methodological approach therefore has implications for the following creation of knowledge.

The choice of methodological approach needs to be based on the problem statement at hand. By answering the problem statement, this study wishes to describe and explain the ex post IPO performance of RLBOs. The level of ambition is to describe what is observed, identify appropriate factors which can explain the observations, and clarify their relative importance.

The problem statement suggests that agency costs will reemerge in RLBOs when they return to public ownership, and it is the ambition of this study to examine if this is reflected by the development in performance. The purpose of the study is thus to answer the problem statement through verification/falsification, and through this process obtain general knowledge about the relation between ownership structure and performance for RLBOs. This implies an investigation through a quantitative study of either the population of RLBOs or a sample thereof which means that the study will not deal with individual motives, attitudes or opinions. Such contributions could certainly shed light on the mechanisms in play, but given the ambition to draw a general conclusion for the population, they are not given priority. The ambition to answer the problem statement by drawing a general conclusion implies the

² Arbnor & Bjerke (1997)

application of the methodological approach referred to by Arbnor & Bjarke (1997) as the analytical.

The main ontological assumptions of the analytical approach are that a phenomenon can be observed independent of the researcher and that objective knowledge is attainable. By perceiving reality to be a whole consisting of individual parts, knowledge of a given phenomenon can be created by breaking down its individual components (defining and operationalizing), measuring them empirically and associating the findings in a summative way typically arguing *ceteris paribus*. This implies that the *ex post* performance of RLBOs can be measured by defining the involved concepts, operationalizing them appropriately (according to the accumulated knowledge within the field of study), and applying them empirically. So, by clearly defining and operationalizing the phenomenon that is RLBOs, and the theoretically and empirically implied causes of the *ex post* IPO performance, these can be objectively observed and analyzed. This is possible as long as there is coherence between the definitions of the concepts in the problem statement and the actual measures applied in the data collection. Any researcher should then, if there's a consensus of the operationalization applied, be able to replicate the achieved results. Available techniques for primary data collection span from i.e. direct observations, interviews, surveys and experiments. Secondary data can also be used as long as there is coherence between the operationalization made when collected, and the operationalization made in the study to which it is secondary³.

The explanatory model of the analytical approach implies that phenomena can be explained by causal relations. That is, if phenomenon Y is observed, then the appropriate and prior (explanatory) variable X can be identified and the relation can be delineated. In this regard, it is significant to distinguish between deterministic and stochastic relations. In a deterministic model (i.e. the theory of gravity) it can be established that X leads to Y. That is, if X occurs then Y will follow, within a set of constraints. The stochastic model on the other hand can determine that X is associated with Y but a causal relation cannot be determined unambiguously, because of the intrinsic random attribute which defines stochastic variables⁴. To determine the relation between changes in performance and changes in ownership structure and leverage for RLBOs a stochastic model will be applied. This model can thus associate the changes in performance with the changes in ownership structure and leverage but it cannot prove that these implied explanatory variables cause the changes. The theory of

³ Arbnor & Bjerke (1997), Vaus (2001) and Salomonsen (1993)

⁴ Arbnor & Bjerke (1997)

agency impact can thus be supported by the empirical findings of the stochastic model but they cannot unambiguously verify the theory. But the underlying assumption remains that the RLBOs are exposed to stimuli to which they respond. The specific stochastic model which will be applied to estimate the associations between explanatory variables suggested by agency theory and performance is a linear regression model, which is estimated using ordinary least squares (OLS)⁵.

Research design

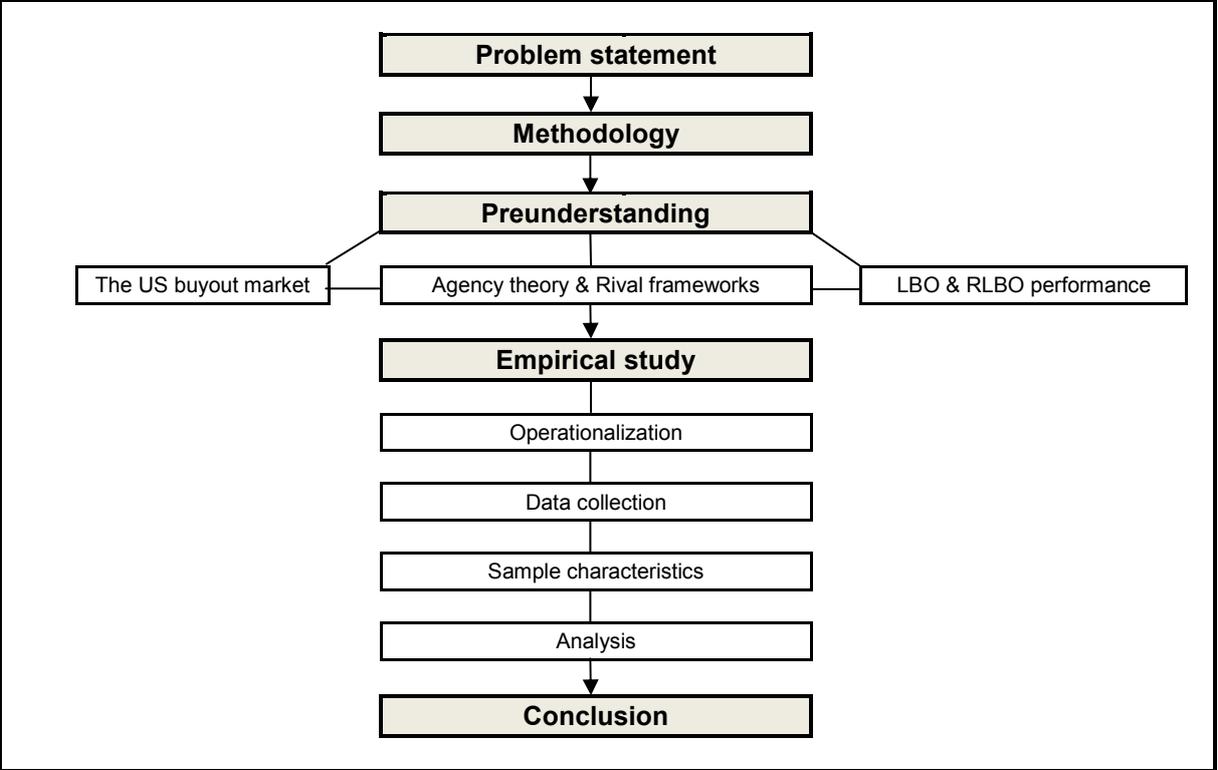
As the motivation for the problem statement is the hypothesis of agency costs reemerging in RLBOs, the approach to answering the problem statement can be characterized as deductive. A deductive approach implies taking a starting point in theory and using this established framework to design the study in terms of data collection, applied methods and analysis. Such an approach works well if the researcher wants to verify or falsify a specific theory, as is the case in this study, but it can also inhibit the researcher in terms of discovering alternative explanations to the phenomenon of interest. Such results would be attainable if an inductive approach was applied, where empirical observations are used as the starting point for constructing theory.⁶ Philosophically, neither a pure inductive or deductive approach seems plausible. The researcher will always, in spite of taking an exploratory approach, ultimately be guided by his perception of reality and science, which could be expected to influence the inductive process. And conversely, a study conducted using a deductive approach should also explore rival frameworks to determine which is appropriate for the particular problem statement at hand. Given the inherent assumption of an agency relation in the problem statement, this study is predominantly deductive but with elements of an inductive approach. This is reflected by the research design which is depicted in Figure 1. Based on the problem statement a preunderstanding is established. First, a historical perspective is provided on the development of the US buyout market and its determinants. Second, the agency theorem as well as rival frameworks is introduced to establish a theoretical understanding the LBO transaction and its hypothesized value creation. Third, the implications of an IPO exit are delineated and fourth, the relevant empirical evidence of LBO value creation and ex post IPO RLBO performance is presented. The purposes of the theoretical and empirical surveys are to establish a theoretical and empirical understanding of RLBOs which can be applied and used as a reference point when the problem statement is investigated empirically. This is necessary for the operationalization, model development and for the ability to interpret the findings. The

⁵ Gujarati (2003) and Aczel (2006)

⁶ Salomonsen (1993), Arbnor & Bjarke (1997) and Vaus (2001)

preunderstanding section will be followed by the empirical investigation, and the two combined will provide the grounds for the final answer to the problem statement.

Figure 1: Research design



Preunderstanding

The origin and development of the US buyout market

The buyout industry has changed significantly from the early 1980s to the 2000s in terms of amount of transactions, funds under management and general perception. In the 1980s when the buyout market initially boomed, it was primarily characterized by hostile takeovers and the extensive use of debt to finance transactions. This caused a great deal of resistance from the incumbent management teams, and the buyout funds were subsequently branded as corporate raiders⁷. The industry has since transformed, and in the process attempted to shed this image by insisting that returns are not generated through financial engineering or asset stripping, but instead through the ability of the ownership structure to align incentives and provide a stable environment for implementing long term strategies of profitability. Today, hostile takeover are much less frequent and transactions no longer have as high leverages as before. The new face of the industry is also reflected by buyout funds ability to attract some the most prominent figures from the political scene and the business community. The infamous former CEO of GE, Jack Welch, is now employed by Clayton, Dubilier & Rice, Lou Gerstner (former CEO of IBM) and George Bush Sr. are with the Carlyle Group and former treasury secretary Paul O'Neill is with the Blackstone Group, to mention a few. And according to Steven N. Kaplan, the perception of buyout funds has indeed changed, at least in the eyes of the stakeholders: *"In the 1980s company bosses were implacably opposed to LBOs. Now they see an opportunity to be able to do a better job and be paid better when they succeed"*. In terms of the size of transactions conducted and funds under management the industry has changed dramatically. In 1980, Kohlberg, Kravis & Roberts (KKR) was the largest fund in the world with \$135 million under management, but as off 2007 there were 3 funds⁸ all with more than \$14 billion at their disposal. The market for buyouts appears to have matured, competition is increased, and the relative position between ample investment opportunities and "powder" has changed significantly.⁹

The leveraged buyout (LBO) and value creation

Following Renneboog & Simons (2005), five main explanatory models have been suggested for the association between the LBO and value creation. The motivation for the LBO transaction outlined in each of these frameworks is based on the transaction being associated

⁷ Buyout funds Kohlberg, Kravis & Roberts and Forstmann Little were referred to as "Barbarians at the Gate" in a bestseller by Bryan Burrough and John Helyar about the struggle in 1988 for RJR Nabisco.

⁸ KKR 2006 Fund, Blackstone Capital Partners V and Texas Pacific Group (TGP) Partners V

⁹ The Economist: *"The new kings of capitalism"*, November 25th 2004 (print edition) and The Economist: *"The uneasy crown"*, February 8th 2007 (print edition)

with wealth gains but the origins of these are perceived differently. The frameworks will be presented in the following but attention will primarily be devoted to the agency theorem as this constitutes the underlying assumption of the problem statement. Also, some of the rival frameworks (wealth transfers, takeover defense hypothesis) are perceived as contemporary as they do not appear to have been applied extensively following the first wave of LBO studies conducted in the late 1980s and early 1990s. It is the perception of this study that the agency theorem has emerged as the dominant explanatory model for understanding LBOs and thus RLBOs. However, the mechanisms suggested by the rival frameworks also contribute to the understanding and perception of LBOs and RLBOs and are thus included.

The principal-agent theory and the public corporation

The primary proponent of the agency theorem has historically been Jensen (1986, 1989) but the underlying logic can be traced back to the thoughts of Adam Smith (1776) and Berle & Means (1932) who both commented on the potential adverse effects associated with a separation of ownership and control within corporations.

The public corporation is, amongst other things, characterized by having a dispersed ownership structure and by ownership being separated from. Shareholders have residual claims on their holdings but they do not initiate or manage short term decisions. These responsibilities are delegated to a management team which in turn is bounded by its fiduciary duty to act in the shareholders best interest. The shareholders can exert their influence by participating in the election of the board of directors. The board of directors is responsible for hiring, compensating and firing senior management, as well as monitoring and controlling its behavior and approving/guiding major decisions. So, the management team is controlled by the board of directors which in turn is controlled by the shareholders. Jensen & Meckling (1976) and Fama & Jensen (1983) show that this separation of ownership and control can be modeled as an agency relationship where the shareholders are the principal and management is the agent. Jensen & Meckling (1976) define an agency relationship as a contract between a principal and an agent in which the principal delegates decision making authority to the agent, who in return is committed to take action. As in any other contractual setting, it is fair to assume that both parties will attempt to maximize their own utility and do so through expropriation if interests are not aligned. As such, it should be expected that a management team will behave opportunistically as long as there is an associated marginal gain in utility.

Utility could be extracted by i.e. reduced effort, risk-averse investments¹⁰, cross-subsidizing favored but unprofitable divisions, discretionary spending or perquisites. The shareholders can attempt to mitigate such diverging actions by contractually creating incentives for the management team to act in their interest and by monitoring its behavior. But as contracting ultimately limited will be bounded, completely aligned interests are in essence hypothetical. Thus, the remaining divergence of interests and the associated actions will materialize as costs (residual loss) as the actions of the management team will not be entirely value-maximizing for the shareholders. Jensen and Meckling (1976) and Fama & Jensen (1983) thus define agency costs as consisting of the monitoring costs incurred by the shareholders and the residual loss. Furthermore, they argue that the management team may incur bonding costs to make it more attractive to the shareholders. That is, commit funds to set up a framework in which the shareholders expectation of the uncertainty of the management team's actions is reduced.

Amplifying this agency problem is the fact that large public corporations are typically characterized by a dispersed ownership structure with minority investors predominantly. If the shareholders are many and also relatively small in size, then their incentive, ability and power to influence management is low (compared to the opposite scenario). And as Grossman & Hart (1980) argue, unless the shareholders experience a marginal gain from incurring the costs of monitoring, the probability of shareholders remaining passive and free-riding increases, which in turn reinforces the agency problem.

According to Jensen (1986, 1989) the LBO constitutes an effective organizational form in terms of mitigating these agency costs and in his 1989 paper "Eclipse of The Public Corporation" he even refers to it as a new model for general management in which investors delegate the tasks of monitoring and controlling management to those best suited; the active investor (buyout funds). According to Jensen (1986, 1989) prime candidates for LBOs are public companies in low growth, typically mature, industries with excess free cash flow relative to competitive internal investment opportunities. Conducting a buyout and taking effective control of a company enables the buyout fund to implement an organizational and capital structure which mitigates agency costs and improves efficiencies. In terms of organizational structure, the incentives of shareholders and management are aligned either by the buyout fund (as shareholders) taking active positions on the board of directors/within the

¹⁰ A management team may favor low risk/low return investment projects as there is no real subjective upside to a high risk project succeeding, but a significant downside if it fails.

management team, or by requiring the incumbent management team of the portfolio company to invest a significant portion of their net wealth in the equity of the firm. By doing so, the interests of shareholders and management are aligned and the relative opportunistic behavior in terms of deriving utility aside from residual claims is decreased. Also, to further align the incentives of shareholders and management, the buyout funds typically implement management remuneration packages which are highly sensitive to performance¹¹.

A proposed relation between managerial equity ownership and firm value was examined empirically by Morck, Shleifer & Vishny (1988). Using a sample of 371 Fortune 500 companies in 1980 they investigate the association relationship between management ownership and market valuation (measured by Tobin's Q). Using piecewise linear regressions, they find evidence suggesting a positive relation between ownership and Tobin's Q when the equity holdings of the board of directors lie within a 0-5% range (significant at a 1% level), a negative relation if the holdings are within a 5-25% range (significant at a 5% level) and possibly a positive relation for holdings above 25% (significant at a 10% level). These findings seem to support Jensen (1989)'s hypothesis as the initial rise in Tobin's Q could reflect improved incentives of management to maximize firm value. On the other hand, the decline if holdings exceed 5% could reflect that entrenchment effects emerge and dominate the incentives effects.

The entrenchment of shareholders and the associated adverse effects reflects an equivalent agency problem to that of the conflict between shareholders and management. Whenever there is a single controlling shareholder or a controlling coalition of shareholders, it can be expected that it will try to expropriate the minority shareholders. Expropriation can be done in several ways i.e. through perquisites, self-dealing or by stealing corporate opportunities. Imagine that a controlling shareholder that owns 60% of company X also owns 90% of company Y. By selling an asset from company Y to company X at an inflated price he effectively expropriates the minority shareholders of company X. The controlling shareholder will gain 0,3 (0,9 – 0,6) times the excess price of the transaction. As long as the transaction can be argued to have a valid business purpose and the valuation of the asset cannot be refuted, it will appear legitimate. So, although the LBO could mitigate the agency costs caused by misaligned interest between management and shareholders, it can on the other hand

¹¹ With the concept of strategic value accountability, Jensen (2007) suggests that management wants to and should be measured on the results it can control. Compensation of a manager should thus have its starting point in his or her decision rights and the associated results. This is significantly different from having performance based compensation linked to i.e. firm market value.

lead to increased entrenchment of shareholders. This implies that for the LBO to create value, the benefit of the aligned interests between shareholders and management must be greater than the adverse effects associated with increased entrenchment of shareholders. When the LBO is proposed by a buyout fund, the existing shareholders (prospective minority shareholders) should anticipate the risk of being expropriated¹² after the transaction as well as the benefit of potentially free-riding on the value creation of the buyout fund.

Another study of the relationship between ownership structure and firm value is Wruck (1989). She examines the relationship between ownership concentration and firm value when a private sale of equity is announced. Based on a sample of 48 firms which made private sales of equity between 1976 and 1985 she finds indications of a positive association between ownership concentration and firm value. Demsetz & Lehn (1985) also investigate the relationship between ownership concentration and profit rates using a sample 511 US corporations, but they do not find a significant (or positive) relation between profit rate and ownership concentration. So, to summarize, concentration of ownership can have several implications. On the one hand, the concentration of ownership which is associated with the LBO enables the buyout fund to establish a presence within the portfolio company as an active investor, either by taking seats on the board of directors or in the management team. This should have a positive influence on the alignment of management and shareholder interests and thus mitigate the presence of agency costs. Also, such a presence, backed by a majority enables the buyout fund to make swift decisions and to implement preferred strategies and perform the associated organizational changes without having to deal with conflicting interests and objectives. On the other hand, concentrated ownership can also lead to entrenchment between the buyout fund and the outside minority shareholders. These shareholders can enjoy the benefits of free-riding the improvements created by the buyout fund but they will also have to incur the costs of monitoring which are necessary to ensure that the buyout fund does not divert profits or effectively expropriates them.

The second distinct characteristic of the LBO regards capital structure and free cash flow. Jensen (1986, 1989) argues that increased leverage, without retention of funds, reduces the free cash flow which is at the disposal of management, and thereby decreases the probability of subpar NPV investments being conducted. By reducing the funds available for management to allocate to investment projects, the probability of incurring a residual loss

¹² The expected risk of expropriation also depends on the content and enforcement of investor protection legislation.

(agency costs) is also reduced. Moreover, increasing leverage forces the firm to generate high enough cash flows to honor the debt obligations and avoid defaulting. In this sense, pressure is added to generate revenues but also to lower costs and improve the operational efficiency. The objective of the leverage exercise is thus to eliminate the negative implications of i.e. complacency, and by forcing a scarcity of resources, reap the benefits of organizational innovation. Finally, as interest payments are tax deductible, the present value of the interest tax shield should also increase firm value. On the other hand, increased leverage also implies added agency costs of contracting with bondholders, so leverage should only be extended to the point in which the marginal gain is still greater than the marginal cost. Jensen & Meckling (1976) argue that agency costs of debt arise because the incentives of the issuer and buyer are not aligned. If the issuers of debt¹³ do not have the same exposure as the debtholders, they may be compelled to take higher operational risks as they will benefit from the upside scenario and only be marginally exposed to the downside relative to the debtholders. So, the debtholders naturally want to minimize the ability of management to behave opportunistically ex post, and can do so by implementing debt covenants. The process of defining covenants, engaging in monitoring and enforcing rights to influence the behavior of management requires resources which when applied can be defined as agency costs. Also, as leverage increases, the probability of bankruptcy or reorganization also increases, and the potential costs of an adjudication process in which appropriate compensation of claimants is ensured, are also taken into account by the debtholders.

Rival frameworks

The hypotheses summarized in the following provide alternative explanations as to why LBOs occur and how the value creation process during buyout fund ownership can be perceived.

Information asymmetries

The hypothesis is based on the existence of asymmetric information between the management of a company and the market. If the management team has knowledge of the future development of the company which the market does not, it can act opportunistically and either buy equity when it knows the company is undervalued, or sell its holdings when it knows that the company is overvalued. If an MBO is completed at an undervalued price and the management team exits the investment at an overvalued price, it would appear that value had been created but this would then merely reflect the effects of asymmetric information at the time of the

¹³ Management will, with the consent of shareholders, issue debt to obtain financing.

transactions. It could further be suggested that a management team might attempt to “relax” or “boost” the information made available to the market in order to extract utility from future transactions.¹⁴

Wealth transfers

The wealth transfer hypothesis perceives the gains associated with the LBO transaction as originating from wealth being transferred from tax authorities, bondholders or employees to the shareholders of the buyout fund. The extensive use of leverage in LBOs implies, as Jensen (1986) also argues, benefits in terms of the tax deductibility of interest payments. In a given fiscal year, the total tax burden is reduced by the interest tax shield. So, when interest payments are tax-deductible, the after tax weighted cost of capital is lowered which implies an increase in firm value. Theoretically, leverage should thus be increased to the point at which the gain in present value of the interest tax shield is offset by the increased costs of financial distress.¹⁵ But as Renneboog & Simons (2005) argue, the extent to which the shareholders can extract benefits from leverage depends entirely on the legislative constraints within which the LBO operates. The buyout transaction could also be argued to be driven by the potential to expropriate debtholders. If the debtholders are not protected through covenants and the terms of the obligations are not renegotiated during the process of the buyout, debtholders could be expropriated ex post through i.e. increased risk of investment the projects conducted, large increases in dividend payments or by juniorization of their priority. Finally, it has been argued by Shleifer & Summers (1988) that in hostile takeovers, the implicit agreements between the employees and management can be broken by which employees are expropriated. By reducing wages and overall employment the buyout fund can transfer wealth from the employees to their shareholders and this could constitute an incentive for a buyout fund to conduct the LBO.

Transaction cost hypothesis

The transaction cost approach to understanding the LBO phenomena suggests that the transaction is motivated by the elimination of costs associated with being listed on a stock exchange. As such, Renneboog & Simons (2005) suggest that the cost of being listed in perpetuity has a present value of approximately \$1 million which would constitute an equivalent gain if the company went private instead.

¹⁴ Renneboog & Simons (2005) and Degeorge & Zeckhauser (1993)

¹⁵ Brealey, Myers & Marcus (2007)

Takeover defense hypothesis

According to the takeover defense hypothesis, MBOs can be seen as the last line of defense from a management team which is being subjected to a hostile takeover. With the prospects of being replaced after takeover, the management team could respond by conducting the LBO themselves.

Implications of an IPO exit

A buyout fund basically has three options for realizing its portfolio investments. One, it can sell the portfolio company to another buyout fund which then would attempt to further increase the value. Two, can sell the portfolio companies to an industrial player which has the prospects of synergies, or three, it can conduct an IPO and thereby sell the shares of the company to public investors. When a buyout fund initiates exit through an IPO, it typically surrenders control and the concentration of ownership is dispersed. Depending on the stake offered, large shareholders (i.e. mutual funds, insurance companies, investment banks etc.) will typically emerge with minority positions, and they will as the typical “large” shareholders partake in the ex post struggle for control. Bennedsen & Wolfenzon (2000) suggest that the way in which ownership is dispersed¹⁶, depends on the need for funds and the expected impact of the ex post contest for control. When ownership is dispersed, a contest for control will take place because having control enables the opportunity to extract subjective benefits. If a single shareholder cannot assume control, then a controlling coalition of shareholders will emerge. This coalition will according to Bennedsen & Wolfenzon (2000) be characterized by having the least amount of cash flow rights possible while still maintaining effective control of the company, as this leaves the coalition with the greatest residual to expropriate from. In such a scenario, Maury & Pajuste (2005) argue that it will be beneficial to have one or more large shareholders outside the controlling coalition, which have the power and incentives to monitor and control the coalition’s behavior. They hypothesize that having such an outside presence increases the contestability of the controlling coalition, and that such a quality is positively associated with firm value (negatively associated with agency costs). In terms of the agency problems between management and shareholders, the dispersion of ownership implies a reduced incentive and ability of shareholders to effectively monitor and control management compared to the situation during buyout fund majority ownership. It could thus be expected that agency costs will increase following the IPO. However, having one or more large shareholder ex post IPO should have a positive effect on the continued mitigation of

¹⁶ Their argument does not only pertain to changes in ownership structure caused by an IPO, but to any change caused by a need for financing.

agency problems as such a shareholder would have a considerable incentive to engage in monitoring and control activities.

LBO and RLBO performance

If the organizational structure of the LBO does in fact have a mitigating influence on agency costs then this should be reflected by changes in performance of LBOs during buyout fund ownership and in the period following an IPO. If agency costs are mitigated, then LBOs should experience improvements in operating performance when under buyout fund ownership and deteriorations in performance following an IPO. In terms of other firm characteristics, agency theory implies that the LBOs should exhibit higher leverage and management equity holdings. Also, improved operational efficiencies/reduced discretionary spending and cross-subsidization in LBOs could be implied by lower levels of net working capital, capital expenditure (CAPEX) and R&D expenditure. Following an IPO it could thus be expected that the levels of net working capital, CAPEX and R&D expenditures increase. Likewise, leverage and management equity holdings should be expected to decrease.

The performance of LBOs

The purpose of the following review of empirical literature is to determine the extent to which buyouts historically have been associated with improved performance. If LBOs experience improved performance and if these changes can be explained by an agency theorem then this would indicate that a reverse process could take place for RLBOs¹⁷. According to Palepu (1990) the early academic literature on the performance of LBOs appears to arrive at consistent findings, suggesting that the operating performance of LBOs improves significantly when pre- and post-buyout levels are examined. Kaplan (1989) investigates the changes in operating performance of MBOs through 3 years after the buyout. Based on a sample of 48 MBO transactions from 1980 to 1986 he finds that the MBOs experience significant ex post increases in operating income and net cash flow, both for the MBOs alone and in comparison to an industry benchmark. This finding of significant improvement in operating performance is consistent with other contemporary large-sample studies such as Bull (1989), Smith (1990), Lichtenberg & Siegel (1990) and Opler (1992), as well as Baker & Wruck (1989). Consistent for these studies is that they examine the operating performance of LBO and compare them to an industry benchmark. Bull (1989) finds positive excess operating profits and cash flows to be significant following the buyout as well as significantly lower tax

¹⁷ One caveat to this reasoning is that RLBOs could be considered a subsample of LBOs with distinct characteristics. So, the findings and inferences made for LBOs in general may not be valid for RLBOs.

expenses. Similarly, Smith (1990) finds, based on a sample of 58 MBOs from 1977-1986, significant increases in operating cash flow in the first year after the buyout and that this change in level of performance is sustained subsequently. Opler (1992) also find significant improvements in operating cash flow following the buyout, both in standalone analysis and in comparison with an industry benchmark. Lichtenberg & Siegel (1990), in a study of LBOs from 1981-1986, take a different approach. Instead of using operating measures, they use total factor productivity (at plant level) to assess performance¹⁸. They find a significantly higher productivity in the 3 years following the buyout compared to the 8 preceding years. Finally, Muscarella & Vetsuypens (1990), in a study of 72 LBOs, also find improvements in operating performance both in absolute and relative terms.

Clearly, the early studies of performance indicate that LBOs experience significant improvements in performance following the buyout, and this result appears consistent through the use of both accounting and productivity measures. Unfortunately, neither of these studies performs cross-sectional regression analysis to investigate the origin of the improved performance. Basically, three different explanations are hypothesized as to why the superior performance is observed; the agency perspective, transfer of wealth and the existence of information asymmetries.

Kaplan (1989) favors the agency perspective, and supports it by examining the capital expenditures of the MBOs. He finds that the CAPEX of the MBO sample decreases significantly ex post buyout, and interprets this finding as a possible indication of a reduction in agency costs. If the MBOs have high levels of free cash flow at the time of the buyout, a significant decrease in CAPEX could be an indication of management no longer investing in subpar NPV projects. He also finds that the median holdings of management increases from about 6% pre-buyout to 23% post-buyout. So, the incentive of management is clearly increased following the buyout which could be the cause of the improvement in performance. Kaplan (1989) also addresses the wealth-transfer and information asymmetry hypotheses. In terms of wealth-transfers, he finds an insignificant drop in excess employment when comparing to his industry benchmark, and argues that this suggests that MBOs are not associated with mass lay-offs. Finally, he does not find evidence of information asymmetries. Examining the ex ante and ex post projections by management and investors he finds that these are typically overstating the expected performance, so there are no indications of these

¹⁸ Total factor productivity can be thought of as a significant determinant of a firms profitability and stock price.

stakeholders trying to lower the price of the buyout. Also, 70% of non-completed MBOs identified were taken over by a different party, thus, indicating the existence of an active market for corporate control. So, Kaplan (1989) argues that it is the agency perspective which provides the best explanation of the improved performance of MBOs.

Bull (1989) does not find evidence suggesting that the improvement in performance is due to a transfer of wealth either. Instead of attributing the change in performance to the agency theorem, he prefers an entrepreneurial explanation in which the takeover party is hypothesized to consist of entrepreneurs who distinguish themselves by their ability to observe and exploit opportunities in an innovative manner. So, even though he observes indicators of agency costs being mitigated, such a cost reduction alone is not believed to be equivalent of value creation.

Like Kaplan (1989), Smith (1990) also appears to favor the agency explanation as opposed to the existence of information asymmetries. In support of this, she finds a significant decrease in CAPEX as well as evidence of net working capital being tightened following the buyout. Also, as the changes in performance observed after the buyout are significant, whereas the equivalent changes pre-buyout are not, the improvement could be attributed to the MBO. As for the information asymmetry hypothesis, she argues that if such exist, then performance improvements should also materialize for proposed MBOs which are not completed. This claim is investigated and no evidence is found to suggest that the operating performance of proposed but non-completed MBOs improve in the year following a MBO proposal.

Muscarella & Vetsuypens (1990) report that the improved profitability observed is more likely to be caused by changes in organizational structure than information asymmetries at the time of the buyout. Like Kaplan (1989) and Smith (1990) they find lower levels of CAPEX following the buyouts as well as no significant changes in employment. Their interpretation of these results is that the improved performance is caused by an improved ability to reduce costs and improve efficiencies enabled by changes in the organizational structure (alignment of incentives through compensation schemes and changes in governance structure). However, they do not present evidence that refutes the information asymmetry hypothesis but they clearly emphasize the explanatory power of the agency perspective.

It is characteristic for these large-sample studies that the authors have interpreted their results in the direction of an agency perspective but neither has actually explored the relation between organizational changes and performance. Baker & Wruck (1989) set out to verify this relation in a case study of the O. M. Scott and Sons Company. Their main finding was

that changes in incentive, monitoring and governance structure lead to improved performance, thus, indicating that the agency theorem has explanatory power.

Overall, these studies indicate that the operating performance of LBOs improves significantly when the development in pre- to post buyout levels are examined and this finding appears consistent and independent across performance measures. The authors seem to favor the agency perspective compared to the information asymmetry explanation and indications supporting this framework are also found. As such Kaplan (1989), Smith (1990) and Muscarella & Vetsuypens (1990) all find that the levels of CAPEX decreases following the buyout. This could indicate less room for spending caused by increases in leverage, or a more disciplined investment approach. Smith (1990) also finds a tightening of net working capital which is also consistent with the agency perspective and Kaplan (1989) show that the LBO in his sample experience significantly increased managerial equity holdings.

Unfortunately, none of the empirical studies regress the changes in performance on i.e. the changes in management equity holdings or leverage. But overall, there are strong indications that the agency perspective provides a valid explanation for the improvement in performance of LBOs from buyout to exit, and the results are not inconsistent with the assumption that a reverse pattern could be expected after an IPO. Also, neither of the studies referenced investigate the impact of buyout fund majority ownership on the entrenchment of shareholders and this agency problem's hypothesized effects. A possible interpretation of the observed improvements in performance could be that the benefits of having a buyout fund as an active controlling shareholder, and the positive effect associated with realigned incentives between management and shareholders, simply dominate the adverse entrenchment effects.

Finally, as Renneboog & Simons (2005) argue, most of the studies concerning the origins of value creation in LBOs have been conducted using samples from 1980s or early 1990s, and the extent to which these results can be extrapolated to the current context can be questioned.

The performance of RLBOs

Degeorge & Zeckhauser (1993) examine the performance of 56 RLBOs which went public from 1983 to 1987. In terms of operating performance they find a 7% increase for the RLBO sample in the year prior to the IPO where industry matched sample shows a slight decline (1-2%). The difference in performance is statistically significant. And not only do the RLBO sample outperform the industry matched sample, they also have statistically superior operating performance relative to a matched sample of ongoing LBOs. However, in the year

following the IPO, the RLBO sample experience a decreases of 3 percent, and the difference in performance relative to the matched sample is significant at a 5% level. So, the pattern in operating performance of the RLBOs seems to be that of superior characteristics leading up to the IPO only to disappoint afterwards. This pattern could indicate the presence of information asymmetries at the time of the IPO. An agency explanation is also hypothesized but it is not favored as the development in performance does not correspond to significant changes in management equity positions nor leverage (no evidence is provided to support these claims though). They do not find any significant differences in the levels of CAPEX, so they also dismiss the idea of the performance being driven by investments/discretionary spending having been postponed to after the IPO to service debt payments. The authors also investigate whether or not this development in performance is anticipated by the market. They find that the RLBO sample exhibits a positive excess return through 2 years following the IPO, but the difference is not statistically significant. This implies that the market has anticipated (or overestimated) the development in operating performance, because otherwise a pattern of inferior performance should be expected.

Mian & Rosenfeld (1993) also assess the stock performance of RLBOs, but do so through 3 years following the IPO. They find that over a 3 year period, the RLBOs sample outperforms their matched sample. The RLBO sample has positive excess returns which become statistically significant in t_2 , a result which is consistent that of DeGeorge & Zeckhauser (1993) but statistically stronger. The superior return performance can be interpreted in different ways. Starting with the observation of Muscarella & Vetsuypens (1989) that LBOs sell at a higher price at the IPO than the cost of the takeover, one would expect that if this couldn't be attributed to improved efficiencies, but rather reflects information asymmetries, then the RLBO sample should perform relatively worse than the matched sample. But this is clearly not the case for the RLBO sample. The authors then investigate whether the excess returns could be caused by an apparently high frequency of subsequent takeovers of RLBOs. They find that nearly 40% of the RLBOs in sample subjected to takeover within 3 years of the IPO. This is important because takeovers are typically associated with the acquirors paying a significant premium, and the existence of such premiums could be driving the superior performance of the RLBO sample. When the full sample is divided into subsequent takeovers and ongoing RLBOs an interesting pattern appears. The takeover sample still has highly significant excess return but there is no significant difference between the returns of the ongoing RLBO and matched sample. This could indicate that the full sample excess returns

are driven by premiums paid for the subsample of subsequent takeovers. This evidence, however, does not contradict that value was created in the fund holding period as an “average” pattern would be expected if the market accurately assessed the efficiencies obtained.

Holthausen & Larcker (1996) examine both the operating and stock performance of 90 RLBOs which went public between 1983 and 1988, and unlike the studies previously referenced, the authors also investigate the explanatory power of leverage and management equity positions. For the sample of RLBOs they find that the average ownership of insiders fall after the IPO from 75% to 49% (from 36% to 24% for operating managers and from 39% to 25% for non-management insiders), and on average the management sells of 8% of their holdings in the IPO. Overall, an average equity stake of 34% is sold in the IPO of RLBOs. The main hypothesis of Holthausen & Larcker (1996) is that the changes in the structure of incentives are associated with changes in performance. To investigate this theory they first examine the development in levels and changes of operating performance and firm characteristics. They find that the operating performance of RLBOs is superior to that of their industry counterparts in the year prior to the IPO, a result which is consistent with that DeGeorge & Zeckhauser (1993). Also, the differences in median operating performance following the IPO suggest that the RLBO continue to perform relatively better although there are indications of deterioration. As such, the RLBO sample experience significant declines from the year prior to the IPO to t0, t1, t2, t3 and t3. The authors also look at the levels and developments in net working capital, CAPEX, R&D and advertising expenditures as well as employees measured relative to assets. In terms of CAPEX they find that the RLBOs in the year prior to the IPO have significantly less CAPEX than the industry matched sample, but following the IPO there are no significant differences. However, there is a significant increase in CAPEX in the year of the IPO, and a significant relative increase in t1 as well. The RLBO sample does not experience significant changes in net working capital but there are indications of significant relative increases when compared to the industry. Throughout the period, the RLBOs spend significantly more on advertising, but there are no significant differences in R&D spending or employment. Finally, the RLBO sample has significantly lower levels (about half) of net working capital every year. The changes in CAPEX and net working capital could reflect the fact that IPOs are typically conducted to finance these activities. It could, however, then also be expected that R&D spending would increase significantly which is not the case. Finally, in terms of employment, the authors find that the

RLBO sample experience significant decreases in employment, but the changes are not significant when compared to the matched sample.

Next, Holthausen & Larcker (1996) perform cross-sectional analysis to investigate whether the changes in performance, net working capital and CAPEX are associated with changes in leverage and equity holdings. Generally they find their regression model to be significant with R^2 values ranging from about 6%-34%. They do not find changes in leverage to be significantly associated with changes in performance, net working capital or CAPEX. But the change in ownership of management and non-management insiders is significantly associated with changes in all three dependent variables. They find a positive association between equity holdings and performance indicating that increased concentration of ownership has a positive effect on operating performance. For net working capital and CAPEX they find a negative association indicating that decreases in equity holdings leads to increased CAPEX and net working capital. These indications are consistent with an agency theorem and still hold after controlling for the infusion of cash (if the purpose of the IPO is to finance CAPEX and net working capital). Also, the results are consistent for both the RLBO sample alone and when adjusted for industry effects.

Finally, Holthausen & Larcker (1996) examine the stock performance of the RLBO sample. Here they find the RLBO sample to have significant positive excess buy-and-hold return in the second year following the IPO, and they find no indications of significant negative returns which would be the case if information asymmetries were in effect (consistent with Degeorge & Zeckhauser (1993) and Mian & Rosenfeld (1993)). In unreported regression the authors also examine the cross-sectional variation between leverage, equity holdings and returns, but without any significant results. For their RLBO sample, changes in leverage and equity holdings cannot explain the variation in returns. This indicates that the market anticipates the effects of changes in organizational structure at the time of IPO.

The findings regarding operating performance by Holthausen & Larcker (1996) are largely supported by the Bruton, Keels & Scifres (2002). Bruton, Keels & Scifres (2002) examine the development in operating performance of 39 RLBOs both during buyout fund ownership and following the return to public markets. During buyout fund ownership, they find that profit margins increase significantly from a mean value of 10,36% to 13,26% and that SG&A expenditures decrease significantly. These results are consistent when the RLBO sample is examined in isolation, and when industry and size effects are controlled for. Following the

IPO, the authors find that the managerial and insider equity holdings decrease significantly (from 22% to 16% and from 68% to 49% respectively) which suggest that agency problems could increase. They support this assumption by examining profits margins and SG&A expenditures through 3 years following the IPO, and consistent with expectations, they find a significant decrease in the profit margin (to about the pre-buyout level) and a significant increase in SG&A expenditures (in t3 only). These patterns suggest that the agency perspective provides an appropriate explanation for the ex post IPO operating performance.

Cao & Lerner (2009) study the stock performance of 526 RLBOs from 1981 to 2003. They measure performance in terms of buy-and-hold returns and find that their RLBO sample provides a significant positive excess return in the year after the IPO (Holthausen & Larcker (1996) found a significant positive excess return in t2). The authors also address the concern of Mian & Rosenfeld (1993) that the excess returns are driven by premiums paid in subsequent takeovers. Here they find that their ongoing RLBOs provide a significant positive excess return through the first 3 years. These results do not support the hypothesis of Mian & Rosenfeld (1993) but it should also be noted that Cao & Lerner (2009) use buy-and-hold abnormal returns (BHARs) in their comparison whereas Mian & Rosenfeld (1993) use cumulative abnormal returns (CARs). The authors also conduct cross-sectional analysis to determine associations for the long run stock performance of RLBOs. Mainly, they wish to investigate whether the holding period (under buyout fund ownership) has implications for the ex post IPO performance. The performance is represented through a wealth relative¹⁹ and they use length of holding period, market capitalization, leverage, underwriter reputation, size of buyout fund and the equity ownership of the buyout fund before the IPO as explanatory variables. Their results show a significant negative association between length of holding period and performance, but the influence is greater for quick flips. Leverage is not found to have significant association with performance, nor does market capitalization, underwriter reputation and equity ownership of the buyout fund prior to the IPO. They do however find a significant (10% level) positive association between performance and the size of the buyout fund, indicating that offerings from larger buyout funds tend to perform better.

Overall, Degeorge & Zeckhauser (1993) and Holthausen & Larcker (1996) both find a statistically significant superior operating performance in the year prior to the IPO. Following

¹⁹ $Wealth\ relative = \frac{\sum(1+R_{i,T})}{\sum(1+R_{Bench\ i,T})}$, where $R_{i,T}$ is the buy-and-hold return of RLBO i for period T, and $R_{Bench\ i,T}$ is the buy-and-hold return of the value-weighted NYSE/AMEX index.

the IPO Degeorge & Zeckhauser (1993) find that the RLBOs have a greater drop in performance than a matched sample, whereas Holthausen & Larcker (1996) find that the RLBOs sample still outperforms their matches but the performance decline significantly in absolute terms. These findings are both consistent with and agency and information asymmetry explanation. Degeorge & Zeckhauser (1993) do not find significant differences in the levels of CAPEX which is why they tend to favor the information asymmetry explanation, but Holthausen & Larcker (1996) find that their RLBOs had significantly less CAPEX in the year prior to IPO and that the levels increased significantly in t0 and t1, thus supporting the agency perspective. The agency perspective is further supported by their cross sectional analysis where they find that increases in net working capital and CAPEX are significantly associated with decreases in management equity holdings. Also, their analysis shows a significant positive association between operating performance and management equity holdings. Thus, the results for operating performance and firm characteristics tend to favor the agency perspective. Further supporting the agency perspective is the fact that, significant negative excess returns are not found by Degeorge & Zeckhauser (1993), Mian & Rosenfeld (1993), Holthausen & Larcker (1996) or Cao & Lerner (2009). So, when examining stock performance, there does not appear to be evidence of the underperformance ex post IPO which is implied by the information asymmetry explanation. Conversely, the RLBOs appear to perform either as well or better than their matched samples. Mian & Rosenfeld (1993) raises the concern that the positive excess returns are driven by premiums paid in subsequent takeovers and finds some indications of this. However, Cao & Lerner (2009) conduct a comparable test and do not find these indications. Also, the observation of insignificant excess positive returns for the ongoing RLBOs is not consistent with the information asymmetry explanation so there appears to be little to no evidence of this hypothesis in the stock performance analyses. Both Holthausen & Larcker (1996) and Cao & Lerner (2009) perform cross-sectional analysis of returns but neither finds any evidence suggesting that an agency perspective can provide a significant explanation of the return variation. This could imply that the market ex ante IPO anticipates an emergence of agency costs.

Study

Design

The form of the study is that of an event study as performance is examined based on the occurrence of a specific event, being the IPO of a LBO. Therefore, the performance and characteristics of RLBOs will be examined using the IPO year as t_0 , the status one year after the IPO as t_1 , the status two years after the IPO as t_2 and so on. The problem statement calls for 2 main investigations. First, can adverse effects of returning to dispersed ownership be found in the ex post IPO performance of RLBOs, and second, can the ex post IPO performance be explained by an agency theorem.

The first investigation will be handled by examining the absolute ex post IPO performance and characteristics of an identified sample of RLBOs as well as their relative magnitude when compared to an appropriate benchmark. As such, it will be investigated whether the RLBO sample shows deteriorating performance and whether levels and changes in variables defined in accordance with an agency theorem indicate this as a valid explanatory model. The second investigation will be conducted by completing cross-sectional regression analysis to determine whether the observed changes performance are significantly associated with explanatory variables defined as agency proxies.

Operationalization

Dependent variables

In terms of examining the development from IPO and forward, as well as conducting cross-sectional regression analysis, the variables defined as dependent are those in which an increased agency presence should be reflected. Measures of a firm's performance can be separated into 2 distinct categories of available variables; accounting variables and return variables. The main difference between the two is that the accounting variables represent historical data, while the stock price is prospective. The accounting variables represent the historical performance of the firm whereas the stock price reflects both the historical accounting performance but also incorporates the market's expectations of the future accounting performance. To assess the ex post IPO performance of RLBOs both the operating performance (accounting performance) and stock performance is considered.

Operating performance

Return on Assets (ROA)

Operating performance will be measured as return on assets (defined as operating income (EBIT) relative to total assets), following the example of Barber & Lyon (1996) and consistent with Kaplan (1989), Bull (1989), Smith (1990), Degeorge & Zeckhauser (1993) and Holthausen & Larcker (1996)²⁰. Operating income is selected because it represents the ability of the firm to generate income before taking into consideration the effects of capital structure (interest expenses), extraordinary items, income taxes or minority interest. It is thereby a measure of the actual productivity of the asset base. Ideally, operating income would be scaled by operating assets, but as public corporations are not required to disclose this figure, the book value of total assets is used instead. Return on assets is thus defined as²¹:

$$ROA = \text{Return on assets} = \frac{EBIT}{\text{Total assets}}$$

Net Working Capital to Total Assets (NWC/TA)

Net working capital can also be considered a measure of a firm's operating performance in the sense that the level of funds tied up for operations to function on a day to day basis is associated with ROA. Also, net working capital constitutes an accounting measure in which agency presence should be reflected. Relatively higher levels of net working capital could be interpreted as an operational inefficiency which is associated with misaligned incentives and lack of control, as suggested by Smith (1990). Net working capital is defined as²²:

$$NWC = \text{Net working capital} = \text{Current assets} - \text{Current liabilities}$$

It represents the funds tied up in liquid funds, inventory etc. necessary for operations to function on a day to day basis. The investment in net working capital is thus realizable, but also represents a reservoir of cash. The level of net working capital is determined by the speed of the production process, that is, from production inputs and realization of accounts payable to inventory period and realization of accounts receivable. The longer the inventory periods and average realization of accounts receivable, the more funds will be tied up in net working capital. If these variables are reduced, the corresponding funds could be unlocked and paid

²⁰ Muscarella & Vetsuypens (1990) and Opler (1992) both use operating income relative to sales rather than total assets. However, as the level of sales doesn't reflect the employed capital of the firm, total assets is the preferred denominator for this performance measure.

²¹ Brealey, Myers & Allen (2008), p. 797

²² Brealey, Myers & Allen (2008), p. 787-808

out to the firm's shareholders. To ensure the possibility of relative comparison, net working capital will be measured relative to total assets.

Capital expenditure to Total assets (CAPEX/TA)

Like net working capital, CAPEX can be perceived as a measure of a firm's operating performance and it has been suggested as an indicator of agency presence empirically by Kaplan (1989), Smith (1990), Muscarella & Vetsuypens (1990), Degeorge & Zeckhauser (1993) and Holthausen & Larcker (1996) as relatively higher levels of CAPEX could reflect non value-maximizing discretionary spending or cross-subsidization. Capital expenditure is defined as²³:

$$CAPEX = BV \text{ of } TA, \text{ year end} - BV \text{ of } TA, \text{ year start} + Depreciation$$

To ensure the possibility of relative comparison, net working capital will also be measured relative to total assets.

Free Cash Flow to Total Assets (FCF/TA)

Free cash flow is theoretically suggested to be associated with agency presence by Jensen (1986, 1989). It is defined as operating cash flow minus investment expenditures. That is, it represents the amount of cash which can be paid out to shareholders after retaining earnings for growth investments. It's defined as²⁴:

$$FCF = \text{Free cash flow} = \left(Depreciation + (EBIT - (EBIT * T_C)) \right) - CAPEX + \Delta NWC$$

Where:

$$EBIT = \text{Net income before tax} + \text{interest}$$

$$\Delta NWC = NWC, \text{ year end} - NWC, \text{ year start}$$

$$T_C = \text{Tax rate}$$

Relatively higher levels of free cash flows could thus indicate that the funds are not directed into i.e. (possibly subpar) internal investment opportunities or cross-subsidization of divisions. Again, to ensure the possibility of relative comparison, net working capital will be measured relative to total assets.

²³ Brealey, Myers & Marcus (2007), p. 534-538

²⁴ Brealey, Myers & Marcus (2007), p. 337-338

Stock performance

Stock performance will be measured as buy-and-hold returns, following the example of Barber & Lyon (1997). In this article, the authors investigate the empirical power and specification of test statistics in event studies designed to gauge long run abnormal returns.

Specifically, they look at how long run returns should be calculated and how benchmarks should be established. In terms of how abnormal returns should be calculated/measured, the authors discuss the use of cumulative abnormal returns (CARs) and buy-and-hold abnormal returns (BHARs).

The buy and hold abnormal return (BHAR) for stock *i*, in terms of the benchmark sample, for period *T* is defined as:

$$BHAR_{i,T} = \prod_{t=1}^T (1 + r_{i,t}) - \prod_{t=1}^T (1 + r_{bench,t})$$

Where

$$r_{i,t} = \frac{(P_{i,t=1} - P_{i,t=0}) + DIV_{i,t=1}}{P_{i,t=0}} \text{ and } r_{bench,t} = \frac{(P_{bench,t=1} - P_{bench,t=0}) + DIV_{bench,t=1}}{P_{bench,t=0}}$$

The alternative to the BHAR measure is the cumulative abnormal return (CAR) which, for stock *I* during period *T*, is defined as:

$$CAR_{i,T} = \sum_{t=1}^T (r_{i,t} - r_{bench,t})$$

BHARs should be used instead of CARs because, one, they include the effects of compounding, and two, Barber & Lyon (1997) show empirically that CARs are a biased predictor of BHARs. CARs have historically been used to grasp the long run stock performance of IPOs as in Ritter (1991), and of RLBOs by Degeorge & Zeckhauser (1993) and Mian & Rosenfeld (1993). But it appears that the recommendation of BHARs by Barber & Lyon (1997) has been accepted as Holthausen & Larcker (1996) and Cao & Lerner (2009) both use buy-and-hold returns to assess the long run stock performance of RLBOs. The use of buy-and-hold returns as a performance measure and its interpretation depends on the degree to which markets are assumed to be efficient. According to Elton et al. (2007), if strong efficiency is assumed, then the security prices will reflect all information, which means that any expected decline in performance due to the IPO and the subsequent dispersion of

ownership should be reflected by the offering price. The market should then expect a deteriorating performance of RLBOs ex post IPO and discount the future value of the agency costs at the time of the offering. This is the argument put forth by Holthausen & Larcker (1996) as to why they use operating measures (accounting variables) and not returns to assess performance, which is also supported by the fact that their cross-sectional regression analysis does not show a significant association between returns and agency proxies. Jensen & Meckling (1976) and Fama & Jensen (1985) also suggest that the market account for agency costs at the time of the IPO. For the subsequent development in returns this reasoning implies that positive excess buy-and-hold returns could indicate that the market overestimated the future presence of agency costs. If the excess returns are negative then this could be an indication of the market overestimating the reemergence of agency costs. If it is not assumed that the offering price reflects an expectation of performance and ownership dispersion being correlated, then deteriorating excess returns following the IPO could indicate an unexpected increasing agency presence.

Explanatory variables

According to agency theory, leverage and ownership structure are the primary determinants of the presence of agency costs within a corporation.

Leverage

Increased leverage is suggested by Jensen (1986, 1989) to have a corrective effect on managerial behavior as it adds pressure to generate a sufficient cash flow to meet the payments and minimizes excess cash flow which could be diverted into subpar investments. That is, it forces organizational innovation and should have a positive influence on operational efficiencies. So, relatively higher levels of debt should have a positive influence on the alignment of incentives between shareholders and management, thus reducing agency costs. Empirically, leverage has also been used as an explanatory variable by both Holthausen & Larcker (1996) and Cao & Lerner (2009) as associations of firm performance. Leverage can be expressed in several ways depending on the level of aggregation and specific purpose. The shared characteristic is that the ratios depict how heavily the company is in debt. Both the long term debt ratio and the total debt ratio will be included as explanatory variables. These ratios are defined as²⁵:

$$LTDR = \text{Long term debt ratio} = \frac{\text{Long term debt}}{\text{Long term debt} + \text{Shareholders equity}}$$

²⁵ Brealey, Myers & Marcus (2007), pp. 793-794

and

$$DR = \text{Total debt ratio} = \frac{\text{Total Liabilities}}{\text{Total Assets}}$$

Ownership structure

Following Jensen & Meckling (1976) and Jensen (1986, 1989) the ownership structure of a company is a second determinant of agency presence. The Orbis database is the only available source for detailed historical ownership information and it contains historical firm level data on the number of recorded shareholders as well as their holdings. This means that although the findings of Kaplan (1989), Morck, Shleifer & Vishny (1988) and Holthausen & Larcker (1996) clearly indicate managerial equity holdings as a proxy for agency presence such a variable cannot be incorporated empirically. Instead the percentage holdings of the shareholders recorded by in the Orbis database will be used to form proxies of agency presence.

Concentration/dispersion of ownership

The ownership structure of a given LBO is dispersed when the buyout fund, as controlling shareholders, offer either its entire holdings or parts thereof to the public. The impact of this dispersion and its assumed association with agency costs arises by going from a situation with concentrated ownership in the respect of having an active investor with a majority, to having a group of large shareholders able to form a majority. During the buyout fund holding period, ownership is concentrated and the majority is in the hands of the buyout fund which behaves as an active investor. This is expected to have a positive effect on the mitigation of agency costs as the interests of management and shareholders are aligned to a greater extent. The IPO causes the ownership to be dispersed, and instead of having a unified majority with a specific plan for the future of the company, a group of “large” and “small” shareholders are left to form majorities and engage in monitoring of management and each other. So, the dispersion of ownership can be expected to lead to agency costs because of diverging interests between management and shareholders and between large as well as small minority shareholders. The defined ownership structure variables should thus be able to reflect the dynamics between ownership concentration and agency presence.

Percentage holdings of the largest shareholder, HI concentration and HI differences

The percentage holdings of the largest shareholder can be used a proxy of agency presence as changes in this variable can reflect changes in the agency problems associated with the alignment of incentives between management and shareholders and amongst shareholders. In

terms of the incentive realignment effect, an increased agency presence would be expected when the buyout fund relinquishes control at the IPO. As such, it would be relevant to examine the changes in percentage holdings of the largest shareholder as the presence of a large shareholder could be expected to be positively associated with the mitigation of agency costs. A large shareholder would be expected to have the ability and incentive to monitor management and thus exert influence to correct its behavior if it diverges with that of the shareholder. As such, increases in the percentage holdings of the largest shareholder could be expected to have a positive association with the mitigation of agency costs and thus performance. On the other hand, Bennedsen & Wolfenzon (200) and Maury & Pajuste (2005) suggest that a large controlling shareholder or a controlling coalition of shareholders will have the incentive to engage in expropriating behavior. Therefore it could be expected that as the percentage holdings of the largest shareholder increase, its ability to expropriate also increases (contestability decreases) which would have a negative association with the mitigation of agency costs and performance. Maury & Pajuste (2005) define contestability as the shareholders ability to challenge/contest the behavior/power of the largest shareholder. The ability of shareholders to challenge the largest shareholder is facilitated if:

- The voting power among the largest shareholders is similar
- The total concentration of voting power amongst the largest shareholders is low
- There is a large shareholder outside the controlling/dominant coalition with the legal power to challenge their behavior

Variables defined as HI concentration and HI differences will also be included, following the example of Maury & Pajuste (2005) who suggest these as proxies for contestability (among others):

$$HI\ concentration = (Voting\ power\ 1)^2 + (Voting\ power\ 2)^2 + (Voting\ power\ 3)^2$$

The HI concentration measure captures the total concentration of voting power amongst the 3 largest shareholders. If the total voting power of these 3 shareholders increases, the contestability is reduced and a negative association with performance/firm value could be assumed. An increase in HI concentration could however also reflect that the incentive and ability of the 3 largest shareholders to effectively monitor and control management which conversely would indicate a positive association with performance/firm value.

$$HI\ differences = (Voting\ power\ 1 - Voting\ power\ 2)^2 + (Voting\ power\ 2 - Voting\ power\ 3)^2$$

This measure expresses the difference in the percentage holdings of the largest and second largest shareholders and the difference in percentage holdings between the second and third largest shareholders. If the differences amongst the largest shareholders are low, contestability is high. So, an increase in this measure can be perceived as contestability deteriorating which should have a negative association with firm value. But again, the measure could also merely indicate the existence of a large shareholder, which as mentioned also could be expected to have a positive association with the mitigation of agency costs.

Matching – defining the benchmark

The primary purpose of matching the RLBO sample is to enable relative comparison between that sample and an appropriate benchmark, as well as control for variables which could bias the cross-sectional regression analysis. By matching, a control sample is established which represent the economic development if the buyout (event) had not occurred. As such, it can be used to assess if the performance of the RLBO sample is significantly different than it would have been, had the RLBO firms not gone through a buyout. So, the criteria on which matching is conducted must significantly influence the performance observed.

Typically in event studies attempting to assess relative performance, industry affiliation and firm size have been used as matching criteria. The link between firm size and performance is sensible from a theoretical point of view, as it could be expected that the size of a firm's operating assets is related to the existence of economies of scale, thereby implying that larger firms are more profitable than smaller firms. This has been indicated empirically by Penman (1991), Fama & French (1995) and Barber & Lyon (1996) which show that firm size influences firm performance. The reasoning behind using industry affiliation can be illustrated by i.e. the structure-conduct-performance (SCP) paradigm. According to this line of thought the characteristics of an industry's structure will influence the conduct displayed by the firms within that industry, and will as such influence the performance observed. Firms in different industries are exposed to distinct exogenous factors which influences their conduct and thus their performance, so it is significant to control for industry affiliation in the matching procedure. Controlling for industry effects is also in line with Porter (1980) who argues that the state of competition and profitability of an industry is determined by the collective strength of 5 competitive forces, which will be distinct across industries. In addition to matching on firm size and industry affiliation at the time of the event, Barber & Lyon (1996), also recommend to control for differences in pre-event performance, a procedure also followed by Loughran & Ritter (1997) and Ghosh (2001). Accounting for differences in pre-

event performance is relevant because it can be expected that the RLBO sample will display distinct characteristics at t_0 in terms of operating performance compared to i.e. the industry-median firms. The business of a buyout fund is fundamentally to buy an asset, increase its price and then sell it again. So, before conducting a buyout, a fund will attempt to determine what kind of potential a given portfolio company has for creating value. According to Vinten (2007), completed buyouts should therefore naturally be of companies displaying distinct characteristics for a value creation opportunity (typically capital structure or operational efficiencies). So, it can be expected that the RLBOs in the sample have displayed distinct characteristics on such variables before the buyout, but it also implies that these characteristics will be distinct at the IPO when the buyout fund attempts to realize its investment. Matching on pre-event performance is thus intuitive and Barber & Lyon (1996) also demonstrate that doing so, along with industry affiliation, yields well specified test statistics for determining the significance of relative differences.

Following the example of Barber & Lyon (1996) the benchmark sample will be created by matching on IPO year, industry affiliation, and pre-event size and performance²⁶. Industry affiliation will be measured using US SICs²⁷, firm size will be measured in terms of total assets and performance will be measured as return on assets (as previously defined). Preferably, the performance could be expressed as the operating income relative to operating assets, but this figure is, as stated earlier, not available so total assets is used as a substitute. Finally the matching procedure is carried out on a 1:1 basis. That is, one match is identified for each firm in the RLBO sample.

Data collection

RLBOs are identified using the Zephyr database, complemented by exploratory searches through Factiva and buyout fund and portfolio company web-pages. And upon identification, Thompson Research and the Orbis database are used to verify the completed deals.

²⁶ Matching on total assets and ROA is done based on the example of Ghosh (2001) using +/- 200 percent as limits for tolerated deviations.

²⁷ According to Clarke (1989), the US SIC is the most common taxonomy used for dividing firm data among industries. SIC codes consist of 4 digits which reflect similarities in product usage or manufacturing technologies. The ordering of the digits is hierarchical. Thus, the more digits share by 2 firms, the more homogenous they will be perceived in terms of industry affiliation.

The Orbis database is further used to gather both accounting data and ownership data for the identified sample. Historical stock prices are collected using Datastream (Thompson Financial) which contains both listed and delisted companies.

Accounting variables

In terms of accounting data, the availability of the Orbis database is somewhat inconsistent so manual lookups in SEC filings (10-K's and Prospectuses) are used to eliminate gaps in the extracted dataset. Also, to be able to determine the change in i.e. free cash flow of a RLBO in 2000, 1998 and 1999 data is needed which is not contained in the Orbis database. Again, here SEC filings are used to plug the gaps.

The Orbis ownership database

The Orbis database gathers ownership information through annual reports, SEC filings (for US companies), private correspondences, websites, press news etc. For US companies they gather ownership information specifically using filed “proxy statements” and the NASDAQ website (Beneficial owner entry). Based on these sources they register the observed shareholders and their holdings. The proxy statements cover all known shareholders with holdings of 5% but the complement of the NASDAQ website allows the database to also contain observations of shareholders with below 1% holdings. The percentage holdings provided by the database relates to the concentration of voting shares. So, if a company has dual class shares, the percentage holdings reported concern the voting shares.

The Orbis database has ownership data available on a monthly basis from 2000 to 2010. However, the availability of the data is inconsistent. For instance, the Orbis database reports 10 recorded shareholders for the RLBO FTD Group, INC. in June 2006, 0 recorded shareholders for the RLBO in July 2006 but then 2 recorded shareholders for the RLBO in August 2006. It thus appears that the July observation is missing. Unfortunately this lack of consistency does not only pertain to this particular RLBO, it is also in effect for the percentage holding observations. If observations are missing, then no change in the variable is assumed. In terms of annualizing the monthly observations, the median percentage holdings is used. The median values are selected as their distributions exhibit less skewness and kurtosis compared to the mean and max value²⁸.

²⁸ See Exhibit 1

Sample characteristics and performance

Completing the procedure described in data collection yields a final sample of 103 RLBOs. Table 1 below shows the distribution of RLBOs by IPO year as well their relative position compared the total amount of LBOs and IPOs. It's important to note that the 103 RLBOs identified do not constitute the population of RLBOs during this time period, but those which where possible to identify and validate given the resources available. For instance, when comparing this list to that of Cao & Lerner (2009) it should be possible to identify 65 further RLBOs from 2000-2003. However, this has not been possible.

Table 1: Distribution of identified RLBOs

Year	RLBOs	Cumulative frequency	Delisted, Merged or Secondary buyout	Total LBOs	Total IPOs	RLBOs to LBOs	RLBOs to IPOs
2000	8	8	0	242	261	3,31%	3,07%
2001	7	15	0	163	61	4,29%	11,48%
2002	11	26	0	180	103	6,11%	10,68%
2003	8	34	1	461	106	1,74%	7,55%
2004	14	48	1	645	298	2,17%	4,70%
2005	35	83	4	745	275	4,70%	12,73%
2006	19	102	7	909	310	2,09%	6,13%
2007	1	103	7	1061	338	0,09%	0,30%
2008	0	103	5	738	88	0,00%	0,00%
2009	0	103	3	410	68	0,00%	0,00%
2010	0	103	4	263	68	0,00%	0,00%
Total	103	103	32	5817	1976	1,77%	5,21%

Annual distribution of identified reverse leveraged buyouts (RLBOs). Column 4 shows in sample RLBOs which have delisted, merged or been through a secondary buyout after the IPO. Column 5 and 6 show the total annual LBOs and IPOs, per the Zephyr database (LBOs have been identified in the database as "Institutional buyouts" and "Management buyouts").

Taking into consideration the defined time period, the resources available for identification and the sample sizes used by earlier studies²⁹, a total sample of 103 RLBOs is satisfactory.

Of the 103 RLBOs, 32 have delisted, merged or gone through a secondary buyout (either buyout fund or industrial player). Similarly Holthausen & Larcker (1996) find that of their 90 RLBOs, only 37 were ongoing after about 3 years, and Mian & Rosenfeld (1993) report that that nearly 39% of their RLBO sample went through a takeover within 3 years of the public offering. As the list of RLBOs is not exhaustive the development in the ratios of RLBOs to LBOs and IPO shouldn't be given too much significance, but it is noteworthy that the RLBOs constitute a relatively small part of both LBOs and IPOs. When comparing to the results of Cao & Lerner (2009), the ratios appear similar although the above figures are a bit lower. Again, this could be attributed to the non exhaustive nature of the RLBO sample.

The mean holding period (including quick flips) for the sample is 39 months (3,25 years) and almost 44 months (3,64 years) if quick flips are excluded³⁰. The longest period a RLBO has been held is almost 12 years (William Scotsman International, Inc. by The Cypress Group, Odyssey Investment Partners and Keystone, Inc.) and the fastest flip was conducted after only 2 months (Celanese Corporation by The Blackstone Group). Cao & Lerner (2009),

²⁹ See Exhibit 2

³⁰ See Exhibit 3

Holthausen & Larcker (1996), Mian & Rosenfeld (1993) and Muscarella & Vetsuypens (1990) report a mean holding period for their samples of RLBOs between 2,43 and 3,46 years. Almost 14 % of the RLBOs identified can be categorized as quick flips. That, is they have gone through an IPO within one year of the buyout³¹.

In terms of the industry distribution within the RLBO sample, the ten most frequent SICs constitute nearly 60 % of the RLBOs identified³². However, the top 10 SICs do not appear to share characteristics which could explain this apparent clustering. Following Jensen (1989) buyouts could be expected to occur in industries with relatively high and stable cash flow (enable the firm to service increased debt payments) and low leverage. However a clear pattern between such characteristics does not emerge from the industry distribution. Some buyout funds have also historically had distinct industry focus, but it is beyond the scope of this study to examine these relationships in detail. The overview presented in Exhibit 5 is included to provide some familiarity to the sample.

Matching

Due to the limited number of IPOs available as matches, it is unfortunately not possible to match every RLBO on IPO year, 3 digit SICs, total assets and ROA. Several RLBOs can, if matched on IPO year, only be matched on either 2 digit or 1 digit SICs, and several then still have large deviations compared to the +/- 200% deviations proposed by Ghosh (2001). If matched on IPO year, 3 digit SICs, and withholding the +/- 200% deviation limit, then 25 of the 103 RLBOs identified can be matched. If the percentage deviations are skipped the 49 RLBOs can be matched on IPO year and 3 digit SICs³³. If the same procedure is conducted using 2 digit SICs, then 45 RLBOs can be matched, and 26 further if the maximum deviation requirement on total assets and ROA is relaxed³⁴. Finally, if 1 digit SIC matching is accepted, then 79 RLBOs can be matched within the requirements, and again, the entire sample can be matched if those are relaxed³⁵.

Ideally, the entire sample would be matched on IPO year, 3 digit SICs and within the tolerated +/- 200 % deviations on total assets and ROA. As seen, this is not the case, so for the sample going forward there is a clear tradeoff between the proximity of matches and data availability. According to Clarke (1989), the US SIC system works best in terms of delineating broad

³¹ See Exhibit 4

³² See Exhibit 5

³³ See Exhibit 6

³⁴ See Exhibit 6

³⁵ See Exhibit 6

industry characteristics (1 and 2 digit SICs) compared its ability to capture the finer differences (3 and 4 digit SICs). This could imply that the drop-off between matching on 3, 2 or 1 digits could be tolerated. Regarding the deviations on total assets and ROA, these are applied to ensure that the match can be accepted as reasonable pre-event. There is no academic argument as to why +/- 200% should be the exact limit. These are the boundaries set up by Ghosh (2001), but they are perceived to reflect the pragmatic reality of his particular study rather than a normative methodological criterion. To match the entire RLBO sample, this limit cannot be sustained, but given that the mean deviations keep well within, the following will be based on the full sample of 103 RLBOs and their identified matches.

Operating performance and firm characteristics

The levels and changes in levels of RLBO performance and characteristics will be assessed from the IPO year through 48 months ($t_0 - t_4$). This delimitation of the ex post period is enforced as the number of observations decrease significantly from year 4 (61) to year 5 (34). The number of observations is impacted by RLBOs delisting, merging or going through a secondary buyout and by the dataset being constrained to 2000-2009. Assessing the performance and characteristics through 4 years after the IPO is also done by Holthausen & Larcker (1996), while Cao & Lerner (2009) examine through 5 years. As previously defined, operating performance is assessed through ROA, net working capital, CAPEX and free cash flow while the proposed determinants of these variables; leverage and ownership structure, are included to examine the extent to which the observed development in performance appears to be associated with the assumed determinants of agency presence. At t_0 , net working capital and CAPEX is expected to be lower for the RLBO sample compared to the matched sample, and leverage as well as free cash flow is expected to be higher. Also, it would be expected that as the agency costs emerge, the levels of the RLBO and matched sample will converge. The expectations is thus to see a converging pattern in performance variables from t_0 to t_4 .

Besides examining the levels and changes over time, it is also relevant to test if these are statistically significant. For instance, to see if the differences in CAPEX are significant at t_0 and to examine whether the differences stay significant until t_4 . Typically, when testing for significant differences (in paired observations) the parametric t-test is applied. This procedure assumes that the population of differences is normally distributed. When examining the distributions of the variables defined they appear to be consistently skewed and there are no

indications of them being normally distributed³⁶. So, to avoid potentially biased test statistics, the non-parametric Wilcoxon signed rank test (paired observations) is used instead. This test does not assume that the population of differences is normally distributed and its ability to provide well specified test statistics has been empirically verified by Barber & Lyon (1996)³⁷. The Wilcoxon signed rank test, tests the null hypothesis that the median observation (difference) is equal to zero, and as the name implies, the test is based on ranks (and not the actual values in the sample). Starting with a set of paired observations, the differences (D) are calculated as are the absolute differences.

$$\text{Difference} = D = x_1 - x_2 \quad , \quad \text{Absolute difference} = |D|$$

The absolute differences are then ranked, starting with the lowest absolute difference which is given the rank of one. If the difference between a pair of observations is zero, the difference is discarded and the sample size is reduced by 1. The ranks of the positive and negative differences are then summed and the test statistic (T) can afterwards be determined as (for a two tailed test):

$$T = \min \left[\sum (+), \sum (-) \right]$$

If the T statistic is below (test is conducted on the left tail of the T distribution) the critical value given the desired level of significance and present sample size, the null hypothesis is rejected.³⁸

³⁶ See Exhibit 7

³⁷ The Wilcoxon signed rank test is also widely used in the empirical studies of both LBO and RLBO performance. It is applied by Kaplan (1989), Smith (1990), Opler (1992), Degeorge & Zeckhauser (1993) and Holthausen & Larcker (1996) in their respective examinations of operating performance.

³⁸ Aczel (2006)

Table 2: Median levels of performance and characteristics for the RLBO, matched and excess sample³⁹

Median levels	t0	t1	t2	t3	t4	t0-t4 mean
Total assets						
RLBO	\$ 724.407	\$ 741.381	\$ 862.530	\$ 780.212	\$ 791.412	\$ 851.709
Matched	\$ 672.331	\$ 785.390	\$ 1,051.124	\$ 1,009.545	\$ 1,039.541	\$ 863.717
Excess	\$ 23.279**	\$ -45.081	\$ -106.898	\$ -181.031	\$ -233.670*	\$ -45.179
ROA (%)						
RLBO	3,71	6,29	3,59	3,38	2,94	3,66
Matched	6,72	7,75	6,34	6,26	5,96	5,70
Excess	-2,87****	-1,94	-2,49	-3,24***	0,38	-1,73***
Net working capital / total assets						
RLBO	11,60%	12,02%	9,76%	13,49%	13,26%	10,11%
Matched	19,47%	20,96%	16,28%	17,76%	22,28%	19,39%
Excess	-8,43%****	-9,62%****	-9,21%****	-7,00%****	-8,00%***	-7,71%****
CAPEX / total assets						
RLBO	11,84%	10,10%	11,19%	7,60%	5,87%	10,39%
Matched	30,66%	19,68%	17,94%	10,32%	7,63%	20,56%
Excess	-20,07%****	-7,63%****	-7,69%***	-5,09%****	-3,29%*	-10,51%****
Free cash flow / total assets						
RLBO	1,09%	2,96%	1,17%	3,62%	4,69%	0,75%
Matched	-4,91%	-4,39%	-2,89%	-0,78%	2,66%	-2,18%
Excess	7,19%****	5,51%****	7,05%****	5,00%****	5,01%**	5,31%****
Long term debt ratio						
RLBO	61,67%	58,84%	57,77%	58,54%	50,52%	63,04%
Matched	40,38%	38,24%	37,62%	41,50%	38,75%	42,27%
Excess	23,51%****	17,62%****	15,65%****	12,38%***	3,13%	16,49%****
Total debt ratio						
RLBO	73,36%	70,44%	66,98%	66,09%	64,55%	70,58%
Matched	57,19%	52,37%	51,65%	52,60%	54,59%	55,66%
Excess	18,81%****	17,15%****	17,04%****	14,94%****	10,57%*	16,00%****
No. of recorded shareholders						
RLBO	3	10	25	54	59	29
Matched	7	13	34	68	67	40
Excess	-1	-3****	-8****	-15****	-10***	-8****
OC, Top 1 shareholder (%)						
RLBO	41,00	37,86	22,90	16,82	16,22	30,86
Matched	31,61	28,91	12,22	13,96	15,40	26,77
Excess	0,86	1,88	3,89	-1,36***	-1,25	0,46
HI concentration (%)						
RLBO	20,95	17,82	7,46	4,36	4,20	15,48
Matched	14,76	11,51	2,70	3,61	4,75	12,65
Excess	1,23	1,19	1,22**	-0,39	-0,10	0,63
HI differences (%)						
RLBO	9,52	5,88	3,30	0,77	0,59	7,36
Matched	6,81	3,93	0,35	0,48	0,33	5,83
Excess	0,14	0,12	0,14	-0,07**	-0,04	0,27

The table reports median the annual levels of selected variables for the RLBO, matched and excess sample through 4 years after the IPO. The distributions are of the variables in the table are skewed, so the median value is the considered the best measure of centrality. The excess series is derived by paring the RLBO and matched observations and calculating the difference. The significance of the median excess levels are estimated, using Wilcoxon Signed Rank Test (paired observations) which tests the null hypothesis that the median observation is equal to zero. *, **, ***, **** represents significance at 15%, 10%, 5% and 1%, respectively. The levels of total assets reported are measured as thousands USD. See Exhibit 8 on the attached CD-ROM for the SAS Enterprise Guide 4.2 outputs from which the reported values are sourced

Following the IPO, the median excess total assets decrease, that is, the matched sample appears to experience higher growth than the RLBO sample. At t0 the median difference is significant at a 10% level. It's insignificant through t1 to t3 and only significant at a 15% level in t4. So, there seems to be an indication that the matched sample experience higher growth in assets following the IPO but the statistical significance is limited.

ROA for the RLBO sample increases from t0 to t1, but drops equivalently in t2 after which small declines occur in t3 and t4. The development in ROA of the matched sample appears more stable with a modest increase in t1, followed by a modest decrease in t2. The ROA of the matched sample also has small declines in year t3 and t4. The pattern in the development in ROA appear to be similar but with the RLBO sample being more volatile. The relative performance of the RLBO sample versus the matched sample improves from t0 to t1, deteriorates from t1 to t3 and is then followed by an improvement in t4. The median excess ROA becomes significantly different from zero in t3 and is significant for the after IPO period

³⁹ See Exhibit 9 for the development in annual changes

average. In terms of change, both the RLBO and matched sample experience significant change in t0, t1, and t2 whereas the changes in t3 and t4 are insignificant.

Given the theoretical implications of the agency theorem and the empirical results of Kaplan (1989), Smith (1990), Muscarella & Vetsuypens (1990), Opler (1992), Degeorge & Zeckhauser (1993) and Holthausen & Larcker (1996) it would be expected that the RLBO sample exhibits superior operating performance relative to the benchmark at the time of the IPO, and Holthausen & Larcker (1996) and Degeorge & Zeckhauser (1993) suggest that it should deteriorate afterwards. From the results of Table 2, it appears that the operating performance of the matched sample is better than that of the RLBO sample, and there are not indications that the RLBO sample's performance deteriorates significantly more than the matched sample's. The difference seems to exist from the time of the IPO and persists in the following 4 years. The main difference appears to be that the performance of the RLBO sample is more volatile.

As the RLBOs and matched firms are matched on ROA in t0, a significant difference cannot be expected at the time of the IPO. The difference in the following period though could reflect deteriorating pattern. However, the excess ROA could be influenced by other factors than those associated with agency costs so even though the ex post IPO development doesn't confirm expectations, this doesn't mean that previously mitigated agency costs are not returning.

In terms of net working capital, the RLBO sample shows significantly lower levels of throughout the period, with the after IPO median being 10 % of total assets. The after IPO median for the matched sample is nearly 20%. In terms of change, both samples have a significant increase in net working capital in t0. Also, the RLBO sample has significant increases in net working capital in t3 and t4, whereas the matched sample has a significant decrease in t2 and a significant increase in t4. There are no significant annual excess changes in net working capital, although the change from t0 to the after IPO median is significant at a 10% level. These results are predominantly consistent with the findings of Smith (1990) and Holthausen & Larcker (1996) who also find lower levels net working capital at the time of exit, and Holthausen & Larcker (1996) also find indications of increasing net working capital of the RLBO sample after the IPO.

The RLBO sample has significantly lower levels of CAPEX at the time of the IPO (the median difference is 20%). This finding is consistent with expectations and the implications

of the results of Kaplan (1989), Smith (1990) and Muscarella & Vetsuypens (1990) which all find that CAPEX decreases significantly following a buyout. Following the IPO, the median CAPEX levels of the RLBO sample decrease. This appears counterintuitive as the expectation would be that increased discretionary spending, cross-subsidization or engagement in subpar investment projects, associated with a dispersion of ownership and decreased leverage, would be reflected by an increase in CAPEX. The median CAPEX levels of the matched sample also decrease. The excess levels are significant throughout but there are indications of the levels converging as the median difference between the RLBO and matched sample decreases and the significance of these levels deteriorates. The expectation that the converging pattern would be driven by an increase in CAPEX of the RLBO sample is not verified. Conversely, it appears to be driven by a relative decrease in the matched sample. Neither Degeorge & Zeckhauser (1993) nor Holthausen & Larcker (1996) find significant differences in CAPEX following an IPO but the deteriorating significance reported are not intuitively contradictory to these earlier findings.

The free cash flow of the RLBO sample is at significantly higher levels throughout the period. The median excess free cash flows are significant at 1% level from t0 through t3, but drops to 10% level in t4. There is little evidence suggesting that the free cash flow of the RLBO sample changes significantly, but the matched sample experiences significant increases in free cash flow in t3 and t4. Perhaps, the drop in significance for the median excess free cash flow from t3 to t4 could be an indication of converging. The higher levels of free cash flow seem to support the agency explanation, as does the drop in significance of the positive excess free cash flow.

The development in the long term debt ratio of the RLBO sample reflects a small decrease to no change from t0 to t3 in medians and then a relatively large drop in t4. Contrary to the pattern in absolute median values the significant changes occur in t0 and t1. The matched sample on the other hand has positive median changes which are significant in t2, t3 and t4, though with decreasing significance. The relative difference in long term debt ratio levels is decreasing throughout the period, and the median difference is significant through year 3. Overall, the long term debt ratio shows a converging pattern with the median excess long term debt ratio decreasing and the significance of the differences also decreasing. The development in total debt ratio is very similar to that of long term debt ratio. The median excess total debt ratio decreases annually but the differences remain highly significant until t4 where the difference is significant at a 15% level. In terms of leverage, there seems to be a pattern in

which the levels of the RLBO sample are converging to those of the matched sample. These results appear to be consistent with the expectations suggested by the agency theorem.

Examining the development in the number of recorded shareholders, it is clear that both the RLBO and matched sample gain more shareholders after the IPO which could indicate ownership being dispersed. In terms of the levels, the matched sample has significantly more shareholders from t1 to t4, which would indicate that the ownership of these firms are become more dispersed following the IPO than that of the RLBO sample's. The median excess difference is significantly different than zero at a 1% level in t1, t2, and t3 but drops to 10% in t4. In terms of change, both samples experience significant increases in the number of recorded shareholders through t3, and the excess change is significant in from t0 to t1 and t1 to t2 consistent with the significance of the excess levels. The number of recorded shareholders is assumed to be associated with agency presence, as increases to a level in which the control of the shareholders with respect to the management team and other large shareholders are reduced, should imply increased agency costs. Examining the levels reported in Table 2, it could be expected that such effects become present from t0 to t2, but not afterwards as the marginal effect on agency costs of adding shareholders is assumed to decline. Such an association is not reflected in the performance variables, but this could be due to other factors driving the variables.

Table 2 shows that the ownership stake of the largest shareholder for both the RLBO and matched sample is significantly reduced from t0 to t4, which is consistent with the expectation of ownership being dispersed. In terms of levels, the largest shareholder is greater for the RLBO sample from t0 to t2, although the median difference is statistically insignificant, whereas in t3 and t4, the largest shareholder of the matched sample is greater but only statistically significant in t3. The median ownership stake of the largest RLBO shareholder is 41% in t0. This level seems consistent with a buyout fund (or group of) having majority ownership before the IPO. Assuming that the largest shareholder following the IPO maintains this position after the IPO, the development in median stakes reflects an expected pattern of the buyout fund gradually exiting its investment. The lower initial median level of ownership concentration for the matched sample at the time of the IPO is also consistent with ownership of RLBOs being more concentrated ex ante IPO. Although the excess levels only are significant in t3 there appears to be a converging pattern from t0 to t4 where the largest shareholder of the RLBO and matched sample become more and more similar. A similar pattern is found in the HI concentration variable which reflects the ownership concentration

amongst the 3 largest shareholders. Again, the median levels of the RLBO sample are greater than the matched until t3 where the median differences become negative. The excess levels though are statistically insignificant, besides in t2, but a converging pattern can be interpreted.

The study of Maury & Pajuste (2005) is not based on an event, so they do not report the development in ownership concentration of the largest shareholder, HI concentration or HI differences. Their study is based on firms from 1993-2000 and they regress firm performance on explanatory variables defined as proxies of contestability. However, they do report full period median values. In terms of ownership stakes, they find that the median holding of the largest shareholder is 40%. Table 2 shows that the median ownership concentrations of the largest shareholder (t0-t4 means) are 31% and 27% for the RLBO and matched sample respectively. These appear to be significantly lower than the results of Maury & Pajuste (2005), but this could reflect that the ownership structures of public corporations in the United States typically are more dispersed than their European counterparts where the presence of several large shareholders is more common. This also applies for the median HI concentration which Maury & Pajuste (2005) find to be 7,54. If the full period medians reported in Table 2 is log-transformed then a value of nearly 3 is achieved. Again, this difference can most likely be attributed to the continental differences in ownership structures.

There are two primary effects expected to be associated with dispersion of ownership. First, the increased dispersion, which is suggested by the developments in the percentage holdings of the largest shareholder and in the HI concentration measure, implies that the RLBOs no longer have majority shareholders (buyout funds) which engages unilaterally as an active investor and has interests aligned with the management team. The alignment of incentives between shareholders and management are more likely distorted and the ability and incentive of the shareholders in the new structure to monitor and control is reduced. Second, in terms of contestability, the decrease in the voting power of the largest as well as the 3 largest shareholders suggests an improved ability of a large outside investor to contest the behavior of these. Maury & Pajuste (2005) hypothesize and show a significant positive association between contestability and firm value, which could imply that increased contestability has a mitigating effect on agency costs. As the concentration variables show increased dispersion, this suggests that the contestability is improved following the IPO.

The final variable in Table 2 is the HI differences. This variable reflects the difference in voting power amongst the 3 largest shareholders. It seems apparent that, although the median

excess differences are statistically insignificant, the difference in voting power is greater for the RLBO sample at the time of the IPO and it appears to converge towards that of the matched sample. Maury & Pajuste (2005) report a full period median value of HI differences of 6,71. Like the concentration variables, the results in Table 2 when log-transformed appear to be significantly lower (nearly 2). If ownership is more dispersed, that is, there are more shareholders with smaller percentage holdings, the differences in holdings of the 3 largest shareholders could also reflect this. The implication of the RLBOs initially having a greater difference in voting rights among the 3 largest shareholders is, following Maury & Pajuste (2005), a negative association with firm value as the contestability is lower. That is, it could be expected that agency costs have a greater presence from t0 to t3 in the RLBO sample than in the matched.

Stock performance

Table 3 shows the estimated buy-and-hold returns of the RLBO and matched sample as well the excess differences. The RLBO sample provides a mean buy-and-hold return of 10,49%, or 4,95% if the median value is used as the measure, through 4 years following the IPO. The matched sample provides a mean buy-and-hold return of 24,74%, or a median buy-and-hold return of 10,23%. The excess mean difference between the RLBO and matched sample is -13,98% and the median difference is -4,28% which is significantly different from zero at a 15% level.

Table 3: Return distributions of the RLBO, matched and excess sample

Return distributions, t0 - t4 mean series	Mean	Median	Std. Dev.	Min.	Max.	Skewness	Kurtosis
Buy-and-hold RLBO return	10,49%	4,95%	60,93%	-89,71%	356,20%	2,16	9,80
Buy-and-hold matched return	24,47%	10,23%	77,78%	-84,23%	360,26%	2,04	5,52
Buy-and-hold excess return	-13,98%	-4,28%*	93,90%	-319,52%	305,10%	-0,56	2,91

Summary statistics for the buy-and-hold return distributions of the RLBO and the matched sample, through 4 years after IPO. The statistics reported are for the 10-t4 mean series. The mean reported is thus the mean of the mean series, and the median is the median value of the mean series. *, **, ***, **** indicate significance at a 15%, 10%, 5% and 1% respectively.

Examining the distributions in Table 3 show that the buy-and-hold returns of the RLBO and matched sample as well as the excess returns do not appear to be normally distributed. The buy-and-hold returns of the RLBO and matched sample are both right-skewed whereas the excess returns are left-skewed. The apparent skewness is also indicated by the seemingly significant differences between the means and medians. In tests of normality⁴⁰, no indications are found that the distributions above (or those contained in Table 4) follow a normal distribution, so the Wilcoxon signed rank test is used to determine the significance of the reported median values of the series⁴¹. The finding of non-normally distributed buy-and-hold

⁴⁰ See Exhibit 10

⁴¹ The same approach for gauging the significance of excess buy-and-hold returns is applied by Holthausen & Larcker (1996) and Cao & Lerner (2009).

returns is consistent with the results of Cao & Lerner (2009) who also find the distributions of RLBO buy-and-hold returns to be skewed.

Table 4: Annual median buy-and-hold returns of the RLBO, matched and excess sample

Median buy-and-hold returns	t0	t1	t2	t3	t4
Buy-and-hold RLBO return	6.40%***	18.96%****	-0.74%	-14.10%	-28.77%
Buy-and-hold matched return	4.72%***	19.78%****	6.00%	-14.21%	-26.47%
Buy-and-hold excess return	0.50%	-11.67%**	-3.76%	-15.30%	-21.19%
No. of RLBOs & matched	103	96	90	80	61

Table 4 reports the annual median buy-and-hold returns for the RLBO, matched and excess series from t0 to t4. *, **, ***, **** indicate significance at a 15%, 10%, 5% and 1% respectively.

Table 4 shows the annual stock performance following the IPO. The RLBO sample provided median buy-and-hold return of mean 6,40% in t0, 18,96% after 1 year, -0,74% after 2 years, -14,10% after 3 years and finally -28,77% after 4 years. Only the median buy-and-hold returns in t0 and t1 are significantly different from zero. The matched sample has a similar pattern of returns. In t0 the sample yields 4,72% which improves to 19,78% in t1. The buy-and-hold returns then decline in t2, and turn negative in t3 and t4. Like the RLBO sample, only the median buy-and-hold returns in t0 and t1 are significantly different from zero. In relative terms, the median excess returns are slightly positive in the year of the IPO but then turn negative in t1. The median excess returns improve in t2 but deteriorates again in t3 and t4. Only in t1 is the excess buy-and-hold return significantly different from zero and this it at a 10% level. Cao & Lerner (2009) conduct a similar examination, and they find a significant positive excess return in t1, but otherwise no significant differences between the RLBO and benchmark⁴² buy-and-hold returns. Holthausen & Larcker (1996), unlike Cao & Lerner (2009) do not find significant positive excess⁴³ buy-and-hold returns in t1, but in t2 instead. They do not find significant differences in t3 or t4 either. Both studies do however find positive excess buy-and-hold returns which is also consistent with the findings of Degeorge & Zeckhauser (1993) and Mian & Rosenfeld (1993).

So, to summarize, the earlier studies of the ex post IPO stock performance of RLBOs have consistently arrived at positive excess returns independent of measures (both for buy-and-hold and cumulative returns). Significant excess buy-and-hold returns have been found in either t1 or t2, but not after 2 years. The results in Table 3 and 4 thus appear inconsistent with the results of previous studies with regards to the finding of negative excess returns. As Cao & Lerner (2009) the excess buy-and hold return at t1 is significantly different from zero but the matched sample outperforms the RLBOs. One apparent difference between this study and those referenced above is the selection of matched firms. Both Cao & Lerner (2009) and

⁴² Benchmark is defined as the buy-and-hold value-weighted NYSE/Amex/Nasdaq index.

⁴³ Benchmark is defined as the buy-and-hold value-weighted New York and American Stock Exchange Index.

Holthausen & Larcker (1996) use a value-weighted buy-and-hold market return as their benchmark, whereas Degeorge & Zeckhauser (1993) and Mian & Rosenfeld (1993) match on industry affiliation and firm size. If it is assumed that the IPO price does not reflect an expectation of increased agency costs following the offering, then the change from significant positive excess returns at t1 or t2 followed by insignificant excess returns, as reported in earlier studies, could indicate a convergence in stock performance. The results in Table 4, specifically the overall increase in negative excess buy-and-hold returns following the offering could also reflect that the market has not discounted the reemergence of agency costs at the offering, and that the RLBOs are being punished as these costs materialize in the corporations following the IPO. In terms of information asymmetries, the significant (10% level) negative excess return in t1 could indicate such an effect at the time of the IPO. However, given the previous empirical results, the relatively weak significance and the fact that RLBOs ought to be more familiar to market this explanation doesn't seem likely. The main finding should be that there is little to no statistical evidence of the market mispricing the RLBOs relative to the matched sample.

The development in buy-and-hold returns could also be influenced by yearly effects. That is, the corporations which were taken public in 2000 could be exposed to a different economic climate than those in the sample which did not enter the public markets before 5 years later. Also, as RLBOs have distinct characteristics at the time of the IPO it could be expected that these may respond differently to some shifts in conditions compared to IPOs in general. To investigate the possible existence of yearly effects, the median buy-and-hold returns of the samples are examined according to IPO year. The results are reported in Table 5.

Table 5: Buy-and-hold returns for the RLBO, matched and excess sample per IPO year

IPO year	Buy-and-hold returns per IPO year							
	2000	2001	2002	2003	2004	2005	2006	2007
Median RLBO BHR, t0-t4 means	16.58%	46.90%	6.67%	13.53%	9.49%	8.27%*	-20.05%	-54.94%
Median matched BHR, t0-t4 means	-59.00%	-44.35%	31.27%***	19.31%	46.49%****	-1.87%	9.37%	35.79%
Median excess BHR, t0-t4 means	21.29%	75.69%	-50.41%*	14.94%	-44.62%***	7.63%	-30.17%***	-90.73%
No. of observations	8	7	11	8	14	35	19	1

Table 5 reports the median buy-and-hold returns for the RLBO, matched and excess series based on the t0-t4 means. The median buy-and-hold return of 16,58% for RLBOs with IPO in 2000 thus reflects the median buy-and-hold return of the four year (t0-t4) means of the RLBO sample. *, **, ***, **** indicate significance at a 15%, 10%, 5% and 1% respectively.

For the RLBO sample, IPOs from 2000 to 2005 provide positive median buy-and-hold returns whereas the medians of 2006 and 2007 are negative. However, only the median buy-and-hold return of the 2005 IPOs is significantly different from zero and only at a 15% level. For the matched sample, the median buy-and-hold returns of IPOs in 2000, 2001 and 2005 are negative but not significantly different from zero. Remaining years provide positive buy-and-hold returns and the returns in 2002 and 2004 are significant. The median excess differences are significant in 2002, 2004, and 2006. Overall, there appears to great variation in the buy-

and-hold returns when they are divided into subsamples according to IPO year. This is partly driven by the small number of observations per year, but there could also be a pattern where the returns of IPOs one year are significantly different from the returns of the IPOs the following year. For instance, the impact of the financial crisis is only reflected in the returns IPOs from 2004 and forward which could give them a downward bias.

Cross-sectional regression analysis

Model development and estimation

The variables presented in Table 6 are those which are available for regression analysis:

Table 6: Variables available for regression analysis

Regression variable	Proxy of	Variable	Scale	Period
Dependent variables	Operating performance	Return on assets (ROA)	%	t0, t1, t2, t3, t4
		Net working capital to total assets (NWC/TA)	%	t0, t1, t2, t3, t4
		CAPEX to total assets (CAPEX/TA)	%	t0, t1, t2, t3, t4
		Free cash flow to total assets (FCF/TA)	%	t0, t1, t2, t3, t4
	Stock performance	Buy-and-hold return (BHR)	%	t0, t1, t2, t3, t4
Explanatory variables	Ownership structure	Number of recorded shareholders	Number	t0, t1, t2, t3, t4
		Total percentage holdings of the largest shareholder (OCT1)	%	t0, t1, t2, t3, t4
		HI concentration	%	t0, t1, t2, t3, t4
		HI differences	%	t0, t1, t2, t3, t4
	Leverage	Long term debt ratio (LTDR)	%	t0, t1, t2, t3, t4
		Total debt ratio (DR)	%	t0, t1, t2, t3, t4

The variables in Table 6 have been estimated for the period of t0-t4. These are thus available on an annual basis all well as in terms of the full period mean.

Given these variables it should be possible to establish regression models of both the operating and stock performance. All variables are measured on ratio scales (percentages and pure numbers). Agency theory suggests that as the ownership structure and leverage changes after the IPO, the performance of RLBOs should change as well. With this in mind, the regression variables, aside from the buy-and-hold returns, will be expressed in terms of the mean change from t0 to t4⁴⁴. The variables will also be expressed in terms of excess differences. As each RLBO is matched on industry affiliation as well as pre-event size and performance, then by using the excess differences between the RLBO and matched observations, the impact of the matching variables on the dependent variables can be controlled for.

As mentioned previously, it is assumed that the residuals of the regression model are normally distributed and this implies that the dependent variables of the regression models should also have this quality. So, the suggested dependent variables are initially tested for normality. Numerical and graphical tests of normality show little to no indications of the “mean excess changes in ROA”, “mean excess changes in NWC/TA”, “mean excess changes in CAPEX/TA” or “mean excess changes in FCF/TA” being normally distributed⁴⁵. Although

⁴⁴ The mean change expresses the average annual change. It is calculated as the mean of the change from t0 to t1, t1 to t2, t2 to t3 and t3 to t4.

⁴⁵ See Exhibit 11

normality is rejected for the “mean excess change in ROA” variable, the distribution graphically resembles a normal distribution though with fat tails and seemingly too much kurtosis. But compared to other measures of operating performance this variable definitely provides the best option for regression analysis. Normality is also rejected for the “mean excess buy-and-hold return” distribution. However, by log-transforming the RLBO and matched buy-and-hold return distributions, normality can no longer be rejected for the excess distribution⁴⁶. The log-transformation though, has implications for the interpretation of such a dependent variable as it mathematically can be shown that:

$$\ln(BHR_{i,RLBO}) - \ln(BHR_{i,Match}) = \ln\left(\frac{BHR_{i,RLBO}}{BHR_{i,Match}}\right) = Ex \ln(BHR_i)$$

Through log-transformation the dependent variable representing stock performance becomes the natural log of the RLBO buy-and-hold return relative to the matched buy-and-hold return. So instead of representing the absolute differences in buy-and-hold returns it now reflects the relative difference.

Regression models

With the suggested dependent variables and the theoretically implied explanatory variables in place, regression models for stock and operating performance can be defined.

Stock performance

The base regression for examining whether the stock performance is associated with the suggested determinants is defined as.

$$Ex \ln(BHR_i) = \alpha + \beta_1 * Ex \Delta Ownership Structure_i + \beta_2 * Ex \Delta Leverage_i + u_t$$

There are 3 variables representing ownership structure available. It would be expected that the variable representing the percentage holdings of the largest shareholder is highly correlated with the concentration of ownership amongst the 3 largest shareholders. If there is strong multicollinearity this would imply a breach in the assumptions of the CLRM, so the association between the concentration variables and stock performance will be estimated in separate regressions. The ownership concentration variables and HI differences variable could also be correlated. I.e. if the percentage holdings of the largest shareholder increase, this probably would be associated with an increase in the differences in voting stakes among the 3 largest shareholders. However if the association is not strong, both variables can be included

⁴⁶ See Exhibit 11

in the regression models which they are initially⁴⁷. With two measures of leverage available (which are also expected to be highly correlated) as well, this leaves 4 regression models to be tested.

Furthermore, as suggested previously, there could be differences in buy-and-hold returns according to the year in which IPOs were conducted. To test for such a phenomenon, the regression models are also estimated with IPO year dummy variables. To avoid the dummy trap of perfect collinearity, the IPO year 2000 dummy variable is omitted. The IPO year 2000 thus becomes the benchmark category which is reflected by the intercept (the mean value of the benchmark category). The coefficients of the dummy variables are interpreted in terms the intercept. For instance, the coefficient for D_{2001} reflects the specific effect of having gone through an IPO in 2001 as opposed to 2000 in terms of the dependent variable.

Expectations

For changes in ownership structure and leverage to be associated with stock performance following the IPO it must be assumed that markets are not fully efficient. It could be argued, as Holthausen & Larcker (1996) do, that the market ex ante IPO anticipates the adverse effects associated with dispersion of ownership and decreases in leverage, and that the price of the IPO reflects these expectations. If this is the case, then the effects of changes in the suggested determinants of stock performance should not be reflected by the development in returns. However, this assumption requires all economic agents involved in the market to hold fully rational expectations (given the set of information available) and act accordingly. This is a very strong assumption. As Holthausen & Larcker (1996) do not find significant association between buy-and-hold returns and change in management equity holdings nor leverage⁴⁸, this assumption is supported, however this does not imply that a study using a different sample at a different point in time will arrive at the same finding.

The variables representing ownership concentration could thus be expected to have a positive association with buy-and-hold returns as the presence of a large shareholder with the incentive and ability to monitor management should have a positive influence on the mitigation of agency costs. However, following Maury & Pajuste (2005)'s suggestion of a relationship between contestability and firm value, the variables representing ownership concentration could also be expected to have a negative association with buy-and hold

⁴⁷ The regression models are tested for MUCO and the results are presented in Table 15

⁴⁸ Cao & Lerner (2009) also find leverage to be an insignificant explanatory variable for the development in buy-and-hold returns which also supports the efficient markets assumption.

returns. As the power of the largest shareholders(s) increases, so does its incentive and ability to divert funds and extract utility. This implies that contestability is reduced which should be associated increased agency costs, and such an increase could also be reflected by a decrease in buy-and-hold returns. Theoretically, there are thus two conflicting expectations regarding the signs of the partial slope coefficients for the ownership concentration variables.

The study of Maury & Pajuste (2005) is not of RLBOs, but of publicly listed companies which have not gone through the process of a LBO. In RLBOs the buyout fund typically remains a large shareholder ex post IPO, and it could thus be expected that the positive effects associated with the ability of the largest shareholder(s) to effectively monitor and control the behavior of management would dominate the effects of shareholder entrenchment.

The HI differences variable representing the difference in voting power amongst the 3 largest shareholders could following Maury & Pajuste (2005) be expected to have a negative association with buy-and-hold returns. The more uniform the distribution of voting power is amongst the largest shareholders, the greater the ability of these shareholders is to contest opportunistic behavior and thus reduce agency costs. But again, the variable could also merely reflect the existence of a large shareholder, which could be expected to be positively associated with the mitigation of agency costs.

The leverage variables are expected to have a positive association with stock performance, following the hypothesis of Jensen (1986, 1989). The added pressure to meet debt obligations, implied by increased leverage, should force an emphasis on revenue generation and cost minimization, which in turn could be reflected by an improved performance. And with fewer funds available to allocate, the probability of subpar investments being conducted should be decreased, as should the diversion of funds to extract utility. Increased leverage should thus have a mitigating effect on the agency problem between shareholders and management which in turn could be reflected by improved stock performance.

The intercept term captures the impact on the dependent variable of the explanatory variables which are not explicitly included in the regression model. It is thus expected to be significant and the sign, considering the development in returns presented in Table 4, is expected to be negative (for regression models which do not include dummy variables).

Findings

Table 7: Stock performance regression models (OLS estimates)

Dependent variable: Ex ln(BHR)	Reg no 1	Reg no 2	Reg no 3	Reg no 4
<i>Ownership structure</i>				
t0-t4 mean excess change in % holdings of the largest shareholder	-0.0549 (0.0016)	-0.0574 (0.0011)		
t0-t4 mean excess change in HI concentration			-0.0478 (0.0004)	-0.0490 (0.0004)
t0-t4 mean excess change in HI differences	0.0551 (0.0046)	0.0577 (0.0035)	0.0540 (0.0019)	0.0555 (0.0018)
<i>Leverage</i>				
t0-t4 mean excess change in long term debt ratio	0.1803 (0.1582)		0.2155 (0.0885)	
t0-t4 mean excess change in total debt ratio		0.3977 (0.3242)		0.4747 (0.2375)
<i>Intercept</i>				
	-0.1206 (0.0976)	-0.1113 (0.1353)	-0.1338 (0.0646)	-0.1222 (0.0990)
<i>Model statistics</i>				
P-value for model	0.0070	0.0112	0.0021	0.0043
R ²	0.1147	0.1055	0.1372	0.1239
Adj R ²	0.0879	0.0784	0.1110	0.0973
No. of observations	103	103	103	103

Table 7 contains the estimated regression parameters and their corresponding p-values (in parentheses below parameter estimates), as well as selected model statistics. See Exhibit 12 for the SAS Enterprise Guide 4.2 outputs from which the results are sourced.

Table 7 shows the estimated parameter of the proposed regression models. First off, it is apparent that all four models are significant and they have R² values ranging from 10-14%. Regressions one and two suggest a significant negative association between the change in the percentage holdings of the largest shareholder and stock performance. This finding is consistent with the expectations and findings of Maury & Pajuste (2005). That is, contestability increases as the voting power of the largest shareholder decreases, which is assumed to have a positive association with the mitigation of agency costs. On the other hand, the sign of estimated coefficient is inconsistent with the hypothesis of increased holdings of the largest shareholder having a corrective effect on managerial behavior.

The slope coefficient of the second regression model, for this explanatory variable, suggests that an increase in the “mean excess change in percentage holdings of the largest shareholder” by one percent, is associated with a decrease in the mean value of the dependent variable (the natural log of RLBO buy-and-hold returns relative to matched buy-and-hold returns) of 0,0574. With the mean buy-and-hold returns of the RLBO and matched samples being 10,49% and 24,47% respectively this implies a ratio of RLBO to matched sample buy-and-hold return being 0,4286 or -0,8470 when log-transformed. A decrease in this value of 0,0574, which is associated with a 1% increase in the “mean excess change in the percentage holdings of the largest shareholder”, decreases the log-transformed value to -0,9044 and when the log-transformation is revoked the ratio decreases from 0,4286 to 0,4047⁴⁹.

Like the percentage holdings of the largest shareholder, the HI concentration variable also has significant and negative slope coefficients, and an equivalent interpretation these coefficients apply.

⁴⁹ The slope coefficients of the other explanatory variables should be interpreted equivalently.

The estimated slope coefficients of the HI differences variable are positive and significant. This is inconsistent with the expectation of an increase in the difference in voting power amongst the 3 largest shareholders having a negative association with contestability. This finding could simply indicate the existence of a large shareholder, which could be expected to be positively associated with mitigation of agency costs stemming from the conflicts between management and shareholders. The positive slope coefficients thereby appear consistent with the incentive realignment hypothesis.

In terms of leverage, the long term debt ratio appears to have the most explanatory power as it is significant at a 10% level in the third regression model. The overall results, though, seem to indicate that changes in leverage cannot explain the ex post IPO stock performance of RLBOs. This is inconsistent with the expectation, but similar to the findings of Holthausen & Larcker (1996) and Cao & Lerner (2009). Although predominantly insignificant, the signs of the leverage slope coefficients are positive, indicating a positive association between the change in leverage and stock performance as expected.

The intercept is significant at about a 10% level and the negative signs are consistent with the expectation based on the negative excess buy-and-hold returns reported in Table 3.

The regression models are also estimated with the inclusion of dummy variables representing yearly effects. The estimated slope coefficients for these dummies are predominantly insignificant although weak significance (10% level) is found for IPOs conducted in 2004 and 2006 with an implied negative association to stock performance.⁵⁰

The reliability of the parameters presented and their estimated p-values depends on the extent to which the assumptions of the regression models are met. The CLRM assumptions include normally distributed residuals with a zero mean value, no multicollinearity, homoscedastic variance, no autocorrelation and appropriate specification. The residuals of the estimated regression models all have zero mean values and the null hypothesis thereof cannot be rejected when the parametric t-test is applied. In terms of distribution characteristics, the residuals graphically appear to follow normal distributions (approximately). This interpretation is predominantly confirmed by the numerical tests conducted, but the Jarque-Bera test of normality appears to reject the null hypothesis of a normal distribution. The results of the Jarque-Bera test are unexpected as the dependent variable initially was transformed to facilitate compliance with the normality assumption. The implication of non-

⁵⁰ See Exhibit 13

normally distributed residuals is that the t and F tests conducted to estimate the significance of the parameters are not valid. However, it appears that although the hypothesis of normally distributed residuals is rejected for some of the regression models by the Jarque-Bera test, the signs of the parameters and their relative magnitude and significance remain consistent across models. The presence of multicollinearity within the regression models is estimated through the variance-inflating factor (VIF), the condition index (CI) and through the R^2 's of auxiliary regressions⁵¹. As a rule of thumb, if the estimated VIF of an explanatory variable exceeds 10 or if the CI is between 10 and 30 (or higher) there is a moderate to severe presence of multicollinearity within the regression model. Although the R^2 values of the auxiliary regressions appear to indicate that the explanatory variables are correlated, the VIFs and CI values suggest that multicollinearity is not a problem within the estimated regression models. Heteroscedastic variance is investigated both graphically and numerically. Graphically, there appears to be a slight positive association between the leverage variables and the squared residuals. That is, as the mean excess change in leverage ratios increase so does the variance. Numerically, heteroscedasticity is investigated through Whites test, and the results clearly reject the null hypothesis of heteroscedastic variance. So, heteroscedastic variance is not perceived to be an issue. The specification of the estimated regression models is tested through Ramsey's RESET test in which the possible presence of omitted variables can be investigated. The findings of this test suggest that the regression models are well-specified and there are no indications of relevant variables having been omitted. Finally, in terms of autocorrelation, the presence of correlated error terms is examined through the Breusch-Godfrey test and the Durbin Watson d statistic, and both procedures suggest that autocorrelation is not an issue the estimated models. So, aside from the results of the Jarque-Bera test, the estimated regression models do not appear to seriously violate the CLRM assumptions, which indicate that the parameters and corresponding p-values should be reliable⁵².

However, even though the regression models do not appear to be effected by multicollinearity, it could be suspected that the signs of the ownership concentration variables and the HI differences variable are influenced by both variables being contained within the estimated models. That is, the OLS estimation might use some of the variation in i.e. the

⁵¹ Auxiliary regressions are used to indicate if the explanatory variables are correlated. The explanatory variables are regressed on one another, in a setting where i.e. the percentage holdings of the largest shareholder is the dependent variable, and the HI differences and long term debt ratio are the explanatory variables. The estimated R^2 value thereby suggests the degree to which they can explain each others variation.

⁵² See Exhibit 14

percentage holdings of the largest shareholder to determine the slope coefficient of the HI differences variable and vice versa. Therefore, regression models which separate these variables are estimated to verify the results presented in Table 8.

Table 8: Stock performance regressions (OLS estimates)

Dependent variable: Ex ln(BHR)	Reg no 5	Reg no 6	Reg no 7	Reg no 8	Reg no 9	Reg no 10
<i>Ownership structure</i>						
t0-t4 mean excess change in % holdings of the largest shareholder	-0.0102 (0.1659)	-0.0107 (0.1495)				
t0-t4 mean excess change in HI concentration			-0.0108 (0.0909)	-0.0110 (0.0876)		
t0-t4 mean excess change in HI differences					-0.0007 (0.9259)	-0.0010 (0.9052)
<i>Leverage</i>						
t0-t4 mean excess change in long term debt ratio	0.1795 (0.1751)		0.1849 (0.1597)		0.1918 (0.1513)	
t0-t4 mean excess change in total debt ratio		0.2294 (0.5798)		0.2427 (0.5559)		0.2574 (0.5405)
<i>Intercept</i>						
	-0.0912 (0.2209)	-0.0872 (0.2558)	-0.0934 (0.2072)	-0.0893 (0.2425)	-0.0948 (0.2093)	-0.0901 (0.2465)
<i>Model statistics</i>						
P-value for model	0.1337	0.2887	0.0834	0.1893	0.3492	0.8140
R ²	0.0394	0.0245	0.0485	0.0327	0.0208	0.0041
Adj R ²	0.0202	0.0050	0.0294	0.0134	0.0012	-0.0158
No. of observations	103	103	103	103	103	103

Table 8 contains the estimated regression parameters and their corresponding p-values (in parentheses below parameter estimates), as well as selected model statistics. See Exhibit 15 for the SAS Enterprise Guide 4.2 outputs from which the results are sourced.

When the ownership concentration variables and the HI differences variable are separated, the magnitude and significance of the estimated slope coefficients decrease. The sign of estimated slope coefficient for the percentage holdings of the largest shareholder remains negative but the coefficient is barely significant at a 15% level. Likewise, the estimated slope coefficient of the HI concentration variable also remains negative though now only significant at a 10% level. The HI differences variable is now insignificant and the signs of the estimated slope coefficients have turned negative. The signs of the estimated slope coefficients for the ownership concentration variables still indicate that an increase in the concentration is negatively associated with stock performance, as suggested by Maury & Pajuste (2005). The insignificance of the HI differences variable could be interpreted to reflect that the entrenchment effects are dominating the incentive realignment effects. That is, if the variable is assumed to simply reflect the presence of a large shareholder, and the associated positive effect of such a shareholder is dominated by the implied entrenchment, then it would not be expected to have a significant association with stock performance.

In terms of leverage, the estimated results of the regression models in Table 8 are consistent with those of Table 7. Total debt ratio remains insignificant while the long term debt ratio is nearly significant at a 15% level. This is also reflected by the overall significance of the estimated regression models where the models containing long term debt ratio are significant at a 15% and 10% level respectively and have higher R² values.

The magnitude and significance of the intercept terms is also decreased but the signs remain negative which is consistent with expectations. When the regression models are estimated with dummy variables representing yearly effects the findings are consistent with those previously reported⁵³.

Equivalent tests of CLRM assumptions are conducted for regression models five through ten. The results again indicate that the assumptions are not violated. The indicators of multicollinearity decrease as would be expected (as the HI differences variable is pulled from the models), heteroscedasticity is still insignificant according to Whites test and the regression models do not appear to suffer from autocorrelation. The p-values of Ramsey's RESET test decrease suggesting that a variable might have been omitted but the significance is still rather weak⁵⁴.

Operating performance

The base regression for examining the associations between operating performance and the suggested determinants is, as for stock performance, defined as:

$$Ex \Delta ROA_{i,T} = \alpha + \beta_1 * Ex \Delta Ownership Structure_{i,t} + \beta_3 * Ex \Delta Leverage_{i,t} + u_t$$

As indicated by the estimated stock performance regression models, inclusion of both an ownership concentration variable and the HI differences variable in the sample model, could be associated with the estimation using the variation in one variable to determine the slope coefficient of the other. Therefore, six regression models are estimated equivalent of those presented in Table 8 with the “mean excess change in ROA” as the dependent variable.

Also, although the dummy variables representing IPO year did not yield any strong significance for yearly effects in the estimated stock performance regressions, such phenomena could be reflected by the “mean excess change in ROA”. So, regression models with IPO year dummy variables are again estimated.

Expectations

The expected effects of the suggested explanatory variables on the “mean excess change in ROA” are equivalent of those stated for the slope coefficients of the stock performance regression models.

⁵³ See Exhibit 16

⁵⁴ See Exhibit 17

Estimation

The normality tests of the “mean excess change in ROA” distribution rejected normality⁵⁵, so it would be expected that the residuals of the regression models specified are not normally distributed either.⁵⁶ If the residuals of the estimated regression models are not normally distributed, then this has implications for the reliability of the estimated parameters.

OLS estimation can be conducted regardless, as the normality assumption does not pertain to this procedure. The estimated parameters will still be obtained while minimizing the squared residuals, but in terms of inferring from the results of the sample to the population, the assumption of normality is essential. In small samples, the assumption of normally distributed residuals is critical for inference, as it provides the link between the probability distributions of the estimated parameters and the t and F distribution which are used in hypothesis testing. The power of the t and F tests rely on the parameters being normally distributed. If the residuals of the regression model are normally distributed then as the parameters are a linear function of these, they too can be proved to be normally distributed. And if the parameters are normally distributed, then their probability distributions become known, and the t and F tests can be applied to test the i.e. whether the estimated parameters are equal to zero, or if the overall regression model is significant. So, if the suggested regression models are estimated as linear regressions using OLS, the obtained slope coefficients would still be efficient but the t- and F-statistics (and corresponding p-values) would not be reliable.⁵⁷

A remedial procedure which could be implemented to mitigate this challenge is the non-parametric bootstrap. If the residuals of the estimated regression models are bootstrapped, by resampling with replacement i.e. 1000 times⁵⁸, then normality could be achieved which would improve the reliability of the t and F test. Alternatively, the estimated parameters of the regression models could be bootstrapped, making the normality assumption dispensable. Applying such bootstrap procedures however pose a practical challenge as SAS Enterprise Guide 4.2, which is used as the primary interface for estimation, does not provide an integrated option for these procedures when estimating linear regressions⁵⁹. The only option

⁵⁵ See Exhibit 11

⁵⁶ A log-transformation of the “mean excess change in ROA” distribution has also been attempted, but unsuccessfully. The distribution does not exhibit the skewness which typically enables such a transformation. The distribution appears to be normal but with rather fat tails and too much kurtosis.

⁵⁷ Gujarati (2003)

⁵⁸ Treating the sample at hand as the population from which new samples are drawn. The sample at hand must therefore be assumed to accurately reflect the population about which inferences are desired.

⁵⁹ The bootstrap procedures described can be conducted in SPSS (PASW Statistics) but this requires access to the bootstrapping add-on module to which a license is not provided by CBS.

found available for bootstrapping the suggested regression models is an iterative OLS estimation in which the standard errors of the estimated parameters are bootstrapped. Conducting such a procedure would not mitigate the breach of the normality assumption, but it would provide more accurate standard errors for the hypothesis testing. It is therefore included as a complement to the OLS estimates.

Findings

Table 9: Operating performance regression models (OLS estimation)

Dependent variable: t0-t4 mean excess change in ROA	Reg no 1	Reg no 2	Reg no 3	Reg no 4	Reg no 5	Reg no 6
<i>Ownership structure</i>						
t0-t4 mean excess change in % holdings of the largest shareholder	0,0420 (0,6100)	0,0420 (0,6090)				
t0-t4 mean excess change in HI concentration			-0,0430 (0,5530)	-0,0430 (0,5470)		
t0-t4 mean excess change in HI differences					0,0410 (0,6600)	0,0310 (0,7400)
<i>Leverage</i>						
t0-t4 mean excess change in long term debt ratio	-2,0930 (0,1590)		-2,1780 (0,1420)		-2,1040 (0,1570)	
t0-t4 mean excess change in total debt ratio		-8,6070 (0,0620)		-8,8160 (0,0560)		-8,5710 (0,0650)
<i>Intercept</i>						
	-0,7730 (0,3550)	-1,0600 (0,2120)	-0,7480 (0,3700)	-1,0400 (0,2210)	-0,7910 (0,3460)	-1,0670 (0,2110)
<i>Model statistics</i>						
P-value for model	0,3070	0,1450	0,2930	0,1380	0,3180	0,1570
R ²	0,0230	0,0380	0,0240	0,0390	0,0230	0,0360
Adj R ²	0,0040	0,0190	0,0050	0,0200	0,0030	0,0170
No. of observations	103	103	103	103	103	103

Table 9 contains the estimated regression parameters and their corresponding p-values (in parentheses below parameter estimates), as well as selected model statistics. See Exhibit 18 for the SAS Enterprise Guide 4.2 outputs from which the results are sourced.

The estimated regression models for operating performance appear to have very low R² values and the models are borderline significant at best. The fourth regression model has the lowest p-value with significance indicated at a 15% level. The low explanatory power of the estimated models is also reflected by the significance of the estimated slope coefficients. In terms of ownership structure, it appears that there are no significant associations between changes in the percentage holdings of the largest shareholder and changes in ROA, or changes in HI concentration and changes in ROA. The estimated slope coefficients of the HI differences variable are also clearly insignificant. So, the hypothesized associations between changes in ownership structure and changes operating performance are not supported by the estimated regressions.

The leverage variables, on the other hand, appear to have a significant negative association with changes in ROA. The slope coefficients of the long term debt ratio variable are significant at about a 15% level, while the estimated slope coefficients of the total debt ratio variable appear significant at nearly a 5% level. The negative association implies that an increase in leverage is associated with a decrease in ROA, which seems inconsistent with the role of leverage suggested by Jensen (1986, 1989). The leverage hypothesis suggests that increases in debt ratios would be associated with improved efficiencies as pressure is added onto the company to increase revenues and lower costs, in order to generate sufficient cash

flows to meet the debt obligations. Leverage could have a negative influence though if it is increased above the point where the costs associated with the increased probability of financial distress, equal the gains associated with the benefits of the interest tax shield and the added incentives. But given the pattern of convergence in leverage ratios reflected by Table 8, this shouldn't be the case for the RLBOs. Alternatively, if sufficient funds cannot be invested in net working capital, or if a shortage of funds available means that the necessary capital investments cannot be made, then this could have a negative influence on operating performance.

Table 10: Operating performance regression models (iterative OLS estimation with bootstrapped standard errors)

Dependent variable: t0-t4 mean excess change in ROA	Reg no 1	Reg no 2	Reg no 3	Reg no 4	Reg no 5	Reg no 6
<i>Ownership structure</i>						
t0-t4 mean excess change in % holdings of the largest shareholder	0,0420 (0,5610)	0,0420 (0,5716)				
t0-t4 mean excess change in HI concentration			-0,0430 (0,4277)	-0,0430 (0,4191)		
t0-t4 mean excess change in HI differences					0,0410 (0,4577)	0,0310 (0,5877)
<i>Leverage</i>						
t0-t4 mean excess change in long term debt ratio	-2,0930 (0,5446)		-2,1780 (0,5374)		-2,1040 (0,5509)	
t0-t4 mean excess change in total debt ratio		-8,6070 (0,0884)		-8,8160 (0,0696)		-8,5710 (0,1066)
<i>Intercept</i>						
	-0,7730 (0,3653)	-1,0600 (0,2206)	-0,7480 (0,3742)	-1,0400 (0,2131)	-0,7910 (0,3515)	-1,0670 (0,2091)
<i>Model statistics</i>						
R ²	0,0230	0,0380	0,0240	0,0390	0,0230	0,0360
No. of observations	103	103	103	103	103	103
<i>Number of samples drawn of SE</i>						
	999	999	999	999	999	999

Table 10 contains the estimated regression parameters and their corresponding p-values (in parentheses below parameter estimates), as well as selected model statistics. See Exhibit 19 for the SPSS (PASW Statistics) outputs from which the results are sourced.

When the regression models are estimated iteratively and the standard errors are bootstrapped⁶⁰, the significance of the estimated slope coefficients for the ownership structure variables is reduced, but the levels still remain above 40%. The standard errors of the estimated leverage coefficients are increased and the long term debt ratios of regressions one, 3 and 5 are no longer significant at a 15% level as was suggested by Table 9⁶¹. Total debt ratio is however still significant at a 10% level for regressions two and four but now at a 15% level for regression 6. The estimated parameters and model characteristics remain unchanged as expected. The findings of insignificant associations between changes in ownership structure and changes in ROA thus remain uncontested, as does the significant negative association between changes in total debt ratio and changes in ROA.

When dummy variables, representing the effect of going public in a specific year, are included in the estimated regression models, no indications of such effects on ROA are found.

⁶⁰ Bootstrap is applied by resampling 999 times with replacement.

⁶¹ The distributions of the standard errors for the long term debt ratio slope coefficients graphically appear to be right-skewed suggesting that the means could be upwards biased (See Exhibit 19). If the mean standard errors are higher because of these distribution properties, the corresponding t-statistics would be smaller and the p-values higher. This could thus account for part of the differences in p-values of the coefficients, which are apparent when bootstrapped and non-bootstrapped estimates are compared.

The slope coefficients of the dummy variables are all insignificant at a 15% level and the findings seem consistent with those of the stock performance regression models.⁶²

As discussed previously, the lack of normally distributed residuals presents issues in terms on relying on the t and F statistics for the estimated models. Graphically, the distributions of the residuals of the estimated regression models resemble that of the “mean excess change in ROA” distribution. That is, they appear to be normally distributed, but the tails are fat and there is too much kurtosis. The non-normal distribution of residuals is confirmed by numerical tests which consistently reject normality. So clearly the significance of the estimated regression models cannot be taken at face value. Aside from the normality breach, tests of the other CLRM assumptions show that the estimated regressions do not suffer from multicollinearity or heteroscedasticity. Both the VIF and CI values are very close to being 1 and the p-values obtained in Whites test do not indicate heteroscedasticity as an issue. The Breusch-Godfrey test and the Durbin-Watson d statistic⁶³ both suggest that autocorrelation is not present in the estimated regression model either. As previously, misspecification is investigated using Ramsey’s RESET test and the results of this procedure do not indicate that variables have been omitted from the models. These results are consistent when the regression models are estimated with dummy variables, but the normality issue remains⁶⁴.

Summary

The estimated stock performance regressions consistently indicate a negative association between the percentage holdings of the largest shareholder and stock performance, and a similar association is also indicated to exist between the percentage holdings of the 3 largest shareholders and stock performance. This seems inconsistent with the expectation of a large shareholder having the ability and incentive to engage in monitoring and correct managerial behavior to mitigate agency costs. This incentive realignment hypothesis would be expected to dominate the associated negative entrenchment effects during buyout fund ownership as the value creation otherwise would be eroded. The associations indicated by the slope coefficients of the ownership structure variables suggests that the remaining positive effects of having a large shareholder ex post IPO are dominated by the negative effects implied by the entrenchment of shareholders. When the buyout fund initiates exit through an IPO its percentage holdings are reduced significantly but the fund typically remains a large shareholder. As such, it would be expected that contestability is improved as the power of the

⁶² See Exhibit 20

⁶³ This test also assumes that the residuals are normally distributed so the achieved d statistic may not be reliable.

⁶⁴ See Exhibit 21

largest shareholder is reduced, and this should have a positive effect on the mitigation of agency costs. The association indicated by the stock performance regressions could then suggest that although the agency costs of entrenchment are reduced, they dominate the positive effects associated with still having a large shareholder. This interpretation is supported by the insignificance of the HI differences variable.

This explanation is however not supported by the estimated operating performance regressions as the ownership structure variables are consistently insignificant. These findings indicate that changes in operating performance cannot be explained by changes in ownership structure when measured as the variables applied. This is inconsistent with expectations, but it must also be noted that the normality assumption is not fulfilled for these regression models, which implies that the significance of the slope coefficients could be unreliable.

In terms of leverage, the estimated stock performance regressions consistently arrive at insignificant associations. This is inconsistent with the expectation, but Holthausen & Larcker (1996) and Cao & Lerner (2009) have arrived at similar results, so in that sense the insignificance is not surprising. The estimated operating performance regressions on the other hand suggest a weak negative relation between increases in total debt ratio and changes in ROA. That is, as the total debt ratio increases, the operating performance deteriorates. This is inconsistent with the suggested incentives effects of increased leverage proposed by Jensen (1986, 1989), but could be explained by increased leverage resulting in insufficient available funds for net working capital and capital expenditures. If the companies cannot complete the necessary investments for activities to be efficient, then operating performance might be influenced negatively. Again it must be noted that the lack of normally distributed residuals in the estimated operating performance regressions implies that the p-values obtained for the estimated slope coefficients could be unreliable.

Conclusion

When pre- and post transaction levels are compared, the early studies of LBOs appear to consistently indicate that operating performance improves during the buyout fund holding period. This finding seems to be consistent in both large sample and case studies and when both accounting and productivity measures are applied. The authors of these studies, although they do not conduct regression analysis to determine associations between agency proxies and performance measures, they predominantly suggest the agency perspective as an appropriate explanatory model for the observed changes in performance. This is supported by examinations of changes in CAPEX, net working capital, managerial equity holdings during the buyout fund holding period and by indicating associations between these patterns and the development in operating performance. Assuming the findings of the 1980's and early 1990's can be extrapolated to a contemporary context and that the findings for LBOs are valid for RLBOs, there appears to be empirical support for the application of an agency perspective to explain the ex post IPO performance of RLBOs. The relevance of the agency perspective is reinforced by the empirical findings of the existing studies of ex post IPO RLBO performance, which suggest a deteriorating performance following the public offering both in absolute and benchmarked terms. Further supporting the agency perspective as an appropriate explanatory model for the observed development in operating performance is the finding of a significant positive association between changes in managerial equity holdings and changes in operating performance by Holthausen & Larcker (1996).

Based on a sample of 103 US RLBOs identified from 2000 to 2007, the ex post IPO operating and stock performance is examined through levels and change analysis as well as cross-sectional regression analysis. The levels and change analysis shows that the percentage holdings of the largest shareholder are reduced significantly from t_0 to t_4 which is consistent with ownership being dispersed following the IPO, and the buyout fund gradually exiting its investment. A similar pattern can be suggested for the development in the holdings of the 3 largest shareholders. This is reinforced by the findings for the difference in voting power amongst the 3 largest shareholders, which indicate a pattern of convergence with the levels of the RLBO sample reaching those of the matched. In terms of firm characteristics, evidence of convergence in the levels of net working capital, CAPEX, free cash flow and leverage is also found between the RLBOs sample and the matched sample. RLBOs having significant lower levels of net working capital and CAPEX at the time of the IPO are consistent with the earlier findings of both LBO and RLBO studies, as are the significant differences in leverage. The

findings for the ownership structure variables, the leverage variables and the firm characteristics variables can be interpreted to support the agency perspective. Relative increases in i.e. net working capital combined with decreasing leverage and decreasing holdings of the largest shareholders could suggest that the ability and incentive for the largest shareholders to monitor and correct managerial behavior is reduced, which according to the agency perspective would lead to increased agency costs.

In terms of stock performance the findings indicate that the matched sample outperforms the RLBO sample significantly in t1, but otherwise the negative differences in median buy-and-hold returns are insignificant. This result is inconsistent with findings of earlier studies which consistently have found the superior buy-and-hold returns for the RLBO sample when comparing to a benchmark sample. When the stock performance is investigated through cross-sectional regression analysis a weak negative association between the change in concentration of ownership amongst the largest shareholders and buy-and-hold returns is found. Furthermore, no significant associations are found between changes in the difference in percentage holdings of the three largest shareholders and stock performance. These results could suggest that the agency costs arising from entrenched shareholders following the IPO, are dominating the positive effects which would be expected to be associated with the presence of large shareholder having the incentive and ability to monitor and correct managerial behavior. These findings however are not supported by the estimated operating performance regressions which do not indicate any significant associations between the ownership structure variables and operating performance. These regressions however have reliability issues as the assumption of normally distributed residuals is breached. Changes in leverage are not found to be significantly associated with stock performance which is consistent with earlier findings but inconsistent with the expectation suggested by Jensen (1986, 1989). Some indications of leverage having a negative association with operating performance is however found which also appears inconsistent with expectations, but again the reliability of the estimated significance can be questioned.

Agency theory as an explanatory model has some empirical support, but it appears to be the entrenchment of shareholders which influence performance of RLBOs following the IPO. Decreases in the holdings of the largest shareholders appear to have a positive association with stock performance, suggesting that the benefits of having a large shareholder ex post IPO with the incentive to monitor and correct managerial behavior are dominated by the adverse effects associated with entrenched shareholders.

Future implications

To further explore the associations implied by the estimated stock performance regression models, Shapley values could be included as explanatory variables to represent the power of the largest shareholders. With the current variables reflecting the percentage holdings of the largest shareholders, the absolute voting power of these are expressed, but not in terms of the ownership structures they operate in. Following Maury & Pajuste (2005) it could be expected that the real power of i.e. the largest shareholder would depend on the setting in which its influence can be exerted. If it is surrounded by a multitude of very small shareholders with little individual influence, its real power for a given percentage holding would be greater than if other large and powerful shareholders were present. The Shapley value, if estimated, would capture this dynamic as it reflects the probability of this shareholder becoming pivotal in creating a majority. If the largest shareholder has a majority, the Shapley value will be 1, but otherwise it is estimated as:

$$SV_{Largest\ shareholder} = \frac{P_{Largest\ shareholder}}{n!}$$

Where n is the number of shareholders observed, $n!$ is the number of possible sequences in which a majority can be formed and P_i is the number of sequences in which the largest shareholder becomes pivotal in creating a majority. As the Shapley value of the largest shareholder increases, contestability is reduced, which would be expected to have a positive association with agency costs and thus a negative association with performance. Or alternatively, if power as measured by the Shapley value increases, the incentive and ability of the largest shareholder to monitor and correct managerial behavior improves, which would be expected to have a positive association with performance.

The reliability of the estimated operating performance regression models can also be improved by applying procedures which mitigate problem of non-normally distributed residuals. As suggested, the residuals of the estimated regression models could be resampled through a non-parametric bootstrap and thereby possibly obtain a normal distribution. And finally, as the Orbis database is inconsistent in terms of data availability for years prior to 2006, equivalent regressions could be estimated in the future, using a sample of RLBOs which have not gone public prior to 2006. In the current dataset no change has been assumed when observations are missing, but this procedure doesn't capture the dynamics of an evolving ownership structure. With more consistent data in the future, better estimations could thus be possible.

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Exhibits

Exhibit 1

Ownership variable	Distribution characteristics		Annual measure for monthly observations			
			Mean	Median	Min	Max
Sum of Top 1	Mean	Mean	23,95	35,56	27,29	39,02
		Median	15,30	28,96	15,13	37,83
		Mean – Median	8,65	6,60	12,16	1,19
		Skewness	1,32	0,78	1,04	0,64
		Kurtosis	1,50	-0,09	0,48	-0,39
	HI differences	Mean	8,33	16,15	12,48	19,05
		Median	1,02	4,83	1,07	8,13
		Mean – Median	7,30	11,32	11,41	10,93
		Skewness	3,13	2,19	2,62	1,86
		Kurtosis	11,73	4,95	7,98	3,14
	HI concentration	Mean	12,55	23,57	15,29	28,72
		Median	3,34	12,00	3,23	20,70
		Mean – Median	9,20	11,57	12,06	8,02
		Skewness	2,95	2,24	2,76	2,04
		Kurtosis	10,81	6,37	9,67	5,18

Exhibit 1 shows the characteristics of the ownership variable distributions. For the variable Sum of Top 1 (the percentage holdings of the largest shareholder), based on monthly observations the annual mean, median, minimum and maximum observations are determined for the period of 2000-2009. Based on the resulting annual series for each measure, the distribution characteristics are estimated (mean, median, skewness and kurtosis), and using these the full period (2000-2009) averages are estimated. These are the values reported in the table. See the attached CD-ROM for the source file of this table (under Exhibit 1).

Exhibit 2

Sample sizes of previous RLBO studies

Study	Cao & Lerner (2009)	Holthausen & Larcker (1996)	Mian & Rosenfeld (1993)	Degeorge & Zeckhauser (1993)	Muscarella & Vetsuypens (1990)	Muscarella & Vetsuypens (1989)
Period	1981-2003	1983-1988	1983-1988	1983-1987	1983-1987	1983-1987
RLBOs	526	90	85	62	72	74

The table shows the most relevant studies to this thesis, their respective sample sizes and time periods. Only Cao & Lerner (2009) and Holthausen & Larcker (1996) conduct cross-sectional studies using sample sizes of 213 and 90 RLBOs respectively.

Exhibit 3

Holding periods of the RLBO sample

RLBOs	Mean	Median	Std. dev.	Min.	Max.
BO fund holding period (Months)	39,18	31,96	29,05	5,26	141,73
BO fund holding period (Months), excluding quick flips	43,59	34,47	28,47	12,07	141,73

The table reports summary statistics for the holding periods of the RLBO sample. The first row represents the entire sample while the second row has data for RLBOs with a buyout fund holding period above 1 year.

Exhibit 4

Percentage of quick flips contained in the RLBO sample

RLBOs	Total	Ratio to total sample
Quick flips (< 1 year holding period)	14	13,59%
Not quick flips (> 1 year holding period)	89	86,41%

The table reports the percentage of the RLBO sample constituted by quick flips and above 1 year buyout fund holding periods.

Exhibit 5

RLBOs		
US SIC	Frequency	Description
52	1	Building Materials, Hardware, Garden Supply & Mobile Home Dealers
12	1	Coal Mining
55	1	Automotive Dealers and Gasoline Service Stations
17	1	Construction - Special Trade Contractors
57	1	Home Furniture, Furnishings and Equipment Stores
22	1	Textile Mill Products
60	1	Depository Institutions
79	1	Amusement and Recreation Services
65	1	Real Estate
34	1	Fabricated Metal Products, Except Machinery & Transport Equipment
82	1	Educational Services
44	1	Water Transportation
33	1	Primary Metal Industries
29	1	Petroleum Refining and Related Industries
75	1	Automotive Repair, Services and Parking
49	1	Electric, Gas and Sanitary Services
87	1	Engineering, Accounting, Research, Management & Related Services
39	1	Miscellaneous Manufacturing Industries
56	1	Apparel and Accessory Stores
61	1	Non-depository Credit Institutions
67	1	Holding and Other Investment Offices
27	2	Printing, Publishing and Allied Industries
59	2	Miscellaneous Retail
20	3	Food and Kindred Products
50	3	Wholesale Trade - Durable Goods
64	3	Insurance Agents, Brokers and Service
63	3	Insurance Carriers
35	3	Industrial and Commercial Machinery and Computer Equipment
25	4	Furniture and Fixtures
58	5	Eating and Drinking Places
51	5	Wholesale Trade - Nondurable Goods
38	5	Measure/Analyze/Control Instruments; Photo/Med/Opt Gds; Watches/Clocks
37	5	Transportation Equipment
80	6	Health Services
13	6	Oil and Gas Extraction
28	6	Chemicals and Allied Products
48	6	Communications
36	6	Electronic, Electrical Equipment & Components, Except Computer Equipment
73	9	Business Services
Total	103	

The table reports the distribution of the RLBO sample on US SIC 2 digit codes as defined at <http://www.naics.com/search.htm>. See the attached CD-ROM for the source file for this table.

Exhibit 6

Matching results using 3 digit SICs

IPO year, 3 digit US SIC	RLBOs	Mean deviation (TA)	Mean deviation (ROA)
Sample size with +/- 200 % constraint	25	57,56%	70,86%
Sample size without +/- 200 % constraint	49	1478,48%	144,00%

Matching results using 2 digit SICs

IPO year, 2 digit US SIC	RLBOs	3 digits contained	2 digits contained	Mean deviation (TA)	Mean deviation (ROA)
Sample size with +/- 200 % constraint	45	25	20	50,38%	81,57%
Sample size without +/- 200 % constraint	71	25	46	571,45%	152,62%

Matching results using 1 digit SICs

IPO year, 1 digit US SIC	RLBOs	3 digits contained	2 digits contained	1 digits contained	Mean deviation (TA)	Mean deviation (ROA)
Sample size with +/- 200 % constraint	79	25	20	34	44,40%	76,59%
Sample size without +/- 200 % constraint	103	33	31	39	144,40%	93,50%

Exhibit 7

See attached CD-ROM for the SAS Enterprise Guide 4.2 output showing the distribution characteristics of the levels and change series for the RLBO, matched and excess sample.

Exhibit 8

See attached CD-ROM for the SAS Enterprise Guide 4.2 output showing the results Wilcoxon Signed Rank test for the excess level series for the RLBO, matched and excess sample.

Exhibit 9

Median changes in performance and characteristics for the RLBO, matched and excess sample									
Median changes	t-1-t0	t0-t1	t1-t2	t2-t3	t3-t4	t0-t2	t0-t3	t0-t4	to - t0-t4 mean
ROA (%)									
RLBO	0.93***	2.11****	-0.83***	-0.28	0.60	0.87	0.32	0.38	0.00
Matched	2.08****	1.75***	-1.77****	-0.64	-0.30	-0.21	-1.72	-1.53*	-0.32
Excess	-1.52****	0.83***	0.85****	-0.46	1.70	2.31	0.25	1.83	0.00
Net working capital / total assets									
RLBO	1.88****	0.27%	-0.39%	1.11%***	1.23%*	0.13%	1.13%	0.76%	0.00%
Matched	5.85****	0.68%	-1.68****	-0.76%	2.56****	-2.11****	-1.31%	0.77%	0.00%
Excess	-4.94****	0.05%	2.41****	2.26%	-0.61****	1.27%	2.62%	-1.78%	0.22%**
CAPEX / total assets									
RLBO	1.36%	-0.99%	-2.80%*	-2.79****	0.09%	-0.56%	-4.42****	-9.90****	-1.67****
Matched	8.02****	-11.83****	-3.34%	-5.32****	-0.38%	-18.38****	-17.29****	-26.51****	-8.37****
Excess	-2.05%	6.99%**	-2.70%	1.77%	1.51%	12.89%***	14.55%*	4.62%**	5.27%***
Free cash flow / total assets									
RLBO	2.34%	0.37%	-2.47%	1.52%*	0.05%	-2.21%	0.58%	4.56%**	0.00%
Matched	1.05%	0.39%	0.72%	6.37****	6.80****	-1.41%	6.41%***	7.47****	0.00%*
Excess	-2.14%	-0.38%	0.96%	-2.99****	0.07****	-1.77%	1.17%	-5.58%	0.00%
Long term debt ratio									
RLBO	-18.56****	-2.35****	-0.17%	-0.38%	-0.73%	-2.25%***	-2.34%	0.66%	-0.74%***
Matched	-13.95****	-0.36%	1.31****	1.08%***	0.35%**	1.66%***	3.29****	5.56****	1.15%***
Excess	-6.94%**	-1.62%***	-3.33****	-1.53%	-2.28%	-4.22%***	-4.64%***	-3.82%***	-0.79%***
Total debt ratio									
RLBO	-15.89****	-2.36****	-0.53%	-0.75%	-0.45%	-3.92%***	-3.63%*	-0.24%	-0.89%***
Matched	-13.97****	-1.03%	1.74****	0.99%***	0.30%	2.24%	4.15%***	5.17****	1.52%**
Excess	-3.51****	-2.40%	-1.92****	-1.48****	-0.98%	-4.20%***	-3.37%**	-1.42%**	-0.62%***
No. of recorded shareholders									
RLBO	0****	0****	5****	6****	0	12****	46****	52****	16****
Matched	0****	0****	11****	3****	0	17****	64****	57****	26****
Excess	0	0****	-3**	0	0	-8****	-13****	-3	-2****
OC, Top 1 shareholder (%)									
RLBO	0.00	0.00	0.00****	0.00	0.00	0.00****	-3.32****	-6.48****	-0.76****
Matched	0.00	0.00***	0.00****	0.00****	0.00****	-2.50****	-1.11****	-5.51****	-1.37****
Excess	0.00	0.00	0.00	-0.30****	0.24	0.00*	-1.98	-4.43*	0.00
HI concentration (%)									
RLBO	0.00	0.00	0.00****	0.00	0.00	0.00****	-2.89****	-4.12****	-0.47****
Matched	0.00	0.00*	0.00****	0.57****	-0.04	-0.11****	-0.07****	-1.34****	-0.12****
Excess	0.00	0.00	0.00	-0.64****	0.00	0.00	-2.18	-4.85****	-0.32
HI differences (%)									
RLBO	0.00**	0.00****	0.00****	0.00	0.00	-0.01****	-2.32****	-2.17****	-0.20****
Matched	0.00****	0.00***	-0.12****	0.00**	-0.22****	-0.15****	-0.34****	-0.59****	-0.19****
Excess	0.00	0.00	0.00	0.00	0.11	0.00	-0.06	0.04	0.00

The table reports median the annual change in selected variables for the RLBO, matched and excess sample through 4 years after the IPO. The distributions are of the variables in the table are skewed, so the median value is the considered the best measure of centrality. For each variable, the change from tx to ty is derived by pairing observations (for the RLBO, matched and excess series) and calculating the difference. The median values of the obtained series are reported. The significance of the median changes are estimated, using Wilcoxon Signed Rank Test (paired observations) which tests the null hypothesis that the median observation is equal to zero. *, **, ***, **** represents significance at 15%, 10%, 5% and 1%, respectively. See Exhibit 9 on the attached CD-ROM for the SAS Enterprise Guide 4.2 outputs from which the reported values are sourced

Exhibit 10

See attached CD-ROM for the SAS Enterprise Guide 4.2 output showing the characteristics of the buy-and-hold distributions for the RLBO, matched and excess sample.

Exhibit 11

See attached CD-ROM for the SAS Enterprise Guide 4.2 output showing the numerical and graphical tests of normality for the proposed dependent variables.

Exhibit 12

See attached CD-ROM for the SAS Enterprise Guide 4.2 output showing the estimated stock performance regression models reported in Table 7.

Exhibit 13

See attached CD-ROM for the SAS Enterprise Guide 4.2 output showing the estimated stock performance regression models containing IPO year dummy variables (Table 7 equivalents).

Exhibit 14

Tests of CLRM assumptions				
Stock performance regression models	Reg no 1	Reg no 2	Reg no 3	Reg no 4
<i>Regression model residuals</i>				
Zero mean value	1,0000	1,0000	1,0000	1,0000
Jarque-Bera test of normality	0,0115	0,0458	0,0245	0,0971
Shapiro-Wilk	0,1407	0,2141	0,1603	0,2512
Kolmogorov-Smirnov	0,15	0,15	0,1314	0,1033
Cramer-von Mises	0,25	0,25	0,25	0,1836
Anderson-Darling	0,25	0,25	0,25	0,2127
<i>Multicollinearity</i>				
VIF	5,72	0,25	4,66	4,79
CI	4,61	4,67	4,1	4,17
R ²	0,8253	0,8271	0,7848	0,789
<i>Heteroscedasticity</i>				
Whites test	0,5287	0,4528	0,6414	0,4798
<i>Autocorrelation</i>				
Breusch-Godfrey (BG) test	0,4051	0,3351	0,4314	0,2975
Durbin Watson d-statistic	2,2299	2,2757	2,1945	2,2581
<i>Model specification</i>				
Ramsey's RESET test				
Power 2	0,9856	0,5848	0,5009	0,3802
Power 3	0,5929	0,8284	0,7327	0,6776
Power 4	0,3592	0,1115	0,885	0,8537

The table contains the results achieved when testing the CLRM assumptions for the estimated regression models. The values reported for regression model residuals are all p-values. The first test is a parametric t-test which tests the null hypothesis of a zero mean value for the residuals of the estimated regression models. The Jarque-Bera test of normality, the Shapiro-Wilk, the Kolmogorov-Smirnov, the Cramer-von Mises and the Anderson-Darling test of normality all tests the null hypothesis of normally distributed residuals. For multicollinearity tests the VIF and CI values reported are the maximum values identified for the estimated regressions. The p-value is also reported for Whites test of heteroscedasticity which tests the null hypothesis of no heteroscedastic variance. The BG test of autocorrelation likewise tests the null hypothesis of no autocorrelation and again the p-value is reported. Finally for Ramsey's RESET test, the p-values of the corresponding F-tests (with the null hypothesis of no model misspecification) are reported. See Exhibit 14 on the attached CD-ROM for the SAS Enterprise Guide 4.2 output showing test of CLRM assumptions as reported.

Exhibit 15

See attached CD-ROM for the SAS Enterprise Guide 4.2 output showing the estimated stock performance regression models reported in Table 8.

Exhibit 16

See attached CD-ROM for the SAS Enterprise Guide 4.2 output showing the estimated stock performance regression models containing IPO year dummy variables (Table 8 equivalents).

Exhibit 17

Tests of CLRM assumptions						
Stock performance regression models	Reg no 5	Reg no 6	Reg no 7	Reg no 8	Reg no 9	Reg no 10
<i>Regression model residuals</i>						
Zero mean value	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Jarque-Bera test of normality	0,0322	0,0607	0,0896	0,0896	0,0405	0,0774
Shapiro-Wilk	0,0840	0,1589	0,1342	0,2413	0,2567	0,1120
Kolmogorov-Smirnov	0,0100	0,0246	0,0142	0,0794	0,1500	0,0462
Cramer-von Mises	0,1299	0,2248	0,1476	0,2500	0,1125	0,0651
Anderson-Darling	0,1072	0,2108	0,1441	0,2500	0,1410	0,0688
<i>Multicollinearity</i>						
VIF	1,01	1,00	1,00	1,00	1,00	1,01
CI	1,10	1,27	1,07	1,26	1,13	1,30
R ² from auxiliary regression	0,0051	0,0031	0,0012	0,0008	0,0044	0,0119
<i>Heteroscedasticity</i>						
Whites test	0,7589	0,8349	0,5809	0,7007	0,5386	0,745
<i>Autocorrelation</i>						
Breusch-Godfrey (BG) test	0,2001	0,1386	0,1331	0,1331	0,2299	0,1527
Durbin Watson d-statistic	2,2310	2,2900	2,2240	2,2800	2,2420	2,3020
<i>Model specification</i>						
Ramsey's RESET test						
Power 2	0,7084	0,0345	0,1515	0,1515	0,6613	0,0868
Power 3	0,0583	0,0258	0,0841	0,081	0,4313	0,0061
Power 4	0,0903	0,0432	0,1559	0,1559	0,0592	0,0173

The table contains the results achieved when testing the CLRM assumptions for the estimated regression models. The values reported for regression model residuals are all p-values. The first test is a parametric t-test which tests the null hypothesis of a zero mean value for the residuals of the estimated regression models. The Jarque-Bera test of normality, the Shapiro-Wilk, the Kolmogorov-Smirnov, the Cramer-von Mises and the Anderson-Darling test of normality all tests the null hypothesis of normally distributed residuals. For multicollinearity tests the VIF and CI values reported are the maximum values identified for the estimated regressions. The p-value is also reported for Whites test of heteroscedasticity which tests the null hypothesis of no heteroscedastic variance. The BG test of autocorrelation likewise tests the null hypothesis of no autocorrelation and again the p-value is reported. Finally for Ramsey's RESET test, the p-values of the corresponding F-tests (with the null hypothesis of no model misspecification) are reported. See Exhibit 17 on the attached CD-ROM for the SAS Enterprise Guide 4.2 output showing test of CLRM assumptions as reported.

Exhibit 18

See attached CD-ROM for the SAS Enterprise Guide 4.2 output showing the estimated operating performance regression models reported in Table 9

Exhibit 19

See attached CD-ROM for the SPSS (PASW Statistics) output showing the estimated operating performance regression models reported in Table 10

Exhibit 20

See attached CD-ROM for the SPSS (PASW Statistics) output showing the estimated operating performance regression models containing IPO year dummy variables (Table 10 equivalents)

Exhibit 21

Tests of CLRM assumptions						
Operating performance regression models	Reg no 1	Reg no 2	Reg no 3	Reg no 4	Reg no 5	Reg no 6
<i>Regression model residuals</i>						
Zero mean value	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Jarque-Bera test of normality	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
Shapiro-Wilk	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
Kolmogorov-Smirnov	0,0100	0,0100	0,0100	0,0100	0,0100	0,0100
Cramer-von Mises	0,0050	0,0050	0,0050	0,0050	0,0050	0,0050
Anderson-Darling	0,0050	0,0050	0,0050	0,0050	0,0050	0,0050
<i>Multicollinearity</i>						
VIF	1,01	1,00	1,00	1,00	1,00	1,01
CI	1,08	1,27	1,07	1,26	1,34	1,30
R ² from auxiliary regression	0,0051	0,0031	0,0012	0,0008	0,0044	0,0119
<i>Heteroscedasticity</i>						
Whites test	0,0648	0,0963	0,1722	0,2555	0,1688	0,1831
<i>Autocorrelation</i>						
Breusch-Godfrey (BG) test	0,6339	0,4822	0,5637	0,4021	0,6209	0,4639
Durbin Watson d-statistic	2,2290	2,2580	2,2360	2,2610	2,2310	2,2600
<i>Model specification</i>						
Ramsey's RESET test						
Power 2	0,1076	0,1797	0,0738	0,1846	0,1013	0,2086
Power 3	0,1820	0,2503	0,1984	0,4146	0,2130	0,3924
Power 4	0,3340	0,4181	0,3412	0,4483	0,3633	0,5032

The table contains the results achieved when testing the CLRM assumptions for the estimated regression models. The values reported for regression model residuals are all p-values. The first test is a parametric t-test which tests the null hypothesis of a zero mean value for the residuals of the estimated regression models. The Jarque-Bera test of normality, the Shapiro-Wilk, the Kolmogorov-Smirnov, the Cramer-von Mises and the Anderson-Darling test of normality all tests the null hypothesis of normally distributed residuals. For multicollinearity tests the VIF and CI values reported are the maximum values identified for the estimated regressions. The p-value is also reported for Whites test of heteroscedasticity which tests the null hypothesis of no heteroscedastic variance. The BG test of autocorrelation likewise tests the null hypothesis of no autocorrelation and again the p-value is reported. Finally for Ramsey's RESET test, the p-values of the corresponding F-tests (with the null hypothesis of no model misspecification) are reported. See Exhibit 21 on the attached CD-ROM for the SAS Enterprise Guide 4.2 output showing test of CLRM assumptions as reported.