Investigating the discount on trade sale transactions

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Abstract

Officer (2007) finds that subsidiaries sold between public companies trade at a 30% discount relative to comparable public market acquisitions. This discount is attributed to target parents selling assets under liquidity pressures and adverse credit market conditions. This implies a transfer of wealth from sellers to buyers, and a material friction in the market for corporate control. I present an alternative view. Assets sold by target parents are more likely to be poorly performing, non-core and sold at a tax loss. The reported discounts reflect this difference in underlying value, not a transfer of wealth from seller to buyer.

I test whether reported discounts are driven by liquidity-pressured target parents or reflect the sale of less valuable subsidiaries. I present four key results. First, Officer (2007) uses the combination of arithmetic mean and percent discounts, procedures which are strongly influenced by asymmetric distribution of discounts. Alternative methods result in lower, or even zero, discounts. Second, measurement of discounts needs to allow for asset specific characteristics. I find that the target's income status and size are associated with reported discounts. Third, using measures of financial constraints and new measures of seasoned equity market conditions, I find little correlation between discounts, measures of financial constraints and measures of equity market conditions. There is some evidence of a fire sale mechanism operating but the circumstances apply to a small portion of the sample, and cannot be used to explain pervasive discounts. Finally, acquirers buying assets at a discount should attract a larger share of wealth created in a sale. This result may explain the so-called listing effect. I find no association between discounts and the acquirer's share of wealth created or returns.

It is tempting to apply the logic of the private company discount to the sale of subsidiaries by public companies. However publicly listed target parents have a wider range of funding strategies and exit strategies than privately owned companies. The case that sizable discounts on the sale of subsidiaries exist, and are attributable to liquidity pressures on target parents, is still to be made.

Declaration

I certify that the work in this thesis entitled "Investigating the Discount on Trade Sales" has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree to any university or institution other than Macquarie University. I also certify that the thesis is an original piece of research and it has been written by me. Any help and assistance that I have received in my research work and the preparation of the thesis itself have been appropriately acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

Tony Carlton

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Chapter 1

Introduction

1.1 Research Question

The purpose of this research is to determine whether asset sales by listed companies take place at a discount. In a new finding, Officer (2007) finds that subsidiaries are sold between public companies at an average discount of 30% to the acquisition price of publicly listed comparables[1]. These discounts are attributed to the combined impact of liquidity pressures on the target parent and external market constraints triggering a fire sale of assets. These results are broadly in line with the financing hypothesis of asset sales, proposed by Lang, Poulsen and Stulz (1995) and the fire sale hypothesis of Shleifer and Vishny (1992). They are consistent with, but do not necessarily explain, the empirical evidence that acquirers of privately owned assets earn superior returns, a notably different result to acquirers of publicly listed targets[2.] These results are also apparently compatible with the 'marketability' discount applied to private companies. The existence of such large discounts suggests a significant transfer of wealth to acquirers of assets, and a significant friction in the efficient reallocation of resources.

I present an alternative view. If a subsidiary is sold between public companies at an apparent discount relative to public market peers, it is because the asset is less valuable than those public market peers. The reported discounts do not reflect a transfer of wealth from seller to buyer due to liquidity

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[1] A subsidiary is a legal entity owned by a parent company but the type of transactions included here the more general terms relating to sale of a division or segment of a business.

[2] Chang (1998) and Officer (2007) both suggest that the discount could contribute to the superior returns earned by acquirers of private targets. However no direct evidence is presented to show a direct link between discount and acquirer returns.

pressures causing a discounted sale, but rather reflect a difference in underlying value. This view is compatible with all theories used to explain asset sales, is consistent with an efficient market for corporate control and is more in line with costs of alternative funding sources available to publicly listed companies.

My research demonstrates that the discounts reported by Officer (2007) are ambiguous, partly due to methodological choices in measuring discounts. I further demonstrate that the discounts can be partially explained by differences in underlying asset values. In particular, I show that the income status of the target asset has a material effect on reported discounts. This conclusion is reinforced by analysis which demonstrates that there is no relationship between measures of financial constraints and discounts, and no relationship between the allocation of announcement returns between buyer and sellers and discounts.

In Section 1.2, I review the motivation for this research and the importance of gaining a better understanding of the pricing of subsidiary sale transactions. In Section 1.3, I outline the nature of the divestment decision. This provides context for assessing the financing motivation for asset sales underlying the conclusions of Officer (2007). In Section 1.4, I make the case for analysing subsidiaries as a market segment distinct to the private company market. In Section 1.5, I review the existing literature on discounts on the sale of subsidiaries, while Section 1.6 provides an overview of the detailed research questions addressed in this thesis.

1.2 Motivation

The market for corporate control has been thoroughly explored in the context of the acquisition of publicly listed companies, but less so for transactions involving the acquisition of unlisted targets. A better understanding of factors determining pricing of subsidiary sale transactions should be of interest to both academics and practitioners. Firstly, divestments are increasingly a normal part of business strategy. Trade sale transactions are important decisions for CEO's and Directors, and a key activity of the investment banking industry. A recent survey of global corporates by EY[3] finds that more than half of surveyed companies made a major divestment in the previous two years**.** Transactions involving unlisted targets are significantly more common by number and, in dollar value, material when compared to acquisitions of public listed companies. Secondly, discounts of 30%, and the resultant transfer of wealth from seller to buyer are large and, if correct, have implications for practice. Understanding the extent to which assets suffer from marketability discounts will contribute to an assessment of the relative effectiveness of divestiture versus other corporate portfolio restructuring strategies, such as spin offs and carve outs. Furthermore, they have implications for assessing the efficiency of the market for corporate control.

Discounts on subsidiary sale transactions are estimated by comparing multiples of private and public transactions. Multiples are a common metric used by stock analysts, M&A specialists, and as a guide for IPO pricing. Fairness Opinions, in the United States, and Independent Expert Reports, in Australia, commonly include a multiples analysis of the relevant transaction, either as a complement to, or instead of, a discounted cash flow analysis. Kim and Ritter (2003) demonstrate that valuations used by underwriters in IPOs are more accurate than the use of systematic valuation procedures generally used in empirical studies in the accounting and finance literature. It is therefore important to ensure that estimates of discounts are robust, and a true reflection of market practice. In addition, there are legal considerations. Marketability discounts are important in legal settings (Bajaj, Denis, Ferris and Sarin (2001)), where courts are required to assess situations where marketability discounts should be applied to valuations and, if so, what the size

[3] EY: Global Corporate Divestment Study: Strategic Divestments Drive Value; 2014: ey.com/transactions

of those discounts should be. This issue is also important in academic research where the use of systematic, replicable methodology is required, as distinct from practitioner use of multiples, where there is greater scope for subjective judgement.

This project builds on recent research into the accuracy of alternative multiples based valuation methodologies, and to demonstrate that important methodological choices have significant impact on results when using multiples in empirical research. With a wide range of methodologies available, this study of the determinants of discounts will contribute to improved knowledge in this area and facilitate discerning choices among methodologies. With a wide range of methodologies available, this study of the determinants of discounts should contribute to improved knowledge in this area.

Acquirers of private targets appear to earn an announcement period excess return of approximately 2%, and a target's public or private ownership status, sometimes described as the listing effect, is now commonly included as a control variable when analysing returns to acquirers. The source of these superior returns is still to be explained. One possible explanation is that acquirers buy such assets cheaply. Sales of subsidiaries at 30% discount to value would support such a possibility, if true. To date, the relationship between such discounts and acquirer returns has not been explicitly tested. Confounding this picture is the fact that, dependent on the use of proceeds, asset sales also attract positive announcement returns for vendors; although not of the scale accruing to owners of acquired public companies a result that could contra-indicate the presence of discounts. Assessing the role of discounts in contributing to returns to acquirers and target parents will contribute to our understanding of this phenomenon.

1.3 The divestment decision: a source of funding and an important strategic decision

The sale of a subsidiary by a listed company is a unique opportunity to study an important segment of the market for corporate control. The EY survey documented dissatisfaction on the part of many companies with their divestment processes, and concluded that divestment outcomes are positively related to active linking of their divestment decisions to strategic portfolio reviews and capital allocation decisions.

Divestments are intertwined with decisions about strategy and use of proceeds. The following examples demonstrate some of the complexities involved in evaluating divestments.

[1] Selling Assets to repay debt: HealthSouth Corp

HealthSouth Corp is the largest provider of inpatient rehabilitative health care services in the United States, with an equity market capitalisation of $1.4 billion. In 2007 they completed a strategic restructure of the company, which largely consisted of selling non-core assets to reduce debt. In 2007, proceeds from sale of assets of $1,140m were applied to debt reduction, which reduced from $3,247m to $1,917m. This restructure was motivated by the desire for debt reduction, but inevitably requires an assessment of which assets to sell and prices achievable for those assets:

"We had excessive debt….our high leverage precluded appropriate investment in our business and limited our ability to pursue growth opportunities….our strategy would build on our core competencies……..there were very few strategic or financial synergies in operating our divisions as one company….there was an opportunity due to the strong credit markets to divest non-core assets" [HealthSouth Corp Annual Report, 2007].

[2] Using an SEO to reduce debt: Wesfarmers

Wesfarmers is a large Australian conglomerate which completed a $19bn acquisition on 23rd November, 2007, just prior to the GFC. Following the

GFC, Wesfarmers was perceived to have difficulties refinancing the acquisition debt, and its AA credit rating was under pressure. There was speculation that Wesfarmers would undertake asset sales in order to achieve its debt reduction. However Wesfarmers raised $6bn in new equity, via a combination of rights issues and strategic placements, with the proceeds applied to debt repayment. Following the equity raising the Managing Director is quoted as saying that "asset sales are now definitely off the agenda".

[3] Selling assets as part of a portfolio and financial restructuring: Lafarge is a French based international construction and building materials company. Between 2004 and 2006 it undertook a series of large scale acquisitions leading to an increase in debt to Euro16bn. In the period 2006 to 2009, Lafarge completed a large scale portfolio and financial restructuring. Divestments of Euro4bn were made which resulted in a more focussed business portfolio, a rights issue of Euro1.5bn was completed (partially underwritten by its two largest shareholders), dividends were reduced and new debt facilities were implemented.

The divestment decision involves a company, firstly, deciding that it needs to sell or exit an asset. This may be triggered by strategic, performance or financing requirements. Management must then select which asset is to be sold, determine an acceptable sale price and then decide on the use of proceeds. There is extensive research on each of these stages in the transaction. Chen and Guo (2005) and Schlingemann, Stulz and Walking (2002) construct models to predict divestment decisions, Officer (2007) analyses pricing decisions, Bates (2005) examines the use of proceeds while Datta, Datta and Raman (2003) examine the net wealth impact of divestment transactions. However, no research has attempted to link each of these aspects to the overall outcome of a transaction, leaving a substantial gap in the literature.

In this research I relate outcomes of the transaction to the following factors: the purpose of the divestment, the use of proceeds and whether the size of measured discounts helps contribute to understanding the relative performance of buyers, sellers and overall wealth creation from the transaction. The steps in the divestment process are interdependent, and the decision to sell an asset and its price involve the combined effect of (i) asset characteristics (ii) vendor firm characteristics (iii) financial market conditions, and (iv) industry conditions.

This research contributes to our understanding of the pricing of subsidiary sale transactions between publicly listed companies, by attempting to explain why companies apparently sell assets at such large discounts, when alternative and potentially lower cost sources of funds are available, why the market apparently reacts positively to such transactions, even though they are transacted at such large apparent discounts and how such transactions apparently create (or at least don't destroy) value for buyer and seller.

1.4 Why divestments are different to selling a privately owned company

Officer (2007) was the first to measure discounts on subsidiary sales. Previous research has focussed on the private company discount as applied to privately owned companies. While it is tempting to apply the logic of private company discounts to subsidiary sales (i.e. it accords with the view that private companies are worth less than public companies), I argue there are significant differences between the divestment of a subsidiary, and the sale of a privately owned business, which justify the study of divestiture discounts as a discrete segment of the market for corporate control, and which should have an important impact on the causes and interpretation of reported discounts. The circumstances of a publicly listed company deciding to sell a subsidiary differ to those of a privately owned business. These differences need to be taken into account if we are to understand the decision of the vendor to sell an asset, the pricing of the asset, the wealth creation impacts and how any wealth creation is allocated between the parties. Furthermore, these transactions give a unique opportunity to study the impact of financial constraints and liquidity pressure on financial decision making. I argue that private companies need to be treated as a different market segment to subsidiaries if public companies[4].

The transactions involving publicly listed companies and those involving privately owned businesses differ along the following dimensions: motivations for sale, alternative use of proceeds and alternative funding sources. I examine each of these in turn.

In the case of a privately owned business, the whole business is being sold, as distinct from the sale of a segment. The decision of the private business owner to sell their equity will usually involve a loss of control and will usually be motivated by the desire to liquidate or monetise their investment, or to secure funds to support further growth of the business. For the owner(s) of a private company, having made the decision to liquidate part or all ownership, the choice is between an IPO or being acquired.

A publicly listed company has a wider range of influences impacting on the decision to divest, relative to those faced by a privately owned business. The decision by management of a listed company to sell a particular asset or segment may be motivated by different factors. Motivations identified in the literature include the financing hypothesis, where an asset is sold to raise funds for debt repayment or to fund growth by the parent company; the strategic rationale, where the objective is restructuring the portfolio of the parent company, and the efficiency hypothesis, where the sale is motivated by the desire to exit a poorly performing business.

If the requirement is financing driven, a public company has a wider range of alternative funding sources than the private business. To access equity, the privately owned business must either sell equity to its existing owners or undertake an IPO. An already listed company, on the other hand, can

[4] The sale by a listed company would usually include the sale of a specific business segment or a specific asset. The legal form of such a sale could involve the sale of physical assets or a subsidiary company. The choice between these will be driven by tax and legal considerations and are not specifically pursued in this research.

undertake a seasoned equity offering. A seasoned equity offering has considerably lower direct and indirect transactions costs than an IPO and permits access to a deeper market for funds compared to the IPO market. A seasoned equity offering also has different tax impacts to an asset sale. A thorough assessment of the potential role that liquidity pressures and financial constraints have on asset sales is incomplete without an understanding of the role of seasoned equity offerings. This choice most closely approximates that faced by any listed company.

Exit choices for the target parent include sale of the subsidiary via trade sale or IPO. If the sale motivation is strategic, then the target parent can spin off the subsidiary, in addition to the trade sale and IPO alternatives. Both transactions will also have different potential use of proceeds and tax consequences. A listed company selling assets will be able to use proceeds to reinvest in the business, repay debt or distribute to shareholders. A privately owned business has broadly similar alternatives. However, an IPO will either involve the vendor directly receiving proceeds from the IPO, thus bypassing the business, or proceeds being reinvested in the business, without changing the business portfolio. These alternative mechanisms have very different tax consequences. Sales of the private company will result in tax consequences for shareholders while the sale of a subsidiary will result in tax consequences for the target parent.

Furthermore, the impact of private benefits of control will be different between a private target and a subsidiary. A privately owned business deciding to exit will involve owners ceding some, or all, private benefits of control whereas the sale of a subsidiary may have minimal effect on the management of the target parent. Another source of difference may be caused by the potential for misvaluation. Baker and Wurgler (2003) demonstrate the impact of equity market misvaluation on investment and financing decisions. The over or undervaluation of a public company’s equity may affect the choice of equity raising versus asset sales as a source of funding, a factor unlikely to be faced by the owner of a private company.

1.5 Prior research on the trade sale discount

1.5.1 The private company discount

Officer (2007) examined the trade sale discount in conjunction with discounts on the sale of privately owned companies, so it is appropriate to briefly review research on the private company discount. One method for determining the private company discount is the comparable transaction method (Kaplan and Ruback (1996), Kim and Ritter (1999))[5], which compares multiples paid for a privately owned target with estimated multiples for a matched sample of publicly listed targets[6]. The estimate of publicly listed comparables is made by either averaging a portfolio of comparable acquisitions, or estimating a "Warranted Multiple" using some form of cross sectional model. In practice, the use of an averaging procedure is most common.

Koeplin, Sarin and Shapiro (2000) compare sales of 84 privately owned companies with a public company acquisition matched by size, date and SIC code. They find average discounts of 18% to 31% when using Enterprise Value to EBITDA, EBIT and book value multiples, but no discount when using the

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[5] Other methods, not relevant for this research include the restricted stock method, and valuation of IPO's. Refer to Bajaj, Denis, Ferris and Sarin (2001) and Comment (2012) for a full discussion of these procedures.

[6] This differs to the traditional comparable technique, described as Trading multiples, which compares valuations of listed companies. Valuing subsidiaries on a trading basis is not possible with subsidiaries due to lack of price data for the private target, so it is not possible to make a direct comparison of value. The comparable transaction method is only used with acquisition or divestment transactions. Furthermore it is not valid to compare the price paid for a private target which has been acquired with the traded price of a comparable public company because the traded price will not include the full premium for control. Refer to Bajaj et al for a discussion of other methods which use non acquisition based transactions.

Enterprise Value to Sales multiple. These results maintain after controlling for growth and size. Officer (2007) examined discounts on the sale of privately owned businesses. Controlling for size, industry membership and announcement window, he found discounts for privately owned businesses averaged 17%. A correlation between credit market conditions and the cash balance of the target company indicate the potential influence of internal and external liquidity pressures in explaining the discount (Table 7, page 594). Franco, Gavious, Jin and Richardson (FGJR, 2011) examine the sale of private firms and estimate the private company discount at 20.9% (Table 4, page 238). FGJR (2011) conclude that the discount increases to 40% when allowance is made for firm specific characteristics, such as profitability and growth. Koeplin et al (2000) make similar adjustments and report that the economic value of the discount is unchanged.

1.5.2 Discounts on sales of subsidiaries

Officer (2007) found an average discount of 30% for sales of subsidiaries by publicly listed businesses. The discount was calculated by, firstly, taking the arithmetic mean of multiples of publicly listed targets in the same two-digit SIC code, and the calculating the percent difference between this and the multiple of the subsidiary sale. To maintain symmetry in the data, Officer excluded any observations where the percent discount exceeded 1, effectively excluding transactions where the multiple of the private transaction was twice that of the public market comparable.

There were statistically significant relationships between the discount and the Commercial and Industrial (C&I) loan spread (negative), parent company's abnormal stock return in the previous twelve month's (positive) and an interaction term which measured the interaction between the parent company's abnormal stock return and an indicator variable, equal to 1, if the disposed subsidiary was in the same industry as the parent. The negative correlation between discounts and this last item suggests that discounts are largest when a company sells a non-core subsidiary. Officer interprets this as evidence of parent companies being forced to sell assets at substantial discounts to raise cash. Variables which were found to have no relationship to discount included cash balances, gearing, IPO market conditions, industry M&A activity, and variation in parent earnings forecast (as a measure of informational asymmetry).

Ma (2006) finds a positive relationship between acquirer announcement returns and relative working capital position of acquirer and vendor. He concludes these returns are attributable to the weaker liquidity position of the seller, but does not incorporate any measures of discounts. Neither Officer (2007) nor Ma (2006) incorporates any asset specific characteristics into their analysis.

1.6 Thesis overview

I identify five issues in the current literature, and which I address in this thesis. The balance of this chapter describes these issues and how they will be addressed in this thesis.

1.6.1 Expectations on Divestment pricing (Chapter 2)

The conclusion that subsidiaries sell at a discount assumes that subsidiaries and public market targets are comparable, and therefore should sell at the same price. In Chapter 2, I demonstrate that a subsidiary is likely to be of lower value than a public market peer, through both a review of existing literature and modelling of the divestment pricing decision. Consequently, I argue that our a priori expectation of the relative price should not be one of equality of prices of subsidiaries and targets.

I examine the existing literature as it relates to the stages of a divestment process and assess implications for the price at which a subsidiary might be sold. Motivations (which may potentially overlap) for asset sales include divesting poorly performing businesses, achieving focus or to raise funds. It is not surprising such assets are less valuable than comparable public takeover targets. The reported discounts are just as easily attributable to differences in underlying asset values as they are to a transfer of wealth due to weak negotiating position of the target parent. Other factors affecting divestment decisions could include the influence of agency costs and the private benefits of control, and managerial and / or market optimism or pessimism. The existing literature also suggests that, when given a choice between an asset sale or spinning off an asset, assets with better growth prospects and higher profitability, are more likely to be spun off. This conclusion is reinforced by the favourable tax treatment of a spin off, for the vendor, relative to selling an asset above book value. Consequently, it is more likely that assets being sold are at the lower end of the valuation spectrum. The key implication of this for research on subsidiary sale discounts, is that measures of discounts should incorporate asset specific characteristics to allow for differences in asset quality.

In Chapter 2, I also model the divestment pricing decision. I relate the breakeven pricing of an asset sale to its motivation, and provide decision makers with precise criteria for evaluating alternatives. This analysis demonstrates that it may be consistent with value creating behaviour for a company to sell an asset at a perceived discount. Circumstances where this may arise include existing from poorly performing businesses, selling assets to remove a diversification discount, or where proceeds from an asset may be lower cost than accessing external equity. Such an analysis has not previously been presented in the literature, to my knowledge. I highlight the important impact tax can have on the decision about which assets to sell and its price. Furthermore, the potential impact of discounts on value being reported by diversified companies could also impact on assets being sold by diversified companies.

This analysis identifies a number of potential explanatory variables to use in the empirical analyses which have not been previously used. These include the tax status of the vendor, the degree of diversification of the vendor, the extent of insider ownership as a proxy for private benefits of control, and measures of misevaluation.

1.6.2 Measuring the discount on trade sales (Chapter 3)

Most analyses of the trade sale discount compare multiples on private trade sales to comparable public market acquisitions. Measuring discounts based on multiples involves a number of methodological choices and procedures which can have a material effect on the conclusions drawn. In Chapter 3, I demonstrate the effect of methodological choices, and potential biases introduced by the combination of arithmetic mean to calculate peer group multiples, percent discount to calculate the discount and trimming procedures used to address an asymmetrical distribution.

Firstly, I assess procedures used in the literature to measure discounts against 'best practices' emerging from accounting and finance research into the use of multiples in valuation, particularly in light of the asymmetric distribution of discounts. I test a range of methodologies for calculating the discount, which reflect developing understanding of best practice in calculating multiples. I demonstrate that the measurement of discounts is highly sensitive to methodological choices. On one measure, the harmonic mean, the discounts entirely disappear. Furthermore, when allowance is made for targets with negative incomes, both private and public, the discounts are materially reduced.

Second, a fundamental assumption in the calculation of discounts is that listed and unlisted assets are directly comparable. However the circumstances of the two types of transactions may cause the underlying values of the assets to be different. This raises the question as to whether a non-core business sold by a listed company will be exactly comparable to a listed company in that same line of business, possibly placing more onus on the researcher to properly control for asset specific variation.

One of the main conclusions of recent research into using multiples is that accuracy is enhanced if allowance is made for firm (or, in our situation, asset) specific characteristics. These differences will be caused by differences in performance, growth prospects and stage in life cycle. In calculating discounts for privately owned businesses, both FGJR (2011) and Koeplin et al (2000) attempted to control for differences in asset quality: FGJR found the discount actually increases to 40% when allowance is made for firm specific characteristics, such as profitability and growth, while Koeplin et al (2000) report that the economic value of the discount is unchanged. However this conclusion need not necessarily carry over to the sale of subsidiaries. Earlier in this Introduction I demonstrated that the sale of a subsidiary can be very different to the sale of a privately owned business. To my knowledge, no study of the trade sale discount on sales of assets by a listed company has attempted to control for asset specific characteristics. Using data available for a subsample of subsidiary sales, I demonstrate that income status, in particular, of target assets has a significant effect on results.

1.6.3 Financial Constraints and raising External Finance (Chapter 4)

The existence of the discount is usually attributed to liquidity pressure on the vendor, whereby firms sell assets when they are under liquidity pressure and therefore tend to sell at “fire sale” prices (Schleifer and Vishny(1992)). Officer (2007) concludes that liquidity pressures are the cause of discounts. Officer (2007) finds that IPO market conditions, bank loan spreads and asset liquidity impact on the size of discounts and Ma (2006) finds a positive relationship between buyer returns and the relative liquidity between buyer and seller. However these models have low explanatory power, and are not economically significant.

The liquidity pressure conclusion is based on results where the only variables found to have a correlation with the reported discounts are adverse external conditions in the debt market and poor share price performance prior to sale, suggesting their combined impact prompts the sale of non-core subsidiaries at a discount. Officer (2007) and Ma (2006) rely on relationships between cash balances and net working capital, respectively. I argue these are not appropriate measures of liquidity pressures. This conclusion does not necessarily rely on a financial constraints rationale; it is potentially consistent with companies selling less valuable assets at a price less than more valuable comparables. I therefore conclude that the impact of financial constraints is asserted, not demonstrated, and the case is still to be made in regard to the impact of liquidity pressures on discounts.

Demonstrating the effect of financial constraints on discounts requires the systematic testing of the transmission mechanism by which financial constraints can cause discounts to occur, which I contend the existing research fails to do. The key steps in such a transmission mechanism are, firstly, the firm has a need for external funding or is at least under liquidity pressure; secondly that the external equity markets are either unavailable or too costly and finally that conditions in the asset markets result in a lack of appropriate competition to achieve fair value for assets being sold. Importantly, I argue that each of these conditions needs to be in place if the fire sale type scenario is to be triggered and used as the primary explanation for discounts.

In Chapter 4, I examine each of these steps and test for their association with discounts. The argument proceeds as follows.

<u>[1] Need to use better measures of financial constraints.</u>

The measures used in previous research, cash balances, debt market conditions and share price performance do not uniquely demonstrate the impact of financial constraints impact. Lower cash balances, higher leverage and poor share price performance could just as easily represent the impact of poorly performing, and therefore less valuable, assets. The better way to test for the impact of financial constraints is to, firstly, use measures of financial constraints that are considered (in the literature) to work and, secondly, directly test whether the actual use of proceeds has a discernible impact on discounts. In response to the first issue, I test for an association between discounts and measures from the financial constraints literature, including the Whited-Wu index. In relation to the second, I test for an association between use of proceeds and discounts by measuring whether firms undertook debt reduction, capital investment or shareholder distributions. The first two uses could potentially be associated with some form of financial pressure to sell assets.

[2] Test for conditions in the seasoned equity markets.

It is well documented that firms selling assets tend to have higher gearing and lower profitability. The financing motivation for asset sales encompasses a number of reasons why it may be sensible for management to seek funds via asset sale rather than issuing equity[7].The general assumption is that equity markets are either not accessible or too costly, either due to market conditions or the firm's own financial condition. The impact of limited access to credit markets and the IPO market have been tested. However publicly listed companies can undertake a seasoned equity offering. The accepted view in the literature is that assets sold via trade sale do so at an average 30% discount. The apparent cost of a secondary market offering is generally lower than the cited 30% discount on trade sales. Why would a company sell an asset at a 30% discount, rather than simply raise external equity? If asset sales are motivated by liquidity, understanding the determinants of the choice between an asset sale and the other major source of new funds, a secondary market offering, will contribute to our understanding of the cost of financial constraints. If the sale

[7] These are discussed in detail in Section 2.3.1.

of assets is motivated by financing requirements then this implies that the cost of raising seasoned equity exceeds that of the measured discounts, or is inaccessible to firms deciding to sell assets. This question is particularly interesting as seasoned equity is a source of funds not readily available to a privately owned company. This should give the publicly listed company more choices as to sourcing of funds, yet Officer (2007) reported discounts on sales by public listed companies, at an average of 30%, which were larger than those for private targets, which averaged 17%.

Consequently, I develop measures of seasoned equity market conditions, and test for an association with discounts. The measures reflect both volume and pricing conditions in the seasoned equity markets, and directly test the state of equity markets as an alternative to asset sales. Explicitly linking asset sales and discounts to equity market conditions has not been examined in the literature. Testing this proposition will provide insights into the impact of financial constraints and the cost of raising equity.

[3] Test for conditions in the asset markets.

Even if a firm is under financial pressure, or confronted by adverse equity market conditions, I argue that if competitive conditions prevail in the asset markets then the firm should be able to achieve fair value from its asset sale. Pulvino (1998) finds evidence of fire sale type pricing in relation to the sale of equipment assets. In Chapter 2, I demonstrate that the evidence is less clear in relation to the sale of operating businesses. Consequently, direct tests of asset market conditions will be an important component of testing the transmission mechanism. I develop tests of asset market liquidity, and test for relationships between these measures and discounts. Following Schlingemann, Stulz and Walkling (2002), I use measures of asset market liquidity. I also directly test the implication of the original Shleifer and Vishny (1992) model of fire sales, that outsiders buy assets in fire sale type conditions.

[4] Test for presence of all three conditions.

I argue that a firm selling an asset needs to have each of the three conditions noted earlier all present, otherwise the fire sale is not the appropriate explanation for an asset sale. For example, lack of liquidity pressure, positive equity market conditions or competitive asset market conditions should, individually, negate the fire sale pressure to sell assets at a discount. Consequently, to test whether this suggested transmission mechanism helps explain discounts I include variables that test for the simultaneous presence of each of the three conditions described earlier.

1.6.4 Does the discount on trade sales explain superior returns to trade sale acquirors? (Chapter 5)

Acquirers of privately owned assets appear to consistently earn positive returns. Research into the so-called listing effect is still to explain why buyers of private assets achieve superior returns. There have been a number of attempts to explain these results, which are summarised in Faccio, McConnel and Stolin (2006).If discounts represent a transfer of wealth between buyer and seller, then they may be an explanation for superior returns to acquirers of private targets. The existence of a clear relationship between discounts on trade sales and positive returns to acquirers would be strong evidence in support of the existence of such discounts. No attempt has been made to test whether there is a link between discounts and acquirer returns. In Chapter 5, I test, for the first time, whether the so-called discount is an explanation for the superior returns achieved by acquirers of subsidiaries. .

The use of equity as consideration has been associated with higher returns, a result at variance with the evidence on public market acquisitions (Faccio, McConnell and Stolin, 2006). The results may also be explained by differences between the process of acquiring a privately owned target and the more high profile public market acquisition. The private trade sale process is usually triggered by the vendor and is usually more transparent (at least to the buyer, if not outside observers), with the acquirer generally having access to financial records, management and physical assets prior to finalising a transaction. The transaction may also include covenants and warranties provided by the vendor. The acquisition of a public target will rarely involve either of these protections. It is possible that these elements better protect a potential acquirer of a business and that the market recognises this in its response to the announcement.

Similarly shareholders of selling firms appear to earn zero to positive returns on announcement of sales, but not of the scale of shareholders of acquired publicly listed companies. Vendors selling assets at below fair value would imply negative announcement returns. The fact that both buyers and sellers earn zero/positive returns suggests that it is not a clear case that acquirer buying cheaply is the source of such excess returns. We undertake these tests in Chapter 5.

Shareholders of companies that sell assets achieve positive abnormal returns on announcement of sale. These returns are a function of use of proceeds and growth opportunities (Bates, 2005). If assets are sold at below 'fair value' then a negative response would be expected from shareholders. A positive response suggests either no discount or, more likely, other factors are affecting the value equation.

If discounts reflect relative bargaining power then there should be a positive relationship between the discount and the return to acquirers. Rejection of the hypothesis would indicate that the discounts do not reflect relative bargaining power, but rather differences in underlying asset value, differential private benefits or differences in public and private sale processes. The process of a private sale may provide advantages to an acquirer, such as contractual terms, due diligence and reduced reputation risk from participating. These benefits could be the source of positive shareholder responses.

In this study I use dollar excess returns to determine the allocation of value created between buyer and seller. Dollar excess returns are simply the traditional excess percentage returns converted to a dollar amount. This measure is appropriate as the assets involved are only a portion of the acquiring and divesting companies. By using publicly listed buying and selling companies I can directly relate the size of measured discounts to the combined wealth impact of the transaction and how returns are allocated between buyers and sellers.

1.7 Conclusion

This thesis addresses the issue about the pricing of subsidiary sale transactions by listed public companies. The current state of the literature suggests such sales take place, on average, at a discount to comparable public market acquisitions. These discounts are usually attributed to parent companies selling assets while being under liquidity pressure. In this chapter I have identified why subsidiary sales are an important sub-segment of the market for corporate control, and how the pricing of subsidiary sales may be different to sales of privately owned companies. I have also identified five issues with the current state of research.

Importantly, I will present an alternative narrative to the liquidity pressure induced fire sale scenario. I will demonstrate that an apparent discount may be consistent with alternative scenarios not prompted by fire sale considerations. The research on discounts is based on the use of multiples methodology, with benchmark valuations based on comparable public market acquisitions. I argue that the circumstances of a subsidiary sale can be different, in ways which may affect the relative pricing of these transactions. Major differences are firstly, it is possible to argue that subsidiary assets being sold are likely to be poorly performing and therefore not strictly comparable to public market acquisitions unless allowance is made for differences in asset quality. Secondly, a public company may still benefit from selling an asset at below its perceived value if the sale provides a more attractive outcome relative to alternatives. Relevant circumstances may include the need to address performance issues related to the asset, selling assets to reduce a diversification discount or selling assets as an alternative to raising external equity.

I identify two important measurement issues. Firstly, the need to consider the appropriate use of multiples methodology to estimate appropriate benchmark valuations which are the basis of discount calculations. Particular issues I address in this thesis relate to the potential influence of asymmetric distributions caused by outliers, and the need to control for asset specific characteristics in deriving benchmark valuations. I will demonstrate that when allowance is made for these two factors the reported discounts are materially reduced, if not eliminated. I provide an outline of best practice for determining benchmark valuations which should lead to more robust estimates of relative pricing of subsidiary sales.

Fourthly, I argue that liquidity pressure has not been directly demonstrated to cause discounts. I identify specific conditions which must be in place to explain an association between liquidity pressure on parent companies, and discounts. These conditions relate to the state of parent company financial situation, the state of the equity markets and conditions in the relevant asset market. I will demonstrate that the transmission mechanism required to explain fire sales needs to have adverse conditions in each of these factors simultaneously present. I will introduce a measure that allows this proposition to be tested.

Finally, I use stock market responses to subsidiary sales to test for whether the presence of discounts can be inferred from market reactions. This is particularly relevant as one consistent empirical finding in research on acquisitions is that acquirers or private targets earn positive announcement returns, in contrast to the results for acquisitions of public market targets. I will test whether such a results is attributable to the acquirers buying assets at a discount to underlying value.

This thesis contributes to the current research by addressing a number of issues with the current research on the pricing of subsidiary sales by public companies. I will provide a viable alternative narrative to the current view, which can be described as the “liquidity pressure induced fire sale” scenario. Furthermore, I will demonstrate that use of appropriate measurement methodologies leads to a conclusion that the presence of discounts is ambiguous. Finally, I will demonstrate evidence to support a transmission mechanism which can explain fire sales, and also demonstrate that the presence of this transmission is limited, and cannot be used to explain the presence of apparently pervasive discounts. This conclusion is further supported by a demonstration that market responses to subsidiary sale transactions do not suggest the presence of discounts.

Chapter 2

Divestment process and pricing

2.1 Introduction

The conclusion that subsidiaries are sold at a liquidity-pressure induced discount depends on the proposition that subsidiaries and public company targets should trade at the same multiple. The purpose of this chapter is to assess this argument. I conclude that a more justified a priori belief is that subsidiaries are less valuable than public market peers.

This conclusion is based on two arguments. First, the extant literature provides a number of rationales as to why the prices of trade sales might differ from public market comparables, without relying on a fire sale explanation. Firms are more likely to sell non-performing, non-core segments or businesses, so assets sold by companies are likely to have a lower value than industry peers. Furthermore, the sale of assets is likely to be delayed compared to 'first best' timing, further contributing to deterioration in value. Assets which generate a taxable profit on sale are more likely to be spun off, rather than sold. Selling a lower valued asset at a lower price does not imply a discount, it just reflects lower value. In Section 2.2, I present a framework for reviewing the divestment process from motivation for sale to use of proceeds. In Section 2.3, I use this framework to review existing literature, and derive a priori expectations about the pricing of subsidiary divestments.

Second, even if subsidiaries that are subject to trade sale have a value equivalent to public market peers, there may be still valid reasons for a target parent to sell at a discount. In Section 2.4, I develop a model for breakeven pricing for a divestment under a range of scenarios. These breakeven discounts give a guide as to the minimum acceptable price for a vendor. This analysis illustrates a number of implications about divestment decisions that are directly relevant to the question of discounts.

Section 2.5 concludes by drawing a number of implications of this model and compares these with insights from the literature review. The analysis reveals a number of insights not previously noted in the literature.

Contributions of this chapter

In this chapter I contribute to the literature by, firstly, providing an integrated framework for assessing the growing literature on asset divestments, including the research questions in this thesis. Secondly, I demonstrate that the motivation for an asset sale can have a significant impact on the minimum acceptable sale price for an asset, and I develop specific criteria for evaluating the NPV of a divestment. This analysis demonstrates that the acceptable price for an asset sale may well be at an apparent discount but this does not require an explanation based on a fire sale. The minimum acceptable sale price may depend on asset specific characteristics, and a range of firm specific characteristics. In particular, the tax impact of the transaction is important. The tax impact is determined by both the taxable profit status of the asset in question, and the selling firm's overall tax position. Other factors which may affect the acceptable pricing of a divestment include the debt capacity of the asset being sold, the value and debt capacity of alternative growth opportunities. The modelling of the divestment pricing presented here can also demonstrate the implied costs of raising external equity if one accepts the financing/financial constraints rationale for explaining discounts.

2.2 Divestment Process

In this section I firstly present key terminology, and then provide a framework of the divestment process that recognises the interrelated nature of the stages in the divestment process.

Define $C_{A,i}$ as the net cost of selling asset *i* as:

$$C_{A,i} = F_{sub,i} + S_{s,i} - P_i. \quad [2.1]$$

$F_{sub,i}$ represents the standalone value of the asset, assuming ownership by a listed entity. This is usually measured by reference to trading multiples of comparable public listed companies[8]. $S_{s,i}$ is the value of synergies available to the current owner which would be lost if the asset is divested. The sum of these two terms represents the value of the asset under continued ownership.

P_i represents the after tax proceeds from asset sale, is defined as:

$$P_i = \left[\left(F_{public,i} + \phi S_{b,i}\right)\left(1 - D_{A,i}\right)\right](1 - i_{vA})(1 - T) + B_i T - I_{fA}(1 - T)$$

[2.2]

The first term in square brackets represents the sale price of the asset. $F_{public,i}$ is the standalone value of the asset, assuming it is a publicly listed entity. $S_{b,i}$ is the value of synergies available to the acquirer with ϕ the share available to the vendor. This sale price reflects any premium for control and the relative negotiating position of buyer and seller. B_i is the book value of assets for tax purposes and *T* is the relevant tax rate. *T* could be firm specific as it should represent the marginal tax rate for the firm. For a firm with tax losses this would be the present value of when any marginal tax costs (benefits) were

[8] In the context of an exit decision it could be measured relative to multiples of comparable spin off entities as well.

paid (received)[9]. I_{fA} are the fixed costs of the asset sale process, and i_{vA} is the variable cost, expressed as a percentage of sale price.

This configuration measures the discount relative to acquisitions of comparable publicly listed companies, consistent with the use of acquisition multiples as the basis for measuring discounts. $D_{A,i}$ represents the discount which the vendor is willing or forced to accept[10]. In previous studies the value of $[(F_{public,i} + \phi S_{b,i})(1 - D_{A,i})]$ has been estimated by using the multiple for comparable public market acquisitions. This is different to measuring the discount relative to the value of continued ownership, defined in equation [2.1] as $(F_{sub,i} + S_{s,i})$. It would be usual to estimate this value using trading multiples rather than acquisition multiples, however this procedure would only provide an estimate of F_{public}, as it would by necessity be based on standalone pure plays and so would implicitly assume S_s=0.

This distinction is important in any discussion of discounts. In Section 2.3, I argue that $F_{sub} < F_{public}$, and so using public company acquisition multiples overstates the size of true discounts. A strong argument could be made that management would make decisions based on a comparison of the after tax sale proceeds with the value of continued ownership, as this is the actual value in hand, rather than with a notional potential value which assumes that synergies available to a new owner, S_b, are equivalent across all transactions[11].

[9] I have not included firm specific subscripts in the interest of simplifying presentation.

[10] A positive value for D_A means the asset is sold at less than estimated market value. A negative value implies a premium is required to breakeven relative to the alternative.

[11] From hereon I only use the subscript i to represent a particular asset when the context requires.

The inter-related steps in the divestment process can be analysed using the following framework which provides a useful way to consider the divestment process and analyse the literature[12].

1] **Motivations for divestments:** describes the strategic motivation for undertaking a divestment process. Extant literature classifies broad motives as financing, efficiency or focussing. I also include a discussion of mis-pricing and the desire by management to avoid equity market monitoring;

2] **Factors affecting the timing** of a divestment (economy wide, industry wide or firm specific): timing can be measured on two dimensions. Externally, timing could be related to levels of economy or industry wide economic, or restructuring, activity. Internally, timing could be measured relative to the life cycle of the particular asset. In this thesis, I address the second of these. The dimension of external timing impacts is addressed by comparing sales of subsidiaries against public market acquisitions in broadly same industries and time periods;

3] **Triggers for asset sales:** considers events which prompt management or directors to undertake a sale process;

4] **Selecting assets to be divested**: deciding which segment or business line to exit;

5] **Selecting the method of divestment:** broad choices include sale, spin off or equity carve out;

6] **Selecting the sale process:** this is contingent on the outcome of Step 5] but, in the event of sale, broad choices would include whether to run an auction or negotiated sale;

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[12] This is a broader framework than suggested by Boone and Mulherin (2007, 2009), which focusses on the actual transaction process, covered in Step 6].

7] **Pricing of divestment transactions:** where a company determines the minimum price at which it is prepared to exit, or at which other alternatives become preferred mechanisms of achieving the desired strategic objective

8] **Use of Proceeds**: choices available include debt repayment, retained to fund growth or distribute to shareholders;

9] **Value creation impacts** of divestments: measured by both market reaction and operating performance. This includes an assessment of event period announcement returns, longer window announcement returns and operating performance, as measured by financial performance.

2.3 Prior Research on Divestment Process

This review focusses on drawing insights from extant literature concerning the likely market value of a subsidiary relative to public market peers, and is limited to examining divestments by listed companies who receive cash proceeds from the divestment (as distinct from a spin off). This subset of transactions is the most relevant for testing the question as to why a listed company might sell a subsidiary at a discount compared to an acquisition of an apparently comparable publicly listed company. I will then draw implications as to what are appropriate a priori expectations regarding the existence and causes of a discount.

2.3.1 Literature Review

Motivations for asset sales

The motivation for asset sales has been widely canvassed in the literature. Schlingemann, Stulz and Walkling (2002) cite three motives for divestment: (i) to transfer assets to those who can operate them most efficiently (the "efficiency" explanation); (ii) to reduce the degree of diversification (the “focussing” explanation); and (iii) to relax credit constraints (the “financing” explanation).

The efficiency motivation is most aligned with the neoclassical model, whereby companies simply make investment and divestment decisions based on the expected NPV of such decisions. Using plant level data, Maksimovic and Phillips (2001) show that, for all firms, the probability of a sale increases with positive aggregate demand shocks. Additionally, for multi-segment firms, the probability of a plant being sold increases when the plant is less productive than industry benchmarks, when the selling division is less productive and when the firm has more productive divisions in other industries. They also establish that overall productivity increases following asset transactions. Liu Yang (2008) Yang (2008) models the choice to either invest in new capital or buy existing assets. He finds that productivity shocks are a determinant of asset sale decisions. Warusawitharana (2008) models decisions about a firm’s optimal scale, and finds that asset sales occur to calibrate a firm to its optimal scale. He finds that Return on Assets and size are strong predictors of an asset sale. A unit standard deviation decrease in Return on Assets increases the likelihood of an asset sale by 34%. Denis and Shome (2005) show that a firm’s decision to downsize is attributable to poor operating performance at the firm and industry level in the three years prior to the decision to downsize. Downsizing firms have an average return on capital of 8.7% below the control sample[13]. This body of evidence provides strong support for the role of efficiency considerations in divestiture decisions.

John and Ofek (1995) find focus to be an important determinant of asset sales. In their sample, companies increase focus by selling unrelated segments. Seller cumulative excess announcement returns are positively related to measures of improved focus. Berger and Ofek (1999) show that firms

[13] The control sample had Return on Capital of 19.2% compared to the downsizing firms which had an average of 10.5% in the year prior to downsizing.

that undertake refocussing have a discount relative to a pure play portfolio of between 20% to 30%, whereas for non-focussing firms this discount is between 10% and 13%. The conclusion is that firms whose diversification strategy is destroying value are more likely to focus. Other results also showed that firms are more likely to refocus when they have diversified into unrelated lines of business, and when the segment has negative cash flows. The results discussed earlier for the efficiency motivation also highlighted that multi-segment firms appear to be under more pressure to divest. (Colak and Whited, 2007). Colak (2010) uses a two stage least squares estimation model to incorporate both diversification and refocus decisions. He finds that the propensity to refocus is determined by firm specific reasons, such as size, profitability, growth, age, research and development and segment industry profitability. Firms are more likely to divest less profitable industries.

Lang, Poulsen and Stulz (1995) present the financing hypothesis of asset sales. They argue that firms with lower operating performance and higher leverage may find asset sales an attractive source of financing because raising external equity may be expensive due to adverse selection costs or agency costs of managerial discretion. Selling an individual asset avoids these problems, including market scrutiny of use of proceeds. They find that the stock price reaction to asset sales is only positive when the proceeds from asset sales are not retained. Allen and McConnell (1998) demonstrate similar results in the context of equity carve-outs. Chen and Guo (2005) find that firms are more likely to sell assets, rather than undertake an equity carve out or spin off, when they have higher leverage. Hovakimian and Titman (2006) find that cash obtained from asset sales is a significant determinant of corporate investment, and that the sensitivity of investment to proceeds from asset sales is stronger for firms that are likely to be financially constrained. Finally, Officer (2007) finds that firms selling assets have lower cash balances and lower cash flow, higher leverage, lower bond ratings, lower Altman Z-scores and lower stock market returns in the preceding twelve months.

Factors affecting the timing of a divestment

Behavioural or agency factors may also impact on the quality of assets for sale leading to a downward bias in the value, and therefore price, of assets being offered via private trade sale. Empire building, refusal to recognise an underperforming asset, a decision to delay bad news, or over commitment could all lead to management deferring the sale of asset, impacting on the value of assets relative to assets being acquired on the public markets. Lambrecht and Myers (2007) demonstrate closure of declining assets will be delayed due to managerial rent extraction, in conjunction with costly collective action by shareholders. The first-best exit decision will be made as a result of an acquisition. Assets owned by a company will consistently be sold later than assets which are subject to public market takeover. Similarly the cost of collective action is greater when an asset is a subsidiary of a public company than when it is itself a listed company, increasing the scope for rent extraction. Using a real options framework, Kwon (2010) demonstrates that the optimal exit threshold for cash flows for a firm in a declining industry is negative.

Triggers for a divestment decision

The above discussion highlights the potential influence of managerial agency costs on the decision to divest. The extant literature suggests that both internal governance and external market for control events play an important role in the divestment process. Berger and Ofek (1999) find that 68% of their refocussing firms have a corporate control event, including managerial turnover or outside shareholder pressure. Datta, Iskandar-Datta and Raman (2003) find that both stock and bond excess returns for divesting firms are significantly positively related to monitoring by private creditors, which mitigate the impact of agency costs. Denis and Shome (2005) find that a variable representing external corporate control activity is statistically significant in their logistic regression results. Haynes, Thompson and Wright (2007) find that management appear to be rewarded for undertaking divestment activities only when strong governance regimes, characterised by the presence of a large equity holder, were in place. Owen, Shi and Yawson (2010) find that positive influences on the decision to divest include boardsize, industry competitiveness and asset market liquidity. Consistent with agency cost explanations, they find that the level of management ownership reduces the likelihood of divesting. Owen et al (2010) also find that stock market announcement responses are positively related to board independence and blockholder ownership.

<u>Selecting assets to be divested</u>

The financing motivation also suggests that financial pressure influences which assets are sold. Schlingemann, Stulz and Walking (2002) show that the firm's decision as to which segment to sell is determined by industry liquidity, as well as size, profitability and relatedness of the segment. They find that firms are more likely to sell those assets which are the most liquid; this characteristic dominates the operating performance of the assets. This implies that financing motivations dominate the preference to sell poorly performing assets. They conclude:

"Strikingly, the segment with the least liquid market is less likely to be divested than the best-performing segment, while the worst-performing segment is less likely to be divested than the segment with the most liquid market".

Kruse (2002) concludes that poorly performing firms are more likely to sell assets in industries that have high growth in sales and profitability, although the firms in Kruse's (2002) sample are under financial distress.

These results support the financing motive for asset sales, in that an asset's liquidity dominates its operating performance. This implies that the decision to sell assets is often financially driven and results from a comparison of the cost of selling an asset relative to other sources of capital. Firms are assumed to sell assets because they are satisfied that the sale price reflects the fair value of the asset and / or that other sources of external finance are unavailable or more expensive. If equity markets are simply inaccessible then even a 30% discount may be the best transaction available.

The earlier discussion on the efficiency motivation for divestments noted evidence that companies tend to sell poorly performing assets, a conclusion seemingly at odds with the above result. Furthermore, the implied cost of alternative equity financing appears to be at odds with apparent costs of raising equity, an issue addressed later in this chapter.

Selecting the divestment method

Having decided to restructure, firms can exit via a trade sale, equity carve-out or spin-off14. If funding is the only priority then carve-outs or trade sales are the only alternatives

Given the decision to liquidate their investment, owners of private firms have the choice of doing an IPO or being acquired by another company. Poulsen and Stegemoller (2008) conclude that firm specific characteristics contribute significantly to the choice between selling out or pursuing an IPO. They show that businesses which are subject to IPO have significantly higher growth rates and capital requirements when compared to assets sold by way of acquisition. Bayar and Chemmanur (2012) find that firms operating in less concentrated industries are more likely to go public, while firms with greater information asymmetry, higher capital intensity and greater private benefits of control are more likely to be acquired. Both Poulsen and Stegemoller (2008) and Bayar and Chemmanur (2011) find that venture capital backed firms are more likely to pursue an IPO. This research supports the notion that owners can choose to exit via the equity market or the market for real assets.

[14] In suitable market conditions firms may run a “dual track” process, where their advisors explore both trade sale and IPO opportunities.

The private trade sale process

Does the seemingly less public process of a private trade sale lessen the chances of a vendor obtaining a fair price for the asset? If there is a competitive process for the sale of the subsidiary, should not the vendor receive the true price for the asset regardless of whether they are financially constrained or not?

Hansen (2001) describes the process typically used in the sale of private companies, and divestitures of divisions, subsidiaries or product lines. Following the decision to sell, potentially interested parties are given a brief description of the business and invited to sign a confidentiality agreement following which they receive more detailed information. Prospective bidders are then invited to provide non binding indicative bids, following which a smaller group are then selected and provided further detailed information, including access to plans, documents and management. Following this step, the process to final transaction can vary. Bidders may be selected to make sealed bids, bidders may make pre-emptive bids or the vendor could decide to continue negotiations with one, or possibly several parties. There is little empirical evidence on the dynamics of the private sale process, however Boone and Mulherin (2007) demonstrate a similar private process precedes many acquisitions or mergers of publicly owned targets as well. They document that 49.5% of publicly listed company acquisitions are completed following negotiations with one party. Even when an auction is held, on average only 1.57 bidders made private written offers and 1.24 bidders made public offers. Boone and Mulherin (2007, 2008, 2009) find no difference in returns to target company shareholders between sale by auction or negotiation, implying there is an effective competitive market process in place. Both Hansen (2001) and Boone and Mulherin (2007, 2008, 2009) address the question as to why vendors don't just run a public auction. Bulow and Klemperer (1996) concluded that there is "no merit in arguments that negotiation should be restricted to one or few bidders to allow the seller to maintain control of the negotiating process".

There are costs involved in the auction process, which explain why vendors act to limit the number of bidders. Hansen (2001) identifies the loss of value which may result from the disclosure of competitive information to current or potential competitors costs incurred with the disclosure ("competitive information cost"), while Boone and Mulherin (2009) identify the disincentive to potential bidders from participating in a full auction due to the search and evaluation costs involved in preparing bids. In order to encourage highly prospective bidders to participate it is preferable to limit the number of bidders. The conclusion of these analyses is that a process which controls the number of bidders provides a higher net sale price than an unfettered auction. This behaviour is in line with the conclusion of Fama and Laffer (1971) that effective competition can result from as few as two bidders.

This discussion demonstrates there is nothing inherent in the sale process that should result in higher prices being paid for publicly listed targets relative to private targets. In both cases there is a similar competitive process in operation and the price received will be a function of the competition for the asset in question. Consequently, in the case of a private trade sale, to justify linking lower prices to the impact of financial constraints, requires that the presence of vendor financial constraints causes potential bidders not to participate. There is no evidence that this is the case. An equally conceivable reason for the low participation by potential bidders could be views about asset quality, which may have prompted the sale in the first place.

There are four differences between a public and private process. None of these differences would be expected to result in prices being systematically lower for a private target relative to a listed target. First, the time lag from announcement to completion is shorter for private trade sales, because the official announcement is usually made on signing of a transaction. Second, the sale of a subsidiary will usually include a contract of sale which includes negotiated representations and warranties. These potentially give purchasers some protection not available in a public market acquisition. Third, the contract for the sale of a subsidiary may include performance fees and other agreements that make it difficult to determine an exact price at the time of acquisition. These will often be a response to valuation or other uncertainties. Finally, the decision making process will be different between private and public companies. In the acquisition (or merger) of a listed company the decision will ultimately be made and negotiated by directors. The Chief Executive Officer would normally be involved. In a subsidiary sale, there would be greater delineation with the management of the subsidiary concerned unlikely to be as critically involved, thus reducing the potential impact of agency costs on any pricing decision. Boone and Mulherin (2007) argue that the equivalence of results from auctions and negotiated sales (which might be favoured by management) suggest agency costs and private benefits of control do not have an impact.

The only situation where a financially constrained vendor may receive a lower than justified price would be where there is only one bidder for the asset, and there are no other alternatives for the necessary funding available and the vendor considers the costs of not selling outweigh the value created from the use of proceeds. I consider these questions in Section 2.4.

Pricing the divestment

Shleifer and Vishny (1992) were the first to draw a link between financial pressures and the need to sell assets at a discount. They argue that, when a firm needs to sell assets, its industry peers are probably also suffering, constraining them from bidding. Consequently, parties outside the industry are best positioned to buy. Because of risk aversion, or simply enhanced negotiating position, they will not pay a price which reflects the asset's best value in use.

There is some evidence of this fire sale effect in relation to equipment assets (Pulvino, 1998). Chang (1998) suggests that this could apply to sales of businesses as well, and explains why buyers of private businesses earn superior returns. Ma (2006) finds a positive relationship between buyer returns and the relative liquidity between buyer and seller. Borisova, John and Salotti (2013) find US companies who sell assets to offshore investors receive higher announcement period returns, implying that selling into a more liquid market increases prices. Eckbo and Thorburn (2008) test for fire sale discounts in automatic bankruptcy auctions. They find evidence of discounts for piecemeal liquidations, but not when the firm is acquired as a going concern. In the context of divestments, most subsidiaries are sold as going concerns. Ang and Mauck (2011) find that distressed firms actually receive a premium relative to non-distressed firms in crisis periods. They measure the price against the price around announcement time, but observe that fire sale discounts may be perceived when measured against the highest price in the 52 week reference period.

Officer (2007) concludes that the combination of vendor financial pressure and external market conditions explain the existence of the 30% average discount. This is on the basis that cash balances for selling firms are lower than industry average, that discounts are larger when debt market conditions are tight, and that the selling firm has suffered poor stock price performance in the twelve months preceding the sale and it sells a non-core business[15]. Officer (2007) also reports a negative correlation between cash flow and discount on a univariate basis, however there is no relationship when included in the multivariate test. The transmission mechanism suggested here is that financially constrained or poorly performing parents sell non-core subsidiaries at substantial discounts to raise cash to support their core line of

[15] Table 7 of Officer (2007) reports a positive co-efficient when discount is regressed on parent stock price performance, suggesting the discount is larger (more negative) when stock price performance is negative. However when stock price performance is interacted with an indicator variable equal to one of the parent and subsidiary being sold are in the same SIC code, the co-efficient of the interaction term becomes negative, suggesting that it is the sales of subsidiaries in non-matching SIC code that explain the positive co-efficient.

business. However there are other results which fail to support such a conclusion. Firstly, there is no difference between discounts depending on whether the consideration is cash or non-cash. A liquidity argument would imply that cash consideration should be associated with larger discounts. Secondly, there is no evidence that selling firms actually need the cash, and no evidence that poor stock price performance, per se, generates a need for new funding[16]?

Use of proceeds

Lang, Poulsen and Stulz (1995) find that just under half of their sample use proceeds to pay down debt, while the balance reinvest. Bates (2005) finds that just over 10% of his sample payout proceeds to investors, and also a positive association between the decision to retain proceeds and available growth opportunities.

Value impacts of divestment

(i) Announcement Returns

Shareholders of companies that sell assets consistently achieve positive abnormal returns on announcements of sale. Lang, Poulsen and Stulz (1995) find that the stock price reaction to asset sales is only positive when the proceeds from asset sales are applied to debt reduction. Ataullah, Davidson and Le (2010) show that, in the United Kingdom, the stock price response to decisions to retain sales proceeds is related to the strength of governance mechanisms. Bates (2005) finds positive long term positive announcement returns only for companies that reinvest. Shorter term announcement returns are sensitive to the leverage and growth opportunities of the divesting firm. If assets were sold at below ‘fair value’ then a negative response would be

[16] These results are examined further in Chapter 4.

expected from shareholders. A positive response suggests either no discount or, more likely, other factors are affecting the value equation

(ii) Operating Performance

The studies consistently show improvements in post divestment operating performance, which is usually accompanied by increased focus. John and Ofek (1995) observe improvements in operating performance, although market reactions are responsive to the changes in focus. Denis and Kruse (2000) find improvements in performance for a sample of firms that divest after sudden sharp declines in performance, while Denis and Shome (2005) find long term performance improvement for firms whose long term performance was below industry levels. It is not possible to attribute the improvement in performance directly to the divestment, as studies can only look at the remaining assets.

2.3.2 Implications for the valuation of subsidiary sales relative to public market peers.

This literature review demonstrates that many divestment decisions are part of an integrated set of actions by companies that relate to operating and financial performance, strategic portfolio mix and growth, as well as agency costs. It is certainly possible to construct a narrative that predicts that assets sold via trade sale are underperforming and therefore relatively less valuable. Companies under pressure for poor operating performance, act to improve firm performance. This action will usually be after poor performance has already manifested itself, as management will usually need some form of pressure, be it external or internal, to respond. Management will usually choose underperforming non-core segments to sell, unless they are under severe financial pressure, in which case they may sell assets with higher growth potential. Management will also be conscious of the exit mechanisms. If they need funds then a trade sale or carve out will be chosen, but a carve-out will be limited to those assets which can benefit from an IPO process. These are usually assets with stable income and growth prospects. Selling firms will also manage tax costs of a sale. A spin off is more likely when a trade sale would generate taxable profits. Again, only assets with characteristics appealing to the equity market will be spun off. Under this scenario, it is possible to conclude that the assets that end up being sold via a trade sale are more likely to be sub-premium, at least from the perspective of the target parent. Under this scenario it is not surprising that subsidiaries sold by public companies trade at a discount to public market comparables.

The liquidity pressure / fire sale scenario is also possible. However this alternative narrative assumes the cost of external finance is prohibitive, as an equity issue will incorporate costs of adverse selection and agency cost issues concerning use of proceeds. The announcement return studies of Lang, Poulsen and Stulz (1995) and Bates (2005) indicate the market's sensitivity to possible agency cost issues. However, we also know that equity markets can be accessed by companies under financial pressure. Equity raisings motivated by deleveraging are common. Hull, Kwak and Walker (2009) examine a sample of 1,290 SEO's of which 31% have debt reduction as the major stated use of proceeds. Similarly, Autore, Bray and Peterson (2009) find that 29% of a sample of SEO's had recapitalisation as the primary stated use of proceeds. Ursel (2006) finds that US firms undertaking non underwritten rights issues have debt to equity ratios twice that of non-rights issuing firms and high levels of financial constraints. DeAngelo, DeAngelo and Masulis (2010) document that seasoned equity offerings are primarily driven by the need for restoring company cash balances.

Under either scenario it is not necessary that a discount, in the sense of a sale price being less than the underlying value, should result. Under the first scenario, the subsidiary is simply less valuable than public market comparables. Under the second scenario, the divestment pricing decision is as much a question about the relative costs of alternatives. Even if the firm is in a weak bargaining position, from a purely financing perspective, there will be a level of discount which makes an asset sale unattractive. I address this question in the following section. Before doing so, it is necessary to address the question about whether there are differences between public and subsidiary targets that may explain the discount.

<u>How comparable is a public target?</u>

Is it possible that public targets are also underperforming assets, and so their values should be in line with subsidiaries? Agrawal and Jaffe (2003) address this question, and conclude that publicly listed targets do not underperform, either in operational performance or market performance prior to the acquisition. Barraclough, Robinson, Smith and Whaley (2013) conclude that takeovers release good news about target quality.

As noted earlier, the private competitive sale process that often proceeds the public process, as described by Boone and Mulherin (2007, 2008 and 2009), can ensure that the asset's underlying value is achieved. However, one difference between the sale process for public and private assets may be the in the level of target resistance. Dimopoulos and Sacchetto (2012) find that target resistance explains a significant proportion of the bid premium for single bidder contests. Target resistance is measured by levels of managerial ownership and governance indices, which include such factors as poison pills. Many of these are not in place for a subsidiary. While agency cost considerations may suggest that the target parent may be resistant to selling, under the scenario described above, the target parent has already initiated the sale process. This situation could lead to differences in prices between public and private targets. The cause however is not necessarily a fire sale argument but more about an underlying difference in the two situations.

2.4 Marginal cost of a discount on sale

There are a number of reasons why the value of a subsidiary, which is the subject of a sale process, is less than a comparable listed target. In such a case, any reported discount simply records the difference in underlying values of private and public target. In this section, I analyse the situation where the subsidiary's underlying value is the same as the public comparables. In Section 2.3.1, I argued that the price offered is the outcome of a competitive process, and the owner may assume the price is the best available. What if the price on offer is lower than underlying value? In the following analysis, I demonstrate that, even if the underlying value of the subsidiary is the same as public market comparables, it may still be value enhancing to sell at a discount. A number of examples illustrate the decisions that may be faced. First, a diversified company is trading at a 10% discount to its pure play portfolio valuation. Management considers that it can reduce this discount by simplifying its business portfolio, but the sale price for the asset is lower than management's perceived value. Second, a company is looking to sell an asset. Its true value is below book value, so its sale will generate a tax loss. Thirdly, a company is in need of funding for future growth. It has a number of non-core assets which it is willing to sell, but it also considers it can undertake a rights issue with the support of its main shareholders. In each case, assume that the best offer for the asset in question is 20% below its underlying value[17]. What decision would a value maximising management make?

In this section I analyse the decision process of the vendor of a subsidiary in these situations.

The following analysis provides an analytical and decision making framework to assess determinants of discounts on trade sales in various market

[17] In the first two cases in particular, it could be argued that the asset in question is more likely to be less valuable than public market peers. This assumption is made to concentrate on other aspects of the decision

and firm specific contexts. Faulkender and Wang (2006) demonstrate that the marginal value of cash depends upon the type of cash regime to which the firm belongs. They identify three different cash regimes: distributing cash, servicing debt or other liabilities and raising cash. Their empirical results show that the marginal value of cash depends on the context in which it is required. I follow a similar approach, and argue that the willingness to accept a discount on the sale of an asset is a function of the motivation for selling the asset. I model the marginal cost of a discount on sale by calculating the breakeven discount, D_A, under four scenarios, which represent the alternative motivations for sale considered earlier. We evaluate the following scenarios:

[1] Simple decision to sell an asset using NPV rule;

[2] Divesting an asset to achieve focus;

[3] Using sale proceeds to fund alternative investments;

[4] Using proceeds to repay debt as an alternative to issuing equity.

The breakeven D_A is calculated to equate the cost (benefit) of divesting with the cost (benefit) of the alternative.

Each of these scenarios can be considered a corner solution to an optimisation problem. They have different determinants of the breakeven D_A and therefore the acceptable minimum sale price for an asset. D_A can be interpreted as the marginal propensity to sell a particular asset: the larger the discount required to breakeven, the less likely the company will choose to sell a particular asset[18]. In addition to providing an understanding of the dynamics of pricing divestments this analysis also provides specific recommendations as to the minimum acceptable sale price for a vendor of an asset. The actual price

[18] Each separable asset will have its own D_A, however we drop asset specific subscripts for simplicity of presentation unless the context requires it.

will represent the negotiated outcome, however the analysis highlights that the minimum boundary for measuring the acceptability of a particular negotiated outcome is more complex than just comparing to the value of asset in use, or the value of comparable public market acquisitions.

In the remainder of this section I analyse each of the specified scenarios. These scenarios are progressively more complex, in that each has more variables involved in solving for D_A.

2.4.1 Divesting as a standalone investment decision

Under this scenario a company simply compares the potential proceeds of selling an asset against its continuing ownership. Assuming proceeds are reinvested at zero NPV or costlessly transferred to shareholders, then re-arranging [2.1] gives the decision rule to sell if:

$$P - F_{sub} - S_s > 0. \qquad [2.3]$$

The breakeven $D_{A,SELL}$ can be calculated by setting the left hand side of [2.3] equal zero. Substituting [2.2] into [2.3], and solving for $D_{A,SELL}$ gives the following expression for the breakeven discount:

$$D_{A,SELL} = 1 + \frac{[BT - I_{fA}(1-T)]}{\left(F_{public} + \phi S_b\right)(1-i_{vA})(1-T)} - \frac{(F_{sub} + S_s)}{\left(F_{public} + \phi S_b\right)(1-i_{vA})(1-T)} \qquad [2.4]$$

To facilitate ease of presentation, let the denominator in the final two terms be represented by *X*. So:

$$X = \left(F_{public} + \phi S_b\right)(1-i_{vA})(1-T)$$

and Equation [2.4] can be restated as:

$$D_{A,SELL} = 1 + \frac{\left[BT - I_{fA}(1-T)\right]}{X} - \frac{(F_{sub} + S_s)}{X}$$

The tax status of the sale is an important determinant of the economics of divestment. This result holds under all the scenarios to be analysed. This can be demonstrated by letting the synergy and cost terms equal zero, in which case the above expression simplifies to:

$$D_{A,SELL} = 1 + \frac{BT - F_{sub}}{(F_{public})(1-T)} = 1 + \frac{B[T - \frac{F_{sub}}{B}]}{(F_{public})(1-T)} \qquad [2.5]$$

The term *BT* represents the tax benefit of writing off the tax book value of asset on sale. The profit on sale can be represented by the profit ratio, F_{sub}/*B*. As F_{sub}/*B* decreases, the breakeven D_A increases i.e. the minimum acceptable sale price falls, as the vendor is willing to accept a lower sale due to the tax benefits generated on sale. A profit ratio (F_{sub}/*B*)<1 implies a taxable loss on sale and a breakeven D_A greater than zero i.e. a rational vendor would accept a sale price less than "value" because of the tax benefits generated by the sale. A profit ratio of (F_{sub}/*B*)>1 implies a taxable profit on sale, implying a positive D_A, or a price premium, would be required to breakeven. This raises the obvious question as to why a vendor would exit an asset via a trade sale if it imposed a tax cost when other exit alternatives, which involved no tax impost, were available. Maydew, Schipper and Vincent (1999) address this situation when they analyse the choice between spin-offs and trade sales, and they find that the tax impact does have an impact on the decision as to whether a company exits via a trade sale or spin off. A vendor with an asset being sold at a tax loss would be positively motivated to exit via trade sale compared to a tax free alternative. This result has important implications for any empirical analysis of discounts on trade sales, as it suggests that there will be a bias in the sample. Companies with assets able to be sold at a loss, or companies with carry forward tax losses, would choose to exit via a trade sale. Tax paying companies selling an asset that generates a taxable profit would require a premium to exit via trade sale. This may explain the positive relationship between profit on sale and market response, found by Clubb and Stouraitis (2002) . A profit on sale implies a market to book value greater than 1, so this implies the more valuable an asset the less likely it is to be sold via trade sale versus other exit mechanisms, due to the tax cost involved. This is consistent with evidence cited earlier that vendors are more likely to undertake an exit via IPO or Spin Off (if the business has higher profitability and growth prospects (Poulsen and Stegemoller, 2008); features most compatible with a positive M/B ratio. These businesses are likely to sell at a premium to the average business, leaving exit via trade sale as the option for businesses likely to generate a loss on sale, or where the parent has tax losses[19].

A second, and more obvious, conclusion can be drawn by letting F_{sub} = F_{public} = B, and setting the cost terms to zero. Expression [4] simplifies to

$$D_{A,SELL} = 1 - \frac{F(1-T)+S_S}{F(1-T)+\phi S_b(1-T)} \qquad [2.6]$$

[19] In addition to the traditional spin off to existing shareholders, a tax efficient means of exiting a business is the Reverse Morris Trust structure. To meet IRS requirements this usually involves the vendor spinning off its subsidiary and then merging with the target entity. The vendor does not receive cash proceeds and the ultimate acquirer must have less than 50% of the combined entity following the transaction i.e. the vendor's target assets must be larger than the acquiring company. These transactions are well documented in the professional literature: http://www.macabacus.com/restructuring/morris-trusts.

which shows that, if $S_s < \phi S_b(1-T)$, then the firm is willing to sell at a discount. This situation results when synergies between the asset and the rest of the business are relatively low. Finally the presence of costs causes the breakeven price to exceed the value of the asset.

2.4.2 Divesting to achieve focus

For this analysis I introduce a measure of the diversification discount applied to the parent, ψ, the extent to which the transaction will remove this discount, υ_i, and the value of the parent, V. The term υ_i is asset specific and is a measure of how much asset *i* contributes to the discount. This could be attributable to information asymmetry, lack of transparency, problematic financial performance, or problems caused by lack of focus. Its value would range between [0,1].

The minimum acceptable sale price for the asset is that which equates the sum of net proceeds from sale plus the improvement in value from the reduced diversification discount to the loss of value from giving up ownership of the asset in question.

This test can be represented as follows:

$$P + \upsilon_i \left(\frac{\phi \mathrm{V}}{1-\phi}\right) = F_{sub} + S_s \qquad [2.7]$$

This expression assumes proceeds from the sale are reinvested at zero NPV or transferred to shareholders without cost. An alternative approach would be to assume that a spin off is used to exit the particular asset.

Solving for $D_{A,FOCUS}$, gives:

$$D_{A,FOCUS} = 1 + \frac{[BT - I_{fA}(1-T)]}{X} - \frac{(F_{sub} + S_S)}{X} + \frac{\phi}{(1-\phi)} \frac{\upsilon_i \mathrm{V}}{X} \qquad [2.8]$$

The first three terms on the RHS are the same as equation [2.4]. The fourth term represents the potential impact on value resulting from achieving greater focus. The greater the extent to which the asset in question contributes to the discount, as measured by υ_i, or the larger the discount, ϕ, then the higher the breakeven D_A is (i.e. minimum acceptable sale price falls). It is noteworthy that the tax benefit effect of writing off an asset, noted in the section 2.4.1 is directionally the same as the impact of the diversification discount, so a loss making asset that is a contributor to a parent company's diversification discount will have a higher (more negative) breakeven discount.

2.4.3 Divesting to fund alternative investments

This scenario assumes the company is unable or unwilling to access equity markets to fund new investments, and so is forced to sell existing assets to fund new projects. This scenario is a possible manifestation of financial constraints, but is also consistent with self-imposed capital rationing, so is not proof of externally imposed financial constraints. However, for this analysis, I assume that a new investment is funded by proceeds from an asset sale, so the pricing of the divestment now includes the NPV of investing the proceeds from sale into an alternative investment. I_q is the outlay on the new investment, q, which has a EV_q/I_q ratio of V_q and a gearing ratio of L_q. NPV of the new project would therefore be:

$$NPV_q = I_q(V_q - 1) \qquad [2.9]$$

The minimum acceptable sale price for the asset equates the sum of net proceeds from sale plus the value created by the new investment with the loss of value from giving up ownership of the asset in question. This test can be represented as follows:

$$P + NPV_q = F_{sub} + S_s \qquad [2.10]$$

I impose the constraint that equity required to fund the new investment equals the net proceeds available from the asset sale, thus ensuring that the scale and financial risk of the firm are held constant. The proceeds available for investing will be the net proceeds less any funds required to reduce debt attributable to the assets being sold. The equity available for reinvestment is therefore:

$$A = P - L_i(F_{sub,i} + S_{s,i}) \qquad [2.11]$$

Where L_i is the debt capacity (Debt to Enterprise Value) of the sold asset[20.] This term recognises that any divested asset will have its own debt capacity and therefore foregoing the contribution to debt capacity from this asset by sale will reduce the debt capacity of the remaining business. The leverage adjustment term highlights the potential inefficiency of using asset sales proceeds for debt reduction; in that the sale itself reduces debt capacity. An obvious empirical prediction arising from this is that firms will tend to sell assets with low debt capacity when they are trying to reduce debt. The equity required by a new project can be expressed as follows:

$$E_q = I_q\left(1 - L_q V_q\right) \qquad [2.12]$$

This equals the equity contribution from the sold asset. Setting *A=E,* the amount of investment available for new investment is:

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[20] This expression assumes the firm's debt capacity is determined by the value of assets under the vendor's ownership. This is a harsher test than just taking debt reduction as a percentage of proceeds, and does impose a cost of selling at a discount in the sense of giving up debt capacity. In Bates (2005), the mean (median) transaction value for asset sales was $500m but the average reduction in debt for his subset of 'Debt Repayers' was $200m, implying a value for *L* of 0.4.

$$I_q = \frac{P - L_i(F_{sub,i} + S_{s,i})}{(1 - L_i V_q)} \qquad [2.13]$$

The amount of investment that can be undertaken using a given amount of proceeds (represented by *P*), increases (not surprisingly), with the gearing capacity and profitability of the new investment opportunities (represented by subscript *q*), and declines with the debt capacity of the sold asset (represented by subscript *i*), and the leakage of proceeds, measured by $(F_{sub,i} + S_{s,i}) - P$.

Substituting the expression for I_q into NPV_q and solving for D_a gives:

$$D_{A,INVEST} = 1 + \frac{[BT - I_{fA}(1-T)]}{X} - \frac{(F_{sub,i} + S_{s,i})}{X}\left[\frac{(1-L_i)}{V_q(1-L_q)} + \frac{(L_i - L_q)}{(1-L_q)}\right] \qquad [2.14]$$

The first two terms are the same as the previous results. The first part of the third term is the same as well, except it now incorporates a term reflecting the value creation and leverage impact of the new project and the gearing of the asset being sold. To demonstrate the impact on breakeven D_A,I take the first derivative of D_A relative to V_q, L_q and L_i as follows:

$$\frac{\partial D_{A,INVEST}}{\partial V_q} = \left(\frac{F_{sub,i} - S_{S,i}}{X}\right)\left(\frac{(1-L_i)(1-L_q)}{V_q^2}\right) \qquad [2.15(a)]$$

$$\frac{\partial D_{A,INVEST}}{\partial L_q} = \left(\frac{F_{sub,i} + S_{S,i}}{X}\right)\left[\left(\frac{1-L_i}{V_q}\right) - \frac{(L_i - 1)}{(1-L_q)^2}\right] \qquad [2.15(b)]$$

and

$$\frac{\partial D_{A,INVEST}}{\partial L_i} = \left(\frac{F_{sub,i} + S_{S,i}}{X}\right)\left[\left(\frac{1}{V_q(1-L_q)}\right) - \frac{1}{(1-L_q)}\right] \qquad [2.15(c)]$$

Expressions 2.15(a) and 2.15(b) are both positive[21], suggesting that the breakeven discount increases the higher the profitability and the higher the debt capacity of the new project. Clearly, if a new investment is attractive enough, as measured by value creation and/or debt capacity, and there is no equity available, or the firm is unwilling to approach equity markets, then selling an existing asset at a discount may still be value creating for the vendor[22].

Expression 2.15(c) shows the marginal impact on breakeven D_a of changes in the debt capacity of the asset being sold. As long as V_q is positive and $L_q < 1$, then Expression 2.15(c) will be negative. This implies that as the debt capacity of the sold asset increases, the breakeven discount declines (becomes less negative). In other words, the vendor needs to sell the asset at closer to fair value.

2.4.4 Choosing between selling an asset or raising equity

A listed company which has decided to reduce debt has the choice of raising external funding by selling an individual asset or issuing equity. Either transaction would occur if the benefits from debt reduction exceed the net cost of the preferred method of raising funds. The following analysis examines the net cost of both alternatives.

The decision problem facing the manager is to reduce debt for the minimum cost, subject to the cost of reducing debt being less than the benefits of reducing debt. This puts an upper limit on the cost of either selling assets, C_A, or selling equity, C_E, for the purpose of reducing debt.

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21 For Expression 2.15(b) will be positive as long as $L_i < 1$

22 While it may be value creating it may not be value maximising. However the strategy of selling existing assets to raise equity is common (and is commonly behind the sale of government asset). It is possible that a decision by management to not approach the financial markets may reflect a desire to avoid scrutiny of financial markets, and so may represent some form of self-interest, rather than a financial constraint.

To determine the cost of raising equity, I assume the issue size equals the net proceeds available for debt reduction, *A,* as determined earlier. Eckbo, Masulis and Nori (2007) show the costs of raising equity include transactions costs, wealth transfer effects arising from any difference between the full information value of the company's equity and its market price, as well as the wealth transfer effects resulting from the difference between the full information value and the actual market value. Importantly, they demonstrate that the cost of the wealth transfer effects is attenuated by the take-up factor, the extent to which existing shareholders participate in the equity issue. Eckbo et al. (2007) exclude issue discounts from their analysis, however, I specifically include them in my modelling because the potential for wealth transfer is a legitimate cost issue to be considered by the issuing company. It is particularly relevant when examining the role of asset sales which, in terms of potential wealth transfer, are similar to a placement. The discount on an asset sale can be considered akin to a discount on a placement. In a placement the new investors are the beneficiaries of the wealth transfer. In an asset sale the acquirer is the beneficiary. Issue discounts vary across different issue methods. In the US, issue discounts vary from under 5% for a firm commitment offering to up to 30% for placements via the PIPES market.

Assuming that market values equal full information values, the cost of raising equity can be written as:

$$C_{E,m}=$$

$$I_{Efm}(1-T)+i_{Evm}A(1-T)+(1-k_m)\left(\frac{E+A}{N_{pre}+N_{issue,m}}-\frac{A}{N_{issue,m}}\right)N_{issue,m} \quad [2.16]$$

Where I_{Efm} are the fixed costs of raising equity under issue method *m*, $i_{Evm}$is the variable cost of issuance expressed as a percentage of issue size, variable k_m is the take-up by existing shareholders under issuance method m, E is the underlying value of the company's pre-issue equity, N_{pre} is the amount of shares outstanding prior to the issue and $N_{issue,m}$ is the amount of shares issued under method m. The final term in [2.16] is the difference between the theoretical post issue price, assuming zero value is attributed to the use of proceeds, and the issue price, and incorporates any issue discounts[23]. As noted earlier, the cost of any discount is attenuated by the take-up of existing shareholders.

The number of shares to be issued, $N_{issue,m}$, is determined by the discount on issue relative to the current market price D_{Em}.

$$N_{issue} = A/\left(\frac{E}{N_{pre}}\right)(1 - D_{e,m}) \qquad [2.17]$$

Expressions for C_A and C_E highlight that the relative cost of the two alternatives is not assessed by simply comparing the discounts on the two fund raising methods. Asset sales are a less efficient means of raising funds, due to the potential for wealth transfer if sold at a discount and loss of debt capacity. Evaluating the cost of selling an asset also incorporates real factors including the relative value of synergies under the ownership of vendor and seller, and tax impacts if the asset sale price differs to the cost basis for tax purposes. Evaluating the cost of selling equity needs to incorporate the discount and also the level of takeup, which will determine the wealth transfer impact of raising

[23] This is a more correct measure of issue discount rather than just comparing issue price to pre issue price. To demonstrate, assume two identical companies, A and B, both with 1,000 shares outstanding at a price of $10, giving a capitalisation of $10,000. Both companies issue new shares at a discount of 10% to market price, with Co A issuing on a 1:5 basis and Co B issuing on a 1:2 basis. Although both companies have issued at a 10% discount to pre issue price the correct discount, relative to the theoretical post issue price, for Co A is 8.44% and for 6.83% for Co B.

equity. To properly compare the alternative costs these expressions are combined to determine the breakeven discount on asset sales, $D_{A,EQUITY}$, which equates C_A with C_{Em}. I assume the amount raised via the equity issuance, after any transactions costs, equals the net proceeds from the asset sale, after allowing for loss of debt capacity, as previously discussed.

The expression for calculating the breakeven discount on selling an asset as an alternative to raising equity is presented below. In order to facilitate presentation a number of terms have been combined and represented by intermediate variable.

$$D_{A,EQUITY} = 1 - \frac{[A]}{X[i_{evm}(1-T)(1-k_m)-1]} - \frac{[B]}{2X^2[i_{evm}(1-T)(1-k_m)-1]} - \left[\left(\frac{-2[A]+[B]}{2X^2[i_{evm}(1-T)(1-k_m)-1]}\right)^2 - \frac{[C]-[D]+[E]}{X^2[i_{evm}(1-T)(1-k_m)-1]}\right]^{0.5}$$

[2.18]

Where:

$$[A] = (1-k_m)[L_a(F_{sub}+S_s)-Y][i_{evm}(1-T)] + Y - L_i(F_{sub,i}+S_{s,i}) + I_{efm}(1-T)$$

$$[B] = E[1-i_{evm}(1-T)] + [1-i_{evm}(1-T)](F_{sub,i}+S_{s,i})(L_i-1) - (1-k_m)(I_{efm}(1-T))[(i_{evm}(1-T)+1]$$

$$[C] = [E(1-D_{em})(1-i_{evm}(1-T))^2(F_{sub,i}+S_{s,i})(1-L_i)]$$

$$[D] = [Y-L_a(F+S_s)+ I_{efm}(1-T)][2Y+E+I_{efm}(1-T)-(F_{sub}+S_s)(1-L_i)-k_m(ED_{em}-L_i+Y)]$$

$$[E] = [(Y-L_i(F_{sub,i}+S_{s,i})+I_{efm}(1-T)]^2(1-i_{evm}(1-T)-k_m)$$

Due to the number of cross product terms this expression is difficult to interpret. The three variables of key interest are D_{em}, the discount on issue and k_m, the take-up by existing shareholders. Accordingly, the breakeven D_a is calculated using benchmark parameters derived from the literature for the alternative equity methods of rights issue, a public offering, placement and a PIPES transaction. Panel A of Table 2.1 shows input parameters for each case and the resultant breakeven discount assuming the divestment transaction is tax neutral.

For typical market parameters for the cost of raising equity, the discount on sale of an asset is less than the 30% reported in Officer (2007). If the available alternative is a rights issue, then a small premium is required. For a public offering priced close to market price an asset would need to be sold at its fair value to be economically equivalent to the equity issue. For a placement or PIPES issue, the breakeven discount on the asset sale is less than the discount on the equity raising alternative and, importantly, is still less than the 30% reported in Officer (2007). The column labelled Breakeven, shows the assumptions required to produce a scenario where a 30% discount on the asset sale may be considered breakeven. The discount on trade sales of 30% reported in Officer (2007) implies a discount on a competing equity issue of nearly 38% for an asset with 40% leverage.

The key conclusions from this analysis are that, firstly, the Breakeven Discount, D_a, is usually lower than the simple headline cost of the alternative. This is due to the leakage of funds from an asset sale as a result of tax impacts, and foregone debt capacity. Secondly, that using estimates of market parameters for the cost of issuing alternative forms of equity, it is not possible to explain why companies would sell assets at a 30% discount to fair value, unless, access is constrained or they can only issue equity at costs in excess of typical market parameters.

Table 2.1
Examples of Breakeven D_a

	Equity issue method				
	Rights	Public offering	Placement	PIPES	Breakeven
Panel A: Tax Neutral divestment					
Issue size	59.47	58.28	51.56	45.75	38.18
A	56.69	55.54	49.06	43.46	36.08
$D_{e,m}$	7.5%	3.3%	15%	25%	38%
k_{im}	88%	0	0	0	0
$D_{A,EQUITY,m}$	-1.34%	0.39%	10.14%	18.56%	29.86%

D_a is calculated for each equity issue method using expression [2.18]. Value of 100 is attributed to F as a base value and the asset is assumed to equal 10% of parent company capitalisation. A negative value for D_a indicates a premium is required when selling an asset to give the same net cost as raising equity via each alternative equity issue method. Assumptions are derived as follows: rights issue (D_{er} = 7.5%, k_{ir}= 88%, Ursal(2006)), public offering: D_{epo}=3.3%, k_{iop}= 0%, Wu(2004), placement: D_{epp} = 15%, k_{ipp}= 0%, Wu(2004), L=40%, Bates (2005). Values for S_s and S_b have been set to zero for the base case, and the book value of assets is set equal to the sale value, to eliminate any tax effects. The value of A is calculated under each case and ensures the amount of funding raised under each alternative equals the net proceeds from selling the asset. Fixed costs for both equity issue and divestment are assumed at $1m and variable costs of 5% for both transactions.

Implications: Why don't companies just use a rights offering?

Applying expression [2.18] to a rights issue, where the equity is trading in line with the full information value of the company and the direct costs are low, shows that, in the event of 100% take-up by existing shareholders, the costs of a rights issue would equal the transactions costs, which are in the order of 3% -5%. Under these circumstances selling an asset at a 30% discount does not appear to make sense.

The failure of companies to use a rights issue in these circumstances is paradoxical. Eckbo and Masulis (1992) address this rights issue paradox using the Myers and Majluf (1984) adverse selection model. The original Myers and Majluf (1984) model did not allow rights offerings, however a rights offering overcomes many of the adverse selection problems posed by Myers and Majluf (1984), as there are no wealth transfers from existing shareholders due to issuing undervalued shares. However Eckbo and Masulis (1992) demonstrate that the rights offering only overcomes this problem if the take-up from existing shareholders is sufficiently high. A low take-up by existing shareholders is equivalent to a (poorly marketed) public offering. The anticipated level of take-up will therefore determine the company's choice between a fully underwritten rights offering, a public offer or a placement. This model appears to explain announcement returns for the various issues choices. Cronqvist and Nilsson (2005) find that for a sample of Swedish rights offerings the level of control by major shareholders is the best determinant of a company's choice of issuance mechanism, offering support for the take-up model.

The anticipated level of take-up would therefore be expected to influence the choice to sell an asset or pursue an equity issue. The lower the expected level of take-up, then the less likely a rights issue will be chosen, leaving the choice between the more expensive public offerings and private placements. In these circumstances an asset sale may become a more attractive alternative. In purely financial terms the sale of an asset can be characterised as similar to a private placement.

2.4.5 Conclusions on D_a

The objective of this modelling has simply been to show how divestment pricing can be affected by a number of factors that relate to the asset in question, the target parent, the cost of alternative funding sources and the benefits derived from using the proceeds. It is left for future research to develop this model. However there are a number of implications from this model which are worth noting.

The ratio B/F measures the tax impact of an asset sale. A value of 1 indicates the asset is sold at book value, $B/F < 1$ indicates a profit on sale and $B/F > 1$ indicates a loss on sale. For a tax paying entity, a value of $B/F > 1$ would generate a tax benefit, partially offsetting the loss generated as a result of selling the asset at a discount. The numerical results show that where the asset write-down is in excess of 20% (PIPES) to 80% (rights) then a 30% discount can be justified.

The value of L represents the debt capacity of the asset being sold. An asset with a high value for L means that when it is sold it reduces firm debt capacity and therefore its sale is able to contribute less to debt reduction. Assets with a low debt capacity are more efficient for the purposes of debt reduction and so can be sold at a larger discount. Assets with high debt capacity would need to be sold at a premium.

The ratio S_s/S_b shows the relative value of the asset in the hands of the current owner potential vendor) and the potential acquirer. A high value indicates that the asset is relatively more valuable in the hands of the current owner. In these circumstances a cost based justification for selling the asset would require the asset to be sold at a premium.

The value of take up by existing shareholders is measured by k_i, and it will be a measure of the extent of wealth transfer. A low value means that new shareholders will provide new funds and, to the extent there is any discount, that will amount to a transfer of wealth from existing to new shareholders.

2.5 Conclusions

The purpose of this chapter has been to determine what are reasonable a- priori expectations to hold about the discounts on the sale of subsidiaries. I address this question from two perspectives. First, I review the literature on the divestment process, and second, I develop values for the Breakeven Discount, D_a, under scenarios which correspond to the common motivations for selling an asset. Both analyses highlight the complex nature of the divestment decision, which involves the interplay of issues in relation to corporate strategy and portfolio mix, operating and financial performance, use of proceeds, tax issues, equity market conditions and asset characteristics. Although the literature tends to classify motivations for selling assets under the broad headings of financing, efficiency or strategic, the broader perspective I have described above makes it difficult to attribute one causal factor to the motivation for an asset sale. This conclusion also applies to any attempt to attribute a particular causal factor to the pricing of an asset sale, which is the focus of this thesis.

Officer (2007) finds discounts in the order of 30% for subsidiary sales between publicly listed companies. He attributes these discounts to liquidity pressure on the target parent prompting a fire sale of assets. Based on the analysis in this chapter I draw the following conclusions, which generally lead one to challenge the underlying premise that liquidity pressures are the cause of assets being sold at a discount.

First, it is unsurprising that the price at which subsidiaries are sold appears to be less than public market counterparts. Most of the common motivations for selling assets, particularly the efficiency and strategic motivations, suggest that companies are selling assets in response to performance or valuation issues. In these circumstances the assets are likely to be underperforming and therefore less valuable. This conclusion is reinforced when consideration is made of possible exit options. In addition to a sale, subsidiaries can be spun-off to shareholders, or sold via an equity carve-out if funds are required by the parent company. Assets exited via either means are likely to have more attractive growth opportunities and a greater chance to survive as standalone businesses. Assets that don't meet these requirements are more likely to be sold. Furthermore, assets that have an exit value in excess of book value are more likely to generate a taxable profit. Consequently, companies who are paying taxes will have a marginal advantage in exiting such assets via a tax free spin-off rather than an asset sale, unless the premium paid exceeds any tax costs. The implication of this analysis is that subsidiaries sold via trade sale are unlikely to be comparable to their public market counterparts, but are likely to have a lower relative value. This is an important conclusion, given the reliance on the use of multiples methodology to measure the size of discounts. Use of multiples assumes that the comparable companies are an appropriate benchmark to determine the implied value of subsidiary targets. If there are systematic differences in the underlying value of subsidiaries, and their presumed public market comparables, then the resulting discounts will be over-stated. At a minimum, this implies that when measuring discounts allowance should be made for differences in asset specific characteristics. I address this issue in Chapter 3.

The second conclusion is that, even if the asset is sold at a discount to underlying value, this could be attributable to reasons other than liquidity pressure. Possible reasons include a lack of competition for the asset in the sale process, or other factors which affect the economics of the sale decision. In relation to the sale process, a company under liquidity pressure that decides to exit via trade sale does not automatically need to result in a sale at of a discount. The main determinant of the asset's price is likely to be the level of competition for the asset.

Third, in a situation where a company is forced to consider accepting a sale price less than an asset's underlying true value, a value maximising company may still decide to sell such assets at a discount, even without the presence of liquidity pressures. It may do so because the tax benefits from sale will enhance the economics of the sale for the target parent, or the flow on effects to the rest of the business may outweigh the size of the discount.

Fourth, even if the firm is selling the asset as an alternative to issuing equity the breakeven analysis shows that the 30% discount does not appear to be consistent with the cost of alternative equity raisings. The size of the acceptable breakeven discount will be a function of the value creation potential of alternative investments which will be foregone if the asset is not sold, or the expected level of take-up by existing shareholders.

This analysis informs our a-priori expectations as to what may be expected when we compare the price of subsidiary sales with public market comparables. In the next chapter I examine the most appropriate use of multiples methodology to measure discounts.

Chapter 3

Measuring discounts

3.1 Introduction

In Chapter 1, I identified a number of potential measurement issues with the existing research on trade sale discounts, in particular the risk that measurement choices can lead to ambiguity in interpreting reported discounts. In this chapter, I empirically interrogate the measurement issues involved in calculating discounts. The results of this chapter give a range of estimates for discounts for a sample of 287 subsidiary sales. These are then be used as the dependent variable in Chapter 4, to test for the impact of financial constraints, and as an independent variable in Chapter 5, where I test for a relationship between discounts and announcement returns.

Valuation using multiples underpins the calculation of discounts, so in Section 3.2, I present an overview of multiples methodology. In Section 3.3, I describe best practice application of multiples methodology, against which to evaluate existing research. Key decisions include the choice of averaging method (arithmetic, harmonic, geometric mean or median), the choice of ratios, the choice of comparable companies and the error measure used to evaluate accuracy (percent errors or logarithmic). One of the main implications from this analysis is the need to adjust for asset specific characteristics, rather than just screening via industry code. This is potentially important in this research, given the analysis in Chapter 2 concludes that public companies are unlikely to be truly comparable benchmarks, thus requiring asset specific adjustments.

In Section 3.4, I demonstrate the impact of important methodological choices using a sample of 287 subsidiary transactions. The results demonstrate that reported discounts are highly sensitive to the choice of measurement methods. The combination of arithmetic mean and percent discount tends to lead to larger discounts, and results which are sensitive to treatment of outliers. The combination of geometric mean and logarithmic errors also results in discounts being reported, however they are more stable across alternative methods of adjusting for outliers. The harmonic mean, commonly used in the literature, tends to result is discounts being considerably reduced or non-existent.

In Section 3.5, I demonstrate the impact of adjusting for asset specific characteristics. I carry out three tests. First, I demonstrate that targets with small to negative incomes have a material impact on reported discounts. Second, I use a regression model to estimate underlying value, based on a target's income and book value, and find that the sample generates a premium, on average, rather than a discount. Finally, I demonstrate that the profitability of the segment from which the asset was sold, has a significant association with discounts, although not in the direction expected.

The analysis in this chapter makes several contributions to the literature. Firstly, I demonstrate that the conclusions of Officer (2007) are ambiguous. Methodological choices affect not only the size of measured discounts, but whether they exist at all. My analysis demonstrates the critical decisions which affect the outcome of any analysis on the measurement of discounts. At a minimum, the implication of this analysis is that research on discounts should include a robustness check on different choices of measurement methodology. Second, I demonstrate the benefits of incorporating asset specific characteristics in the analysis. This is especially important where, a priori, it is likely that the target asset may not be truly comparable with the selected peer companies. Finally, I demonstrate the application of valuation methodologies from other parts of the corporate finance literature to address the question of determining a benchmark valuation.

3.2 Overview of multiples valuation

3.2.1 Multiples methodology

Transaction multiples are commonly used by practitioners in the fields of equity analysis, IPO pricing, M&A analysis, private company and tax valuations. Multiples are used either as a primary valuation method, or to validate cash flow based valuations or simply to assess relative pricing on transactions. Applications in academic research include research by Rhodes-Kropf, Robinson and Viswanathan (2005), and Loughran and Wellman (2011), who demonstrate the Enterprise Value multiple is a determinant of stock returns. Kraft and Schwartz (2010) also derive an expression for the value to cash flow multiple based on firm specific characteristics and macroeconomic variables.

The method of comparables calculates a multiple based on a peer group of companies for a given value driver or financial indicator, $\widehat{Multiple}^{EV}_{m,comparable}$ and then uses that multiple to determine the implied value of the target[24]. The estimate of Enterprise Value $V^{EV}_{target,m}$ of the target business using multiple m can be depicted as follows:

$$V^{EV}_{target,m} = Metric_{m,target} x \widehat{Multiple}^{EV}_{m,comparable} \quad [3.1]$$

The generic definition for a multiple is:

$$Multiple^{EV}_{comparable,m,} = \frac{V^{EV}_{m,comparable}}{Metric_{,comparable,m}} \quad [3.2]$$

[24] In practice, trading multiples are calculated using traded stock prices and are used in the valuation of listed securities. Transaction multiples are usually calculated on transactions where control changes. The focus of this research is on transaction multiples.

Measurement of multiples is commonly undertaken using accounting based metrics, although they can refer to non-accounting measures of performance. Enterprise Value multiples, such as Enterprise Value to EBITDA (or EBIT), Enterprise Value to Free Cash Flow, Enterprise Value to Sales and Enterprise Value to Net Operating Assets[25] use performance metrics measuring the Enterprise Value. A similar process can be described for valuing Equity Market Capitalization. Common equity valuation multiples such as the Price Earnings multiple and the Price to (Equity) Book Value, use Equity Market Capitalisation as the Value and use metrics measured from the shareholder perspective.

The 'industry practitioner' model can be broadly described as calculating the arithmetic average and/or median of a sample of comparable companies, with judgment applied to the selection of companies used in the peer group. Industry practitioners will adjust for differences between comparables and targets by the use of multiple measures, judicious selection of peers (especially in relation to outliers) and adjustments to earnings[26]. Kim and Ritter (1999) conclude that the role of this judgment appears to add value. In a sample of IPOs the mid-point of the offer price range has a lower prediction error than using the method of comparables. Industry practitioners have the advantage of detailed industry and firm knowledge, as well as being able to canvas investors as to likely pricing.

There are, however, measurement issues involved in determining the estimated multiple. I address these issues in the remainder of this chapter. Although the use of multiples is common industry practice, there are no prescriptive rules about how best to estimate them, leaving scope for

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[25] Further references to each of these will be use their short names as follows: P/E, P/B, EV/EBIT, EV/FCF, EV/S, EV/NOA

[26] Adjustments will comprise calculating normalized earnings, whereby one off impacts on historical results are removed. The use of forecast earnings has a similar effect.

subjectivity in regards to the choice of methodology and uncertainty in estimates. The issue for empirical research is how to produce valuations without the detailed industry and market knowledge. I address this issue by reviewing the literature on multiples based valuation to determine which procedures have the highest accuracy in valuation. This approach is justified by the apparent improvement in accuracy that results from use of more sophisticated valuation procedures, which attempt to incorporate asset specific characteristics Henschke and Homburg (2009), Deng at al (2010) and Gus De Franco et al. (2011) use this approach to estimate discounts on sales of non-listed companies, whereas Officer (2007), for example, makes no specific adjustments for specific characteristics of the asset being sold

3.2.2 Robustness of valuations using multiples

Most multiples research uses large samples to evaluate existing publicly companies. Conclusions about the accuracy of multiples methodology varies. Henschke and Homburg (2009) report median absolute valuation errors under 20% for their best models.

Research in a transaction context is more limited. Kaplan and Ruback (1995) compare the market valuation of 52 highly leveraged transactions with value estimates derived from DCF analysis, the comparables (multiples) method and a hybrid of both. They conclude the combined method gave the most reliable results, followed by the DCF method and then the multiples method. The comparables transaction method[27], which is closest to the method that I use in this research, was arguably the most accurate. Median and mean valuation errors were -0.1 percent and -.07 percent respectively, with 57.9 percent of transactions falling within 15 percent of the actual value. These

[27] This method calculates comparable multiples by selecting comparable firms that have undergone a similar transaction in the same industry.

results are broadly consistent with the DCF valuation estimates, although the standard deviation was slightly higher[28]. The superiority of the DCF valuations should not be surprising, as they are based on forecasts provided in the transaction documents. Kim and Ritter (1999) test the accuracy of multiples to value IPO's. When based on historical earnings, the traditional ratios perform poorly. Using the simple multiples approach, mean (median) prediction errors range between 16.3 percent and 26.2 percent (10.5 percent and 32.8 percent), with between 11.1 percent and 21.6 percent of IPOs falling within 15% of the actual. Incorporating firm specific characteristics, specifically profitability and growth, using a regression model improves performance, with between 18.2 percent and 25.9 percent of IPOs falling within 15% of the actual. In the diversification discount literature, the diversification discount is the difference between a company's actual multiple and the multiple of a portfolio of pure plays.

3.2.3 Multiples, valuation and comparables

The economic rationale for their use lies in the relationship between value, and the key metrics used in the multiples, primarily earnings and book value. This relationship can be demonstrated using the Residual Income model

[28] The sample size of this method was reduced due to unavailability of comparable transactions.

or the traditional discounted cash flow model[29,30]. The Residual Income valuation model is:

$$EV_{i,t} = IC_{i,t} + \sum_{k=1}^{\infty} E_t \left[\frac{(ROIC_{i,t+k} - r_i)}{(1 + r_{i,t})^k} \right] x IC_{i,t+k-1} \qquad [3.3]$$

$IC_{i,t}$ is the book value of Invested Capital of firm *i* at time *t*. E_t […] is an expectation operator. $ROIC_{i,t+k}$ is the Return on Invested Capital for firm i in each future period, measured by $After\ Tax\ Operating\ Earnings_{i,t+k}/IC_{i,t+k-1}$ and $r_{i,t}$ is the potentially time varying discount rate for firm *i* (usually measured as the weighted average cost of capital)[31]. In practice, of course, this model can be used with individual year forecasts, but in most analytical applications simple assumptions are made about the behaviour of key value drivers. In subsequent empirical analysis, I use multiples based on the book value of assets, earnings and sales.

Each of these multiples can be represented in terms of its underlying valuation drivers. The Enterprise Value to Book ratio can be derived by dividing both sides by $IC_{i,t}$, giving:

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29 Feltham and Ohlson (1995) demonstrate that the value derived using Residual Income valuation equals that using discounted cash flow methods, by invoking the clean surplus relationship. The Residual Income version is used here because it better ties back to firm accounting characteristics than the discounted cash flow model does. As our focus is primarily on asset valuation I am using the Enterprise Value version of the model.

30 Similar derivations are presented in Bhoraj and Lee (2002) and Henschke and Homberg (2009).

31 Similar expressions can be presented for equity valuation, using Shareholders' Equity, Profit After Tax and the Geared Cost of Equity as the relevant parameters. I have used the Enterprise Value version because the data available for subsidiaries is usually expressed at an asset (or Enterprise Value) level. Furthermore, Loughran and Wellman (2011) argue that the EV multiples are most closely related to stock returns.

$$\frac{EV_{i,t}}{IC_{i,t}} = 1 + \sum_{k=1}^{\infty} E_t \left[\frac{(ROIC_{i,t+k} - r_i)}{(1 + r_{i,t})^k} \right] x \frac{IC_{i,t+k-1}}{IC_{i,t}} \quad [3.4]$$

This expression demonstrates that the EV to Book multiple will be determined by expected profitability ($ROIC_{i,t+k}$), expected growth (($IC_{i,t+k-1.}/IC_{i,t}$) and risk (r_i).

This can be extended to show the earnings multiples as well.

$$\frac{EV_{i,t}}{Earnings_{i,t}} = \frac{1}{ROIC_{i,t}} \langle 1 + \sum_{k=1}^{\infty} E_t \left[\frac{(ROIC_{i,t+k} - r_i)}{(1 + r_{i,t})^k} \right] x \frac{IC_{i,t+k-1}}{IC_{i,t}} \rangle$$

[3.5]

This shows that the earnings based multiple is also influenced by the current level of Return on Capital.

Similarly, the expression can be extended to show the Enterprise Value to Sales ratio.

$$\frac{EV_{i,t}}{Sales_{i,t}} = \frac{IC_{i,t}}{Sales_{i,t}} \langle 1 + \sum_{k=1}^{\infty} E_t \left[\frac{(ROIC_{i,t+k} - r_i)}{(1 + r_{i,t})^k} \right] x \frac{IC_{i,t+k-1}}{IC_{i,t}} \rangle$$

[3.6]

Expression 3.6 shows that the EV to Sales ratio is also impacted by the current level of Capital Turnover (Sales/Invested Capital).

Aside from demonstrating the relationship between multiples and other valuation methodologies, these expressions demonstrate an underlying relationship between multiples and firm financial characteristics, which provide a basis for selecting comparable firms. Each expression shows the precise constraints which must be placed on potential comparables. Expression 3.4 specifies that forecast ROIC and growth rates must be the same; Expression 3.5 also requires current ROIC to be the same, while Expression 3.6 requires profit margins to be the same, in addition to forecast ROIC. Alternatively, these models require the target company to have financial results equal to the average of the selected peers.

In Chapter 2, I argued that a justified a priori belief was that subsidiaries which were offered for sale were more likely to be underperforming, with lower growth prospects. This translates directly into the above valuation expressions. Companies, or assets, with lower Returns on Capital and/ or lower growth rates, will have lower multiples. Therefore, to properly measure discounts, allowance needs to be made for differences in underlying performance of key value drivers between target assets. The approach used in Officer (2007) assumes all assets should trade at the average of comparable transactions.

3.3 Applying multiples methodology to evaluate subsidiary sales

In this section I review recent research into the valuation accuracy of multiples. This provides a framework for assessing the use of multiples methodology in calculating discounts. There are two broad approaches to comparables valuation. The first, and most common, involves averaging of peer group multiples. Issues to be addressed include (i) how best to estimate the average multiple, (ii) selection of peers, and (iii) selecting preferred financial ratios. One of the key issues in this research is how to control for asset specific characteristics. The second method of comparables valuation addresses this by using cross sectional regression models, based on Expressions 3.4 to 3.6, which incorporate asset specific characteristics as independent variables. I describe these two methods in Section 3.3.1 and 3.3.2. Both methods derive an estimate of value of the target company. The final step is to determine the accuracy of the valuation by comparing to the actual price. I address this issue in Section 3.3.3.

3.3.1 Valuation using peer companies

Following Baker and Ruback (1999), the basic version of valuation using peer companies assumes a directly proportional relationship between the measure of value, and the value driver, represented as follows:

$$V_{target}^{EV} = \widehat{M}_{comparables,m}^{EV} x Metric_{target,m}^{EV} + \varepsilon_{target} \qquad [3.7]$$

Where V_{target}^{EV} is the derived value of the target, $\widehat{M}_{comparable,m}^{EV}$ is the estimate of multiple *m*, derived from comparable companies. $Metric_{target,m}^{EV}$ is the value of the financial metric, for the target asset, that matches multiple, *m*. It can be historical or forecast. ε_{target} is the error term, with an expected value of zero.

For each comparable, a multiple would be calculating using the following generic definition:

$$M_{comparable,m}^{EV} = \frac{V_{comparable}^{EV}}{Metric_{comparable,m}} \qquad [3.8]$$

The issue is how to use these to estimate the $\widehat{M}$ term in Expression 3.7

In using comparable companies there are three issues to decide. First, which averaging method to use, second, which financial metrics and multiples should be used and finally, how to select comparable companies. Each of these is now discussed.

3.3.1.1 Alternative Averaging Methods

The simplest approach uses one of the alternative measures of central tendency, typically chosen from arithmetic mean, harmonic mean, geometric mean or the median. The various means can be calculated on a simple or weighted basis. Definitions for each term, assuming equal weights, are provided below. For each target transaction, there are *n* comparable transactions for each multiple *m*. $I_{j,m}$ *rep*resents the set of comparable transactions:

Arithmetic Mean: $$\bar{M}^{AM}_{comp,m} = \frac{1}{n}\sum_{j=1}^{n} M_{j,m}$$ [3.9a]

Harmonic Mean: $$\bar{M}^{HM}_{comp,m} = \frac{1}{\frac{1}{n}\sum_{j=1}^{n}\frac{1}{M_{j,m}}}$$ [3.9b]

Geometric Mean:

$$\bar{M}^{GM}_{comp,m} = \prod_{j=1}^{n} M_{j,m}^{1/n} = exp\left\{\frac{1}{n}\sum_{=j=1}^{n} ln\big(M_{j,m}\big)\right\}$$ [3.9c]

Median: $$M^{M}_{comp,m} = Median(M_{j,m,}j \in I_{j,m})$$ [3.9d]

Expression 3.9b shows that the harmonic mean is the reciprocal of the arithmetic average of the reciprocals of each multiple. Using the Price/Earnings multiple as an example, calculating the Harmonic Mean involves calculating the average of the Earnings/Price ratio for each firm *j*, and then taking the reciprocal. Musumeci and Peterson (2011) show the benefits of using the Earnings/Price ratio, rather than Price/Earnings ratio, partly because it reduces the impact that small and negative values in Earnings, can have in creating extreme observations. Dittmann and Maug (2006) also note that the second expression in Expression 3.9c shows that the Geometric Mean can be interpreted as a retransformed Arithmetic Mean of the logarithms of the multiples $M_{j,m}$.

The simple average and median are the most commonly used by practitioners. Officer (2007) uses both these measures in the calculation of discounts on sales of subsidiaries by public companies. However the harmonic mean and median are more commonly used in empirical research assessing the valuation accuracy of alternative multiples methodologies. Dittmann and Maug (2006) document the almost equal use of both methods. Each has advocates. Baker and Ruback (1999), Liu, Nissim and Thomas (2002) and Agrrawal, Borgman, Clark and Strong (2010) all argue the harmonic mean is an improvement over the simple mean and median. Dittmann and Maug (2006) advocate the geometric mean and median (in conjunction with logarithmic error). The preferred averaging scheme can be assessed on two grounds: economic and statistical.

Economic interpretation

Agrrawal, Borgman, Clark and Strong (2010) demonstrate that, economically, the choice between the arithmetic and harmonic mean can be described in terms of the weights applied to a portfolio of peer companies. The arithmetic mean uses earnings as the weights, whereas the harmonic mean uses market values as the weight. So the harmonic mean assumes a portfolio comprised of an equal investment in each of the peer companies, whereas the arithmetic mean assumes a portfolio where the earnings of each peer company are given equal weight. This means the arithmetic mean is automatically giving more weight to high multiple companies in the portfolio.

Statistical

The statistical equivalent of the above economic interpretation is presented by Ditmann and Maug (2008) and Agrrawal, Borgman, Clark and Strong (2010), who both demonstrate that the Arithmetic Mean will always produce higher multiples than the Geometric Mean, which will always produce higher values than the Harmonic Mean[32]:

[32] They do this by talking the natural logarithm of each definition, and then using Jensen's inequality to demonstrate the above result

$$\overline{M}^{AM}_{comp,m} > \overline{M}^{GM}_{comp,m} > \overline{M}^{HM}_{comp,m} \qquad [3.10]$$

The arithmetic mean will always produce the highest market value estimate, and the harmonic mean will produce the lowest value. Expression 3.3 suffers from the problem that the error term is potentially a function of value, causing a correlation between the dependent variable and the error term. An estimating equation can be generated by dividing both sides by the dependent variable as follows[33]:

$$1 = \hat{M}\frac{Metric^{EV}_{comparable,m}}{V^{EV}_{comparable}} + \frac{\varepsilon_{target}}{V^{EV}_{comparable}} \qquad [3.11]$$

Constraining the second term to an expected value of zero, and applying the expectations operator gives:

$$1 - E\left[\hat{M}\frac{Metric^{EV}_{comparable,m}}{V^{EV}_{comparable}}\right] = E\left[\frac{\varepsilon_{target}}{V^{EV}_{comparable}}\right] = \qquad [3.12]$$

Solving for $\hat{M}$ gives the harmonic mean:

$$\widehat{M} = \frac{1}{E\left[\frac{Metric^{EV}_{comparable,m}}{V^{EV}_{comparable}}\right]} \qquad [3.13]$$

33 This follows Liu, Nissim and Thomas (2002), Baker and Ruback (1999), Beatty, Riffe and Thompson (1999) and Deng, Easton and Yeo (2010) also demonstrate the minimum variance properties of the harmonic mean estimator

Baker and Ruback (1999) find that the harmonic mean is empirically the closest to the minimum variance multiple, significantly outperforming the simple and weighted arithmetic average[34],[35].

The implications of this conclusion for my research question are significant. Using the arithmetic mean to calculate the multiple for peer companies results in the highest value for peers of the available alternative measures, thus leading to the highest possible estimate of any discount.

Distributional characteristics

Outliers

Outliers have most influence on the arithmetic mean. The harmonic and geometric means, both inherently adjust for outliers by their transformation of the underlying data. Under the practitioner model this is less of an issue, as selected outliers can be omitted, however in the context of empirical research selective omission introduces subjectivity. This is particularly relevant in the context of ratios, where they have a lower bound of zero. Setting an upper bound partially addresses this issue, however it also omits part of the sample, introducing bias into the calculation of a discount. FGJR (2011) report the loss of 81 out of 348 observations for EV/EBITDA and 217 out of 487 observations for EV/Sales multiples when they apply this procedure to a sample of private company sales.

Treatment of companies with negative incomes

Companies with negative incomes comprise around 20% to 30% of any sample and are generally omitted from most studies. Deng, Easton and Yeo

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[34] They also verify the assumption that the errors in Expression 3.6 are proportional to value

[35] Note that the estimate of $\widehat{\mathrm{M}}$ derived will be different to an ordinary least squares regression which would be minimising the mean squared pricing error.

(2010) include firms with negative incomes and find a decrease in valuation errors when valuations incorporate sales and book value, measures which are not normally negative. They do, however, find that the relative ranking of accuracy changes from that generally accepted in the literature, with EV to book value and EV to sales being the most accurate, in contrast with more usual conclusion that earnings based multiples are the most accurate.

3.3.1.2 Selecting the preferred financial indicator

The general consensus on ranking of financial indicators is that forecast earnings measures are preferred to historical earnings measures, which are preferred to book value which is preferable to sales. Deng, Easton and Yeo challenge this when allowance is made for negative income companies. This is noteworthy, for the sample in this research, and for Officer's sample, sales multiples were the most commonly available.

One problem with the simple multiples approach is how to reconcile different values derived using different multiples. One way to address this is to combine different multiples into a combined measure. This has the advantage of combining different dimensions of valuation, such as a multiple based on income, and one based on book value. Valuation accuracy is generally improved when measures are combined either by a simple weighting procedure, or using regression to determine weights (Penman (1998)). Valuation accuracy is further improved when allowance is made for an intercept term.

V_{target} is the average estimate of the target, based on combining value estimates using each multiple *m*, $V_{est,m}$:

$$V_{target} = \sum_{m=1}^{n} V_{est,m}\, w_m \qquad [3.14]$$

and w_m is the weight attributed to multiple *m*, with $\sum_{m=1}^{n} w_m = 1$. Setting *m*=1 corresponds with using a single multiple to value a company. Henschke and Homberg (2009) and Beatty et al (1999) use simple averages of several multiples. Weights can be determined using an arbitrary weighting procedure or empirically estimated (Penman, 1998). Penman (1998) develops an optimal weighting scheme. Henschke and Homberg (2009) show that using averages only improves accuracy when additional ratios are added to the Price/Book value. The accuracy of earnings ratios is unaffected.

3.3.1.3 Criteria for selecting peers

The use of averaging methods, as discussed in the previous section, relies on finding appropriate comparables. The simplest approach to selecting comparables is to select companies from the same industry. Liu et al (2002) find that using the entire sample of firms in an industry is better than using the entire cross section of firms in all industries. Stefan Henschke and Carsten Homberg (2009) Henschke and Homberg (2009) find that accuracy, defined as the absolute percentage prediction error, improves materially from matching on the basis of 1 digit SIC code to 4 digit SIC; using the 1 digit SIC code gives very similar estimates to just using market averages as the estimate.

However, recent research demonstrates that allowance for firm specific characteristics appears to materially improve valuation accuracy and has a material impact on the value of predicted multiples. The adjustment for firm specific characteristics can be made statistically (Henschke and Homberg, 2009). Alternatively adjustment can be made via selection of comparables on the basis of matching on characteristics.

Bhojraj and Lee (2002) show that accuracy in forecasting future multiples[36] is improved by using a closely matched group of comparable firms. These comparable firms are selected using a two step procedure. The first step is to estimate warranted multiples by regressing actual multiples against a number of value drivers as independent variables, measuring profitability,

[36] Note that this is different to most other studies which test valuation implied by multiple with actual valuation.

growth and risk. Specific variables include: industry adjusted profit margin, indicator variable for firms which have a negative industry adjusted profit margin, industry adjusted earnings forecast, book leverage, return on net assets, return on equity, and research and development expenditures. The second step involves selecting comparables using a filter to ensure each matches the target firm. The filters include industry membership, size and closenness based on the warranted multiple. This final filter incorporates the addition of firm specific characteristics. Including this final filter resulted in a doubling of R^2, in the case of the Enterprise Value to Sales ratio, and a trebling in the case of the Price to book ratio. Further evidence supporting this approach is provided by Cooper and Cordeiro (2008) and Henschke and Homberg (2009). Cooper and Cordeiro (2008) find that using a peer group of ten firms, selected on the basis of proximity of growth rate to that of the target, is just as accurate as using all firms in the industry; they conclude that it is more important to include comparable firms with growth rates close to those of the target firm, rather than simply adding firms so as to achieve larger sample size. Henschke and Homberg (2009) find that when they make adjustments to their comparables based on similarity of financial characteristics they achieve slightly better results than just using industry membership as the filter for inclusion in the peer group. They conclude, like Cooper and Cordeiro (2008), that selection of the peer group based on similarity of value related financial characteristics is more important than simply relying on industry membership. Henschke and Homberg (2009) show that selecting firms on the basis of 4 digit SIC codes gives a similar accuracy to using filters, however the number of target firms that can be matched to sufficient 4 digit comparables only applies in about one quarter of the sample.

3.3.2 Warranted Value using regression

Chapter 2 presented theoretical and empirical arguments to support the proposition that subsidiaries sold will be lower value than public market peers. Subsidiaries being sold are more likely to be poorly performing relative to other assets in a portfolio, or non- core. They are also likely to have lower growth options relative to other assets in the portfolio. These differences in characteristics are likely to cause variations in valuations. The Warranted Value approach facilitates the incorporation of asset specific variables into the valuation, and is therefore less reliant on finding excat peers, and is less affected by other issues involving the use of multiples. Using Expressions 3.3 to 3.6, it can be demonstrated the relationships between value and profitability are not always straightforward. To demonstrate, it is necessary to make some identifying restrictions to Expressions 3.3 to 3.6 to generate a more tractable form of model.

Rhodes-Kropf, Robinson and Viswanathan (2005) assume that expected future ROIC is a constant multiple of expected future discount rates, as follows: $(E_t(ROIC_t)=\lambda E_t \forall t>1)$. In the event of perfect competition, λ would equal 1, as the Return on Investment would equal the required return. In addition, assuming that book value is expected to grow at a constant rate over time, Expression 3.4 simplifies to:

$$EV_t = \alpha_{0t} + \alpha_{1t} IC_t \quad [3.15]$$

If λ=1 then α_{0t} = 0 and α_{1t} =1, reproducing the well known result that a business earning its cost of capital has a market value equal to Book Value. More generally, this model implies that value is determined by Book Value. To incorporate income into the model, Rhodes-Kropf, Robinson and Viswanathan (2005) make an alternative assumption, and simply let book value and net income grow at the same rate, allowing Expression 3.4 to be rewritten as:

$$EV_t = \alpha_{0t} + \alpha_{1t} IC_t + \alpha_{2t} Earnings_t \quad [3.16]$$

Following the procedure in Expressions [3.4] to [3.6], Expression [3.16] would be converted to a multiple by dividing EV_t by either one of the right hand side variables. Rhodes-Kropf, Robinson and Viswanathan (2005) convert to logs to account for skewness in the accounting data. They also allow for the inclusion of negative income firms by using absolute values for income, and an indicator variable for negative income targets. Allowing this expression to be estimated over time, *t*, and industries, *j*, gives the following specification of:

$$ln\left(EV_{jt}\right) = \alpha_{0,jt} + \alpha_{1,jt} ln\left(IC_{jt}\right) + \beta_{2,jt} ln(Earnings)^{+}_{jt} + \alpha_{3,jt} I_{(<0)} ln(Earnings)^{+}_{jt} + \varepsilon_{jt} \qquad [3.17]$$

$Earnings^{+}_{jt}$ represents the absolute value of earnings, while the fourth term includes an indicator variable equal to 1 for firms with negative income. The coefficients in these regressions will be proportional to discount rates and growth rates.

Rhodes-Kropf, Robinson and Viswanathan (2005) use this model to analyse the value impacts of public mergers and acquisitions. I propose to use this model to incorporate asset specific characteristics into the analysis. Expression 3.17 is estimated using a sample of public market acquisitions. The estimated value, rather than an estimated multiple, would then be estimated for each target using that target's relevant financial data. This estimated value can be described as the Warranted Value:

$$\widehat{WV}_{target} = e\exp(\ln\left(\widehat{EV}_{target}\right)) \qquad [3.18]$$

3.3.3 Estimating the discount

Having calculated the relevant value, the next question is to determine the accuracy of the method. Two error measures commonly used in the literature are the Percentage Error (which I will refer to as the *Percent Discount*) and the Log Error (which I will refer to as the *Ln Discount*):

Percent Discount:

$$e_{pct}(target) = \frac{\widehat{M}_{target,m}}{M_{comps,m}} - \qquad [3.19a]$$

Ln Discount:

$$e_{ln}(target) = \left(\frac{\widehat{M}_{target,m}}{M_{comps,m}}\right) \qquad [3.19b]$$

The bias of each measure, $E(e_{pct})$ and $E(e_{ln})$ is used as the estimate of the discount. The value for $\widehat{M}_{comps,m}$ is estimated using alternative averaging methods, described in Section 3.3.1. If values were estimated using regression models, as described in Section 3.3.2, then the discounts are calculated directly from the estimated value, $\widehat{WV}_{target}$, and the actual value, V_{target}:

Percent Discount:

$$e_{pct}(target) = \frac{\widehat{WV}_{target}}{V_{target}} - 1 \qquad [3.19c]$$

Ln Discount:

$$e_{ln}(target) = ln\left(\frac{\widehat{WV}_{target}}{V_{target}}\right) \qquad [3.19d]$$

Noting that $e_{pct}=exp(e_{ln})-1$, it can be seen that the two error, or discount, measures will give different results. Which is appropriate will, at least partly, depend on whether the user of the results prefers to give equal weight to dollar mispricings, which the Percent Discount does, or relative mispricings, which the

Ln Discount does[37]. Dittmann and Maug (2006) describe the upward bias in the Percent Discount method, however this is only correct if relative mispricings are accepted as the appropriate benchmark. It is also noteworthy that the Percent Discount gives equal treatment to dollar overvaluations and dollar undervaluations.

Dittmann and Maug (2006) extend Baker and Ruback's (1999) analysis and examine the joint decisions about the averaging method with the error measure. They demonstrate that, for errors measured in percentage terms, the following rankings will result under each of the averaging methods:

$$E\left(e_{pct}^{AM}\right) < E\left(e_{pct}^{GM}\right) < \left(e_{pct}^{HM}\right)E \qquad [3.20]$$ [38]

Arithmetic Mean will be biased upwards and will give the highest discounts. They conclude that, if the percent error method is being used, then harmonic mean has the least bias. However they demonstrate that the percent error method for calculating errors suffers from the deficiency that it fails to treat over and under valuations equally. One of the main objectives of this thesis is testing the robustness of reported results in Officer (2007), so both measures will be used.

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[37] A simple example illustrates. Assume the target has a value of 1, and two comparables have values of 0.5 and 1.5. Using the Percent Discount, the target would have discounts of -0.5 and 0.5 respectively, and an expected value of zero. Using the Ln Discount, gives discounts of -0.693 and 0.405, respectively and an expected value of -0.14.

[38] These results are the opposite signs to Dittmann and Maug (2006) as they have used the actual value in the denominator, whereas I have used the estimated value in the denominator. This is consistent with Officer (2007) and also consistent with the concept of measuring the discount relative to an external benchmark value.

3.4 Research Design

The empirical analysis in this chapter is directed at measuring two questons in relation to discounts on sales of subsidiary transactions. The first question is whether discounts exist, and the second is, if so, what range of values can be attributed to these discounts. This second question is important, as it is relevant for assessing the relative efficiency of asset sales as a means of corporate portfolio restructuring. The review of prior research identified key issues in the application of multiples methodology. Based on this analysis, I now evaluate the methodology used by Officer (2007) to estimate discounts, and describe the approach I adopt in the empirical analysis.

3.4.1 Estimating Discounts using alternative averaging methods

The empirical analysis is initially directed at calculating discounts using both percent errors and logarithmic errors, as follows:

$$Percent\ Discount = \frac{M_{tgt,m}}{\widehat{M}_{comps,m}} - 1$$

and

$$Logarithmic\ Discount = ln\left(\frac{M_{tgt,m}}{\widehat{M}_{comps,m}}\right)$$

Where M_{tgt} is the relevant multiple for the subsidiary transaction, and $\widehat{M}_{comps,m}$ is the average for the portfolio of comparable companies, calculated for each transaction. I use these measures of accuracy as estimates of discounts. These calculations assume that the portfolio of comparables, represented by $M_{comps,m}$ is an appropriate basis for valuing the target. Chapter 2 demonstrated arguments as to why this may not be the case. The Percent Error calculation follows Officer (2007) while the Logarithmic Discount is an alternative way to respond to skewness in the data.

Preferred averaging method for estimating $\widehat{M}_{comps,m}$

The Arithmetic Mean suffers from a number of issues, both conceptually and practically, when used to measure multiples. Most significantly, it will provide the highest estimates of discounts, particularly when used in conjunction with Percent Discount. I address this issue by calculating discounts for each of the averaging methods, namely the Arithmetic Mean (AM), Harmonic Mean (HM), Geometric Mean (GM) and Median, to test whether the choice of method affects results. These calculations are all presented in Expression 3.9. Each of the averaging methods were calculated using both simple and weighted averages. The results are similar for both, so only results for simple averages are reported. Results using weighted averages of comparables are reported in Appendix 3. In both cases the discounts are simple averages.

Treatment of outliers

It is necessary to address outliers in the arithmetic mean / percent approach because of the asymmetry in calculated discounts. Outliers can be addressed in a number of ways. First, Officer (2007) drops observations where the premium on the subsidiary sale is 1 or more. This is to maintain symmetry with the fact that the discount has a lower bound of -1[39].This is equivalent to excluding any transactions where the target multiple, M_{tgt}, is twice that of the public market peers, $M_{comps,m}$. The level 1 is selected to maintain symmetry with the lower bound of -1. There are two issues with this approach. FGJR (2011) cite the loss of power from the reduced sample size. More importantly, in economic terms, it is eliminating a potentially important subset of transactions. In so doing, it potentially introduces a bias towards finding the presence of discounts. Another issue is that the Officer (2007) method introduces a further bias, in that outlier public market transactions are still included in the

[39] Due to the private target value having a minimum bound of zero.

calculation of $M_{comps,m}$. So, if a public market transaction has a multiple that exceeds the peer portfolio by two times, it is still included in calculating $M_{comps,m}$, however if that same transaction was a private transaction, M_{tgt}, it would have been excluded from the sample. This potentially leads to a further tendency to overstate the discount (i.e make it more negative). A consistent approach would exclude public market comparable with premia in excess of 1. I have used this approach in the following analysis, so that for calculations of the arithmetic mean outliers in excess of 1 are omitted both in calculating the average multiple for public market peers and then when calculating the overall average discount for the sample. To test the impact of dropping observations I carry out tests which drop observations which are 5 and 20 times that of the average.

An alternative way to treat outliers is by truncation of extreme observations, and setting them at some pre-set level. I do this by calculating the 99 and 95 percentiles for each ratio over the whole sample, and winsorize any extreme observations at the 99 and 95 percentiles relevant for that particular multiple[40]. The advantage of this method is that it preserves all transactions, while reducing the distorting impact of extreme outliers. The third method for addressing outliers is to transform the data using the harmonic and geometric mean. The previous discussion highlighted how such measures reduce extreme observations. The fourth method is to use the median as the measure of central tendency, as it effectively ignores outliers. Finally, using the Ln Discount method also results in a more symmetrical distribution with less outliers. In this research I will demonstrate the effect of each of these methods.

The research also highlights the potential influence of companies with negative income. I specifically test for the impact that treatment of companies with negative incomes can have on results. I demonstrate that, when a sample

[40] I treat truncation as replacing extreme value with a preset value, whereas winsorisation replaces extreme values with a value equal to a pre-specified percentile.

relies predominantly on the Value to Sales ratio, negative income companies are included and, unless the targets and comparables have the same mix of positive and negative income companies, this can distort results.

Given the significance of these issues for my research question, I report results for each of these methods of addressing extreme observations.

Which ratios

Multiples used were the Deal Value to Sales ratio, the Deal Value to EBITDA, the Deal Value to Assets. This group comprises one of each major type of multiple. Deal Value is defined as the total value of consideration paid, and includes any publicly disclosed assumed liabilities. These multiples generally correspond to equity values.

Results are calculated for each of ratio individually, and an average discount was also calculated as the equal weighting of each ratio. Only 25% of transactions had all three ratios reported, while 50% had only the Deal Value to Sales ratio. Due to the reliance on the Deal Value to Sales ratio, I did not test using any other weighting methods.

Discounts

This disagreement on preferred averaging method is also reflected in disagreement on the preferred way of measuring discounts (or pricing errors). I address this by calculating discounts on private trade sales using each of the possible combinations described in the previous section. This will test the impact of the methodology in Officer (2007), who used only simple averages. In this thesis I present results for the following combinations of averaging method and discount calculation method: *Arithmetic Mean/Percent Discount* (AM/PC), *Harmonic Mean/Percent Discount* (HM/PC), *Harmonic Mean/Logarithmic Discount* (HM/Ln) and *Geometric Mean/Logarithmic Discount* (GM/Ln). The use of Arithmetic Mean/Percent Discount follows Officer (2007), while using Harmonic Mean/Percent Discount will demonstrate the impact of moving from arithmetic to harmonic mean. Using Harmonic Mean/Logarithmic Discount will demonstrate the impact of using the logarithmic error method, while the Geometric Mean/Logarithmic Discount represents the measure preferred by Dittmann and Maug (2006), as the best response to skewed data. I have not reported the Median measures, as they closely track the Geometric Mean results, with a correlation in excess of 0.9 in all cases. The conclusions are unchanged using either method.

Discounts are reported as negative values in the tables and in the discussion of results. A "larger" discount therefore means a "more negative" value.

3.4.3 Adjusting for asset specific characteristics

3.4.3.1 Estimating Value using Warranted value

Finally, the research suggests that multiples based valuation is enhanced if allowance is made for asset specific characteristics. This is achieved by either selecting comparable companies based on similarity of underlying value drivers, as identified in Expressions 3.3 to 3.6, or by using a cross sectional regression to directly estimate valuations based on underlying value drivers. I address this issue by using a cross sectional regression model following Rhodes-Kropf, Robinson and Viswanathan (2005), explained in Section 3.3.2. This model is used to estimate a Warranted Value, which uses the target's own income and book value. This estimate of Warranted Value is then used instead of the average of peer company multiples. The calculation is specified as follows:

$$Percent\ Discount = \frac{V_{tgt}}{WV_{tgt}} - 1$$

and

$$Logarithmic\ Discount = ln\left(\frac{V_{tgt}}{WV_{tgt}}\right)$$

V_{tgt} represents the actual transaction value for the target sale, extracted from the SDC data base. It is defined as the Total Value of consideration paid by the acquirer, excluding fees and expenses but including payments for all securities including equity and debt, including assumed liabilities. It is different to Rank Value which adds Net Debt to the Transaction Value. WV_{tgt} is the Warranted Value, equal to $exp(ln(\widehat{EV}_{tgt}))$. $\widehat{EV}_{tgt}$ is estimated by a cross sectional regression equation using the sample of public market comparables acquisitions[41]. The regression equation is of the form described in Expression 3.17:

$$ln(EV_i) = \alpha_{0,i} + \alpha_1 ln(IC_i) + \beta_2 ln(Earnings)_i^+ + \alpha_3 I_{(<0)} ln(Earnings)_i^+ + \varepsilon_i$$

This method will facilitate explicit allowance of companies with negative incomes. As previously noted, the coefficient terms α_1 and α_2 incorporate the impact of profitability, growth and cost of capital. The model was estimated using Ordinary Least Squares, and incorporated industry and yearly fixed effects.

3.4.3.2 Other asset characteristics

The Warranted Value method depends on subsidiary financial data which, as noted earlier, is not commonly available. In this section, therefore, I describe an approach for attributing asset specific characteristics to individual transactions, even though asset specific data is not available. I estimate three variables, namely size, segment profitability and an asset's leverage.

[41] Unlike the discounts, each public company is used without replacement

Size[42]

Transaction size is one item of asset specific information that is more widely available, and is generally included as a control variable. In this context *Transaction Size* is interpreted as a measure of asset maturity, and also as a measure of exit alternatives available to the target parent. A large scale transaction would have the option to exit via spin off or carve-out[43]. I would expect a positive relationship between size and discounts (i.e. larger transaction size would be associated with smaller discounts or larger premia). *Transaction Size* is measured for each transaction, *i*, as follows:

$$Size_i = ln(Deal\ Value_i) \qquad [3.21]$$

where *Deal Value*$_i$ is the transaction value used to calculate the multiples.

Segment profitability

If asset profitability is not available, one alternative is to attribute the profitability of the segment to which the asset belongs, to the asset in question. To do this, I matched the two digit SIC code of the subsidiary, as recorded in the SDC file, with the two digit SIC codes of the target parent segments. The assumption is that this was the segment from which the asset was sold.

I then calculated the *Return on Capital* for the relevant segment using segment financial data available in Compustat. *Return on Capital* was calculated using the following Compustat items for each relevant *target parent segment,s*:

[42] Descriptive statistics for all independent variables are included in Appendix 4. This is to facilitate easy reference as they are used in multiple chapters.

[43] Chen and Guo (2005) observe that spin offs and carve outs are generally larger than asset sale transactions.

$$ROC_s = \frac{PTIS_S}{IAS_S} \qquad [3.22a]$$

or, when $PTIS_s$ was unavailable:

$$ROC_s = \frac{ops_s}{ias_s} \qquad [3.22b]$$

$PTIS_s$ and OPS_s are Pre tax Income and Operating profit for each segment respectively, and can be regarded as the equivalent of Earnings before Interest and Taxes (EBIT). Ias_s is the Identifiable Total Assets for each segment. Where there was more than one segment with the same two-digit SIC code, the weighted average of both were calculated.

For each target segment with a matching transaction industry, *ind*, the Return on Capital was calculated for all firms in the same two digit SIC code, using the following Compustat items:

$$ROC_{ind} = \frac{EBIT_{ind}}{ICAPT_{ind}} \qquad [3.23]$$

Where $EBIT_{ind}$ is earnings before Interest and Taxes, and $ICAPT_{ind}$ is Invested Capital, defined as the sum of Long Term Debt + Short term Debt + Minority Interest+ Shareholder's Equity. This is the equivalent of Total Assets less Operating Liabilities. Industry Return on Capital was set as the median value for each industry with the same two digit SIC code as the selling segment. The relative profitability of the target segment was calculated by deducting the Industry Return on Capital from the target segment Return on Capital, as follows:

$$ROC\ Diff_i = ROC_s - Median(ROC_{ind}) \qquad [3.24]$$

A positive relationship between profitability and discount would be expected. An asset with higher industry profitability would be expected to be relatively valuable and therefore be sold at a lower (less negative) discount.

<u>Asset Debt Capacity</u>

In Chapter 2, the analysis of the breakeven discount, D_a, demonstrated that an asset's debt capacity can influence the acceptable sale price for that asset. If the asset is being sold for financing purposes, then the only substitute equity provided by that asset is the difference between the after tax sales proceeds and the asset's debt capacity. Consequently, If a target asset has a high debt capacity then selling that asset removes that target's debt capacity, reducing the amount of substitute equity available. Consequently any discount, which is incurred on the total transaction value, has a magnified impact as a percentage of the actual substitute equity raised. The analysis in Chapter 2 demonstrated that there should be a positive relationship between an asset's debt capacity and discounts. An asset with a high debt capacity will need to be sold at a lower (less negative) discount in order to breakeven.

To test for this, individual subsidiaries were matched with target parent segments, following the same procedure just described for Return on Capital. For each segment with a matching transaction, industry leverage was calculated by taking the median leverage of all firms in the same two digit SIC code, in the fiscal year preceding the announcement of the asset sale. Leverage was calculated using book value data derived from Computstat. Leverage was calculated as follows:

$$Leverage_i = \frac{Net\ Debt_i}{Total\ Assets_i} \qquad [3.25]$$

where:

Variable	Components	Compustat Item
Net Debt$_i$	Long Term Debt + Debt in Current Liabilities – Cash and Short Term Investments	DLTT + DLC - CHE
Total Assets$_i$	Total Assets	AT

This leverage was then assigned to the target asset in question.

Target Income Status

The earlier analysis demonstrated that the income status of the target appeared to have an impact on the reported discount, with targets with negative incomes selling at materially lower multiples. Although the sample size is considerably smaller, I have also included the *Target Income Status* as an independent variable in a separate set of regressions. This variable is assigned a value = 1 if the Target's EBIT in the Last Twelve Months was positive, and is assigned a value of zero if the target's EBIT in the Last Twelve Month's was negative. This variable is only assigned a value if target EBIT was reported in the SDC data base.

Multivariate Model

To test for a relationship between these variables and discounts, I ran the following multivariate regressions. The first regression includes Size, ROI Difference and Leverage, as follows:

$$Discount_i^d = \alpha_0 + \alpha_1 Size_i + \alpha_2 ROC\ Diff_i + \alpha_3 Leverage_i + u_i \qquad [3.26]$$

Where $Discount_i^d$ is the discount, *d,* calculated using the four methods previously outlined (Arithmetic Mean/Percent Discount, Harmonic Mean/Percent Discount, Harmonic Mean/Logarithmic Discount, Geometric

Mean/Logarithmic Discount) for each transaction $i.\alpha_0$ is the constant and α_1, α_2 and α_3 are the respective coefficients for the terms previously defined, and u_i is the error term with an expected value of zero.

The second regression also includes the Target's Income Status. It is run as a separate regression because of the smaller sample size available.

$$Discount_i^d = \alpha_0 + \alpha_1 Size_i + \alpha_2 ROC\ Diff_i + \alpha_3 Leverage_i$$
$$+ \propto_4 Tgt\ Income\ Status_i + u_i$$

[3.24]

Where Tgt Income Status$_i$ is an Indicator Variable, with a value of 1 if the target reported a positive EBIT in the twelve months prior to the transaction, and zero if it reported a negative income in the twelve months prior to the transaction.

The previous discussion highlighted the important impact that outliers can have on results, and also the impact that management of outliers can have on reported results. This is particularly noticeable using the Arithmetic Mean. Similar issues arise in the context of the regression analysis. Using Ordinary Least Squares with raw data can result in outliers having a significant influence on results. This is the case with the current sample, particularly using the Percent Discount method for the Arithmetic and Harmonic Mean. However using Dependent variables that have been managed, by either winsorising, truncating or censoring can produce bias in the Ordinary Least Squares regression. Following Leone et al (2014), I have used robust regression procedures to address this issue. The process of dropping observations (using Arithmetic Mean) or winsorizing (for harmonic and Geometirc Mean) resulted in different cutoff levels for each potential transaction because the actual cutoff was defined relative to the comparable for each transaction, which varied across transactions. Thus regression approaches for truncated or censored data were not considered appropriate.

The actual regression procedure used was the rreg routine in Stata. This routine commences by fitting a regression using OLS and then excluding any observations with a Cook's D > 1. It then initially uses Huber weights, followed by a bi-weight scheme, to weight individual observations, with lower weights ascribed to observations with larger residuals. Standard errors are calculated using the pseudo values approach described in Street, Carroll and Ruppert (1988). To assist maintain consistency with Officer (2007) I have included selected results in Appendix 5 based on using Ordinary Least Squares with the dependent variable being Arithmetic Discounts, where selected outliers have been dropped, or the Harmonic and Geometric Means, where the discounts have been winsorised at the 99th percentile, as described earlier.

3.4.4 Sample Transactions

Asset sale transactions are sourced from the Thomson Financial Mergers and Acquisitions (SDC) data base. These tests are carried out on a sample of US acquisitions, for announcement dates during the calendar years 1997 to 2009. Transactions were selected on the criteria that the target was identified as a subsidiary, and both the target parent and acquirer were public companies[44], with a United States nationality. Only completed transactions in excess of $50 million are included[45], and must have transaction multiples recorded on the SDC database. This restriction reduces the sample significantly however our analysis of the sample suggest the transactions are representative, a conclusion similar to Officer (2007). In light of concerns about the accuracy of this database (Barnes, Harp and Oler, 2013), transaction data for each subsidiary sale transaction was reviewed for correctness. Errors

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[44] Searches included both Target Immediate Parent and Target Ultimate Parent.

[45] Officer (2007) also included uncompleted transactions however it is difficult to justify including uncompleted transaction data, as any resulting discount or premium did not, in fact, eventuate so it is difficult to justify as a cost incurred by the target parent.

included misclassification of public / private status of transaction parties, inclusion of mergers and reverse takeovers. Companies in Chapter 11 were also excluded, to avoid the influence of financial distress on the sample. The final sample size was 339.

For each subsidiary sale transaction, comparable public market acquisitions in the same two digit SIC code were selected. Public market transactions must also have reported multiples but the SDC coverage of public transactions is virtually 100%. Matching is completed on the basis of industry sector, size and time period. Industry sector is matched using two digit SIC codes. Transactions with a minimum rank value of $50 million were collected, and were required to have an announcement date with plus or minus thirty months of each private sale and to be within plus or minus 60% of the ranking value of the private subsidiary sale, subject to only transactions with a ranking value of $50 million being included. Transaction sizes were not adjusted for inflation over the period. These criteria reduced the sample to 287 transactions.

Public market comparables are used with replacement, so some public market transactions are used multiple times. Ratios are based on the reported Deal Value divided by the relevant accounting metric.

3.4.5 Descriptive Statistics

Descriptive statistics for discounts are presented in Appendix 1, while Appendix 2 presents graphs of the discounts. These graphs demonstrate the significant impact that outliers have on the distribution. They also demonstrate the impact that the various methods of adjusting for outliers, namely dropping observations, winsorizing, using harmonic or geometric mean or using the Ln Discount have a significant impact on the shape of the distribution. They highlight the importance of, at least initially, using all approaches to understand the influence they have on reported discounts.

3.5 Results

3.5.1 Analysis of Arithmetic Mean

Table 3.1 presents results for an initial analysis of the Arithmetic Mean/Percent Discount procedure, in particular the impact of dropping (panel [A] and truncating (Panel [B]) outlier transactions. Discounts represent the simple average of the Deal Value to Sales ratio, Deal Value to EBITDA and Deal Value to Net Assets. Dropping observations where the premium exceeds 100% is equivalent to dropping transactions where the multiple exceeds the average for that transaction by two times. Table 3.1 shows the results if the maximum cut-off point is 2X, 5X and 20X, as well as results using the raw data. The results using raw data show an average premium, and a discount using the median. They suggest that using the Arithmetic Mean/Percent Discount does require some management of outliers.

The bolded results in Column [A], Row [D] correspond to the procedure in Officer (2007). They show a mean discount of 41.9% and a median discount of 52%, both directionally consistent with Officer (2007). Howeve,r if public market outliers are excluded on the same basis as subsidiary outliers (Column [B]), then the magnitude of discounts is reduced by nearly a third, but are still statistically significant. I consider that both public and private transactions should be treated consistently and therefore consider the treatment in Column [B] to be the most appropriate.

The second key result from this table is that the mean value for percent difference is sensitive to decisions about dropping observations, and that using a cut-off of 2X magnifies the size of reported discounts. This cutoff results in nearly 10% of the sample being dropped, losing the effect of larger premia from the sample. The third important result is that the sample median, for Arithmetic Mean/Percent Discount, is consistently a discount, in the order of 30%, under various procedures for managing the data.

Panel [B] shows the impact of truncating observations. Using truncated data results in an average premium using the mean, while statistically significant discounts are reported using the median. This preliminary analysis demonstrates that, using the Arithmetic Mean/Percent Discount method, the median consistently produces a discount in the order of magnitude reported by Officer (2007). However, using the sample mean, results are highly sensitive to the treatment of a relatively small number of outliers. In subsequent analysis, I will use the Arithmetic/Percent Discount results using the Officer (2007) methodology, adapted to apply similar treatment to public and private comparables.

3.5.2 Analysis of Harmonic and Geometric Means

Table 3.2 shows results using the harmonic and geometric means, showing the impact of truncating at the 99 and 95 percentiles. Dropping observations should be unnecessary, as each method is meant to adjust for the asymmetric distribution. For the harmonic mean, premia are reported for the raw data, as well as the truncated cases. These results obtain for both sample mean and sample median, and are statistically significant. Using the logarithmic discount reduces the levels of reported premia, but they are still statistically significant. The geometric mean and logarithmic discount combination result in discounts; however the sample mean is only statistically significant when the data is truncated at the 95 percentile. Using the sample median, results in statistically significant discounts in the order of 12%.

3.5.3 Analysis of Individual Multiples

Table 3.3 presents results for the different multiples (Deal Value to Sales, Deal Value to EBIT and Deal Value to Net Assets) used in calculating the average discounts used in the previous analysis. For ease of comparison, column [D] in Table 3.3 corresponds to the relevant results in Table 3.1 (Arithmetic Mean) and Table 3.2 (Harmonic and Geometric Mean). The first observation is that only approximately one-third of the sample has a Deal Value to EBIT or Deal Value to Net Assets ratio. Consequently, the results are dominated by the Deal Value to Sales ratio. The analysis demonstrates that using the simple average is a fair representation of the results for each individual combination of ratios and discount method. For the Arithmetic Mean/Percent Discount, all ratios and the average show a premium for both sample mean and sample median. For the Harmonic Mean (both Percent and Logarithmic Discount) ratio, all ratios and the average show a premium. For the Geometric Mean / Logarithmic Discount, the average of the multiples is a discount, using the sample median. This result is attributable to the Deal Value to Sales ratio; all other measures are not statistically different to zero.

3.5.4 Treatment of Negative Income targets

Section 3.3 highlighted the issue of negative income targets. The influence of negative income targets in this particular sample is potentially significant, due to the reliance on the Deal Value to Sales ratio. Along with the Deal Value to Net Assets ratio, this multiple can still be sensibly calculated for negative income targets. Consequently, negative income targets remain in the sample. Given the potential significance of negative income targets, I have calculated discounts using two sub-samples.

First, discounts are calculated using only private targets who reported positive EBIT in the previous twelve months. For the public market comparables, only public targets with positive incomes were included. The results are summarised in Table 3.5, Column [B], which reports discounts based on the average of the three ratios. For ease of comparison, Column[A] includes the relevant results from Table 3.1 and Table 3.2. The sample size is reduced due to the fact that many private targets do not have disclosed financial data. Consequently, the difference between the two results is the difference between targets who reported prior year positive income, relative to targets who reported negative income, or did not report any financial data. This subsample shows materially different results. For the Arithmetic Mean/Percent Discount, discounts are still present, but are materially smaller. For the Harmonic Mean, for both Percent Discount and Logarithmic Discount, premia are still present, and larger than those for the whole sample. Using the Geometric Mean/Logarithmic Discount resulted in discounts for the whole sample, using both sample mean and median however, for the subsample of positive income targets, the Geometric Mean results in discounts which are not statistically different to zero. These conclusions apply whether using sample means or sample medians.

For the second test, discounts were calculated on sub-samples of positive income and negative income targets, using the Deal Value to Sales ratio. Discounts are reported in Table 3.4. Column [C] for positive income targets only, and column [D] for negative income targets. Again, in both cases the same criteria were applied to both private targets and public market comparables[46]. The overall results demonstrate a material difference between the two sub-samples. For the Arithmetic Mean/Percent Discount, discounts for the positive income sub-sample are not statistically different from zero, for either sample mean or median. For the negative income sub-sample, both sample means and medians show materially larger discount. For the Harmonic and Geometric Means, the positive income sub-sample shows statistically significant premia using both sample means and medians. For the negative income sample, results are not statistically different to zero. Although the sample is smaller, this analysis suggests that the income status of the target has an impact on discounts, and that targets with negative incomes appear to sell at materially lower multiples than positive income targets.

[46] Therefore the targets with negative incomes are only compared to public market targets with negative incomes.

3.5.5 Conclusions on the existence and magnitude of discounts

This analysis leads to several conclusions. First, the presence of multiples is dependent on the measurement procedures adopted. Using the Arithmetic Mean, discounts are only reported when extreme observations are dropped from the sample. The analysis of the Arithmetic Mean results suggests it is problematic about what conclusions to draw using the sample mean, as it would require a judgement about the value of the extreme observations. While the sample median consistently shows discounts at approximately 30%, the median is still influenced by the skewed distribution. Excluding the extreme observations means that the generality of the conclusion reached by Officer (2007) is limited.

The second conclusion is that, using the other methods for calculating discounts, it is not possible to draw a strong conclusion that discounts exist. For the Harmonic Mean, under either method for calculating the discount, premia are actually present. Using the Geometric Mean, discounts are only reported for the sample mean when observations are truncated at the 95th percentile, while for the sample median, discounts of 12% are recorded. Both of these results are largely attributable to the influence of the Deal Value to Sales ratio. However, even If correct, this level of discount is more compatible with a scenario that the discounts simply reflect the reasonable transactions costs of other alternatives.

Finally, it appears that the income status of the target has an influence on reported discounts. Subsidiary targets with positive incomes are sold at a premium to public market comparables with positive income, while subsidiary targets with negative income targets appear to be sold at prices no different to public market comparables who also have negative incomes. The only exception to this conclusion obtains with the Arithmetic Mean/Percent Discount, where positive income targets have zero discounts, and negative income targets have large discounts. Under all cases, positive income subsidiary targets appear to sell at higher multiples than negative income subsidiary targets. The sensitivity of results to income status also suggests the benefits of attempting to adjust for asset specific characteristics. I address this in the next section.

Based on this analysis, I conclude that the results reported in Officer (2007) are ambiguous, and they do not support an unequivocal statement that such discounts exist. This analysis also demonstrates that any research into discounts should include robustness checks as to the choice of methodology and sample screening procedures.

The treatment of outliers is clearly important. For the econometric analysis in this thesis I use the raw discounts and robust regression procedures to address the problem of outliers. However to test for consistency with the work of Officer (2007) I have also used Ordinary Least Squares methodology, but with the discounts adjusted for outliers. The following procedures have been used. For the Arithmetic Mean/Percent Discount I use the sample which excludes transactions with multiples in excess of two times the relevant transactions. This is the adjusted Officer (2007) methodology, presented in Table 3.1, Column [B], Row [D]. For the other measures I use the sample where multiples for both private and public transactions are truncated to the 99^{th} percentile for the whole sample. These alternative results are presented in Appendix 5, and will be described in subsequent chapters.

In the next section, I examine results when I adjust for asset specific differences.

Table 3.1
Arithmetic Mean/Percent Discount

Means and medians for discounts calculated using different criteria for excluding extreme transactions. For each transaction, an average of peer group multiples is calculated using the arithmetic mean. Discounts are calculated as the percentage difference between peer group average and private transaction multiple. Mean is the simple average of discounts for the sample. Median is the median of the sample. Discounts are calculated as the average of Deal Value to Sales ratio, Deal Value to EBIT ratio and Deal Value to Net Assets ratio. Numbers in brackets under Mean are standard errors and under Median is the z-statistic for Median. Testing for differences to zero were carried out using a two-tailed t-test for means and Wilcoxon signed rank test for medians. Significant differences at 1%, 5% and 10% levels are represented by ***,** and * respectively.

Panel A: impact of dropping observations

		Observations	[A] Only private sale outliers excluded		[B] Public market acquisition outliers also excluded	
			Mean	Median	Mean	Median
[A]	Raw data	285	53.2742 (35.1329)	-0.3599*** (-3.713)	53.2742 (35.1329)	-0.3599*** (-3.713)
[B]	Drop if multiple is 20X average	275	-0.0116 (0.0775)	-0.4234*** (-5.326)	0.0114 (0.0774)	-0.3599*** (-4.826)
[C]	Drop if multiple is 5X average	268	-0.2135*** (0.0459)	-0.4371*** (-6.775)	-0.1505*** (0.0454)	-0.3357*** (-5.543)
[D]	Drop if multiple is 2X average	251	-0.4187*** (0.0261)	-0.5210***(-11.246)	-0.2757*** (0.0266)	-0.3258*** (-8.678)

Table 3.1 (cont)
Arithmetic Mean/Percent Discount

Means and medians for discounts calculated using different criteria for excluding extreme transactions. For each transaction, an average of peer group multiples is calculated using the arithmetic mean. Discounts are calculated as the percentage difference between peer group average and private transaction multiple. Mean is the simple average of discounts for the sample. Median is the median of the sample. Discounts are calculated as the average of Deal Value to Sales ratio, Deal Value to EBIT ratio and Deal Value to Net Assets ratio. Numbers in brackets under Mean are standard errors and under Median is the z-statistic for Median. Testing for differences to zero were carried out using a two-tailed t-test for means and Wilcoxon signed rank test for medians. Significant differences at 1%, 5% and 10% levels are represented by ***,** and * respectively.

Panel A: impact of dropping observations						
		Observations	[A] Only private sale outliers excluded		[B] Public market acquisition outliers also excluded	
			Mean	Median	Mean	Median
Panel B: impact of truncating observations						
[E]	Truncate at 99 percentile	285			3.1884** (1.4732)	-0.3368*** (-3.244)
[F]	Truncate at 95 percentile	285			0.7722** (0.3162)	-0.3101*** (-2.639)

Table 3.2
Discounts using Harmonic and Geometric Means

Means and medians for discounts calculated demonstrating effect of truncating observations. For each transaction, an average of peer group multiples is calculated using the harmonic or geometric mean. Discounts are calculated either as percentage difference between peer group average and private transaction multiple,or the natural logarithm of the ratio of private transaction multiple to peer group average. Mean is the simple average of discounts for the sample. Median is the median of the sample. Discounts are calculated as the average of Deal Value to Sales ratio, Deal Value to EBIT ratio and Deal Value to Net Assets ratio. Numbers in brackets under Mean are standard errors and under Median is the z-statistic for Median. Testing for differences to zero were carried out using a two-tailed t-test for means and Wilcoxon signed rank test for medians. Significant differences at 1%, 5% and 10% levels are represented by ***,** and * respectively.

		Observations	[A] Harmonic Mean/Percent Discount		[B] Harmonic Mean/Logarithmic Discount		[C] Geometric Mean/Logarithmic Discount	
			Mean	Median	Mean	Median	Mean	Median
[A]	Raw Data	285	61.0003* (35.7614)	0.2254*** (5.651)	0.3032*** (0.0910)	0.1418** (2.176)	-0.0175 (0.0938)	-0.1261*** (-3.065)
[B]	Truncate at 99 percentile	285	4.3596*** (1.5046)	0.2254*** (5.652)	0.2120*** (0.0716)	0.1418** (2.166)	-0.1039 (0.0743)	-0.1261*** (-3.019)
[C]	Truncate at 95 percentile	285	1.5689*** (0.3311)	0.2254*** (5.686)	0.1577** (0.0612)	0.1436** (2.151)	-0.1368** (0.0636)	-0.1187*** (-2.914)

Table 3.3
Discounts for different multiples

Discounts on sale of subsidiaries relative to comparable public market transactions. Discounts are calculated using Deal Value ("DV") to Sales, DV to EBIT, DV to Assets and DV to Income, where available. A negative value represents a discount relative to average of public market comparables. Panel A shows results for calculating discount using percent error, and Panel B shows discount calculated using logarithmic error. Discounts calculated using the Arithmetic Mean are calculated by excluding any acquisition premia in excess of 100% and excluding comparables where Peer Acquisition multiple > 2*Average. Discounts calculated using the harmonic or geometric mean are winsorized at the 99% percentile. Numbers in brackets under Mean are standard errors and under Median is the z-statistic for Median . Sample size is shown in in square brackets in Median column. In the mean and median columns ***,** and * denote whether the mean or median is significantly different from zero at 1%, 5% or 10% levels (respectively), using a two-tailed t (mean) or Wilcoxon (median) test. Results in Column [D] correspond to those reported in Table 3.1 for Arithmetic Mean and Table 3.2 for Harmonic and Geometric Mean.

Comparables measured by:	[A] Deal Value to Sales		[B] Deal Value to EBIT		[C] Deal Value to Assets		[D] Average	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Panel A: Discount measured by % discount								
Arithmetic	-0.2985*** (0.0314)	-0.3936*** (-8.051) [228]	-0.2229*** (0.0600)	-0.3039*** (-3.500) [76]	-0.2484*** (0.0484)	-0.3464*** (-4.485) [85]	-0.2757*** (0.0267)	-0.3258*** (-8.678) [251]
Harmonic	5.4260*** (2.0883)	0.1551*** (4.337) [273]	3.794*** (1.3261)	-0.2386*** (3.529) [99]	2.5135*** (0.8549)	0.1955*** (3.322) [113]	4.3596*** (1.5046)	0.2254*** (5.652) [285]

Table 3.3 (cont)
Discounts for different multiples

Discounts on sale of subsidiaries relative to comparable public market transactions. Discounts are calculated using Deal Value ("DV") to Sales, DV to EBIT, DV to Assets and DV to Income, where available. A negative value represents a discount relative to average of public market comparables. Panel A shows results for calculating discount using percent error, and Panel B shows discount calculated using logarithmic error. Discounts calculated using the Arithmetic Mean are calculated by excluding any acquisition premia in excess of 100% and excluding comparables where Peer Acquisition multiple > 2*Average. Discounts calculated using the harmonic or geometric mean are winsorized at the 99% percentile. Numbers in brackets under Mean are standard errors and under Median is the z-statistic for Median . Sample size is shown in in square brackets in Median column. In the mean and median columns ***,** and * denote whether the mean or median is significantly different from zero at 1%, 5% or 10% levels (respectively), using a two-tailed t (mean) or Wilcoxon (median) test. Results in Column [D] correspond to those reported in Table 3.1 for Arithmetic Mean and Table 3.2 for Harmonic and Geometric Mean.

Comparables measured by:	[A] Deal Value to Sales		[B] Deal Value to EBIT		[C] Deal Value to Assets		[D] Average	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Panel B: Discount measured by logarithm								
Harmonic	0.2446*** (0.0804)	0.1442** (2.042) [273]	0.3195** (0.1365)	0.2140** (2.136) [99]	0.2619** (0.1133)	0.1786* (1.826) [113]	0.2120*** (0.0716)	0.1418** (2.166) [285]
Geometric	-0.1123 (0.0821)	-0.1674*** (-3.078) [273]	0.0322 (0.1407)	-0.0257 (-0.429) [99]	0.0316 (0.1150)	-0.0386 (-0.400) [113]	-0.1039 (0.0743)	-0.1261*** (-3.019) [285]

Table 3.4
Average discounts adjusting for target income status

This table shows discounts on sale of subsidiaries relative to comparable public market transactions, where income data is available for the subsidiary target. A negative value represents a discount relative to average of public market comparables. Discounts using Arithmetic Mean are calculated by excluding any acquisition premia in excess of 100% and excluding comparables where Peer Acquisition multiple > 2*Average. Discounts using Harmonic and Geometric Mean have been winsorized at the 99th percentile. Panel A shows results for calculating discount using percent error, and Panel B shows discount calculated using logarithmic method. Columns [A] and [B] show results average discount calculated using DV to Sales, DV to EBITDA, DV to assets and DV to Income, where available. Column [A] shows results for the whole sample, regardless of whether target has reported income data. These results are reproduced from Table 3.1 (for Arithmetic Mean) and Table 3.2 (for Harmonic and Geometric Mean). Column [B] shows results for targets who report positive income. Columns [C] and [D] show discounts calculated using only the Deal Value to Sales Ratio. Column [C] shows results for targets reporting positive income. Column [D] shows result for targets reporting negative income. Targets who do not report any income results are excluded from results in Columns [B], [C] and [D]. Sample size is shown in in square brackets in the Median column. Numbers in brackets under Mean are standard errors and under Median is the z-statistic for Median.In the mean and median columns ***,** and * denote whether the mean or median is significantly different from zero at 1%, 5% or 10% levels (respectively), two-tailed t-test for means and Wilcoxon signed rank test for medians.

Results on next page

Table 3.4 (cont) **Average discounts adjusting for target income status**								
	Positive Income Targets only				Positive and negative Income targets			
	[A]		[B]		[C]		[D]	
Comparables measured by:	Whole sample results (Tables 3.1 & 3.2)		Positive Income Targets Only		Deal Value To Sales for Positive Income targets		Deal Value to Sales for Negative Income targets	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Panel A: Discount measured by % discount								
Arithmetic	-0.2757*** (0.0266)	-0.3258*** (-8.678) [251]	-0.1280*** (0.0418)	-0.1449*** (-3.071) [89]	-0.0672 (0.0563)	-0.1330 (-1.387) [73]	-0.6185*** (0.0809)	-0.6547*** (-3.464) [16]
Harmonic	4.3596*** (1.5046)	0.2254*** (5.651) [285]	3.4140*** (1.0252)	0.6460*** (6.105) [99]	3.2310*** (0.9426)	0.5942*** (5.854) [96]	23.0159 (14.0420)	-0.3569 (0.438) [22]
Panel B: Discount measured by logarithm								
Harmonic	0.2120*** (0.0716)	0.1418** (2.166) [285}	0.4221*** (0.1059)	0.3215*** (3.857) [99]	0.6177*** (0.1149)	0.4664*** (4.886) [96]	0.2118 (0.5041)	-0.4415* (-0.308) [22]
Geometric	-0.1038*** (0.0743)	-0.1261*** (-3.019) [285]	0.1501 (0.1081)	0.0536 (0.834) [99]	0.3096*** (0.1088)	0.2278** (2.434) [96]	-0.1968 (0.5273)	-0.9016 (-1.023) [22]

3.5.3 Incorporating asset specific characteristics.

3.5.3.1 Discounts calculated using Warranted Value

I now examine the impact of allowing for asset specific characteristics, using the model specified in Expression 3.17. The model was originally run using all public market targets[47]. The estimation was limited to using public market takeover targets, rather than all listed public companies, to incorporate any takeover premia that may be present in the takeover market. Using listed companies would under estimate value.

Results are summarised in Table 3.5. Model [1] shows results for regressing *Value* against *Book Value* only, while Model [2] shows results for regressing *Value* against the *Income* variable and the *Negative Income Indicator* only. Model [3] shows results for running the model combining *Book Value,* the *Income Variable* and the *Negative Income Indicator*. Model [4] incorporates including *industry fixed effects*, defined as the two digit SIC code. Model [5] shows results running *yearly fixed effects*.

The regressions have high explanatory power, in line with those for Rhodes-Kropf, Robinson and Viswanathan (2005). The model as specified has an R^2 of 60%, and the two fixed effects versions contribute some improvement. The coefficient estimates make intuitive sense. All of the variables are significant, the only exception being the *Income* variable in Model [5], the Yearly Fixed Effects model.

In the simple linear regression with Ln(Book value) as the only coefficient (Model 1), the Book Value coefficient is 0.539. This implies that increases in the book value of assets result in an increase in market value, but

[47] Duplicate public market targets were deleted.

at a declining rate[48]. Including Income variables (Model 3), results in a reduction in the book value coefficient to 0.146. This decline is consistent with Rhodes-Kropf, et al (2005). In both cases the coefficient values are lower than in than in Rhodes-Kropf, et al (2005). In Model [2], which includes only the Income variables, the coefficient value for Income is 0.652, while in Model [3] it is 0.538. These coefficient values are higher than Rhodes-Kropf, et al (2005). In Model [3] the Income coefficient is greater than the book value coefficient. This should be expected as the Income coefficient should reflect an income capitalisation multiple, which would generally exceed a book value multiple. The coefficient value for the indicator variables can be interpreted as the percent change in value of the business. The coefficient for the negative income indicator is negative, implying that companies with negative income suffer a valuation discount, in the order of 10% to 16%, across all the models. This further highlights the need to appropriately control for target income status when calculating discounts.

When allowance is made for industry effects, Model [4], the explanatory power improves marginally,. and each variable remains significant. Of the 32 industry dummy variables, 19 were significant at the 5% level or better. Coefficient values ranged between 0.53, for SIC code 28 (Chemicals and Applied Products), to -1.19 for SIC code 60 (Depository Institutions). Allowing for year effects, in Model [5], has no discernible on explanatory power, coefficient values or significance levels, as compared to Model [3].

For each subsidiary sale with financial data available in SDC, Warranted Value was estimated using the "sample-wide" model (Column [3]), and the industry fixed effects model (Column [4]). Discounts are calculated for each transaction using the Percent Discount and the Logarithmic Discount. Table 3.6 shows discounts for the sample using the *Warranted Value / Percent Discount*

[48] In this model, market values and book values are both expressed as natural logarithms.

and *Warranted Value / Logarithmic Discount* methods[49]. The sample means and median for the sample-wide model results in premia, but are not statistically different to zero. The sample mean for the industry fixed effects model is a statistically significant premium using *Percent Discount*, and the sample median is statistically insignificant from zero. The conclusion is that, when allowance is made for asset specific financial characteristics, and industry membership, there is no evidence of discounts.

Table 3.7 presents comparisons of the discounts calculated using multiples and a number of alternative averaging methods, and those calculated using *Warranted Value*. This subsample is limited to using transactions where financial data is available for the target subsidiary in the SDC database. The results for means and medians of this subsample of transactions are broadly in line with the whole of sample results reported earlier. Specifically, for discounts calculated using multiples, the Arithmetic Mean results in the largest discounts, and the Harmonic Mean results in premia. These are consistent with the results reported in Table 3.3. In this subsample, geometric mean results in premia which are not significantly different to zero. These results differ to those in Table 3.3, where the geometric mean resulted in discounts, albeit smaller than those calculated using the Arithmetic Mean. For discounts calculated using Warranted Values, means result in premia, while medians using the fixed effects model result in discounts. Again, these are consistent with results reported in Table 3.6. Based on this analysis I conclude that the subsample used to undertake a matched comparison of the two methods is representative of the larger sample. In all cases the Warranted Value method produces premia although, again, these are statistically insignificant from zero, except for the Harmonic Mean / Logarithmic Discount combination,

[49] The sample size is slightly larger than for the averaging methods because some subsidiary sales that did not have matching public market comparables can be included in these calculations because they do not rely on industry specific matching.

Using the Warranted Value approach allows the incorporation of asset specific characteristics into the calculation of a benchmark target valuation. When using multiples to calculate the benchmark, allowing for asset specific characteristics is achieved by selecting comparable companies that have a similar profile on selected characteristics. This is a more subjective method, and does not allow for the quantitative adjustments for differences in characteristics that can be achieved by use of a regression model[50].

There are two conclusions to draw from this analysis. First, when allowance is made for asset specific characteristics in the calculation of Warranted Value, .there appears to be no evidence of discounts. Second, making specific allowance for asset specific characteristics produces results that are significantly different to those calculated using the *Arithmetic Mean* and *Harmonic Mean* averaging methods. This analysis suggests the Warranted value approach is a viable alternative to the traditional use of multiples methodology.

[50] Although refer to Henschke and Homberg (2009) for an effort at making such adjustments. Section 3.5.3.2 following also attempts to incorporate asset.

Table 3.5
Output for regression equation to estimate Warranted Value

This table presents results for alternative models used to test relationship between the actual value of public takeover targets and financial characteristics of each target. Alternative models are based on Expression 3.13. The sample comprises all public market comparable targets over the period 1997 to 2009, and were extracted from the SDC Platinum Database. Independent variable is the natural logarithm of Transaction Values defined as Total consideration paid by the acquirer excluding fees and expenses. Book Value is the natural logarithm of Total Assets, and Income is the natural logarithm of Net Income. Negative Income Indicator has a value of 1 if the target company had negative income. Industry fixed effects refers to the 2 digit SIC code of each target. Yearly fixed effects refers to the calendar of the announcement of the transaction.. ***,**,* indicate significance at the 1, 5 and 10 percent levels respectively. The first number in each row is the coefficient estimated using Ordinary Least Squares, and the bottom number is the robust standard error. Model [1] and Model [2] test for the effect of book value of assets, and income variables, respectively. Model [3] corresponds to Expression 3.13, Models [4] and [5] include industry and year fixed effects respectively.

Models	[1]	[2]	[3]	[4]	[5]
Constant	2.759***	4.069***	3.517***	2.360***	3.557***
Book value	0.539*** (0.013)		0.146*** (0.018)	0.500*** (0.026)	0.143*** (0.018)
Income+		0.652*** (0.013)	0.538*** (0.021)	0.283** (0.022)	0.538 (0.020)
Negative Income indicator		-0.162*** (0.018)	-0.111*** (0.019)	-0.128*** (0.016)	-0.108*** (0.018)
Industry effects	No	No	No	Yes	No
Year effects	No	No	No	No	Yes
Observations	2901	2854	2852	2843	2852
R^2	0.42	0.58	0.59	0.72	0.61

Table 3.6
Discounts using Warranted Value

Warranted Value for each subsidiary target is calculated using financial data for each subsidiary trade sale available in SDC database. Warranted Value is estimated using the regression models from Table 3.5, which were estimated using public market takeover targets. Results only include subsidiary targets that have financial data available in the SDC Database. Percent Discount is [(Actual Value$_{tgt}$/Warranted Value$_{tgt}$)-1], and Logarithmic Discount is Ln(Actual Value$_{tgt}$/Warranted Value$_{tgt}$).The results under the columns headed Sample wide model show discounts where the Warranted Value for each subsidiary target is calculated using Model [3] from Table 3.5. This includes only target book value of assets, income and an indicator variable set to 1 if income is negative. The results under the columns headed Industry Fixed Effects show discounts where Warranted Value is calculated using Model [4] from Table 3.5, which additionally includes industry fixed effects. Industry membership is defined by the 2 digit SIC code of the subsidiary target. Sample size is shown in the right hand column. Standard errors are in round brackets in the mean column, z statistics in ropund brackets in the median column. Results of t-test (means) and Wilcoxon signed-rank test (medians) for difference from zero are presented by ***, ** and * at the 1%, 5% and 10% levels respectively.

		Sample wide model (model [3] from Table 3.5)		Industry Fixed Effects model (model [4] from Table 3.5)		Sample Size
		Mean	Median	Mean	Median	
[A]	Warranted Value/Percent Discount	7.2801 (5.1246)	0.0380 (1.386)	9.2188* (4.884)	-0.1119 (0.248)	125
[B]	Warranted Value / Logarithmic Discount	0.1097 (0.1161)	0.0372 (0.004)	0.0764 (0.119)	-0.1186 (-1.024)	125

Table 3.7
Comparison of Discounts calculated using Warranted Value and Multiples

This table compares discounts calculated using multiples, as presented in Tables 3.1 through 3.4, with discounts calculated using estimates of Warranted Value, as presented in Table 3.6. Warranted Value is estimated using the regression models from Table 3.5. Both calculations only include subsidiary trade sales where financial data for each target subsidiary is available in SDC database. For each transaction, comparable multiples are based on the average of Deal Value to Sales, Deal Value to EBIT and Deal Value to Net Assets ratios when available for each transaction. Discounts calculated using multiples are have been calculated using combinations of averaging methods (arithmetic, harmonic and geometric means) and discount calculation (percent discount and logarithmic). Discounts using Arithmetic Mean are calculated by excluding any acquisition premia in excess of 100% and excluding comparables where Peer Acquisition multiple > 2*Average. Discounts using Harmonic and Geometric Mean have been winsorized at the 99th percentile. Standard errors are in round brackets in the mean column, z-statistics for testing whether median equals zero are in round brackets in the median column. Sample size is in square brackets in the Differences in means column. Differences in means (medians) column has standard error (z-statistic) in round brackets; Significance tests for differences from zero for means, medians and Differences in means and medians at the 1%, 5% and 10% levels are represented by ***, ** and * respectively, using two-tailed t-test for means and Wilcoxon signed rank test for medians

		Sample wide model (model [3] from Table 3.5)				Industry Fixed Effects model (model [4] from Table 3.5)			
		Mean	Differences in means	Median	Differences in medians	Mean	Differences in means	Median	Differences in medians
[A]	Arithmetic Mean / Percent Discount	-0.2435*** (0.0419)	-0.7957*** (0.2360)	-0.2550*** (-5.030)	-0.2856*** (-4.172)	-0.2435*** (0.0419)	-0.7707** (0.4421)	-0.2550*** (-5.030)	-0.1031*** (-3.107)
	Warranted Value / Percent Discount	0.5522** (0.2360)	[95]	0.0307 (0.735)		0.5272 (0.4445)	[95]	-0.1519	

Table 3.7 (cont)
Comparison of Discounts calculated using Warranted Value and Multiples

		Sample wide model (model [3] from Table 3.5)				Industry Fixed Effects model (model [4] from Table 3.5)			
		Mean	Differences in means	Median	Differences in medians	Mean	Differences in means	Median	Differences in medians
[B]	Harmonic Mean / Percent Discount	5.2656** (2.1251)	-3.1183 (4.2813)	0.4255*** (4.838)	0.3844*** (3.026)	5.2656** (2.1251)	-5.6182 (4.3457)	0.4255*** (4.838)	0.5348*** (4.432)
	Warranted Value / Percent Discount	8.3839 (6.0948)	[105]	0.0411* (1.696)		10.8838** (5.8050)	[105]	-0.1093 (0.232)	
[C]	Harmonic Mean / Logarithmic Discount	0.3397** (0.1209)	0.1786** (0.0883)	0.1685** (2.354)	0.1283* (1.837)	0.3397*** (0.3397)	0.2403*** (0.0794)	0.1685** (2.354)	0.2843*** (3.831)
	Warranted Value / Logarithmic Discount	0.1610 (0.1256)	[105]	0.0402 (0.366)		0.0993 (0.0993)	[105]	-0.1158 (-0.887)	
[D]	Geometric Mean / Logarithmic Discount	0.0367 (0.1228)	-0.1244 (0.0915)	-0.0667 (-0.660)	0.1069 (-1.578)	0.0367 (0.1228)	-0.0627 (0.0799)	-0.0667 (-.660)	0.0491 (-0.161)
	Warranted Value / Logarithmic Discount	0.1610 (0.1256)	[105]	0.0402 (0.366)		0.0993 (0.1376)	[105]	-0.1158 (-0.887)	

3.5.3.2 Other asset specific characteristics

The final analyses test for a relationship between selected other asset specific variables, namely Transaction Value (*Size*), Industry Adjusted Profitability (*ROC Diff$_i$*) and Asset Leverage (*Leverage$_i$*). The latter two values are attributed to the asset in question by assigning to each sold subsidiary the relevant value of profitability or leverage for the segment from which the subsidiary was assumed to be sold.

The results for this analysis are presented in Table 3.8. These variables were tested using the multivariate regression model specified in Expression 3.25.

For all of the models, the coefficients for each of the variables are statistically significant, generally at the 5% or 1% level of significance. The coefficients for *Size* and *Leverage* are in the expected direction, with both exhibiting a positive relationship. For transactions with higher transaction values, or with higher leverage, the discount gets lower (less negative). The coefficients for both variables appear to be economically significant. For *Size*, using the Logarithmic Discount versions of the models, a one standard deviation change in Transaction Size is associated with a reduction (less negative) in discount of 0.13, while for *Leverage*, a one standard deviation change in Leverage corresponds to a reduction (less negative) in discount of between 0.19 and 0.28. These results align with the economic analysis presented in Chapter 2. Size can be interpreted as a surrogate for asset quality. In relation to Leverage, Chapter 2 demonstrated that the higher the leverage of the asset being sold the breakeven discount became less negative, as the equity equivalent of proceeds from the sale was reduced, and the usefulness of the assets ale as a source of funding is diminished

The results for the *ROC Diff* variable are counter to expectations. The greater the segment's industry adjusted profitability, the larger (more negative) the discount. The coefficient values are statistically and economically significant. A one standard deviation in segmental industry adjusted profitability is associated with an increase in discount of approximately 0..5 and 0.17. One possible explanation for this result is that the assumption that the segment's profitability can be attributed to the sold asset is incorrect. It is possible that, if a profitable segment is selling an individual asset, it may be because that asset is underperforming and its profitability may not be in line with the rest of the segment. The results in Table 3.4 suggest that the income status of a target is an important explanation of variations in discounts, and were in the expected direction. Those results are possibly more reliable, given that they are based on income data for each specific target, rather than an attributed income based on segmental reporting data.

Table 3.9 reports results when the Target Income Status is included as an Independent variable in the regression. The coefficient takes on the expected positive sign, and is statistically significant in three of the four models (excluding the Arithmetic mean model). The coefficient is economically significant, suggesting that a target with positive income will have a smaller (less negative) discount in the order of 0.40 to 0.50 compared to a target with negative income. Of note, is that the coefficients for *Size* and *ROI Diff* lose their statistical significance.

This analysis reinforces the previous results using Warranted Value, namely that variation in discounts is partially explained by making allowance for asset specific characteristics.

A possible weakness with this final analysis is that the process of attributing segment characteristics, namely profitability and gearing, to individual assets may not be appropriate, and it is driven mainly due to lack of asset specific data. Industry and year fixed effects were also considered. In this thesis, industry classifications were based on SIC codes. The highest meaningful level of aggregation for these is the two digit level. This still results in 57 different industry groupings, with only a small number of such two digit industries having greater than 5 transactions. In my opinion, such industry effects cannot be reliably estimated given the sample size. Accordingly, I grouped each transaction according to the Fama French 12 industry classification. Yearly effects were measured by allocating each transaction to the calendar year in which the transaction announcement was made.

In both analyses presented in Tables 3.8 and 3.9 the inclusion of yearly fixed effects had no impact on the sign or value of the coefficients, or statistical significance. Similarly, for the Table 3.8 results the inclusion of industry fixed effects had minimal effect, the only change being that the size variable's significance level dropped to just outside the 10% range. However for the Table 3.9 results, the inclusion of the industry fixed effects resulted in coefficient losing their statistical significance. I attribute the sensitivity of these results to the small sample size.

Table 3.8
Asset Specific characteristics and discounts

This table reports results of regressing alternative specifications of discounts as the independent variable against asset specific characteristics. Estimation uses robust regression procedures, using the STATA rreg routine. All discounts are raw data, as reported in Tables 3.1 and 3.2. Size is the natural logarithm of the transaction value, Industry Leverage is the median Debt to Assets ratio of the 2 digit SIC industry code of segment to which the sold asset belonged. Segment ROI-Industry Median ROI is the EBIT divided Total Assets ratio of the segment to which the sold asset belonged. Numbers in round brackets are the standard errors of the regression coefficient. Significance levels are represented by ***, ** and * at the 1%, 5% and 10% levels respectively.

	Arithmetic Mean / Percent Discount	Harmonic Mean / Percent Discount	Harmonic Mean / Logarithmic Discount	Geometric Mean / Logarithmic Discount
Constant	-0.8429*** (0.1475)	-0.4530* (0.2555)	-0.6800** (0.2725)	-1.1190*** (0.2688)
Size	0.0655** (0.0259)	0.0904** (0.0449)	0.1089** (0.0478)	0.1184** (0.0471)
Industry Leverage	1.1696*** (0.1794)	0.8699*** (0.3106)	1.0263*** (0.3343)	1.4913*** (0.3297)
ROI Diff	-0.3801** (0.2229)	-0.6827* (0.3858)	-0.7610* (0.4158)	-1.2067*** (0.4102)
Observations	202	202	203	203

Table 3.9
Asset Specific characteristics and discounts, including target income status

This table reports results of regressing alternative specifications of discounts as the independent variable against asset specific characteristics. Estimation uses robust regression procedures, using the STAT rreg routine. All discounts are raw data, as reported in Tables 3.1 and 3.2. Size is the natural logarithm of the transaction value, Industry Leverage is the median Debt to Assets ratio of the 2 digit SIC industry to which the segment to which the sold asset belonged. Segment ROI-Industry Median ROI is the EBIT divided Total Assets ratio of the segment to which the sold asset belonged. Tgt Income Status is an Indicator variable with a value of one if target EBIT in the prior twelve months was positive, and zero if target EBIT was negative in the preceding twelve months. Numbers in round brackets are the standard errors of the regression coefficient. Significance levels are represented by ***, ** and * at the 1%, 5% and 10% levels respectively.

	Arithmetic Mean / Percent Discount	Harmonic Mean / Percent Discount	Harmonic Mean / Logarithmic Discount	Geometric Mean / Logarithmic Discount
Constant	-1.0449*** (0.2884)	-1.0128* (0.5098)	-1.2249** (0.4883)	-1.5234*** (0.4661)
Size	0.0808 (0.0497)	0.1252 (0.0878)	0.1347 (0.0840)	0.1312 (0.0802)
Industry Leverage	1.4173*** (0.3036)	1.1847** (0.5364)	-0.9637*** (0.9131)	1.5466*** (0.5011)
ROI Diff	-0.3092 (0.5281)	-1.2996 (0.9330)	-0.7610 (0.4158)	-0.7498 (0.8716)
Tgt Income Status	0.1838 (0.1283)	0.4972** (0.2267)	0.4201** (0.2222)	0.3842** (0.2121)
Observations	89	89	90	90

3.6 Conclusion

Multiples are a common valuation tool in applied corporate finance, and are a common benchmark used in empirical research, including the diversification discount and IPO pricing. Their use in studying discounts in trade sales of M&A transactions is particularly prevalent. In this chapter I have examined issues in relation to the use of multiples and the calculation of discounts as applied to the sale of subsidiaries. In particular, I examine the results of Officer (2007), who concluded that the average discount on the sale of a subsidiary was 30%. This was based on using the *Arithmetic Mean* to calculate average multiple of comparables, the *Percent Discount* to calculate the discount, and trimming of the sample for outlier observations. I draw four conclusions.

First, the choice of measurement tools to calculate discounts has a significant impact on results. In particular, the combination of Arithmetic Mean / Percent Discount / Sample Trimming, could result in a tendency to produce larger (i.e. more negative) discounts. I demonstrate that, in the presence of asymmetric distributions of multiples, other averaging methods, namely the *Harmonic Mean*, *Geometric Mean* and *Median* all have a strong theoretical basis to be used as the primary mechanism for calculating averages of comparable companies. Similarly, using the *Logarithmic Discount* method accounts for the asymmetrical distribution of discounts. Another advantage of these alternative procedures is that they require less management of the sample observations, with truncation at 99% appearing to be sufficient[51.] Using each of these methods on a sample of 287 subsidiary sales, I demonstrate a

[51] One exception to this may be the Harmonic Mean/Percent Discount combination which did produce average results that were not within what may be considered sensible bounds. Table 3.6 shows that even truncating to 95% still produces results that may be outside what may be considered sensible bounds. The 99% truncation was maintained to be consistent with an approach of minimal sample management.

range of results which are in line with the theoretical analysis. My analysis shows that, using the combination of Arithmetic Mean / Percent Discount / Sample Trimming produces results in line with Officer (2007). Using the other methods for calculating discounts results in the elimination of discounts, when using the harmonic mean, or a much lower (less negative) discount when using the geometric mean.

These results lead to the second conclusion, that the original Officer (2007) results concerning the presence of discounts, should be regarded as ambiguous. If there was variability across methods but they all still produced discounts, then the argument for the presence of discounts would be stronger. However, the fact that the sign is sensitive to the method places more pressure on the choice of methodology. As demonstrated in this chapter, the method which produces the largest (most negative) discounts, the Arithmetic Mean/percent Discount method, probably has the least theoretical support.

Thirdly, incorporating asset specific characteristics into the analysis appears to have an impact on results. By using the Warranted Value approach, I demonstrate that the discounts are non existent. Similarly, the univariate and multivariate analysis suggests that transaction size and the income status of the target, particularly whether it has reported negative income, appear to have a material effect on reported discounts. This suggests that an appropriate methodology for calculating discounts should endeavour to recognise asset specific characteristics. This can be achieved through the use of the Warranted Value approach, the more limited multivariate analysis used here to include asset size, profitability and leverage, or even more selective choice of comparable companies.

Finally, when considering the choice of procedures to measure discounts, the geometric mean and median appear to be most stable methods for calculating comparable multiples, while Ln Discount method for calculating bias appears to be more stable across a range of scenarios. This is demonstrated in the analysis earlier in the chapter in the context of outliers, but it also appears in the regression analysis as well. Such methods appear to be less susceptible to changes in model specification and sample management. Consequently, their results are generally more robust. This conclusion may have implications for the practical use of these methods.

The discounts calculated here will be the independent variables for analysis which looks at impact of liquidity pressure (Chapter 4) and announcement returns (Chapter 5).

Chapter 4

Liquidity pressure and discounts on trade sales

4.1 Introduction

Do liquidity pressures on the target parent cause subsidiaries to be sold at a discount? The discussion in Chapter 2 demonstrated that the evidence used to support this proposition is consistent with many of the theories used to describe motivations for asset sales. The analysis in Chapter 2 also demonstrated that companies may sell assets at an apparent discount for reasons other than liquidity pressure, due to the beneficial flow on effects to the rest of the business. In this chapter, I test whether liquidity pressures on the target parent are the source of discounts on subsidiary sales, using empirical tests which distinguish liquidity pressures from other potential sources of discounts. These tests show that companies who sell subsidiaries appear to act to improve their financial position, with both leverage and investment activity reduced in the year following completion of the sale. However I find no link between measures of liquidity pressure and discounts. I conclude that the case that liquidity pressures cause discounts has still to be made. The presence of a financing motive for asset sales does not necessarily lead to the conclusion that such a sale should be executed at a discount.

In Section 4.2, I critically evaluate the rationale, and the existing empirical evidence, as to why financial constraints might cause a discount. I conclude that the existing literature does not adequately demonstrate that financial constraints or liquidity pressures are the reason for the existence of trade sale discounts.

In Section 4.3, I present hypotheses designed to distinguish target parent liquidity conditions from other sources of discounts. I demonstrate that, to properly establish a link between liquidity pressure and the discount on sale, three necessary conditions need to be satisfied. First, the firm should actually have a requirement for new external funds; second, other sources of external finance are not available or more costly, and, finally, that a fire sale scenario, characterised by low industry liquidity, exists. These three conditions mirror three types of liquidity referred to in the literature, namely firm level, financial market and asset market. Only when these three conditions are jointly in place should a firm's poor bargaining position result in it receiving less than fair value for the sale.

In Section 4.4, I describe the empirical strategy designed to test these hypotheses. In these empirical tests, I introduce a number of innovations. To measure liquidity pressure, I use contemporary measures of financial constraints instead of problematic measures such as cash balances. I also explicitly link discounts to use of proceeds, a test justified by the analysis in Section 2.5, which demonstrated the link between discounts and alternative use of proceeds. To test for the impact of financial market conditions I introduce a measure of the state of seasoned equity markets, the SEO Index. For already listed companies, IPO market conditions may affect the ability to undertake a carve out of the target subsidiary[52], however if the main motivation of the asset sale is financing, then a seasoned equity offering is a viable alternative source of funding. To date, as far as I am aware, this measure has not been used in the context of subsidiary trade sales. Finally, I directly test for the potential fire sale scenario, by measuring the relatedness of target asset and the acquirer. Again, the application of this test is innovative because, as far as I am aware, this has not been tested in the context of subsidiary trade sales. A key element of this empirical strategy is testing for the joint presence of these three necessary conditions.

[52] A carve out will provide funds to the parent company whereas a spin-off will not generate funds for the exiting parent company.

In Sections 4.5, I report results of applying the empirical tests to the sample of transactions used in Chapter 3. The analysis finds that, generally, the financial position of target parents deteriorates from the year prior to sale to the year following completion of the sale, a result consistent with firms being under financial pressure. However, this relationship does not extend to explaining differences in reported discounts. The results therefore do not support a link between the combined impact of liquidity pressure and fire sale scenario. I conclude that the argument for discounts being caused by liquidity pressure induced fire sales is not supported.

Contribution of this research

The contribution of this research is threefold. First, although previous research has recognised the importance of measuring liquidity pressure, this is the first attempt to formally find a relationship between financial constraints and the reported discount on trade sales. It highlights the conditions needed to demonstrate the link between liquidity pressure and discounts on asset sales. This is important, as it helps us to better understand the relative importance of various theories of asset sales.

Second, in Chapter 1, I highlighted the need to consider the sale of subsidiaries as a separate market segment. Doing so allows a focus on potential explanatory variables which are peculiar to the sale of subsidiaries by publicly listed companies. In this chapter I use measures of seasoned equity market issuance activity, and measures of use of proceeds which are not relevant in the private company sector. Such measures have not been previously used in the literature and the SEO Index, in particular, would appear to be an essential variable in any test of financing motivations for asset sales.

Third, the results obtained make an original contribution to the literature because they suggest that the liquidity pressure induced fire sale narrative is not supported by the empirical evidence. The failure to find a link between discounts and a range of measures directed at measuring liquidity pressured behaviour suggest that the asset sale decision is more complex than that portrayed by a simple application of the financing motive for asset sales. The examples in Chapter 1 and analysis in Chapter 2 demonstrate that asset sales, and their pricing, result from the interplay of many factors. In this chapter, in conjunction with the results from Chapter 3, which emphasise the importance of underlying asset values, I demonstrate the influence of a number of these factors on the pricing of subsidiary sale transactions.

4.2 Prior Research: liquidity pressure and sale discounts

The combined liquidity pressure and fire sale narrative is a strong candidate to explain trade sale discounts. The transmission mechanism suggested is that financially constrained companies sell certain assets at substantial discounts to raise cash to fund growth or repay debt. In this section I review prior research relevant to this argument. I conclude that, although there is strong evidence of a link between poor financial performance and asset sales, the evidence extending this link as the explanation for discounts is inconclusive.

Shleifer and Vishny (1992) were the first to draw a link between financial pressures and the need to sell assets at a discount. They argue that, when a firm needs to sell assets, its industry peers are probably also suffering, in ways that constrain them from bidding. Consequently, parties outside the industry are best positioned to buy. However, because of risk aversion, or simply enhanced negotiating position, they will not pay a price that reflects the asset's best value in use.

The literature review in Section 2.2 demonstrated the mixed empirical evidence in relation to the fire sale hypothesis. There is some evidence of this fire sale effect in relation to operating assets Pulvino (1998). However Ang and Mauck (2011) and Eckbo (2010) provide conflicting conclusions in relation to operating businesses. Chang (1998) suggests the fire sale rationale could apply to sales of businesses and may explain why buyers of private businesses earn superior returns. Given that discounts are measured relative to public market acquisitions in the same industry, applying the fire sale argument to explain private trade sale discounts effectively generalises the argument to one of relative negotiating power, regardless of whether the buyer is from the same industry or not.

The only research which explicitly explores the link between liquidity pressure and discounts is Officer (2007) and, indirectly, Ma (2006). Officer (2007) concludes that the combination of vendor financial pressure and external market conditions contributes to the existence of the 30% average discount. This is on the basis that cash balances for selling firms are lower than industry average, discounts are larger when debt market conditions are tight, the selling firm has suffered poor stock price performance in the twelve months preceding the sale and it sells a non-core business[53.] Officer (2007) also reports a negative correlation between cash flow and discounts on a univariate basis, however there is no relationship when included in the multivariate test. Aside from stock price performance, none of these variables appears in the regressions to explain the discount. Ma (2006) finds a positive relationship between the relative liquidity position, as measured by net working capital, of acquirers and vendors, and announcement returns. This supports a conclusion that the relative financial position enhances the negotiating position of the acquirer.

[53] Table 7 of Officer (2007) reports a positive coefficient when discount is regressed on parent stock price performance, suggesting the discount is larger (more negative) when stock price performance is negative. However when stock price performance is interacted with an indicator variable equal to one of the parent and subsidiary being sold are in the same SIC code, the coefficient of the interaction term becomes negative, suggesting that it is the sales of subsidiaries in non matching SIC code that explain the positive coefficient.

However, this evidence in favour of the link between financial pressure and discounts is inconclusive, for four reasons, which I consider in the balance of this section.

(i) Measuring liquidity pressure.

In Officer (2007), the conclusion about the presence of liquidity pressure is based on the size of the sale proceeds relative to cash balances, and the presumed impact of poor stock price performance. In Ma (2006), a similar conclusion is drawn based on net working balances of acquirer and target parent. Neither of these measures conclusively demonstrates liquidity pressure. Poor stock price performance does not, automatically, generate a need for new funding. It more likely reflects poor current or anticipated operating performance that potentially creates pressure on management to address underlying performance issues. This potential alternative view is reinforced by another result in Officer (2007), namely that an interaction term incorporating stock price performance and the non-core status of the asset, had a negative impact on discounts. This result can justify an argument that the discount reflects poor asset quality (as explored in Chapter 3) as much as any financing pressure.

Furthermore, assuming a low (industry adjusted) cash balance is indicative of the need for funding is not consistent with extant literature. There is little evidence to support the argument that the level of cash balances is a measure of liquidity pressure. In fact, the literature suggests that constrained firms hold precautionary cash balances. Opler et al (1999) find that firms with higher growth opportunities and riskier cash flows tend to hold higher cash balances, and those with better access to external finance have lower cash balances. They also demonstrate cash balances are adversely impacted by operating losses. Many of the empirical studies on financial constraints also demonstrate that the least constrained firms tend to have lower cash balances. Whited and Wu (2006) and Hadlock and Pierce (2010) find that cash balances are lower for least financial constrained firms. Almeida, Campello and Weisbach (ACW, 2004), measure financial constraints using four different univariate measures: Payout ratio, firm size, bond ratings and Commercial Paper (CP) ratings. They find that for each measure of financial constraints, the least constrained firms have lower cash balances. All of these results suggest that lower cash balances are, per se, not a measure of financial constraints or liquidity pressure. Similarly, the investment cash flow sensitivity literature suggests that cash balances are not a determinant of financial constraints. T. Opler, L. Pinkowitz, R. Stulz and R. Williamson (1999) Opler et al (1999) find the level of cash balances has little impact on capital expenditures. R.E. Carpenter et al. (1998) Carpenter et al (1998) find some association between cash balances and inventory investment but find that cash flow is the most successful variable in explaining variations in inventory investment. On the weight of this evidence it is unlikely that the level of cash balances provides a robust measure of liquidity pressure.

To address this issue, I propose a number of empirical tests which directly test for the presence of financial pressure on vendors, which I describe in Section 4.3

(ii) <u>No relationship between discounts and consideration</u>

Officer (2007) finds no difference between discounts for transactions which used either cash or non-cash consideration. A liquidity pressure argument would imply that cash consideration should be associated with larger discounts[54].

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[54] Although it should be noted the significant majority of trade sales have cash consideration, as distinct from the greater use of equity consideration in public market transactions.

(iii) External market access

Officer (2007) finds a positive relationship between debt market conditions and discounts, which is supportive of a liquidity pressure argument, but finds no relationship between IPO market conditions and discounts. However this test ignores the fact that an already listed firm might have access to the seasoned equity market and, if the motive was purely raising cash, then accessing the seasoned equity market would be the most viable alternative. Unlike a privately owned company, an already publicly listed company has the opportunity to sell seasoned equity, or to sell other assets. For a publicly listed company, conditions in the seasoned equity market are more relevant, especially if the motivation is related to financing.

The seasoned equity market is larger and less subject to extreme swings in availability. Howe and Zhang (2010) find that seasoned firms are less affected by investor sentiment and information asymmetry than newly listed firms. If the firm's primary motivation is one of funding liquidity requirements, rather than portfolio restructuring, then accessing the SEO market may be a more reliable, low cost alternative.

Equity raisings motivated by deleveraging are common. Hull, Kwak and Walker (2009) examine a sample of 1,290 SEO's of which 31% have debt reduction as the major stated use of proceeds. Similarly, Autore, Bray and Peterson (2009) find that 29% of a sample of SEO's had recapitalisation as the primary stated use of proceeds. Ursel (2006) finds that US firms undertaking non underwritten rights issues have debt to equity ratios twice that of non-rights issuing firms and high levels of financial constraints, but are able to successfully use rights issues. Furthermore, DeAngelo, DeAngelo and Stulz (2010) demonstrate that a corporation's near term cash need is the primary motive for undertaking an SEO. McLean (2011) documents the changing role of equity issuance as the main contributor to the build-up of precautionary cash balances.

Further impetus for this argument is gained by comparing the costs of raising external equity with the reported discounts. Hennessy and Whited (2005) estimate the shadow price on external equity at about 6%. However, in practice, the costs and benefits of raising external equity vary significantly, depending on the actual method chosen. The most common methods available to listed firms include rights issues, committed offerings and placements. Rights issues are potentially the lowest cost alternative, as the discount does not involve any explicit wealth transfers from existing shareholders. Eckbo(2008) generates a pecking order of equity raising techniques and demonstrate that the choice between these methods is likely determined by expected takeup of a rights offering by existing shareholders. Transactions costs on these issues are generally considered to be well under 10%. Equity raised via the Private Investment in Public Equity ("PIPES") market appear to have the largest issue discounts, with an average discount of 30% (Dai, 2008).Allowing for conditions in the seasoned equity market is important so as to represent the major alternative source of finance for the target parent; it also indirectly may measure the overall level of finance availability for potential buyers as well. So the potential transmission mechanism may have two paths, either as an alternative source of funds for the target parent, or as a source of funding for the acquirer.

(iv) No evidence on fire sale conditions

The fire sale scenario of Shleifer and Vishny (1992) was driven by adverse industry conditions. In the context of this research, discounts are measured against public market acquisitions in the same industry, thus controlling for industry conditions. Officer (2007) finds a relationship between abnormal share price performance in the previous twelve months, and also whether the asset sold was non-core. While these results might indicate some pressure to sell, these results are also consistent with other motivations for selling assets, including the desire to address a poorly performing business portfolio or to achieve strategic focus. Consequently, the Officer (2007) results do not uniquely support a fire sale hypothesis. A generalised version of the fire sale hypothesis may be based on the relative bargaining power of the target parent and acquirer. More appropriate tests should incorporate the combined impact of selling pressure (on the target parent) and weak negotiating position. Consequently, it is necessary to incorporate a measure of bargaining power. Ma (2006) tests for this using relative net working capital of acquirer and target parent however, as noted earlier, net working capital has no real basis as a measure of liquidity pressure.

4.3 Hypotheses to test for liquidity pressure induced fire sales

The general problem with demonstrating the proposition that liquidity pressure induced fire sales are the cause of the discounts, is the fact that many of the results are compatible with alternative models of asset sales. I contend that, although there is strong evidence of a link between poor financial performance and asset sales, the evidence in favour of linking this to discounts is insufficient. To demonstrate a causal link between financial constraints and asset sales (discounts) three conditions need to be met.

First, the firm must have a demand for funds. As noted, measures of cash balances, net working capital or stock price performance are an ambiguous signal of this. A more effective measure of financial pressure may be alternative financial constraints indices which, firstly, combine each of these individual variables into an index and, secondly, the indices are estimated based on a relationship with an independent estimate of financial constraints. A complementary approach is to directly measure the possible demand for funds. One measure of demand for funds is the use of proceeds. In the context of divestments, Bates (2005) demonstrates the importance of use of proceeds, as announcement returns are clearly associated with different uses of divestment proceeds.

The second condition needed to demonstrate causality between financial constraints and asset sales is that other cost effective sources of funds are not available. The general presumption in the literature is that external equity financing is either inaccessible or too costly[55]. In testing for the impact of IPO market conditions, Officer (2007) was the first to attempt to directly measure the impact of market conditions on discounts. However, for a publicly listed company, seasoned equity is a more accessible source of equity. Demonstrating that external equity financing is either inaccessible or too costly should include a test of conditions for raising seasoned equity.

Third, to confirm causality between financial constraints and asset sales a fire sale scenario needs to be demonstrated. The fire sale scenario is characterised by industry outsiders acquiring assets at discounted prices. To demonstrate this requires an assessment of the market for assets in the target industry, and the involvement of industry outsiders.

Finally, to establish a causal link to the discount, each of these conditions must be present. That is, individually, each condition is necessary but not sufficient, and the argument fails if any one of these conditions is missing. Clearly, if the vendor does not need funds then there is no liquidity pressure. In addition, even if the vendor does require funds, if equity or debt markets are accessible then the vendor may still have a cost effective alternative supply of funds. Finally, even if financial markets are costly or inaccessible, if there is competitive bidding for the relevant asset then it is possible the vendor will achieve a price for the asset which reflects its underlying value. Consequently, in addition to testing for the presence of each of these conditions, I propose to test for the simultaneous presence of each condition as the explanation of the discount.

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[55] Lang, Poulsen and Stulz (1995) identify three reasons why external capital markets may be expensive: the underinvestment and asset substitution problems, impact of adverse selection costs and finally the impact of agency costs of managerial discretion.

In the balance of this section, I examine each of the three conditions in more detail, and describe how they can be empirically tested.

4.3.1 Measuring Liquidity Pressure

The first step to establish is that selling firm has a need for funds.

First, I use contemporary measures of financial constraints rather than the problematic cash balances and net working capital. Second, I directly test whether there is a relationship between use of proceeds and discounts. In Section 2.5, I demonstrated that the value impact of use of proceeds can affect the vendor's decision about an acceptable sale price (and therefore discount). Finally, I test whether performance pressures have an impact on discounts. Officer (2007) used stock price performance in the preceding twelve months to measure this, however this measure does not necessarily translate into current funding pressure on the business.

4.3.1.1 Financial Constraints

Carreira and Silva (2010) document the range of measures used to measure financial constraints. The Whited-Wu index (Whited and Wu,2006) is comprised of individual firm financial statement data measuring cash flow, long term debt, total assets, firm sales growth and industry sales growth. It also includes a variable indicating dividend paying status. More recently Hadlock and Pierce (2010) have developed a financial constraints index based only on firm Size and Age. Carreira and Silva (2002) conclude that both these indices, and the ACW (2004) measures described earlier, are highly correlated. Hovakimian and Titman (2006) develop a selection equation with which to classify firms whose investment activity as being more or less sensitive to the availability of internal funds, and therefore more or less sensitive to the impact of asset sales proceeds. They argue this selection equation represents the propensity of a firm to be in either investment regime. This selection equation incorporates variables measuring size, age, dividend payout status, debt to assets and bond ratings, all variables specified in the previous models. In addition, they find that firms with lower market to book ratio (a measure for growth opportunities) and lower levels of financial slack (measured by cash balances) are more likely to be financially unconstrained. Thus,, while not building an index of financial constraints, Hovakimian and Titman (2006) find that the variables that distinguish between apparently constrained and unconstrained firms are similar to those in Whited and Wu (2006), ACW (2004) and Hadlock and Pierce (2010).

Using empirically based measures of financial constraints appears to be a good basis for testing the impact of liquidity on the selling prices of assets. These indices incorporate a number of financial characteristics into a simple measure of constraints. Their broad consistency in terms of variables, even though they are derived from different measures of financial constraints also gives them more credibility than asserting a causal connection between discounts and cash balances. I summarise this argument in Hypothesis 4.1(a) below:

H4.1(a): The discount on asset sales is positively related to the extent to which sellers are financially constrained[56]

This hypothesis will be tested using the Whited-Wu and Holdrick-Pearce indices, and the vendor's credit rating.

Hadlock and Pierce (2010) note the low correlation between their index and that of Kaplan and Zingales (1998). They argue the Kaplan and Zingales (1998) index is subject to measurement error, due to financial constraints measures being included in both dependent and independent variables. I have not specifically used the ACW (2004) measures as they do not provide a specific

[56] The hypotheses in this chapter are framed from the perspective of the liquidity pressure induced fire sale narrative. Acceptance, therefore, lends support to such an argument.

measure of liquidity pressure, and the variables are included in the other indices. Although highly correlated, the Whited-Wu (2006) and Hadlock Pierce (2010) indices differ in that Whited-Wu (2006) is based on financial characteristics, whereas the Hadlock-Pierce index is based only on size and age.

I am not aware of previous tests of the relationship between any of the contemporary measures of financial constraints and the discount reported on the trade sale. Given that these measures better reflect firm level financial pressure these tests make a contribution to the existing literature.

4.3.1.2 Selling firm use of proceeds

The financial constraints measures noted earlier may not measure the liquidity pressure on a firm at the point of announcement. A more direct test examines the use of proceeds from the asset sale. Firms can use proceeds to distribute to shareholders, repay debt or retain to build up cash balances or reinvest. Bates (2005) documents that 50% of firms selling assets use proceeds to repay debt, with the balance evenly split between distributions to shareholders and retention. Gayane Hovakimian and Sheridan Titman (2006a) Hovakimian and Titman (2006) find that firms are more likely to retain and use proceeds from the sale of assets if they have attractive growth opportunities.

For firms seeking to reinvest proceeds or repay debt, the decision about an acceptable sale price (and therefore discount) would incorporate the benefits of alternative investment, or the costs of alternative sources of finance, respectively. The analysis of breakeven discounts in Section 2.5 demonstrated that the presence of these other factors may justify the sale of assets at a discount. However, if the asset sale is only motivated by the distribution of proceeds to shareholders, it is not clear why a company would sell an asset at a discount. A zero to low discount would therefore be expected. These arguments are summarised in Hypothesis 4.1[b]

H4.1(b): Financially constrained firms who have attractive reinvestment opportunities or who seek to reduce debt will sell assets at larger discounts than firms who distribute funds to shareholders

It is difficult to directly test for the presence of value creating growth opportunities that would otherwise be foregone. I use the target parent's Tobin's Q. As direct measures of the use of proceeds, I use variables which measure the actual level of capital expenditure, debt reduction and shareholder distributions. In each case I calculate these measures for the year of announcement and the year following completion, and compare to the relevant measure for the fiscal year preceding the announcement. In testing for the relationship between discount and use of proceeds, I distinguish between constrained and unconstrained firms. While there have been a number of studies examining the relationship between use of proceeds and market reaction to the asset sales (Bates, 2005), I am not aware of any studies which examine the relationship between use of proceeds and the discount on the sale.

I have not used company announcements as a source of information on use of proceeds because such announcements are not always available. Furthermore, looking at actual changes in investment and financing activity gives a better context than an isolated announcement. Bates (2005) in his robustness tests found his results were not affected by whether he used announced use of proceeds or a direct measure of debt reduction or shareholder distributions as I describe above[57].

[57] Bates' (2005) measures were industry adjusted however I have used unadjusted measures to better focus on the decision of each firm. My benchmark is the level of each variable prior to the announcement of the asset sales.

4.3.2 Testing for a relationship between external market conditions and discounts

The second condition required to establish the link between liquidity pressure and discounts is an established relationship between external market conditions and discounts. The previous discussion implies that the decision to sell assets is often financially driven and results from a comparison of the cost of selling an asset relative to other sources of capital. Firms are assumed to sell assets because they are satisfied that the sale price reflects the fair value of the asset and / or that other sources of external finance are unavailable or more expensive. If equity markets are simply inaccessible then even a 30% discount may be the best transaction available. However if markets are accessible then documented discounts of 30% imply that alternative sources of external capital have a greater cost.

Firms under financial pressure to reduce debt have two broad choices, sell assets or raise equity. In a world without frictions, there would be no need to sell assets so as to reduce debt. Firms would make value maximising choices about the scale and composition of their asset portfolio, while adjustments to capital structure would be implemented by accessing capital markets to raise or reduce equity. In a world *with* frictions these decisions become interdependent58. Due to the costs of raising external finance, firms maintain internal financial flexibility through the maintenance of reserve borrowing capacity, surplus cash balances, hurdle rates in excess of cost of capital and dividend payouts that lag earnings increases. Even so, firms still require external finance.

Officer (2007) tested the impact of external market conditions using a measure of credit market conditions and IPO market conditions. While adverse credit market conditions had the expected negative impact on reported

[58] Denis (2011) discusses strategies companies pursue in the event of financial frictions and the nature of costs they impose on companies.

discounts, IPO market conditions were found to be insignificant. The IPO market is only an option for exiting the specific asset. However, if finance is the motivation, then using seasoned equity is the most viable alternative.

I summarise this analysis with the following hypotheses:

H 4.2(a): There will be a negative relationship between discounts and the level of issuance activity in the seasoned equity market;

H 4.2(b): There will be a positive relationship between discounts on trade sales and issue discounts in the seasoned equity market

To measure SEO issuance activity, I introduce a new measure called the SEO Index. This is analogous to the Schlingemann et al (2002) Industry Liquidity Index, which calculates the level of asset sales by industry sector over time, scaled by industry assets. Officer (2007) adopts this approach to calculate the IPO Index. The SEO Index developed here follows a similar approach. I extend these volume based measures and calculate an index for Issuance Discounts. These are calculated relative to the theoretical ex-issue price for each issue. This measure incorporates the relative scale of the issue, a factor not incorporated when the headline discount is used.

To the best of my knowledge the impact of the market for seasoned equity offerings has not been tested in the context of financial constraints literature, or in the context of explaining the discount on asset sales.

4.3.3 Fire sale scenario

The third condition required to establish the link between liquidity pressure and discounts is the need to sell assets in fire sale conditions. This condition is critical. Even if there is financial pressure to sell, the existence of a discount still requires a fire sale type rationale, as competition for the asset would normally be expected to result in the asset being sold at fair value, as discussed in Chapter 2.

In the circumstances of this study, where prices of subsidiaries are compared to public companies in the same industry, the presence of fire sale may be difficult to discern. Controlling for industry, time and size should eliminate any differences in competitive position of private versus public sale markets, even in the so-called fire sale scenario, leaving any differences in multiples to reflect differences in underlying asset quality. The fire sale argument also implies that there are a reduced number of buyers available. It is difficult to test this in a private versus public sale process. Officer (2007) reports that the level of post bid competition for sales of private assets is about a quarter of the level for publicly listed targets. However this difference most likely reflects differences in sale process rather than a difference in the competitive nature of the sale process. The SDC data base records the number of bidders and also flags for post-bid competition. The public market acquisition process allows for post announcement competition, and this variable is easily measured. For a subsidiary sale the public announcement of a transaction usually occurs on completion of the transaction, and represents the culmination of a competitive private sale process. It would be unusual for any potential bidders to not have been canvased as part of the sale process, so it is unlikely that any bidders would emerge following the announcement of a completed transaction. A private sale process should have more potential buyers participating in the process because the cost of entry for a potential acquirer (both direct and reputational) is less than that for a public takeover.

I have argued that the comparison of prices on (broadly) contemporaneous public and private transaction is not really a test of the fire sale hypothesis. A more direct test is whether there is a difference in prices achieved by a public company when it sells assets to within industry participants or sells to buyers outside the industry. The hypothesis is that discounts should be larger (more negative) when assets are sold to buyers outside the industry:

H4.3(a):Discounts on sales of subsidiaries are higher when the subsidiary is sold to an acquirer in a different industry.

A more general test of the liquidity of assets is to use the Asset Liquidity Index developed by Schlingemann et al (2002). This measures the level of sales of assets by industry. It is an indirect test of the fire sale hypothesis, in that the fire sale hypothesis implies limited competition for assets. A high level of trading in assets in a particular industry would be indicative of a number of willing buyers, whether from within the industry or not. Officer (2007) did not find a relationship between this variable and discounts but I have included it due to partially different sample period. The impact of asset liquidity can de described in the following hypothesis:

H4.3(b): There will be a negative relationship between the level of asset sales in an industry and the discount on subsidiary sales.

As noted in the earlier discussion it is difficult to interpret the economic significance of discounts, as calculated in this research (and Officer (2007)), given that industry membership is controlled for. Hypothesis H4.3(c) reflects a broader interpretation of the fire sale argument by testing whether a weaker bargaining position of the target parent is associated with discounts.

H4.3(c): There will be a negative relationship between the relative bargaining power of the target parent and acquirer

In the context of this thesis, relative bargaining power is measured in terms of financial position. Ma (2006) used net working capital as a measure of relative bargaining position. In spite of the positive result, the earlier analysis of financial constraints concluded that it is not clear that net working capital is an appropriate basis for measuring financial condition. Based on my earlier argument that it is preferable to use a direct measure of financial constraints, I calculate the relative value of the Whited-Wu Index for the acquirer and target parent

An alternative, and possibly more direct, measure of *Pressure to Sell* on a target parent company may be financial performance. Significant falls in profitability are used by Owen, Shi and Yawson (2010), and Denis and Kruse (2000) as a measure of impetus to restructuring and divestments. Consequently, I include a measure of financial performance which includes a situation where a company reports write-offs or restructurings greater than 50% of profits in the fiscal year prior to the announcement, or the company reports an accounting loss in the year of announcement or the prior year. These are more direct measures of pressure on a company to respond to performance issues. Consequently, they can be expected to weaken a company's negotiating position.

Furthermore, accounting based measures should have a more timely connection with the asset sale whereas market price responses may anticipate the need for restructuring well before such an event is recognised or acted upon. I note that using measures of performance, be they stock price or accounting based, can just as easily translate into pressure on management to address performance issues with poorly performing assets as they do financial pressure, so I interpret a positive result cautiously.

4.3.4 All conditions need to be met

As discussed earlier, each of these conditions must necessarily be present to support the proposition that discounts on subsidiary sales are attributable to liquidity pressure induced fire sales. Accordingly, in addition to the individual tests just described, a final joint test is needed:

H4.4: There is a positive relationship between discounts on trade sales and the combined impact of financial constraints, external market conditions and asset market liquidity

Tests of this hypothesis will use interaction terms involving the variables discussed earlier in this section.

4.4 Research Design

4.4.1 Regression Model

I test a regression model of the following form:

$$D_i = \beta_0 + \boldsymbol{X}'_{i,f}\boldsymbol{\beta_F} + \boldsymbol{X}'_{i,m}\boldsymbol{\beta_M} + \boldsymbol{X}'_{i,s}\boldsymbol{\beta_S} + \boldsymbol{\beta_S}\boldsymbol{I_i} + \boldsymbol{X}'_{i,c}\boldsymbol{\beta_C} + u_i$$

where D_i represents the discount for transaction *i*. $\boldsymbol{\beta_F}$ represents the coefficients for a set of observable specific characteristics concerning the level of financial constraints relating to the target parent in transaction *i*. These represent the level of liquidity pressure facing the target parent. $\boldsymbol{\beta_M}$ represents the coefficients for a set of observable specific characteristics relating to external market conditions at the time of transaction *i*. $\boldsymbol{\beta_S}$ represents the coefficients for a set of observable characteristics representing fire sale conditions. $\boldsymbol{I}_i$ is an interaction term representing the simultaneous presence of adverse conditions for the previous three states namely, internal liquidity pressure, adverse external market conditions and fire sale scenario, representing a poor bargaining position on the part of the target parent. Finally, $\boldsymbol{\beta_C}$ represents the coefficients for a set of control variables relevant for the target parent. These control variables represent other factors which the previous discussion has demonstrated may have an impact on the level of discount. The regression test only uses firms who have sold assets and published the price.

Variables included in each of these sets are described below.

This equation was tested using the robust regression methodology described in Chapter 3.

4.4.2 Discounts

The independent variable is the discount on trade sale for a sample of subsidiary sales between listed companies over the period 1997 to 2009, who have multiples data available in SDC. Sample selection procedures and measurement of the discounts were explained in detail in Chapter 3. Chapter 3 highlighted the range of discount outcomes possible, due to the joint impact of decisions about the calculation of the comparables multiple and the discount. The analysis in this chapter will be restricted to the following four methods: arithmetic mean/percent discount, harmonic mean/percent discount, geometric mean/logarithmic discount and median/logarithmic discount. The first method maintains consistency with Officer (2007), while the others are in line with conclusions from Chapter 3. The analysis has been carried out for each of the main methods and results are reported in Section 4.5.3 on robustness.

4.4.3 Independent Variables[59]

4.4.3.1 Liquidity Pressure

Financial Constraints

To test for the presence of financial constraints for each selling firm financial constraints have been calculated using each of the indices discussed earlier, namely Whited-Wu (2006) and Hadlock-Pierce (2010). In each case the original parameters from each of the papers are used60. Aside from ensuring

[59] Due to the number of variables, Table 4.1 at the conclusion of this section contains a summary of each variable and its expected relationship with discounts.

[60] This approach was used by Officer (2007) in using the Altman Z model.

consistency with the original papers, each of the papers has long sample periods which should provide some parameter stability. To test for this, I calculated the Whited-Wu index for my sample using the parameters in Hadlock and Pierce (2010), who did re-estimate the Whited-Wu index. Applying both versions to the current sample, I find a correlation in excess of 0.8.

To measure financial constraints around the time of sale, each measure of financial constraints has been calculated in the year prior to the announcement of the sale, in the year of announcement and in the year following completion of the transaction.

Indices were calculated for each target parent using financial data from Compustat.

The Whited-Wu (2006) index is calculated using the following expression:

$$\begin{aligned}\text{Whited-Wu index}_t = & -0.091\text{xCash Flow}_{it} - 0.061\text{xDivPos}_{it} + \\ & 0.021\text{xLong Term Debt}_{it} - 0.44\text{xSize}_{it} + \\ & 0.102\text{xIndustry Sales Growth}_{it} - 0.035\text{xSales Growth}_{it}\end{aligned}$$

Where:

Cash Flow	Income plus Depreciation
DivPos	Indicator variable set to 1 if company has paid dividend
Long Term Debt	Book Value of Long Term Debt
Size	Logarithm of Book Value of Total Assets
Industry Sales Growth	Sales growth in two digit SIC code of target parent
Sales Growth	One year sales growth of target parent

Hadlock and Pierce (2010) developed an ordered logit model with the following estimates, which I use as an index of financial constraints for each of the selling firms:

$$\text{Likelihood Ratio} = -0.744\text{LnTA}_{it} + 0.042\text{LnTA}_{it}^2 - 0.075\text{Age}_{it} + 0.0010\text{Age}_{it}^2$$

TA_{it} represents *Total Assets* and, following Hadlock and Pierce (2010), *Total Assets* was truncated at $4.5 million. *Age* is calculated as the number of years the firm had share price data in CRSP, with 1960 as the earliest date[61].

For both Whited-Wu (2006) and Hadlock-Pierce (2010), lower values imply less financially constrained firms.

For target parent ratings, Standard & Poors long term issuer ratings were used, and were extracted from Compustat. For the statistical analysis each rating category was converted to a numerical value, with a value of one attributed to "AAA", increasing by one for each rating notch.

Calculations for use of proceeds

Observations for use of proceeds were derived from financial data, by examining the levels of investment, debt and shareholder distributions in the pre-announcement year with results in the year following completion. Higher levels of capital expenditure or debt repayments are interpreted as a signal that the vendor was more motivated to sell the asset at a discount. This is in line with the analysis of scenario [3], selling assets to fund alternative investment opportunities, and scenario [4], selling assets to fund debt repayment, in Section 2.4. Data for capital investment, total debt,shareholder distributions and Total Assets were extracted from Compustat, using Compustat codes shown in Table 4.1(a).

[61] Hadlock and Pierce (2010) truncated Age at 37 years.

Table 4.1 (a) Definitions for Use of Proceeds Variables		
Variable	Components	Compustat
Investment	Total Capital Expenditure + Acquisitions	AQC+CAPX
Debt	Long Term Debt + Debt in Current Liabilities	DLC+DLTT
ShareholderDistributions	Dividends + Purchases of Common Stock	PRSTKC+DVC+DVP
Total Assets	Total Assets	AT

These values were then scaled by Total Assets for each firm in the same fiscal year, and the movement in each ratio was calculated as the change in the ratio from the fiscal year prior to the sale announcement to the fiscal year following the fiscal year in which the transaction was completed. These definitions are summarised in Table 4.1(b). A negative value for the *Investment* variable implies that capital expenditure increases in the year following the divestment. A negative value for the *Debt* variable implies that balance sheet debt is reduced in the year following the divestment. As noted earlier, In the context of this study, a negative value for either variable is consistent with asset proceeds being used to fund other investments or repay debt. Both these scenarios could explain why a vendor might be willing to sell an asset at a discount to fair value. A positive relationship between either of these variables, and Discounts, would imply that the discount is larger (more negative) due to the higher pressure for the alternative use of proceeds. I would expect a null relationship between Discounts and use of proceeds for Distributions to shareholders.

Table 4.1(b) Definitions of Use of Proceeds variables	
This table presents definitions for the Use of Proceeds variables, which are used as measures of financial pressure to sell. Definitions are expressed in terms of Compustat variables presented in Table 4.1(a). The subscripts Pre refers to the fiscal year prior to the fiscal year in which the transaction is announced, and Post refers to the fiscal year following the fiscal year in which the transaction is completed.	
Variable	Definition
Use of Proceeds: Investment	$\frac{(AQC_{Pre} + CAPX_{Pre})}{AT_{Pre}} - \frac{(AQC_{Post} + CAPX_{Post})}{AT_{Post}}$
Use of Proceeds: Debt	$\frac{(DLC_{Pre} + DLTT_{Pre})}{AT_{Pre}} - \frac{(DLC_{Post} + DLTT_{Post})}{AT_{Post}}$
Use of Proceeds: Distributions	$\frac{(PRSTKC_{Pre} + DVC_{Pre} + DVP_{Pre})}{AT_{Pre}} - \frac{(PRSTKC_{Post} + DVC_{Post} + DVP_{Post})}{AT_{Post}}$

4.4.3.2 External Market Conditions

To test the potential impact of availability of funding from the equity markets I have calculated the SEO Liquidity Index. This is analogous to the Schlingemann et al (2002) Industry Liquidity Index. For each 2 digit SIC industry, I calculate the twelve month running total of seasoned equity issues by all companies in each 2 digit SIC code. This index was calculated using the SDC equity Issues database. Seasoned equity offerings were limited to FollowOn transactions[62] of equity and convertibles. Total issues are scaled by the median of annual proceeds over the sample period for each two digit SIC code. For each transaction I match the value of the SEO Liquidity Index in the announcement

62 Excludes block sales which are also included in SDC even though they are technically not raining new equity at the corporate entity level.

month of the relevant transaction, thus testing for the influence of issuance activity in the previous twelve months. Matching was done on the basis of the target parent's two digit SIC code, as provided in the SDC database. If equity market conditions exert pressure on selling companies then a positive relationship between the value of the index and recorded discounts should be observed; when equity market availability is low vendors will be under pressure to sell at a larger discount if they need funds.

I have also calculated a SEO Issuance Discount Index. This is calculated as follows:

$$Discount_{s,t} = \frac{\sum_{i=1}^{n} \frac{(Offer\ Price_i - TEIP_i)}{TEIP_i} Proceeds_{i,t}}{\sum Proceeds_{s,t}}$$

The first term in the numerator is the discount per issue, *i*, which is then used to calculate a weighted discount for each industry, *s*, in period *t*. TEIPi is the theoretical ex-issue price, defined as:

$$TEIP_i = \frac{(Shares\ outstanding\ pre\ offer_i x\ Price_i) + Proceeds_i}{Shares\ outstanding\ post\ offer_i}$$

where $Price_i$ is the closing price for the issuer on the day prior to the transaction. I have used this procedure for two reasons. First, the SDC database has an item described as Discount, which I was unable to reconcile to other data disclosed for transactions. Second, it is the most correct measure of discount. Headline discounts do not incorporate the relative size of the issue, however the relative size does influence the level of wealth transfer to new investors. Chen, Dai and Schatzberg (2010) include relative size as a measure of price elasticity of the issue, as an indirect measure of this. Note, this does not represent the true cost of an equity issue as presented in Expression 2.15, as it does not incorporate the mix of existing and new shareholders which will, in turn, determine the size of wealth transfer from existing to new shareholders.

The analysis of breakeven discounts in Section 2.5 demonstrated that the wealth transfer component of the cost of issuing equity was a function of take-up by existing shareholders. A high level of take-up by existing shareholders would reduce the size of any wealth transfer, lowering the expected cost of an equity issue. This, in turn, would lower the acceptable discount at which the company could justify selling an asset. Consequently, if the purpose of the asset sale is purely financing driven, then we would expect a positive relationship between discounts and expected take-up. In judging access to equity markets firms with blockholders will be expected to have greater ability to. To measure Expected Take-up, I use the *Number of Blockholders* in the target parent's registry.

To measure the cost of accessing the credit markets the spread between the Moody's seasoned Baa bonds and five year Treasuries was calculated on a twelve month moving average basis. Data was extracted from the United States Federal Reserve Selected Interest rates publication[63].

This variable is described as *Credit Spread*, and is calculated as follows:

$$Credit\ Spread = \frac{\sum_{t=Announce-12}^{Announce}(Baa\ Bond\ Yield_t - Five\ Year\ Treasury\ Yiled_t)}{12}$$

where Announce is the month of the announcement of the transaction.

A negative relationship would be expected, as a higher credit spread would imply a higher cost of accessing debt markets and therefore the breakeven discount on an asset sale would be lower (more negative).

[63] http://www.federalreserve.gov/releases/h15/data.htm

4.4.3.3 Firesale Conditions

In the context of subsidiary sales, one key implication of the firesale hypothesis that sales of assets should occur to acquirers outside the industry. Accordingly, I set an Indicator Variable, *Acquirer Target SIC Match*, equal to one, if the two digit SIC code of the target and acquirer match. In this sample, 55% of transactions had targets and acquirer with the same two digit SIC code. At the three and four digit level the percent matches were 40 percent and 31 percent, respectively.

The two digit SIC codes were sourced from SDC, using the assigned primary two digit SIC code. For the targets, SDC is the only source of data on the SIC code.

I also used the *Industry Asset Sales Index*, as used by Officer (2007) and Schlingemann et al (2002). For each two digit SIC code, an index of asset sales in the previous twelve month is calculated. As with the SEO Index, the value of index in the month of announcement is matched with each transaction. This index is a measure of asset liquidity for each two digit SIC industry.

As a further test of the fire sale hypothesis I also established an Indicator variable for targets who did not match the two digit code of either the acquirer or the target parent. In Chapter 3, targets who did not match the parent's primary two digit SIC code, were labelled as non-core. This variable thus measures discounts on non-core targets sold to another not in the industry, which are labelled "orphan" assets in the following analysis. I have labelled this variable as *Orphan Asset*.

Officer (2007) used a target parent's share price performance in the twelve months prior to announcement as a measure of pressure on the target parent. As noted earlier, it is not clear that this automatically translates into financial pressure. Poor share price performance could reflect the market's reassessment of value of a firm's assets, and any discounts on sale of a subsidiary just reflect this lower value[64]. However, poor share price performance may be a source of market discipline prompting the firm to take remedial action. Consequently, the target parent's *Abnormal Returns in prior Twelve Months* is included as a variable. This was calculated as the difference between the Target parent's *Total Monthly Return* in the twelve months preceding the announcement less the Returns on the *Value Weighted Market Index* over the same period. Monthly share price and market return data was sourced from CRSP.

Following Officer (2007), I have also interacted this variable with a *Core Indicator* variable set to 1 (and zero otherwise) if the target's two digit SIC code matches that of the parent. In both cases the two digit SIC code is sourced from Thomson SDC database.

In relation to testing for relative bargaining power, I have calculated the *Relative Whited-Wu Index*, by dividing the Whited-Wu Index value for the acquirer by that of the target parent, as follows:

$$Relative\ WW\ Index_i = \frac{Whited - Wu\ Index_{acquirer}}{Whited - Wu\ Index_{target\ parent}}$$

Values for the Whited-Wu index are negative, and the less financially constrained a firm the more negative is the index. Consequently, for a transaction where the acquirer is less financially constrained, the *Relative WW$_i$ Index* should exceed 1. The relative bargaining power hypothesis would posit a negative relationship between the *Relative WW Index* and discounts.4.4.3.4 Interaction Term: establishing the coincidence of all conditions.

To be able to link the discount, causally, to the liquidity pressure induced sale I have argued that three conditions need to be simultaneously in place. These three conditions relate to firstly, the financial pressure on the

[64] This alternative view was examined in Chapter 2 and 3.

vendor, secondly, adverse external market conditions and finally, adverse conditions in the relevant asset markets. Accordingly the interaction term is set to a value of one when the measure of financial constraints is below the median level, the level of SEO market activity is below median level and the target's two digit SIC code fails to match the acquirer's. This latter condition represents the situation where a vendor sells the asset "outside the industry".

I have defined four alternative combinations of variables for the *Interaction* term:

Table 4.2
Definition of Interaction Terms

This table defines Interaction terms which test for the combined presence of financial constraints on the vendor, adverse external market conditions and adverse conditions in the asset market. The Interaction term is an indicator variable set to one of all conditions are present.

Interaction term equal to 1	if the following three conditions are affirmative:		
Interaction_1	Whited-Wu Index > Median	SEO Volume Index < median	No match on acquirer and target SIC code
Interaction_2	Debt Change < Median	SEO Discount Index< Median	No match on acquirer and target SIC code
Interaction_3	Debt Change < Median	Credit Spread > Median	No match on acquirer and target SIC code
Interaction_4	Whited-Wu Index > Median	Credit Spread > Median	No match on acquirer and target SIC code

4.4.3.5 Control Variables

This thesis has already identified a number of firm specific and asset specific factors which could affect discounts, but which are not directly related to financial constraints. It is necessary to control for these in the multivariate model.

Marginal Tax Rate represents the potential impact of a sale on tax profits. The analysis in Section 2.5, concerning the *Breakeven Discount, D_a*, showed a positive relationship between tax rate and the breakeven discount rate. If a firm is in tax losses then it will be indifferent as to whether the sale generate a tax or loss, and tax would not be a factor in choosing between a sale or spin-off. However a tax paying firm would only sell via a trade sale if the premium is sufficient to compensate, as demonstrated by Maydew, Schipper and Vincent (1999). Consequently, a positive relationship between the marginal tax rate of the target parent, and discounts, would be expected. The marginal tax rate used in the tests is from the MTR file on Compustat, compiled by J. Blouin, J Core and W. Guay, using the non-parametric procedures described in Blouin, Core and Guay (2010). I have used the data item MTRBCINT, which is the estimate of the marginal tax benefit of additional interest expense. As the sale of an asset is a marginal decision, the relevant tax rate should more closely correspond to the marginal tax rate on interest deductions. It would be preferable to have the taxable profit status of each sale, however that is not available consistently across the sample of companies.

Diversification measures the number and concentration of business segments owned by the target parent. A firm's diversification status appears to be an important determinant of divestment activity. I measure diversification by calculating the Herfindahl index for each target parent in the year prior to the announcement of the sale. The index was calculated using segment sales data, as provided in the Compustat segment data files. The Herfindahl Index is calculated is defined as follows:

$$H = \sum_{i=1}^{n} s_i^2$$

Where s_i is the sales for segment i, with the firm having n segments. The more diversified a company, the lower the value of the Herfindahl Index. The previous analysis suggests a positive relationship between the value of the index and the discount.

Firms with stronger internal governance are expected to be more pro-active in undertaking restructuring activity. The relationship between governance and discount is problematic. If stronger governance prompts pro-active restructuring activity by management then the asset may be sold earlier than otherwise, thus retaining more value potential. Stronger governance may also signal more discipline on price. Both these arguments suggest a negative relationship between governance and discount. Counterbalancing this, there may be more pressure to address performance issues, weakening the bargaining power of the firm and leading to a negative relationship. Following Bargeron, Schlingemann, Stulz and Zutter (2008) and Owen, Shi and Yawson (2010), I incorporate a variable intended to measure relative discipline within an organisation. I use two measures of institutional ownership as surrogates for corporate decision making that reduces scope for managerial agency costs. The two measures are first, the percentage of *Institutional Ownership* and, second, the *Concentration of Institutional Ownership*. *Institutional Ownership* is calculated as the Percentage of Institutional Ownership in the target parent. *Concentration of institutional ownership* is calculated using the Herfindahl Index, with ownership percentage as the input into the index calculation. A value of 1 signifies a dominant institutional owner, while a value close to zero would signify diffuse ownership. This data is sourced from the Thomson Reuters Shareholder Ownership Summary of 13F filings. These values are calculated for both the acquirer and the target parent, and the ratio of each is calculated as follows. *Relative Institutional Ownership* is the acquirer's percentage of Institutional ownership divided by that of the target parent. *Relative Concentration of Ownership* is the acquirer's Herfindahl Index for Institutional Ownership divided by that of the target parent. In both cases, a ratio greater than one signifies either a greater percentage of institutional shareholders or a greater concentration of institutions in the acquirer, relative to the target parent. This data is sourced from the Thomson Reuters Shareholder Ownership Summary of 13F filings.

Whether the segment is a core business or not may affect the acceptable discount. The discussion in Section 2.4 demonstrated that selling a core business involves greater flow on effects to the business, particularly the loss of synergies. The breakeven discount for selling a core business would therefore be lower (less negative) than an unrelated segment, and so a positive relationship between core status and discount can be expected. The core status of a divestment will be measured by a *Core Indicator* variable, set to one if the target 2 digit SIC code matches that of the target parent. For consistency I use the two digit SIC code of the target parent included in the SDC database.

The analysis in Chapter 3 demonstrated that *Transaction Size* had a positive association with discounts. A larger transaction value could be a surrogate for asset age and stage of development. Larger transactions may also have the alternative of accessing IPO market, so may give target parents greater bargaining power. *Transaction Size* is therefore included as a control variable.

Moeller, Schlingemann and Stulz (2004) find that *Relative Size* of the transaction (for the acquirer) helps explain returns to acquirers of private targets. I apply here to target parents. The more significant an asset is to the target parent it may be expected a more disciplined sale process may be applied to secure the best possible price. *Relative Size* is measured as the *Transaction Value* divided by the *Market Value of Assets* of the target parent.

The firm's *Tobin's Q* represents a number of factors, primarily future profitability and growth opportunities. Again, the relationship between Tobin's Q[65] and discounts is problematic. The analysis in Chapter 2 suggested that higher value creating growth options would be associated with larger discounts as firms have more motivation to exit assets and reinvest. A financial

[65] Tobin's Q is used here in line with the Corporate Finance literature, where it is measured as Market value of Assets divided by Book Value of Assets, as reported in the financial statements, rather than the asset's replacement cost. I use this term to distinguish it from the Market to Book ratio, which usually applies at the equity level. Debt is estimated assuming that the market value of debt equals the book value of debt.

constraints rationale would lead to a similar conclusion. Hovakiminian and Titman (2010) find in their selection equation that higher growth opportunities increase the probability of the firm being classified as financially constrained. Counterbalancing this, high Q firms may have easier access to markets and therefore do not have to sell assets at a discount. This line of argument is supported by Chen and Guo (2005), who find a negative relationship between Tobin's Q and the likelihood of divesting. *Tobin's Q* is measured using financial results for the fiscal year preceding the announcement of the sale. The firm's market value is calculated as Total Assets – Book Value of Shareholder's Common Equity plus the Market value of Shareholder's Common Equity, and Tobin's Q is calculated as Market Value of Firm divided by Book value of Total Assets.

Table 4.3 presents a summary of each independent variable and its expected relationship with discounts.

Table 4.3
List of Variables and expected relationship with Discounts

This table lists the independent variables used in the research design summarised in Section 4.4.1. Definitions of calculation of each variable are given in the notes, as is the rationale for each statement of expected relationship. Positive, implies smaller (less negative discount) as value of independent variable increases.

Variable	Comment	Expected Relationship
Financial Constraints		
Whited-Wu Index	More negative value for index signals less constrained	Negative
Hadlock-Pierce Index		Negative
Use of Proceeds: Investment	Change in value from year prior to announcement to year post completion. A more negative value implies greater increase in capital expenditure or greater reduction in debt	Positive
Use of Proceeds: Debt		Positive
Use of proceeds: Distributions		Nil
Ratings = 1 if Investment Grade		Positive
Consideration Indicator = I if cash		Negative
Access to Financial Markets		
SEO Liquidity Index		Positive
SEO Discount Index		Positive
Number of Blockholders		Positive
Credit Spread		Negative
Fire Sale Conditions		
Acquirer has non-matching SIC Code		Negative
Industry Asset Liquidity Index		Positive
Target SIC code does not match acquirer or parent ("Orphan asset" =1)	If they do not match then larger discount expected (more negative)	Negative
Pressure to Sell		Negative

Table 4.3 (cont) List of Variables and expected relationship with Discounts		
This table lists the independent variables used in the research design summarised in Section 4.4.1. Definitions of calculation of each variable are given in the notes, as is the rationale for each statement of expected relationship. Positive, implies smaller (less negative discount) as value of independent variable increases.		
Variable	**Comment**	**Expected Relationship**
Fire Sale Conditions (cont)		
Acquirer Whited-Wu Index relative to Target Parent's Whited-Wu Index	Higher value indicates Acquirer is less financially constrained	Negative
Relative Institutional Ownership	Acquirer relative to target parent	Negative
Relative Concentration of Institutional Ownership	Acquirer relative to target parent	Negative
Target Parent Abnormal Share price performance in previous twelve month		Positive
Target Parent Abnormal Share price in previous twelve months x Core Indicator (=1 if core)		Negative
Interaction		
Indicator = 1 if three conditions exist		Negative
Control Variables		
Marginal Tax Rate		Positive
Target Parent Diversification [[Herfindahl Index = 1 if single segment]		Positive
Concentration of Institutional ownership		Positive

Table 4.3 (cont) List of Variables and expected relationship with Discounts		
This table lists the independent variables used in the research design summarised in Section 4.4.1. Definitions of calculation of each variable are given in the notes, as is the rationale for each statement of expected relationship. Positive, implies smaller (less negative discount) as value of independent variable increases.		
Variable	**Comment**	**Expected Relationship**
Concentration of Institutional ownership		Positive
Concentration of institutional ownership	Herfindahl Index of institutional ownership = 1 for one owner	Positive
If target SIC code matches target parent = 1		Positive
Transaction Size		Positive
Relative Size		Positive
Tobin's Q		Indeterminate

4.4.4 Sample

The sample transaction used in the empirical analysis are the same transactions described in Chapter 3, subject to the additional requirement that they have financial data available on Compustat and share price data available on CRSP. This has led to a variable sample composition. The number of observations are recorded in each table.

4.4.4.1 Descriptive Statistics

Appendix 4 presents descriptive statistics of all independent variables used in Chapters 4 and 5 in this thesis.

<u>Financial constraints</u>

Table 4.4 presents summary results for each of the indices and ratings. For each measure results are shown in the financial year prior to announcement, in the year of announcement and in the year following completion of the transaction. *p*-values for differences in means using a two tailed t-test, and p-values for differences in distribution using the Wilcoxon signed rank test are presented in the right hand side of the table. For both *p*-values, Column [A] shows the *p*-values for testing between announcement year and pre-announcement year, and post-completion year and announcement year, respectively. Column [B] shows the *p*-values for differences between post completion year and pre-announcement year.

An important preliminary observation about these values is that the sample averages do not appear to reflect a high level of financial constraints. For the Whited-Wu index, 60% of the sample would be classified as less financially constrained using the quartile benchmarks in the original Whited-Wu paper. Similarly, 60% of the sample have investment grade credit ratings ("BBB-"or better).

The Whited-Wu index shows a statistically significant decline over the period, when looking at means, but no material change when looking at the distribution (medians). This represents a weakening in financial position over the pre-announcement to post completion period. Examination of the Whited-Wu index components suggests this result is attributable to declines in size and firm sales growth, partially offset by lower industry sales growth and leverage66. The Hadlock-Pierce index shows no material change over the period, as the reduction in size effect balances the fact that companies in the sample will have aged by two years over the period67. Similarly, average credit ratings have fallen half a notch, from "BBB+" to "BBB".

Descriptive Statistics: Use of Proceeds

Table 4.5 presents results for each measure of use of proceeds, namely investment, debt and shareholder distributions, each scaled by the target parent's Total Assets. Firms appear to reduce their level of *investment* activity in the period following the sale, and also their level of *debt*. Both of these reductions are statistically significant, using either parametric or non-parametric tests. In the case of investment, the reduction occurs in each year of the sale period, whereas debt appears to fall in the year of the announcement. The level of *shareholder distributions* increases over the period, but the change is not statistically significant.

The results from examining the use of proceeds are consistent with changes in the components of the Whited-Wu Index. Leverage reduces but growth (measured by sales growth and investment spending) also appears to decline. This scenario is consistent with the analysis of divestment motivations in Chapter 2, in that target parent financial metrics appear to weaken on a

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[66] Detailed results are not reported but the changes noted here show statistically significant differences between the pre-announcement and post completion years at 10% significance level. The dividend payment variable did not change materially over the period.

[67] Like most studies in this area, these results do suffer from a survivorship bias, due to the desire to have pre and post transaction accounting and share price data.

number of dimensions, making it difficult to attribute any asset sales (or associated discounts) to one particular motivation.

Table 4.4
Financial Constraints for Target parent firms over sale period

Results for each index measure. Equations used to calculate each index value are as per the original papers of Whited-Wu (2006) and Hadlock-Pierce (2010) respectively. All data derived from Compustat and CRSP. Year of announcement is fiscal year in which announcement occurred. Post completion year is fiscal year following fiscal year transaction was treated as effective. *N* is the sample size for each index value. *p* values for means and medians refer to differences between announcement year and post completion, both relative to the pre-announcement year. Tests are the two tailed t-test for means and the Wilcoxon signed-rank test for medians.

	Mean	Std Error	Median	z-Statistic	N	p value for differences in Means		p value for differences in Median	
						[A]	[B]	[A]	[B]
[A] Whited-Wu Index									
Pre-announcement	-0.411	0.007	-0.418		322				
Announcement year	-0.403	0.007	-0.418		322	0.04		0.085	
Post Completion	-0.383	0.008	-0.421		322	0.00	0.00	0.905	0.138
[B] Hadlock-Pierce									
Pre-announcement	-4.359	0.046	-4.654		322				
Announcement year	-4.318	0.036	-4.652		322	0.20		0.520	
Post Completion	-4.233	0.070	-4.653		322	0.20	0.10	0.141	0.189
[C] Long Term Issuer Rating									
Pre-announcement	8.2 :BBB+	0.239	8: BBB+		222				
Announcement year	8.6: BBB	0.245	9: BBB		222	0.00		0.00	
Post Completion	8.8: BBB	0.250	9: BBB		222	0.10	0.00	0.14	0.00

Table 4.5
Use of Proceeds for Target Parent Firms over the sale period

This table shows changes in investment, debt and shareholder distributions over sale period. Investment is sum of Capital Expenditure and Acquisitions, Debt is sum of Long Term Debt plus Debt in Current Liabilities and Shareholder Distributions is sum of Dividends plus Repurchases of Common Stock. Each item is divided by Total Assets. Announcement Year is fiscal year in which transaction was announced, pre-announcement year is prior fiscal year and post-completion is fiscal year following transaction completion. *p*-values for differences in means using two-tailed t-test and medians using Wilcoxon signrank test. Column [A] refers to differences between each year and preceding year, while Column [B] shows difference between post-completion and pre-announcement years.

	Mean	Std error	Median	N	p-values for differences in means		p-values for differences in median	
					[A]	[B]	[A]	[B]
Investment, scaled by Total Assets								
Pre-announcement	0.087	0.006	0.054	322				
Announcement year	0.079	0.006	0.051	322	0.15		0.07	
Post Completion	0.066	0.005	0.041	322	0.01	0.00	0.03	0.00
Debt, scaled by Total Assets								
Pre-announcement	0.313	0.011	0.313	322				
Announcement year	0.298	0.010	0.292	322	0.02		0.00	
Post Completion	0.287	0.011	0.271	322	0.01	0.02	0.73	0.06
Shareholder Distributions, scaled by Total Assets								
Pre-announcement	0.038	0.004	0.016	322				
Announcement year	0.046	0.004	0.020	322	0.11		0.02	
Post Completion	0.048	0.007	0.018	322	0.75	0.14	0.39	0.09

Results are presented using the four discount measures referred to earlier, namely the Arithmetic Mean/ Percent Discount, Harmonic Mean/Percent Discount, Harmonic Mean/Logarithmic Discount and the Geometric Mean/Logarithmic Discount. Justification for these choices was given in Chapter 3. The first method maintains consistency with Officer (2007), while the other measures have stronger theoretical support and also show the effect of moving from Percent Discount to Logarithmic Discount. The results in Chapter 3 also demonstrated that this combination of metrics covers the full spectrum of possible outcomes. The Harmonic Mean generally showed premia, the Arithmetic Mean showed the highest level of discounts and the Geometric Mean produced lower (less negative) discounts.

For the preliminary analysis, I present univariate results by each group of independent variables described in Section 4.4. As most of the independent variables are continuous I present the results of simple regressions of each independent variable against each discount metric. Table 4.6 shows the coefficient for each independent variable and the *p*-value of the significance test for the coefficient value. I then complete the analysis using multivariate regression with the discount as the Dependent variable. Where appropriate I have used the values of various indices in the year prior to the announcement of the transaction. This is to attempt to use metrics that would have influenced the decision concerning the pricing of the asset.

4.5.1 Univariate results

Table 4.6[A] shows results for the financial constraints variables. There are no variables which have a statistically significant univariate relationship with any of the discounts. The only variables to compare with Officer (2007) are the form of consideration and the rating, which are both insignificant in Officer (2007) as well.

Table 4.6[B] shows results for the independent variables measuring access to markets. Again, all the results are statistically insignificant. The only variable with *p-values* approaching acceptable significance levels is the *Number of Blockholders*. Significance levels of less than 0.20 are reported for both *Harmonic Mean* discounts, as well as the *Geometric Mean.* A positive relationship was expected, on the basis that having blockholders would provide more certainty about whether the company can approach the equity markets in need of funds. This variable followed from the model in Chapter 2 which demonstrated that take-up by existing shareholders was a significant determinant of the cost of raising equity. The sign of the *Blockholder* variable is positive, in line with expectations.

Table 4.6[C] shows results for the fire sale variables. Again, all the results are statistically insignificant, except for the relative *Concentration of institutional Ownership,* which is significant at the 10% level for the Harmonic *Mean/Logarithmic Discount.* A negative relationship was expected, in that higher concentration of institutional ownership in the acquirer would lead to better outcome for the acquirer. However the sign is positive, suggesting the discount gets smaller (less negative) the higher the relative concentration of institutional ownership in the acquirer.

Table 4.4[D] shows results for the Interaction variable, designed to test for the simultaneous presence of each of the three components of the fire sale scenario, namely the need for funds, inability to access external market and difficult trading conditions in the asset markets. The number of variables under each group leads to a large number of potential combinations. Table 4.6[D] presents results for four such combinations. The number of transactions for which the Interaction variable equalled one, was generally less than 10% of each sample, possibly indicative of the lack of firesale conditions. In order to demonstrate the economic significance of the *Interaction variable*, Table 4.6[D] shows sample mean and sample medians for the two groups of transactions. For the Arithmetic Mean/Percent Discount, the Interaction Term_1 has discounts lower for the group suffering from a higher Whited-Wu Index value, SEO issuance activity at low levels and selling outside the industry. However the difference is not statistically significant, and is not evident in the other versions of the Interaction term. For the Harmonic Mean/Percent Discount, premia for the firesale group are lower but not statistically significant. For both *Harmonic Mean/Logarithmic Discount* and *Geometric Mean/Logarithmic Discount*, the first two *Interaction terms* have larger (more negative) discounts for transactions where the target parent suffers from the three conditions, however again results are not statistically significant.

Table 4.6[E] shows results for the Control variables. The only variable with a statistically significant relationship with discounts is transaction size, a result established in Chapter 3. Size had an (expected) positive relationship with all discounts except the Harmonic Mean / Percent Discount. The *Marginal Tax Rate* had a negative sign, against expectations, suggesting a higher tax rate is associated with a less negative discount. The economic interpretation of this may be that, tax paying companies are prepared to sell rather than exit via spin off if the premium is sufficiently high to compensate for the extra tax cost.

These generally negative results suggest there is little evidence of a combined liquidity pressure / fire sale effect influencing the level of discounts. Over the whole univariate analysis the only variables that appear to have a significant relationship are *Transaction Size*, the *Number of Blockholders* and *Concentration of institutional Ownership.*

In order to test this further I carried out two additional analyses. First, for each independent variable the sample was segmented on the basis of whether, for each variable, they were above or below the mean. Conditional means and medians were calculated. Second, I ran regressions for each group of independent variables against each discount. For example, only the financial constraints variables were included in one regression, with each group of variables treated likewise. The results were broadly consistent with the univariate results in that there were predominantly no results which were statistically significant or consistent across the alternative measures of discounts. Due to the volume of results I have not reported on the details;

however the main conclusions can be summarised according to each broad group of variables. For the *Financial Constraints* variables, there were no variables that showed any association with any discount. For the *Access to Financial Markets* variables, *Credit Spread* and *SEO Volume Index* both appeared for the *Arithmetic Mean/Percent Discount*. For the *Fire Sale* variables, the *Indicator* variable for testing whether the target's two digit SIC code matches that of the acquirer, and also the *Prior Twelve Months Abnormal Return* both appeared. In addition, the *Relative Concentration Of Institutional Ownership* also reported significant results in a number of the tests. For the *Control* variable, *Transaction Relative Size*, *Tobin's Q*, and the *Concentration of Institutional Ownership* produced statistically significant results with at least one discount. Importantly, the overall conclusion from this supplemental analysis is the lack of any consistent relationships between discounts and the variables specified.

As a further robustness check, I reran the single regressions using the robust regression routine in STATA, rreg. The overall conclusion is unchanged. The most consistent result was a statistically significant positive relationship between *Relative Size* and discounts. This implies that as the asset gets larger relative to the target parent, the discount gets smaller (less negative). This could suggest the parent company places more discipline on sales which are relatively large and therefore have greater financial and reputational impact. It could also be reflecting the generally positive result that asset size has on discounts as well. This variable is included in the multivariate regressions. One other positive result was reported in single instances of ratios. The *Use of Proceeds for Investment* was significant, but only for the Harmonic Mean / Percent Discount. Similarly, the Interaction Term was significant for the Harmonic Mean / Ln discount.

I now turn to analysis of these results in a multivariate model.

Table 4.6 [A]
Financial Constraints Variables: Univariate Results

This table shows results of regressing alternative combinations of averaging and discount calculation examined in Chapter 3 against a number of independent variables measuring financial constraints. The Whited-Wu and Hadlock-Pierce indices are calculated in the year prior to announcement. Use of proceeds are each of change in Capital Expenditure, Interest Bearing Debt and Shareholder Distributions, each scaled by the target parent company's Total Assets, from the year prior to announcement to the year following completion. Consideration and ratings are both Indicator variables taking on a value of 1 if Consideration is cash or rating is investment grade respectively. p-values refer to the co-efficient in the are simple linear regressions. Sample size is in square bracketed under the p-value. Co-efficients significantly different to zero are signified by ***,**, and * at the 1%, 5% and 10% levels respectively.

Variable	Arithmetic Mean / Percent Discount		Harmonic Mean / Percent Discount		Harmonic Mean / Logarithmic Discount		Geometric Mean / Logarithmic Discount	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Whited-Wu Index	-0.094	0.675 [236]	13.596	0.301 [269]	0.311	0.608 [269]	0.178	0.778 [269]
Hadlock-Pierce	-0.026	0.455 [236]	0.032	0.9 [269]	-0.004	0.969 [269]	-0.039	0.696 [269]
Use of Proceeds: Investment	-0.321	0.275 [236]	4.139	0.799 [269]	-0.097	0.897 [269]	0.092	0.907 [269]
Use of Proceeds: Debt	0.052	0.650 [236]	2.060	0.770 [269]	0.165	0.611 [269]	0.225	0.507 [269]
Use of Proceeds: Distributions	0.136	0.705 [236]	-3.238	0.882 [269]	-0.191	0.850 [269]	0.018	0.986 [269]

Table 4.6 [A] (cont)

Financial Constraints Variables: Univariate Results

This table shows results of regressing alternative combinations of averaging and discount calculation examined in Chapter 3 against a number of independent variables measuring financial constraints. The Whited-Wu and Hadlock-Pierce indices are calculated in the year prior to announcement. Use of proceeds are each of change in Capital Expenditure, Interest Bearing Debt and Shareholder Distributions, each scaled by the target parent company's Total Assets, from the year prior to announcement to the year following completion. Consideration and ratings are both Indicator variables taking on a value of 1 if Consideration is cash or rating is investment grade respectively. p-values refer to the co-efficient in the are simple linear regressions. Sample size is in square bracketed under the p-value. Co-efficients significantly different to zero are signified by ***,**, and * at the 1%, 5% and 10% levels respectively.

Variable	Arithmetic Mean / Percent Discount		Harmonic Mean / Percent Discount		Harmonic Mean / Logarithmic Discount		Geometric Mean / Logarithmic Discount	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Consideration = 1 if cash	-0.037	0.586 [196]	1.723	0.480 [221]	-0.131	0.453 [221]	-0.128	0.479 [221]
Rating = 1 if Investment Grade	-0.006	0.910 [251]	2.864	0.344 [285]	0.066	0.649 [285]	0.043	0.775 [285]

Table 4.6 [B]
Access to Markets Variables Univariate Results

Results of simple linear regression of each discount measure against each variable measuring access to markets. Coefficient is regression coefficient of simple linear regression and p-value is two-sided significance level of t-test on each coefficient. Number of observations varies on availability of data for each variable. SEO Liquidity Index is calculated for each two digit SIC code, and measures equity issuance in previous twelve months scaled by median equity issuance over sample period for that industry. SEO Discount Index measures effective discount on equity issues in each two digit SIC code. It does not make allowance for wealth transfers from existing to new shareholders. Number of Blockholders is number of institutional blockholders in each target parent, disclosed in Thomson Reuters ShareOwnership Summary, extracted from SEC 13F filings. Credit Spread is average over previous twelve months of five year BBB bond spread less five year Treasuries. Both items extracted from United States Federal Reserve Selected Interest Rates file. Discounts using Arithmetic Mean are calculated by excluding any acquisition premia in excess of 100% and excluding comparables where Peer Acquisition multiple > 2*Average. Discounts using Harmonic and Geometric Mean have been winsorized at the 99th percentile. Sample size is in square bracketd under p-value. Co-efficients significantly different to zero are signified by ***,**, and * at the 1%, 5% and 10% levels respectively.

Variable	Arithmetic Mean / Percent Discount		Harmonic Mean / Percent Discount		Harmonic Mean / Logarithmic Discount		Geometric Mean / Logarithmic Discount	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
SEO Liquidity Index	-0.001	0.248 [249]	-0.007	0.767 [282]	-0.000	0.737 [282]	-0.001	0.362 [282]
SEO Discount Index	-0.001	0.589 [226]	0.035	0.784 [256]	0.002	0.791 [256]	-0.000	0.977 [256]
Number of Blockholders	0.004	0.851 [229]	1.830	0.117 [261]	0.075	0.164 [261]	0.076	0.183 [261]
Credit Spread	-0.033	0.223 [251]	1.708	0.239 [285]	0.063	0.358 [285]	0.073	0.306 [285]

Table 4.6 [C] **Fire Sale Variables Univariate Results**								
Results of simple linear regression of each discount measure against each independent variables measuring pressure for a fire sale by target parent company. Acquirer and target matching SIC code equals 1 if acquirer has same 2 digit SIC code as target. Orphan Asset equals 0 if the Target's 2 sigit SIC code does not match that of either parent or acquirer. Asset liquidity index measures acquisition activity in same 2 digit SIC code as target. Target parent abnormal return measures target parent excess return in twelve months prior to transaction. Target Parent Abnormal return x SIC match where SIC match equals 1 if SIC code of target matches that of parent. Relative Whited-Wu index measures ratio of Acquirer's Whited-Wu index value relative to target parents' in year preceding announcement of transaction. Pressure to sell equals 1 if target parent has announced an accounting loss of major write-offs in fiscal year prior to transaction. Ln Ownership measures percent of institutional ownership in target parent, while Concentration measures the Herfindahl Index value of institutional ownership. Discounts using Arithmetic Mean are calculated by excluding any acquisition premia in excess of 100% and excluding comparables where Peer Acquisition multiple > 2*Average. Discounts using Harmonic and Geometric Mean have been winsorized at the 99th percentile. Coefficient is regression coefficient of simple linear regression and p-value is two-sided significance level of t-test on each coefficient. Number of observations varies on availability of data for each variable.								
Variable	Arithmetic Mean / Percent Discount		Harmonic Mean / Percent Discount		Harmonic Mean / Logarithmic Discount		Geometric Mean / Logarithmic Discount	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Acquirer and target matching SIC Code (=1 if match)	-0.033	0.549 [251]	4.087	0.181 [285]	0.131	0.367 [285]	0.072	0.634 [285]
Orphan Asset (= 1 if no SIC code match between target and either acquirer or parent)	0.022	0.719 [251]	-3.518	0.294 [285]	-0.059	0.710 [285]	-0.028	0.866 [285]
Asset Liquidity Index	0.007	0.715 [232]	-1.054	0.363 [262]	0.006	0.905 [262]	0.008	0.883 [262]

Table 4.6 [C] (cont)
Fire Sale Variables Univariate Results
[Table description on previous page]

Variable	Arithmetic Mean / Percent Discount		Harmonic Mean / Percent Discount		Harmonic Mean / Logarithmic Discount		Geometric Mean / Logarithmic Discount	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Target Parent Abnormal Return	0.047	0.342 [226]	-1.279	0.658 [259]	-0.020	0.877 [259]	-0.030	0.827 [259]
Target Parent Abnormal return x SIC match with target	0.007	0.914 [226]	-.0567	0.878 [259]	0.000	1.000 [259]	-0.013	0.940 [259]
Relative Whited-Wu Index	0.023	0.557 [217]	-0.709	0.756 [248]	-0.079	0.482 [248]	-0.093	0.427 [248]
Pressure to Sell (=1 if yes)	-0.002	0.973 [221]	0.121	0.972 [251]	0.101	0.507 [251]	0.111	0.487 [251]
In ownership	0.004	0.286 [206]	-0.055	0.817 [237]	-0.004	0.673 [237]	-0.004	0.711 [237]
In concentration	-0.011	0.437 [206]	-0.202	0.772 [237]	0.059	0.058 [237]	0.051	0.118 [237]

Table 4.6[D]

Conditional means based on alternative Interaction terms

Each interaction term is set to 1 if three conditions are met. Term_1 is Whited-Wu Index< median, SEO Volume Index<median; Term_2 is Debt Change < median and SEO Discount Index<media. Term_3 is Debt change< median and Credit Spread > median. Term_4 is Whited-Wu Index< median and Credit Spread> median. The third item in every term is that the two digit SIC code of target should not match that of the acquirer. Discounts using Arithmetic Mean are calculated by excluding any acquisition premia in excess of 100% and excluding comparables where Peer Acquisition multiple > 2*Average. Discounts using Harmonic and Geometric Mean have been winsorized at the 99th percentile. Significance levels for whether the discount means (medians) differ to zero are shown by ***,**,* at the 1%, 5% and 10% level respectively. P-values for differences in means between each group are shown in the table under the relevant results. Sample size ofr each category is in square brackets under the Mean.

Independent Variable	Arithmetic Mean/Percent		Harmonic Mean / Percent		Harmonic mean/Ln		Geometric Mean /Ln	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
[A] Interaction Term_1								
Interaction term=0	-0.266 [236]	-0.3227	4.469 [267]	0.2496	0.238 [267]	0.1462	0.080 [267]	-0.1131
Interaction term=1	-0.432 [15]	-0.4602	2.732 [18]	-0.2190	-0.177 [18]	-0.3408	-0.454 [18]	-0.5971
p-value for differences in means/medians	0.1392	0.1879	0.7796	0.2201	0.1590	0.1073	0.2212	0.2717

Table 4.6[D] (cont) **Conditional means based on alternative Interaction terms** [Table description on previous page]								
Independent Variable	Arithmetic Mean/Percent		Harmonic Mean / Percent		Harmonic mean/Ln		Geometric Mean /Ln	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
[B] Interaction Term_2								
Interaction term=0	-0.284 [224]	-0.3392	4.805 [256]	0.2424	0.241 [256]	0.1407	-0.078 [256]	-0.1648
Interaction term=1	-0.206 [27]	-0.2159	0.427 [29]	0.1702	-0.040 [29]	0.1436	-0.330 [29]	-0.763
p-value for differences in means/medians	0.3626	0.3219	0.3799	0.7019	0.2365	0.5571	0.3068	0.6896

Table 4.6[D] (cont) **Conditional means based on alternative Interaction terms** [Table description on previous page]								
Independent Variable	Arithmetic Mean/Percent		Harmonic Mean / Percent		Harmonic mean/Ln		Geometric Mean /Ln	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
[B] Interaction Term_3								
Interaction term=0	-0.280 [233]	-0.3417	4.480 [264]	0.2184	0.210 [264]	0.1332	-0.106 [264]	-0.1999
Interaction term=1	-0.218 [18]	-0.1042	2.843 [21]	0.2638	0.232 [21]	0.2341	-0.078 [21]	-0.0259
p-value for differences in means/medians	0.3826	0.3828	0.7768		0.9358	0.6920	0.9214	
[D] Interaction Term_4								
Interaction term=0	-0.282 [233]	-0.3599	4.502 [263]	0.2114	0.2048 [263]	-0.1396	-0.110 [263]	-0.1888
Interaction term=1	-0.192 [18[	-0.1566	2.652 [22]	0.2621	0.2983 [22]	0.1875	-0.034 [22]	-0.3611
p-value for differences in means/medians	0.3867	0.2162	0.7433		0.7278	0.4755	0.7879	0.5077

Table 4.6 [E]
Control Variables: Univariate Results

Results of simple linear regression of each discount measure against each control variable. Coefficient is the regression coefficient of simple linear regression and p-value is the two-sided significance level of the t-test on each coefficient. Number of observations varies on availability of data for each variable. Marginal Tax Rate is the non-parametric MTRINT rate available on Compustat. Herfindahl Index is calculated based on segment sales revenue for target parent for the fiscal year prior to the announcement of sale. Herfindahl Index: change is the change in value of H from the year prior to the announcement Herfindahl Index. Institutional Ownership is the percent of ownership in target parent, and Concentration is the Herfindahl Index based on ownership shares by institutions. Target / Parent matching SIC code equals 1 if target 2 digit code matches that of parent. Transaction Size is the log of Transaction Value. Relative Size is Transaction value divided by Enterprise Value of target parent. Target parent Tobin's Q is Enterprise value divided by Total Assets. Enterprise value is Total Assets less book value of equity plus market value of equity, in the year prior to the announcement of sale. Sample size is shown in square brackets under the p-value

Variable	Arithmetic Mean / Percent Discount		Harmonic Mean / Percent Discount		Harmonic Mean / Logarithmic Discount		Geometric Mean / Logarithmic Discount	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Marginal Tax rate	-0.184	0.572 [211]	2.258	0.910 [240]	-0.243	0.782 [240]	-0.179	0.846 [240]
Herfindahl Index	0.032	0.715 [237]	3.541	0.480 [251]	0.212	0.374 [251]	0.236	0.340 [251]
Hefindahl Index: change	-0.091	0.242 [237]	-3.711	0.411 [251]	-0.399	0.062 [251]	-0.409	0.066 [251]

Table 4.6 [E] (cont) **Control Variables: Univariate Results** [Table description on previous page]								
Variable	Arithmetic Mean / Percent Discount		Harmonic Mean / Percent Discount		Harmonic Mean / Logarithmic Discount		Geometric Mean / Logarithmic Discount	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Institutional Ownership	-0.212	0.122 [227]	12.764	0.114 [261]	0.245	0.515 [261]	0.257	0.513 [261]
Institutional Ownership Concentration	0.100	0.630 [227]	-5.142	0.688 [261]	-0.487	0.413 [261]	-0.711	0.253 [261]
Target and Parent matching SIC = 1	0.0034	0.948 [251]	-3.618	0.234 [285]	-0.167	0.248 [285]	-0.175	0.244 [285]
Transaction Size	0.065	0.004 [251]	1.269	0.324 [285]	0.171	.0005 [285]	0.193	0.002 [285]
Relative Size	0.127	0.164 [220]	-1.501	0.793 [251]	0.173	0.499 [251]	0.197	0.461 [251]
Target Parent Tobin's Q	-0.016	0.444 [220]	-1.256	0.329 [251]	-0.050	0.389 [251]	-0.089	0.140 [251]

4.5.2 Multivariate Results

The multivariate test includes all of the variables which were identified at the conclusion of the previous section. However, for the multivariate test it is important to have variables from each of the broad groups of variables specified in the original model. Consequently, I have included variables from the Financial Constraints group, and also the Interaction group, to ensure that both these important groups of variables are represented. For the Financial Constraints group, the *Whited-Wu Index* has been included. For the Interaction term, *Interaction Term_1* has been included. Table 4.7 below presents the summary of the variables to be used.

Table 4.7 List of Variables used in Multivariate tests		
This table lists the independent variables used following the univariate and preliminary multivariate tests. Positive, implies smaller (less negative discount) as value of independent variable increases.		
Variable	Comment	Expected Relationship
Financial Constraints		
Whited-Wu Index	More negative value for index signals less constrained	Negative
Access to Financial Markets		
SEO Liquidity Index		Positive
Credit Spread		Negative
Number of Blockholders		Positive
Fire Sale Conditions		
Acquirer has non-matching SIC Code		Negative
Relative Concentration of Institutional Ownership	Acquirer relative to target parent	Negative
Target Parent Abnormal Share price performance in previous twelve month		Positive
Interaction		
Indicator = 1 if three conditions exist	Three conditions are target Whited-Wu index value is higher (worse) than median, equity issue volumes are lower than median and the Acquirer and Target have different 2 digit SIC codes.	Negative
Control Variables		
Concentration of Institutional ownership		Positive

Table 4.7 **List of Variables used in Multivariate tests**		
This table lists the independent variables used following the univariate and preliminary multivariate tests. Positive, implies smaller (less negative discount) as value of independent variable increases.		
Variable	Comment	Expected Relationship
Concentration of institutional ownership	Herfindahl Index of institutional ownership = 1 for one owner	Positive
Transaction Size		Positive
Relative Size		Positive
Tobin's Q		Indeterminate

Tests were carried out for each of the four discount measures used thus far, using robust regression procedures described in Chapter 3. Selected results are included in Table 4.8. These regressions include representative variables from each of the four groups of variables described in Table 4.7. The overall tenor of the univariate results carries through into the multivariate analysis, in that there are few statistically significant relationships. Across the regressions, the most consistent result is the significance of the *Transaction Size* variable. In all regressions the size coefficient has a positive sign, indicating that as transaction size increases, the discount gets less negative. This is consistent with the results from Chapter 3. The value of the size coefficient ranges between 0.15 and 0.27. The standard deviation of the size variable is approximately 1.205, suggesting a one standard deviation variation in size is associated with a reduction (less negative) in the discount of between 0.15 and 0.30. These are economically significant in the context of the size of reported discounts.

The *Interaction* term is significant in three of the regressions. The coefficient has a negative sign, in accordance with the hypothesis, and ranges between -0.505 and -0.828. The Interaction term is described in Table 4.2, but generally takes on a value of one when three conditions exist simultaneously, namely poor liquidity position of the vendor, poor external market conditions and the asset is sold outside the industry. I have argued that each of these conditions needs to be present for a discount to be attributed to liquidity pressures. The statistically significant negative coefficient for this variable lends support to this contention. The size of the coefficient is economically significant, suggesting a marginal increase (more negative) increase in discounts of 50 percent to 80 percent when the three conditions are present. It should be noted however that there are only a small number of transactions where this variable takes on the value of one (refer to Table 4.6[D]). This suggests a small number of transactions are having a significant influence on the value of the regression coefficient. It should also be noted that, in Table 4.6[D], the differences in means between discounts of transactions where the Interaction term was zero or one, were directionally in accordance with the above results but not statistically significant[68].

Relative Ownership Concentration was also significant for three regressions. This variable measures the relative concentration of institutional ownership between the acquirer and target parent, a higher value indicating more concentrated institutional ownership in the acquirer. This was included as a measure of relative discipline between acquirer and target parent, and a negative sign was expected. However the coefficient is positive, with values ranging between 0.064 and 0.149, thus the greater the relative concentration in the acquirer, the smaller (less negative) the discount. This result is not consistent with my hypothesis concerning the impact of relative discipline.

The variable *Acquirer and Target matching SIC code* is set at one if the Acquirer and Target have the same two digit SIC code. A negative relationship was expected, following from the fire sale argument that acquirers from

[68] The regressions were rerun omitting transactions where the Interaction term was one. The coefficient values and significance levels of the other coefficient were largely unchanged.

outside the industry may signify a lack of buyers within the industry. In accordance with this hypothesis, this variable has a statistically significant negative value in both regressions where discounts are measured using the Percent calculation. Again, the size of the coefficient is economically significant.

The variable representing the *Whited-Wu* index had a positive and statistically significant value in the two regressions where the discounts are measured using the Percent calculation. Higher values of this index represent stronger financial constraints, and thus a negative relationship was hypothesized. A positive sign is counter to this argument, and suggests firms with higher levels of financial constraints sell assets at lower (less negative) discounts. One possible interpretation of this result may be the that, in line with Lang, Poulson and Stulz (1995), firms required to sell assets for funding purposes may be forced to sell the most liquid, and possibly better performing assets, rather than necessarily to poorest performing assets. However firms selling assets for strategic or performance reasons will more likely have the flexibility to sell the poorly performing asset. This scenario would explain a positive relationship between discounts and the Whited-Wu index value.

The only other variable with the statistically significant result is the *Tobin's Q*, measured as the Enterprise Value divided by Total Assets. This variable is only significant when discounts are measured using the Arithmetic Mean/Percent Discount combination. Its sign is negative, suggesting that target parents with lower Tobin Q values sell assets at larger (more negative) discounts. This is arguable consistent with target parents with lower than average values simply selling their lower valued assets.

Table 4. 8

Regression Results for Liquidity Pressure Hypothesis variables

Results for robust regression for each combination of averaging and discount method. Coefficient values for each variable in the first row. Standard errors in brackets in second row. Standard errors are output from the STATA robust regression routine, and the calculation is described in J. O. Street et al. (1988) Street et al (1998). Whited-Wu index is value of index in year prior to announcement. SEO Volume Index is equity issue activity in same two digit SIC code as target period in preceding twelve months, scaled by activity over whole period. Credit spread is the average difference between Baa bonds and Five Year Treasuries in the preceding twelve months.. Number of Blockholders is the number of Blockholders in parent company. Relative Ownership Concentration is ratio of concentration of institutional shareholders in acquirer divided by those in the target parent. Acquirer & target matching SIC is set to one when acquirer and target have the same 2 digit SIC code. Interaction term is set to one when measures of target parent liquidity are poor, equity market conditions are poor and the target and acquirer have different 2 digit SIC codes. Size is the natural logarithm of Transaction value. Relative Size is the Transaction Value divided by the sum of the target parent's equity market value and book value of debt. Tobin's Q is the sum of target parent parent's equity market value and book value of debt divided by total assets.

Results over page

Table 4. 8 (cont)

Regression Results for Liquidity Pressure Hypothesis variables

[Table description on previous page]

	Arithmetic Mean / Percent Discount	Harmonic Mean / Percent Discount	Harmonic Mean / Ln Discount	Geometric Mean / Ln discount
Whited-Wu Index	1.038**	2.152**	1.228	1.372
	(0.537)	(0.837)	(0.843)	(0.923)
SEO Volume Index	-0.001	-0.000	-0.001	-0.001
	(0.000)	(0.001)	(0.001)	(0.001)
Credit Spread	0.006	-0.003	-0.014	-0.024
	(0.041)	(0.064)	(0.064)	(0.070)
Twelve Month Abnormal return	0.085	0.148	0.131	0.164
	(0.082)	(0.128)	(0.129)	(0.141)
Number of Blockholders	-0.045	-0.042	-0.009	-0.031
	(0.034)	(0.054)	(0.055)	(0.060)
Acquirer & Target matching SIC Code (match=1)	-0.192**	-0.326**	-0.179	-0.216
	(0.090)	(0.141)	(0.142)	(0.156)
Relative Ownership Concentration	0.010	0.149***	0.077***	0.064**
	(0.017)	(0.026)	(0.026)	(0.028)
Interaction Term_1	-0.203	-0.505**	-0.829***	-0.654**
	(0.191)	(0.297)	(0.299)	(0.328)
Size	0.155***	0.219***	0.237***	0.257***
	(0.043)	(0.067)	(0.068)	(0.074)
Relative Size	0.041	0.264	1.008	0.812
	(0.401)	(0.640)	(0.644)	(0.705)
Tobin's Q	-0.067**	-0.028	-0.022	-0.060*
	(0.033)	(0.051)	(0.051)	(0.056)
Constant	-0.488*	0.009	-0.688**	-0.890**
	(0.319)		0.503	(0.550)
Number of observations	195	195	195	195

4.5.4 Discussion of Results

I now briefly summarise the results as they relate to the hypotheses outlined earlier in this chapter. Hypotheses H4.1(a) and (b) hypothesised a positive relationship between financial constraints and discounts. My analysis shows that target parents do appear to be under financial pressure, in the sense that their measures of financial constraints deteriorate over the pre-announcement to post-completion period, reflected in declines in gearing and investment activity. However, importantly, these measures did not show any statistical relationship with the size of discounts. This mirrors the results for Officer (2007) who found that on many metrics the sample of target parents had poor industry adjusted measures of liquidity however none of these variables, aside from stock price performance, appeared as statistically significant in multivariate tests. In this study, I have used measures of financial constraints different to Officer. Using the Whited-Wu (2006) and Hadlock-Pierce (2010) indices, measures which are derived from the financial literature, and using direct measures of use of proceeds, I find no relationship.

Hypothesis H4.2 (a) and (b) hypothesised a negative relationship between discounts and external market conditions. Again, aside from one positive result in the univariate tests I find no relationship between equity market activity and discounts. In this study I used a measure of equity market activity more appropriate for a listed company, namely SEO market activity, but no relationship was found.

Hypotheses H4.3 hypothesised that buyers outside the industry would be able to acquire assets cheaply. The multivariate tests find that, when discounts are measured using the percent method, that the discount is higher (more negative) when the 2 digit SIC code of the acquirer and target match. This is opposite to the hypothesised direction, and suggests that within-industry buyers obtain largest discounts. This could be consistent with an argument that within-industry buyers are consolidating and acquiring poorer performing assets to rationalise. This result does not manifest itself when discounts are measured using the logarithmic method.. I find no relationship between the level of asset sale activity in each two digit SIC code and discounts.

In developing Hypothesis H4.4, I argued that the liquidity pressure induced fire sale narrative required the simultaneous presence of a need for funds, costly or difficult to access external funds, and low liquidity in the asset markets. Unless each of these was present then the transmission mechanism from liquidity pressure to discounts potentially breaks down. In our sample, less than ten percent of transactions actually met these conditions, although nearly twenty percent did meet a criterion which just combined company financial constraints and external equity markets. The *Interaction Term* was statistically significant in the multivariate analysis. This suggests that the transmission mechanism required to explain a fire sale, and described earlier in this chapter, has some explanatory power. However, the fact that it applies in a small proportion of transactions means that it cannot be used as the explanation for discounts which may be reported sample wide.

Tests were run for the potential impact of industry and year fixed effects, in accordance with the procedure described in Chapter 3. Allowance for the fixed effects had no material effect on the sign, magnitude or statistical significance of the key results discussed here.

4.6 Conclusion

There is evidence that companies selling assets are acting to change their financial position, as there are statistically significant changes in investment and debt for the target parents. However there is little evidence that any such pressure translates into explaining discounts on the transaction. The most significant result in this regard is the statistically significant coefficient value for the Interaction variable. This is designed to incorporate the combined presence of liquidity pressure on the vendor, adverse equity market conditions and adverse asset market conditions. The coefficient value is significant. I conclude that this result is evidence in support of the suggested transmission mechanism required to trigger a fire sale. However, of equal significance is the fact that only a small proportion of the sample (18 firms) has a value of one for this indicator variable. This suggests that the mechanism suggested describes possible fire sale transactions but cannot be used to explain the pervasive presence of discounts, should they exist. I conclude therefore that the analysis in this chapter has been unable to unearth any significant evidence that discounts are attributable to liquidity pressure on the selling firm.

It is important to emphasise that this does not contradict the financing motivation for selling assets, it simply asserts that such sales take place at fair value. The implication of this conclusion is that the discounts identified in Chapter 3 must be attributable to other factors.

One of the key propositions of my thesis is that the characteristics of the underlying assets should be considered when measuring and evaluating discounts. It is noteworthy that the most significant variables in the regressions related to the asset's transaction value. This is, admittedly, a surrogate for many factors but the key point is that it relates to the asset. The other significant influence on discounts was the relative concentration of institutional ownership, related to industry membership of the transaction parties and the target, possibly hinting at a aspects related to the asset may play a role in explaining discounts.

In the next chapter I examine in more detail the relationship between acquirer and seller, and use market announcement responses to further test for the presence and causes of discounts.

Chapter 5

What does the market response to sale announcements tell us about discounts

5.1 Introduction

The focus of this thesis is to test the robustness of reported discounts on trade sales and to explore potential explanations for variations in these discounts. Chapter 3 demonstrated that variations in asset profitability partially explain variations in discounts, while Chapter 4 concluded that financial constraints and the impact of equity market conditions were not an explanation for these discounts. In this chapter I explore the market value impacts of divestment announcements, by testing whether the reported discounts on sale help explain announcement returns to buyers and sellers, and the allocation of value created between buyers and sellers.

Insights from this analysis are important for two reasons. First, existing evidence suggests that seller announcement returns to asset sales are neutral to marginally positive, depending on the use of proceeds, the financial condition of the seller and perceived growth opportunities. This analysis will contribute to the existing literature by assessing whether reported discounts can help explain market reactions to divestment announcements. Conversely, we can also use market reactions to test the robustness of discounts. An association between market response and discount would support an argument that such discounts are true[69], while no association would counter that argument.

[69] True in the sense that they reflect the fact that an asset was sold < true value, rather than the discount simply reflecting the fact that assets sold in these circumstances are simply less valuable than public market peers.

Second, public companies that acquire private targets consistently earn positive abnormal announcement returns, with acquirers recording positive abnormal announcement window returns of approximately 2%. Described as the so-called listing effect[70], this phenomenon is recorded for the United States and Europe, (Faccio, McConnel and Stolin, 2006) and is clearly different to the well-known result for public acquirers of public companies. A further 'anomaly' is that acquirers of private targets using equity as consideration achieve superior returns to those using cash. Again, this differs to results for acquirers of public targets, where stock based acquisitions perform worse than cash financed ones. Potential explanations include enhanced monitoring by new blockholders (Chang, 1998) lack of shareholder overlap (Hanson and Song, 1997), method of payment (Chang, 1998) or a size effect, whereby smaller acquirers tend to buy private targets. However, even allowing for these effects, the private status of the target still emerges as a factor associated with superior returns to acquirers. As Faccio et al (2006) conclude: *"the fundamental factors that give rise to this listing effect…remain elusive*".

One possible explanation is that acquirers of private targets earn superior returns because they are able to buy "cheaply". This proposition complements the Officer (2007) finding that sales of subsidiaries are sold at a 30% discount to public market comparables. Officer (2007) attributes this result to seller liquidity pressure. Ma (2006) shows that buyer abnormal returns are positively associated with the relative liquidity position of the buyer, selling pressure on the seller and negatively associated with the intensity of asset liquidity. In this study I use a matched sample of buyers and sellers to test the relationship between reported (Chang, 1998) discounts, and buyer and seller abnormal returns. If the discounts are "true", then they can be used as a measure of a "cheap" acquisition that should, in turn, be reflected in higher

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[70] Describing this phenomenon as a listing effect may be appropriate for privately owned standalone businesses but is problematic for subsidiaries of already listed companies, whose ownership just changes from one listed company to another.

returns to the acquirer. This relationship between reported discounts, and buyer and seller abnormal returns has been asserted in the past but, to my knowledge, has not been formally tested. I test this relationship using a sample of private targets for which I have calculated the discount on sale relative to public comparables.

This research makes the following contribution to the literature. First, I link reported discounts and market value effects. To date studies have concentrated on calculating the discounts without testing market value impact. The market value impact is a potentially important means to validate whether these discounts exist, a primary objective of this thesis. Second, it advances on previous research in this area by being the first to use relative (as between buyer and seller) measures of financial constraints and institutional ownership levels to test their impact on reported discounts and the allocation of value created between buyer and seller.

This chapter is organised as follows. Section 5.2 reviews the literature on the listing effect, particularly in terms of the distinction between privately owned companies and subsidiary targets. This literature has generally focussed on deal characteristics. Recent research by, for example, Officer et al (2009) incorporates asset specific characteristics.

Section 5.3 presents hypotheses designed to test whether firstly, the relative allocation of wealth effects of divestment transactions between buyers and sellers helps explain the nature of reported transaction discounts and, secondly, whether relative bargaining power of buyer and seller helps explain the discounts or the relative allocation of wealth between buyer and seller. Section 5.4 presents the research design, while Section 5.5 presents the empirical results.

5.2 Prior Research: Listing Effect

5.2.1 Acquirer Abnormal Returns

Research on the listing effect follows the classic event study approach, by initially calculating Cumulative Abnormal Returns (CAR's), with the calculation of mean and median CAR's conditioned on the private or public status of the target. Cross sectional regression models, including a range of explanatory and control variables, are used to explain the CAR's. The private or public status of the target is usually represented by a dummy variable. We will follow this approach in our discussion of the research, firstly by describing and analysing the listing effect, followed by an evaluation of proposed explanations, and how they relate to this research and the liquidity argument in general.

Two important conclusions can be drawn from this review. First, the listing effect is consistently positive. The returns average 1.5% to 2%. Second, cross sectional regressions demonstrate that after controlling for other identified explanations, the listing effect is still positive and of the same order of magnitude.

5.2.2. Possible explanations for the listing effect

Possible explanations for the listing effect include cross ownership, beneficial effect of new blockholders, payment method, transaction size, relative size of target and acquirer, and how difficult the target is to value. In the balance of this section I review this research, specifically to identify factors which may be relevant to assessing discounts on sale of subsidiaries, as distinct from privately owned companies. Both types of targets are labelled as private, however in Chapter 1, I identified why they may have different characteristics, particularly in relation to alternative funding sources, alternative motivations and alternative use of proceeds.

<u>Cross ownership:</u>

Hansen and Lott (1996) argue that the private status of the target is a surrogate for the degree of cross ownership. Acquisition of another public company helps to internalize between-firm externalities (adverse effects on other firms through competition, for example). With diversified shareholders, who hold shares in both acquirer and target, companies are willing to pay more for acquiring a public company rather than a private target, as shareholders of the acquirer can recapture any overpayment via their position as target shareholder. They cannot do this if the acquirer buys a private target. Hansen and Lott (1996) present this as the explanation for the positive returns to acquirers. Faccio et al (2006) fail to find support for the Hansen and Lott (1996) hypothesis. Another possible test of this hypothesis would be to differentiate between privately owned targets and subsidiaries of public companies. The subsidiary of a public company should be subject to the same cross ownership effect as a public target, and we would therefore expect to see positive acquirer returns occurring only for the acquisition of private targets but not subsidiaries. However Faccio et al (2006) find the co-efficient for private companies and subsidiary are identical, while Moeller, Schlingemann and Stulz (2004) and Fuller, Netter and Stegemoller (2002) find that returns for acquiring subsidiary targets are actually higher, both results at odds with the cross ownership hypothesis.

Method of payment:

Chang (1998), Fuller, Netter and Stegemoller (FNS, 2002) and Moeller, Schlingemann and Stulz (MSS, 2004) all find that in the acquisition of private targets CAR's for acquirers who use stock as consideration generally exceed returns to those acquisitions using cash consideration. This result is the opposite to that found for the acquisition of public targets. Moeller et al (2004) find a statistically significant difference of 1% in CAR when equity is used to acquire subsidiaries, but not for private targets. However in all cases returns are still positive. Their cross sectional regressions provide weak evidence that cash acquisitions have lower returns, even when allowance is made for ownership status. Similarly, Fuller et al (2002) find that even when a method of payment variable is included they still find positive acquirer CAR's. Thus, while there may well be a method of payment effect, it does not explain the listing effect. As an aside, it is also noteworthy that, in the large US samples of MSS and FNS, equity is used more commonly when private owned targets are acquired, whereas cash is more common when subsidiaries are acquired. Equity or mixed equity/cash are used in approximately 60% of standalone private target acquisitions, and in about 30% of subsidiary acquisitions[71]. Fuller et al (2002) demonstrate that the choice of method of payment by an acquirer is affected by target characteristics. The use of equity as consideration has been associated with higher returns, a result at variance with the evidence on public market acquisitions (Faccio, McConnell and Stolin, 2006).

In order to better understand the combined effect of private target status and method of payment choice, a number of other explanations have been tested, including the effect of blockholders and the impact of difficult to value targets. I now examine each in turn.

<u>Blockholders:</u>

Chang (1998) suggests that using equity as consideration creates the potential for new blockholders in the acquiring firm. Firm value is increased if the benefits of improved monitoring outweigh the potential costs of increased ownership concentration. Chang (1998) finds support for this hypothesis, in that positive acquirer returns are only recorded when equity is used as consideration. This is in contrast to the use of equity in acquiring public targets, which show lower returns than when cash is used as consideration. Unlike in

[71] These percentages are boosted by the number of mixed consideration transactions. Looking at pure equity transactions, the difference is even starker, with 5% of subsidiary transactions being pure equity, and 25% of standalone private targets being pure equity.

other studies, Chang (1998) finds that when cash is used as consideration acquirer CAR's are zero. Furthermore, when equity is used as consideration he finds that, when a new blockholder is created, the positive acquirer CAR's of 4.89% significantly exceed those when no blockholder is created of 1.79%. While Chang finds the blockholder effects boosts returns, even when no blockholder is created returns are still positive, so this effect does not completely explain the listing effect. In addition, as noted above, while Chang finds that returns for cash acquisitions of private targets are zero, most other studies find positive acquirer CAR's whether cash or equity is used, again weakening the blockholder hypothesis. FNS (2002) find some evidence for a blockholder effect, but find that even after allowing for this as well as method of payment, positive abnormal returns are still earned by acquirers of public targets.

Difficult to value targets:

In the presence of asymmetrical information, or with a difficult to value target, an acquirer can mitigate their risk by issuing stock to the target shareholders instead of paying cash. In the case of public target acquisitions the use of stock as consideration is associated with lower CAR's (Travlos, 1987). However with a private target it can be argued that there is greater information asymmetry associated with the target asset. Hansen (1987) demonstrates that, in the presence of target information asymmetry, using stock will mitigate the risk for the acquirer. Officer et al (2009) directly test this by identifying a sub-sample of difficult to value targets, defined by the relative size of R&D expenditure to sales. They find that for difficult to value targets the use of stock finance has a significant impact on CAR's. Acquirers issuing stock (79% of the sample) earned strongly positive returns, whereas acquirers using cash suffered negative returns of -5.8%. For targets not deemed difficult to value returns were positive, and not statistically different, regardless of whether stock was used as consideration. In a cross sectional regression with announcement period returns as the dependent variable, Officer et al (2009) find that a dummy variable for Development Stage has a negative impact on returns, however, when interacted with an equity finance dummy variable (which equals 1 if stock is used), the co-efficient more than offsets the negative Development Stage co-efficient. The combination of difficult to value targets and the method of payment have a material effect on CARs. However, the Officer et al (2009) univariate results suggest that even after allowing for this factor there is still a listing effect. It is not possible to determine whether this is the case with the cross sectional results, as they are based solely on private targets.

The terms asymmetrical information and difficult to value appear to be almost interchangeably in this paper. I would argue they are different. Asymmetrical information normally refers to when one party has more information than another about an asset's value, as modelled by Myers and Majluf (1994). Officer et al (2009) argue that private target acquisitions expose acquirers to this risk. However, the sale process for private targets does effectively mitigate information asymmetry. Alternatively, and more importantly, a difficult to value target may be difficult to value because of inherent uncertainty in the valuation. Officer et al's (2009) definition of difficult to value is definitely measuring this aspect.

Transaction size and relative size:

MSS (2004) test whether a size effect may be the underlying cause. They find that acquisitions of public targets tend to undertaken by larger companies, and so the inclusion of relative size is an important control variable.

Governance and ownership status:

Bargeon, Stulz et al (2008), Owen, Shi and Yawson (2010) and Hanson and Song (2000) all document the important impact that ownership and governance have on outcomes of acquisitions or divestments. This conclusion was reinforced in Chapter 4, where the relative concentration of institutional ownership was found to be one of the few factors associated with discounts (albeit in the opposite direction to that expected).

5.3 Relationship between discount and returns to acquirers

The listing effect remains unexplained. One potential, but unexplored, source of the listing effect is that acquirers purchase private targets cheaply. Ma's (2006) results provide some support for this, when he finds a positive relationship between acquirer returns and the relative liquidity position of the target parent and acquirer72. It is also a logical implication of Officer (2007), who attributes discounts to liquidity pressure induced fire sales. If it is true that acquirers are able to buy assets cheaply, then this amounts to a transfer of wealth from target parent to acquirer. In this thesis, I have explored alternative explanations for the presence of discounts. These alternative explanations include the possibility that the reported discounts reflect differences in underlying value between subsidiaries and public market comparables. Even if the discounts are genuine, they could reflect the influence of factors other than liquidity pressure, but flow-on effects to the rest of the business73. Neither of these scenarios would imply a transfer of wealth from target parent to acquirer.

In this section, I present a series of hypotheses to determine whether it is possible to use announcement returns to help distinguish between these

[72] Although in Chapter 4, I assess the robustness of such conclusions due to possible doubts about using relative net working capital as a measure of relative bargaining power.

[73] Tax benefits from sale, and reduction of diversification discount were two possible explanations examined.

alternative explanations for the presence of discounts. I test the following questions. First, is there a relationship between discounts and acquirer returns? A positive finding would imply that the market reaction is validating the argument that there is a transfer of wealth from target parent discount measures. Second, I test whether relative bargaining power of buyer and seller explains the allocation of value created in a transaction. Again, this will provide insights into the explanatory power of the alternative perspectives.

The sample of transactions used in this research allows the measurement of returns to both buyer and seller, so it possible to determine the total value created by a transaction, at least as measured by announcement returns. To measure the creation and allocation of value from a trade sale transaction we calculate dollar abnormal return. Dollar abnormal return is the sum of pre-announcement market value of the acquirer and seller, multiplied by their respective announcement period abnormal returns. It has been used by Bradley, Desai and Kim (1988), Moeller, Schlingemann and Stulz (2008) and Datta and Iskander-Datta (2003) to test for the allocations of gains between buyers and sellers.

5.3.1 Do market responses imply the presence of a discount?

The relative allocation of wealth between the two parties can be used a measure of the extent to which the asset was sold at fair value. We can state the hypothesis as follows:

H5.1: If a private asset is sold by one public company to another at a discount to true value then a greater proportion of value created by the transaction should accrue to the acquirer the larger the discount

This hypothesis will test whether the observed superior performance of buyers of private assets can be explained by the relative discount on these assets. If discounts reflect relative bargaining power then there should be a positive relationship between discount and return to acquirer. Rejection of the hypothesis would indicate that the discounts do not reflect relative bargaining power, but rather differences in underlying asset value, differential private benefits or differences in public and private sale processes. The process of a subsidiary sale may provide advantages to an acquirer, such as contractual terms, due diligence and reduced reputation risk from participating. These benefits could be the source of positive shareholder responses.

The issues involved in measurement of trade sale discounts are fully explored in Chapter 3. Testing this hypothesis requires measurement of returns to buyers and sellers, the net wealth impact of these transactions and how returns are allocated between buyers and sellers. Consequently, in this section I describe the procedure for calculating the wealth creation impact of the transaction, and how it is allocated between buyer and seller.

Abnormal Dollar Returns

CAR's can only be calculated at parent level, so are affected by the scale of buyers and sellers, both relative to each other and the target asset. Abnormal dollar returns allow results to be related to actual transaction size. Abnormal dollar returns are calculated for acquirer and target parent respectively as follows:

$$\Delta W_{acq,\Delta t} = V_{acq,t-2} \cdot CAR_{acq,t=1} \qquad [5.1]$$

and

$$\Delta W_{tgt,\Delta t} = V_{tgt,t-2} \cdot CAR_{tgt,t=1} \qquad [5.2]$$

where $V_{acq,t-2}$ *and* $V_{tgt,t-2}$ are the equity market capitalisation of the acquirer and target two days prior to the announcement of the transaction.

The total wealth created by the transaction is

$$\Delta W_{\Delta t} = \Delta W_{acq,\Delta t} + \Delta W_{tgt,\Delta t} \qquad [5.3]$$

The share of value created captured by the acquirer and seller is calculated as follows:

$$Share_{acq} = \Delta W_{acq,\Delta t} / \Delta W_{\Delta t} \qquad [5.4]$$

and

$$Share_{tgt} = \Delta W_{tgt,\Delta t} / \Delta W_{\Delta t} \qquad [5.5]$$

This hypothesis implies larger gains to the acquirer, $Share_{acq}$, being attributable to larger discounts.

5.3.2 Does Financial Pressure on Seller affect transaction price?

Officer (2007) concludes that the discounts reported are attributable to sellers being under financial pressure, and this complements general evidence that companies who sell assets tend to have poorer financial performance. However, the direction of causality is unproven; if companies are in a poor financial position due to poor financial performance then the discount could still be caused by a lower underlying asset value, rather than constituting a genuine discount.

Shareholders of companies that sell assets achieve positive abnormal returns on announcements of sale. These returns are a function of use of proceeds and growth opportunities (Bates,,2005). If assets are sold at below 'fair value' then a negative response would be expected from shareholders. A positive response suggests either no discount or, more likely, other factors are affecting the value equation.

The argument about a relationship between seller abnormal returns and seller financial pressure is similar to that explored in Chapter 4, when considering the relationship between discounts and financial pressure. If target parents sell at less than underlying value due to financial pressures, then we should see a negative relationship between measures of financial pressure and seller abnormal returns.

H5.2: If an asset is sold at a genuine discount then sellers under more financial constraints should report a lower abnormal announcement return and record a lower share of wealth created

In Chapter 4, I failed to find any such relationship between measures of financial pressure and reported discounts. In order to avoid complexity of results, I restrict analysis to just the Whited-Wu Index, as the measure of financial constraints.

As demonstrated in Chapter 2, the E(NPV) of the sale decision reflects the costs of selling (including taxes, discounts, agency costs of additional cash) and benefits (based on use of proceeds). The market response to an announcement reflects the market's assessment of these impacts, relative to information already factored into share price. I propose to use market returns to test the robustness of calculated discounts. Using a matched sample of buyers and sellers allows us to test at both buyer and seller level for the same transaction.

Testing a relationship between discounts and announcement returns is a joint test of whether the discount is a true one or not and whether it was anticipated by the market. The nature of potential responses are summarised in Table 5.1.d below.

Table 5.1 **Expected seller abnormal announcement returns**			
	Discount is true		
		YES	NO
Discount already expected by market	YES	No market response	Positive market response
	NO	Negative market response	No market response

This shows that a nil market response could be consistent with discounts being true or not true, depending on the market's expectation. We therefore need to control for expectations about a possible sale taking place at a discount. Many companies announce that strategic reviews are under way, and many companies announce that a sale process is underway. However these do not necessarily signal an expectation about price. As an alternative to using announcements, I condition market responses on measures of Seller Pressure, which attempt to measure pressure to sell at a discount. This measure is different to the measures of financial constraints. I use the measure from Chapter 4 labelled as *Pressure to Sell*. It is an Indicator variable set to 1 when the company has reported accounting losses, whether they have announced major write-offs or restructurings or whether they are undertaking an asset sale program. Companies who meet these criteria and then sell an asset at a reported discount are less likely to report a negative announcement return.

5.3.3 Does relative bargaining position explain the discount and the allocation of gains?

Relative financial position

The fire sale argument depends on the buyer being in stronger financial position than the seller; testing this argument therefore requires an assessment of relative financial position of buyer and seller.

H5.3 There will be a negative relationship between the relative financial position of the acquirer and discounts (i.e. more negative), and a positive relationship between the relative financial position of the acquirer and the share of value created from the transaction.

Ma (2006) finds that relative liquidity position of acquirer and target parent helps explain abnormal returns to acquirers. Relative liquidity was measured by the ratio of buyer net working capital to seller net working capital (normalised by total assets). An indicator variable for buyers whose net working capital exceeded that of sellers recorded a co-efficient of 0.7 – 0.8 in regressions, material in the context of total abnormal returns of around 2%.

However, this conclusion is based on buyer abnormal returns, and not explicitly linked to a measured discount. Furthermore, the measure of relative liquidity used is net working capital. Based on the discussion in Chapter 4, I argue these are not the best available measures of financial pressure on selling companies.

<u>Insider Ownership</u>

In the context of publicly listed targets, Bargeron, Schlingemann, Stulz and Zutter (2011) show that buyer abnormal returns are related to the ownership status of the buyers. Target shareholders receive lower abnormal returns when the acquirer is privately owned, or where insiders have high levels of ownership in a public company. The implication is that public companies with diffuse ownership tend to pay too much for acquisitions. This factor could also play a role in the acquisition of private targets. The use of a matched sample provides an interesting experimental opportunity to test whether the level of insider ownership has an impact on returns and, by implication, transaction price. Applying the Bargeon et al (2011) argument to target parents, I argue that target parents with concentrated ownership will be just as focussed on achieving a good price as are acquirers with high levels of insider ownership.

This is a similar argument to that of Owen, Shi and Yawson (2010). This can be tested as follows:

H5.4: Higher concentrated ownership in the buyer (seller) relative to the seller (buyer) will results in higher buyer (seller) abnormal returns and a higher proportion of value creation being captured.

Where insider ownership in buyer and seller is similar, regardless of whether it is high or low we expect nil difference in returns being attributable to this factor.

5.4 Research design

I propose to test these hypotheses using two measures of market reaction, cumulative announcement returns (CAR's), and dollar abnormal returns (DAR's). Returns to buyers and sellers will be calculated using Cumulative Abnormal Returns methodology. Net wealth created from the transaction will be calculated following Bradley, Desai and Kim (1988) and Moeller, Schlingemann and Stulz (2004). They both demonstrate that the use of dollar returns is necessary to be able to allocate the wealth created between buyers and sellers, and also provides a better depiction of the economic impact of transactions compared to the use of average percentage returns.

In this research I will use absolute dollar returns as the primary measure of wealth creation. Results can be distorted by the use of average abnormal returns in divestment analyses, where the assets involved are only a portion of the acquiring and divesting companies. In this research we will use a matched sample of buying and selling companies and calculate absolute dollar returns for each transaction. This will allow us to directly relate the size of measured discounts to the combined wealth impact of the transaction and how returns are allocated between buyers and sellers.

I test a regression model of the following form:

$$Ret_{i,p} = \beta_0 + \boldsymbol{X}'_{i,f}\boldsymbol{\beta_P} + \boldsymbol{X}'_{i,m}\boldsymbol{D_M} + \boldsymbol{X}'_{i,c}\boldsymbol{\beta_C} + u_i$$

Where $Ret_{i,p}$, represents the measure of market response for transaction *i*.. Based on the preceding discussion this could be either the CAR, the dollar value of wealth created or the share of value created captured by either party to the transaction. The subscript *p* signifies this equation can be estimated for either target parent or the acquirer. $\boldsymbol{\beta_P}$ represents the coefficients for a set of observable specific characteristics concerning factors affecting the negotiating position of the target's parent. $\boldsymbol{D_M}$ represents the alternative emasures of discounts as discussed in previous chapters. In this analysis these discounts are used as explanatory variables. Finally, $\boldsymbol{\beta_C}$ represents the coefficients for a set of control variables relevant for the target parent. These control variables represent other factors which the previous discussion has demonstrated may have an impact on the level of discount. The regression test only uses firms who have sold assets and published the price.

Again, robust regression procedures were used, and raw data for measures of market returns (dependent variable) and Discounts (explanatory variable) were used.

5.4.1 Sample

These tests will be carried out using the sample of US acquisitions, covering the period 1997 to 2009 used in the previous empirical analysis. Transactions are included which meet the following criteria: announcement date was between 1 January 1997 to 31 December 2009, transaction size was at least $50 million, the transaction was completed, the transaction involved the sale of a subsidiary from a publicly listed company to another publicly listed company, both based on the United States, and information on transaction multiples was included in SDC. For each target, we identify target parent and acquirer, allowing a matched sample of buyer and seller. Share price and financial data were collected from CRSP and Compustat respectively[74]. These requirements yield a sample of 287 transactions. This sample allows us to measure returns to buyers and sellers, value created by the transaction and the reported transaction multiple. Discounts are calculated in accordance with procedures discussed in Chapter 3. To the best of my knowledge, this is the first sample to be constructed which allows a direct analysis of transaction pricing and returns to buyers and sellers.

5.4.2 Buyer and Seller returns

Cumulative Abnormal Returns

Buyer and seller returns were measured using traditional measures of cumulative abnormal returns (CAR) over an event window, using the following equation:

$$CAR_j = \sum_{t=-1}^{1} \left[R_{j,t} - E\left(R_{j,t}\right)\right] \qquad [5.2]$$

where $R_{j,t}$ is the continuously compounded return (including dividends) for stock *j* on day *t*. The expected return, $E\left(R_{j,t}\right)$, is estimated using the market model with parameters estimated over an estimation window from 250 days prior to 30 days prior to the current transaction. The CRSP equal weighted market Index was used. The -1/+1 event window is commonly used in event studies. Abnormal returns were winsorized at the 99 and 1 percentiles. Results were also estimated using the constant market return model, using the CRSP value weighted Index.

The calculation of Dollar Abnormal Returns was explained earlier.

Descriptive Statistics for the Cumulative Abnormal returns and Dollar Abnormal Returns are presented in Table 5.2.

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74 SDC has information on target and acquirer parents, for both Immediate and Ultimate Parents. Data was collected for identified Ultimate Parents except where the Immediate Parent is identified as a separately listed public company.

Table 5.2

Announcement period returns to Buyers and Sellers

Panel A shows CAR's for buyers and sellers using an event window of t=-1 to t=+1, with expected returns based on market model estimated over t-250 to t-30, using equal weighted index and continuously compounded returns. Returns are winsorised at 1 and 99 percentiles. Panel B shows the dollar abnormal returns calculated by multiplying the pre=announcement market value of buyer and seller by the CAR over the announcement window. Figures in brackets are the p value for the two tailed t-test for means and the Wilcoxon signed rank test for medians

	Mean	Median	N	Standard Error of the mean	z-statistic	5%	95%
Panel A: CAR [(%)							
Acquirer CAR	1.80***	1.49***	321	5.05	17.916	-12.15	16.97
Seller CAR	1.67***	0.75***	314	4.21	17.748	-7.16	13.19
Combined CAR	1.82***	1.77***	297	3.51	18.412	-6.83	10.79
Panel B: Dollar Abnormal return ($m)							
Acquirer DAR	22.68	13.70***	320	97.81	17.916	-818.25	351.22
Seller DAR	121.33**	10.66***	314	119.7	17.748	-628.04	1325.70
Combined DAR	161.86	29.16***	296***	119.72	18.385	-1862.21	1943.90
Panel C: Share of Combined Dollar Abnormal return (%)							
Acquirer DAR %	14.79	35.15***	296	35.35	18.385	-108.31	207.71
Seller DAR %	85.21*	64.85***	296	35.35	18.385	-107.7	208.31

Table 5.2 shows that both buyers and sellers earn positive abnormal returns on announcement of the transaction, with all results significant at the 1% level. The actual levels of returns are in line with the existing literature. For dollar abnormal returns, for the sample mean, the only significant result is recorded for sellers, where the average dollar abnormal return is $124.7 million per transaction. Results for acquirers are also positive, but not significantly different to zero. For medians both results are smaller, but are significantly different to zero. Sellers, on average, earned about two thirds of value created from each transaction, slightly less if using the sample median. By definition, acquirers captured one third of value created using the sample mean and just under one half using the sample median.

Most of the companies in this sample have one or a small number of transactions and transactions are spread reasonably equally over the period, so there are no impacts of time clustering or firm fixed effects on these results.

These results, that both parties have positive returns and particularly that the sellers have captured a greater share of the value creation, do not support the argument that acquirers are acquiring assets at a discount and creating value. The CAR's are calculated using equal weights while the dollar abnormal return is a weighted average. The difference between these results for acquirers suggests a size effect, with larger acquirers creating less value. This result is in line with Moeller, Schlingemann and Stulz (2004).

5.4.3 Independent variables

The variables used in this chapter have all been introduced and defined in previous chapters, so will not be described in detail.

Discounts on sale

In previous research the announcement period CAR has been acting as the surrogate for an assumed discount on sale. This study directly tests the relationship between returns and discounts on sales. Chapter 3 demonstrated significant variation in results based on the methodology selected, which involved the joint selection of metric (arithmetic, harmonic or geometric mean, or median) and discount measure (percentage discount or natural logarithm). This analysis uses the same measures of discount in the previous analysis, namely, the *Arithmetic Mean/Percent Discount*, *Harmonic Mean/Percent Discount*, *Harmonic Mean/Logarithmic Discount* and the *Geometric Mean/Logarithmic Discount*.

The discounts are the equal weighted average of discounts calculated using Deal Value to Sales, Deal Value to EBIT, Deal Value to Book Assets. It should be noted that the Deal Value to Sales multiple was the only multiple available for approximately 70% of the sample.

Procedures for sample selection were fully discussed in Chapter 3. In calculating discounts, for each target a portfolio of acquisitions of comparable public listed targets was identified, on the basis of matching two digit SIC code and time and size windows. Both acquirer and target parent must be listed in the United States.

Financial Pressure on Seller

Ma (2006) measured relative liquidity using net working capital, normalized by total assets. In spite of its impressive result, this measure does not generally appear in the literature on financial constraints. Accordingly, I use the measures utilized in Chapter 4, particularly the Relative Whited-Wu Index from Chapter 4. This calculates the Whited-Wu Index for both acquirer and target parent in the fiscal year prior to the sale being announced. The Relative Index is calculated as follows:

$$Relative\ WW\ Index_i = \frac{Whited - Wu\ Index_{acquirer}}{Whited - Wu\ Index_{target\ parent}}$$

Concentration of Ownership

I measure the concentration of ownership using the same measure from Chapter 4, which measured the concentration of institutional ownership. This data was extracted from the Shareholder Ownership Summary analysis provided by Thomson Reuters, which is based on company 13-F filings[75]. Concentration is measured using the Herfindahl Index.

Relative Size

Relative Size measures transaction value relative to the market value of the target parent's equity. This differs to the way this is defined in most acquisition studies, where the relative size is defined relative to the market value of the acquirer. Transaction size is measured relative to target parent value as a measure of importance to the vendor. A positive relationship between relative size and discounts (less negative) would imply that vendors may negotiate more aggressively for larger assets due to the materiality of the transaction.

5.5 Empirical results

In this chapter empirical results are presented by each of the hypotheses.

5.5.1 Hypothesis 5.1

This was designed to test whether the size of the discount was related to the amount of relative value captured by the parties to the transaction. This can be taken as a measure of the market's interpretation of the price and whether it reflects a discount or not. Table 5.3 presents results of robust linear

[75] Accessed via WRDS.

regressions of Cumulative Abnormal Returns, Dollar Abnormal Returns and Share of Total Value Created, as Dependent variables, against each of the discount measures. The regressions are done for both acquirers and target parents.

The analysis shows that, for *Cumulative Abnormal Returns* and there is only one statistically significant relationship, between the Harmonic Mean/Percent Discount and Acquirer CAR. The co-efficient is negative, indicating that acquirer returns decrease as the discount gets smaller (less negative) suggesting that returns respond positively to larger discounts, in line with 'acquirers buy cheaply' scenario. However, the economic significance of this co-efficient value is small, given that discounts have been expressed in decimal terms (i.e. a 10% discount is 0.10). Furthermore, in the regressions on *Share of Value Created*, there is a positive co-efficient for the same ratio for acquirers. This means that, as the discount gets smaller (less negative), then the share of value created for the acquirer increases. This suggests that the higher the relative price paid by an acquirer then the greater the share of value captured. This is the opposite implication to what has been drawn in relation to the CAR, and is difficult to explain. It is consistent with a scenario where the buyer may be considered to have purchased a valuable asset. This conclusion is consistent with the discussion in the balance of this thesis, namely that a judgment about the price paid for an asset needs to be done in context of the asset characteristics.

The only other statistically significant result is in relation to *Dollar Abnormal Return,* where there is a negative relationship between Absolute Dollar Value Created and the Arithmetic Mean/Percent method for calculating discounts. This implies that as discounts get smaller (less negative) the dollar value created decreases. Again, this the opposite to the result that would obtain if acquirers were creating value at the expense of a parent selling assets at less than underlying value

Table 5.3

Regressions of CAR, DAR and Share of Value against Discounts

Results of regressing alternative measures of shareholder returns (Cumulative Abnormal Return, Dollar Abnormal Return and Share of Value Created) as dependent variable on each of the discount measures used in previous chapters. Discounts are raw observations, and robust regressions have been estimated using the STATA rreg routine. Standard errors are in round brackets under each co-efficient estimate. Significance levels for whether the co-efficient estimates differ to zero are shown by ***,**,* at the 1%, 5% and 10% level respectively. Sample size is shown in square brackets under the p-value.

Variable	Arithmetic Mean / Percent Discount		Harmonic Mean / Percent Discount		Harmonic Mean / Logarithmic Discount		Geometric Mean / Logarithmic Discount	
	Acquirer	Target Parent	Acquirer	Target Parent	Acquirer	Target Parent	Acquirer	Target Parent
Cumulative Abnormal Returns								
Coefficient	-0.0100	-0.0024	-0.-0005	-0.0000	-0.0041	-0.0009	-0.0015	-0.0012
Standard Error	0.0099	0.0073	0.0002	0.0001	0.0032	0.0023	0.0031	0.0022
p-value of coefficient	0.315 [238]	0.740 [232]	0.028** [271]	0.907 [263]	0.730 [272]	0.687 [263]	0.640 [272]	0.594 [263]
Dollar Abnormal Returns								
Coefficient	-23.393	-9.425	0.1439	0.4817	-0.1783	1.6944	-1.183	1.073
Standard Error	13.77	30.03	0.2142	0.4541	4.5349	10.064	4.3848	9.645
p-value of coefficient	0.091* [237]	0.754 [232]	0.502 [271]	0.290 [262]	0.969 [270]	0.866 [262]	0.787 [271]	0.911 [262]

Table 5.3 (cont) Regressions of CAR, DAR and Share of Value against Discounts								
Results of regressing alternative measures of shareholder returns (Cumulative Abnormal Return, Dollar Abnormal Return and Share of Value Created) as dependent variable on each of the discount measures used in previous chapters. Discounts are raw observations, and robust regressions have been estimated using the STATA rreg routine. Standard errors are in round brackets under each co-efficient estimate. Significance levels for whether the co-efficient estimates differ to zero are shown by ***,**,* at the 1%, 5% and 10% level respectively. Sample size is shown in square brackets under the p-value.								
Variable	Arithmetic Mean / Percent Discount		Harmonic Mean / Percent Discount		Harmonic Mean / Logarithmic Discount		Geometric Mean / Logarithmic Discount	
	Acquirer	Target Parent	Acquirer	Target Parent	Acquirer	Target Parent	Acquirer	Target Parent
Share of Total Value Created								
Coefficient	-0.027	0.027	0.006	0.045	0.045	-0.045	0.0419	-0.0419
Standard Error	0.102	0.102	0.002	0.0323	0.0323	0.0323	0.0311	0.0311
p-value of coefficient	0.792 [218]	0.792 [218]	0.015** [248]	0.166 [249]	0.166 [249]	0.166 [249]	0.18 [249]	0.18 [249]

5.5.2 Hypothesis 5.2

Hypothesis 5.2 focused on the need to appropriately control for market expectations when drawing conclusions about announcement returns. In this case, the concern was that if sale of an asset was anticipated then there would be nil market response. To control for the possibility of market expectations I calculated abnormal returns for the target parent conditional on the *Pressure to Sell* variable. Figure 5.1 presented the alternative scenarios. Table 5.4 presents results for the CAR's conditioned on the *Pressure to Sell* variable

Table 5.4
CAR'S conditional on Pressure To Sell

CAR's are calculated for target parents. Pressure to Sell takes on value of 1 if target parent has suffered accounting loss in current or previous fiscal year, or announced writeoffs or restructurings in excess of 50% of profits. T-test (signed rank) test of difference for mean (median) to zero for each subsample represented by ***,**,* at the 1%,5% and 10% level respectively. P-value for differences in means and median between subsamples is shown in the bottom row

			Mean	Median
Pressure To Sell		N		
= 1	Discount anticipated	125	1.9401%**	2.0803%***
= 0	No pressure = Surprise	196	1.7246%**	1.2529%***
p-value of differences in means / medians			0.8432	0.6036

For the subsample where the *Pressure to Sell* equals 1, the CAR was 1.94%, and is statistically different to zero. Based on the reasoning represented in Figure 5.1 a positive response is consistent with the discount not being "True" (the market does not consider the asset was sold at less than fair value). Where the *Pressure to Sell* is zero, then those sales can be interpreted as being a surprise to the market, and the results interpreted in the usual way. If the market considered the asset was sold at less than fair value then the market would respond negatively. The positive response indicates that the market did not consider the asset is sold at less than fair value. The differences in means are not statistically different to zero, suggesting the adverse accounting status of the target parent is not associated with a market response different to that of the control sample. The results for the sample medians are consistent with the results just discussed for the sample mean.

Based on this analysis, I conclude that the market does not respond as if the assets are sold at a discount.

5.5.3 Hypotheses 5.3 and 5.4

The final hypotheses are tested using a multivariate least squares regression model. The results are presented in Tables 5.5 and 5.6. The only difference between each model is that a different discount is used as an independent variable. In Table 5.5 the dependent variable is the Acquirer's Cumulative Abnormal Return, while in Table 5.6 the dependent variable is the Acquirer's share of value created from the transaction. In Table 5.5 there are no statistically significant results. Importantly, the coefficient value for each of the discount measures is not statistically significant, suggesting that the size of the discount has no influence on the level of returns to the acquirer. If the asset was being exchanged at less than fair value then there would be a positive relationship between the discount (less negative) and the acquirer's returns. Similar results obtain for regressions for the target parent, so it is difficult to conclude any gain was at the expense of the target parent.

Table 5.6 examines the share of value created captured by the acquirer. There is only one statistically significant relationship, for the variable *Relative Size.* This variable measures the value of the transaction relative to the equity market capitalisation of the target parent. However there is a positive relationship between this variable and the share of value captured by the acquirer i.e. the larger the relative value of the transaction for the vendor, the greater a share of value is captured by the acquirer. This relationship is counter to expectations, if relative size is interpreted as a measure of motivation or discipline for the vendor. In Chapter 4 there was some evidence of a positive relationship between Relative Size and Discount[76], in that an increase in *Relative Size* was associated with smaller (less negative) discounts. This result implies that *Relative Size* works in the favour of the vendor, a conclusion at odds with the above result about share of return. I contend these result cannot be attributable to the vendor selling at a discount, because of the contradictory result from Chapter 4 and, the fact that, the discount is included as an explanatory variable anyway. One possible explanation for this result may be that, for a vendor exiting an asset, more relatively important assets may signal news about the firm's overall operations. The announcement effect may therefore contain responses to news signals more complex than a judgement about the asset's sale price relative to a fair value.

These regressions were also run including industry and year effects as discussed in earlier chapters. Year effects had no impact. Allowing for industry effects had no impact on the results where the CAR was the dependent variable. For analyses where the Acquirer's share was the dependent variable, the Relative Size variable had the same sign, magnitude and significance. However, two other variables also became statistically significant. Size, measured by the natural logarithm of transaction value had a negative coefficient in all regressions, while the *Relative Whited-Wu* index had a coefficient in all four regressions. In relation to size, this implies that the acquirer captures a greater share of the transaction value creation as transaction value declines. This potentially conflicts with the previous discussion concerning *Relative Size.* In relation to the *Relative Whited-Wu* index, this suggests that, where the acquirer is less financially constrained than

[76] This result was only found in the univariate analysis using robust regression. It did not appear in the multivariate analysis.

the vendor then the acquirer captures a larger share of value creation. This aligns with the liquidity pressure, and is consistent with the results of Ma (2008), who used relative working capital. However, again the mechanism for this additional value capture is not through acquiring the asset at a discount. In Chapter 4, the target parent's Whited-Wu index value was found to have a positive relationship with discounts, a conclusion at variance with the liquidity pressure argument. Furthermore, in the analysis in this chapter the impact of discounts is controlled for by their inclusion as an explanatory variable. I conclude that a possible explanation for these results is similar to that given for Relative Size, namely that the announcement effect contains news in addition to information about the pricing and valuation of the asset. In Chapter 4 an attempt was made to control for this factor by including the *Pressure to Sell* variable, however it has not been significant in any of the statistical analysis.

Table 5.5
Regression Results for Acquirer CARs

Results for robust regression for each combination of averaging and discount method. Dependent variable is the CAR for the acquirer based on a -1 to 1 event window. Excess returns calculated using market model estimated over -270 to -30 relative to event date. Coefficient values for each variable in the first row. Standard errors in brackets in second row. Other independent variables are defined in Chapter 4. Relative Size is the Transaction Value divided by the target Parent's Equity market value. Relative institutional ownership and relative Whited-Wu index are relevant values for the acquirer divided by relevant values for the target, both measured prior to the transaction. Size is the natural logarithm of the transaction value. Discounts are raw observations, and robust regressions have been estimated using the STATA rreg routine. Standard errors are in round brackets under each co-efficient estimate. Significance levels for whether the co-efficient estimates differ to zero are shown by ***,**,* at the 1%, 5% and 10% level respectively.

	Arithmetic Mean / Percent Discount	Harmonic Mean / Percent Discount	Harmonic Mean / Ln Discount	Geometric Mean / Ln discount
Size	-0.007*	0.006	0.006	0.006
	(0.004)	(0.004)	(0.004)	(0.004)
Relative Institutional ownership concentration	0.005**	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Relative Size	0.021	0.006	0.007	0.007
	(0.039)	(0.037)	(0.037)	(0.037)
Relative WW Index	-0.001	-0.003	-0.003	-0.003
	(0.007)	(0.006)	(0.007)	(0.006)
Discount	-0.016	0.000	-0.002	-0.002
	(0.012)	(0.000)	(0.005)	(0.004)
Constant	-0.038	-0.018	-0.018	-0.019
	(0.028)	(0.024)	(0.025)	(0.025)
Number of observations	172	199	199	199

Table 5.6

Regression Results for Acquirer Share of Value Created

Results for robust regression for each combination of averaging and discount method. Dependent variable is the Share of value created for the acquirer based on a -1 to 1 event window. Value created is the sum of CAR multiplied by pre announcement equity value for acquirer and target parent. Excess returns calculated using market model estimated over -270 to -30 relative to event date. Coefficient values for each variable in the first row. Standard errors in brackets in second row. Other independent variables are defined in Chapter 4. Other independent variables are defined in Chapter 4. Relative Size is the Transaction Value divided by the target Parent's Equity market value. Relative institutional ownership and relative Whited-Wu index are relevant values for the acquirer divided by relevant values for the target, both measured prior to the transaction. Size is the natural logarithm of the transaction value. Discounts are raw observations, and robust regressions have been estimated using the STATA rreg routine. Standard errors are in round brackets under each co-efficient estimate. Significance levels for whether the co-efficient estimates differ to zero are shown by ***,**,* at the 1%, 5% and 10% level respectively

	Arithmetic Mean / Percent Discount	Harmonic Mean / Percent Discount	Harmonic Mean / Ln Discount	Geometric Mean / Ln discount
Size	0.0422	-0.0124	-0.0107	-0.0088
	(0.03694)	(0.0333)	(0.0338)	(0.0338)
Relative Institutional ownership concentration	-0.0266	-0.0193	-0.0193	0.0190
	(0.0214)	(0.0151)	(0.0153)	(0.0152)
Relative Size	1.4785***	1.5175***	1.5272***	1.5242***
	(0.3360)	(0.3167)	(0.3180)	(0.3181)
Discount	0.0826	0.0899	0.0876	0.0892
	(0.0599)	(0.0569)	(0.0569)	(0.0570)
Relative WW Index	-0.2261**	0.0050	0.0019	-0.0036
	(0.1027)	(0.0040)	(0.0322)	(0.0305)
Constant	-0.0917	0.2703	0.2740	0.2608
	(0.2484)	(0.2109)	(0.2313)	(o.2148)
Number of observations	172	199	199	199

5.6 Conclusion

In this chapter I presented four hypotheses designed to test the market's reaction to subsidiary sales, and draw inferences for the validity or otherwise of reported discounts. A key implication of the liquidity pressure induced fire sale scenario is that there is a transfer of wealth from target parent to acquirer.

The analysis in this chapter finds no evidence of any adverse market response to reported discounts. In the univariate analysis, the key statistically significant result was that acquirers capture a larger share of value when the premium is higher (discount is less negative). This is the opposite to that implied by a simple wealth transfer argument. It means that target parents capture a larger share of value creation when there is a larger (more negative) discount.

Using multivariate regression to control for other variables that reflect relative financial constraints and concentration of institutional ownership, I again find no relationship between discounts and the abnormal returns. Significant relationships were found between Relative size and acquirer returns and, in some regressions, between transaction size and relative Whited-Wu index values. However, I conclude that these impacts have a separate effect than simply causing a discount in a transaction. I conclude that these results are not attributable to the presence of discounts, but must be attributable to other factors.

Thus, in both single and multivariate models I find no relationship between discounts and announcement returns. I conclude that the market is not acting as if the assets in question are being traded at a price that causes a negative market response. This is not the response that would be expected if assets were sold at a 30% discount to underlying value.

Chapter 6

Conclusion

Divestments are an important tool of business strategy, an important activity of corporate finance practitioners and the subject of much academic research. Officer (2007) found that subsidiaries sold between publicly listed companies did so at an average discount of 30% relative to comparable public market transactions. He concludes that these discounts are consistent with the financing motivation for asset sales of Lang, Poulsen and Stulz, (1995) and the fire sale hypothesis of Shleifer and Vishny (1992). If correct, these conclusions imply a significant transfer of wealth from target parents to acquirers, and suggest significant frictions in the market for corporate control.

On the basis of the research and modelling undertaken in this project, I present an alternative explanation. Assets sold by parent companies are simply less valuable than their public market comparables. Discounts reflect these differences in underlying asset values. I identify four places in which my findings clearly challenge the prevailing literature in this area and support this alternative explanation.

6.1 Key Results

<u>Discounts should be expected</u>

Discounts are, in fact, a defensible a priori expectation, for two reasons. First, I have established that existing research demonstrates that subsidiaries sold by public companies may be less valuable than public market peers. Firms regularly adjust their asset portfolios to improve performance (Makismovic and Phillips, 1997). Empirical evidence is consistent with companies selling underperforming assets. Warusawitharana (2008) and Yang (2008) show that companies sell assets that are underperforming[77]. Another common motivation for asset sales is to achieve focus (Berger, 1995). While there is debate in the literature about the diversification discount, whether the apparent discount is due to diversification per se, or the fact that diversified companies own lower valued assets, both support a view that assets sold by diversified companies will be of lower value. The fact that assets are owned by companies, rather than being separately listed companies, potentially leads to delay in sale, further lowering value. This delay may be attributable to rational reasons, with managers responding to the optionality of assets by delaying exit decisions (Kwon, 2007). However, these delays may also be attributable to governance related factors. Lambrecht and Myers (2007) demonstrate there are extra costs involved in the market for corporate control acting on subsidiaries, relative to the more open access to a publicly listed target. This is reinforced by Owen et al (2010) who demonstrate a positive relationship between divestments and the level of blockholder ownership, suggesting that private benefits of control may cause a delay in management acting on underperforming assets.

Furthermore, companies exiting subsidiaries have choices of several exit mechanisms, namely asset sale, spin off or equity carve out. Companies requiring cash proceeds will either pursue a trade sale or carve out. Again, evidence suggests that lower valued assets are exited via trade sale. For assets whose value exceeds their tax value, exiting via the tax free spin off has benefits for the target parent. While these may be partially offset by loss of benefits to the acquirer, Maydew, Schipper and Vincent (1999), demonstrate a bias for assets which are sold at taxable profit to be exited via spin off. Stegemoller and Cooney (2010) demonstrate, in the context of private companies, that

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[77] There is some contrary evidence to this. Schlingemann, Stulz and Walkling (2002) argue that companies sell their most liquid assets in preference to the most poorly performing assets[77]. Kruse (2002), in the context of firms in financial distress presents a similar conclusion, although the firms in my sample, and that of Officer (2007), are not under financial distress. The intuition in favour of companies selling the worst performing, rather than their best, assets is also compelling.

companies with higher profitability and growth potential are more likely to exit via IPO. Both of these arguments imply that assets sold via trade sale are probably lower value.

The second reason that discounts are to be expected is that even if the asset's underlying value is comparable to public market peers, it may still be rational for a company to sell at a discount for reasons other than liquidity pressure. I have analysed alternative scenarios associated with asset sales. These include the sale of a poorly performing business, selling an asset to achieve improved focus, or selling an asset to either fund growth or repay debt. Under each scenario the sale has second order effects on the business which can justify selling at a discount[78]. Examples of such factors include the sale of an asset at a tax loss, the value uplift resulting from reduced diversification, the value created by undertaking investments that would otherwise be foregone, or the benefits of debt reduction. Companies are more likely to sell assets with lower synergies and with lower debt capacities and, as noted earlier, the ability to generate tax losses will influence the decision about which assets may be sold.

I conclude that the presence of discounts is consistent with many alternative analyses of the divestment decision and does not need the liquidity pressure induced fire sale to provide a rationale.

<u>Conclusions concerning presence of discounts influenced by measurement methodology</u>

The results in Officer (2007) are sensitive to the methodology chosen to calculate the multiple of the peer group, and the method for calculating the discount. Officer (2007) calculates the multiple of the selected peer group

[78] Of course these scenarios are only relevant where competition for the assets is sufficiently lower to force the target parent to become taker. In the event of competition for an asset we would expect a price closer to underlying value to be achieved, regardless of the target parent's motivation for selling.

using the arithmetic mean, and calculates the discount using the percent difference between the subsidiary multiple and that of the selected peer group. The distribution of discounts has zero as the lower bound, but has potentially extreme observations. For each of these dimensions of calculating the discount (averaging method, discount calculation and treatment of outliers), there are a number of preferred alternative ways to determine the discounts.

Using a sample of 287 subsidiary sales, that have pricing data available, I demonstrate that, using some methods that are popular in the literature such as the harmonic mean, the discount disappears. Yet using other methods, such as the geometric mean, a smaller discount in the order of 10-15% was still recorded. Ironically, this result only arises on the winsorised sample; with the raw data the Geometric Mean reports a zero discount. This level of discount is more in line with an allowance for the transaction costs of alternatives. In relation to methods for calculating the discount, the logarithmic method appeared to produce more stable results across the various methods. Similarly, using the Median as a measure of central tendency produced the most consistent results across the different methods of adjusting for the sample outliers. Finally, alternative treatments of outliers demonstrated that Officer's (2007) dropping of premia greater than 1 tended to produce larger (more negative) discounts. Furthermore, in calculating the discounts, I also adopted a procedure which ensures consistency between outliers in both the private transactions and their public market peers which resulted in a material reduction in the size of discounts reported by Officer (2007).

My analysis also demonstrates how to incorporate asset characteristics into estimation of the comparable multiple by using cross sectional regression to calculate a Warranted Value. This is potentially an improved method over the use of simpler averaging processes, which, as noted above, are sensitive to the method chosen, as well as to the selection criteria for comparable companies. This methodology resulted in premia being reported for the sample of subsidiary sales.

The fact that under some methodologies the discount is eliminated and under others it is materially reduced, shows that results are highly sensitive to measurement methodology, which weakens the robustness of Officer's (2007) conclusions, and leads to the conclusion that the evidence in favour of discounts is ambiguous.

This thesis has also documented the range of methods used in practice to calculate multiples and discounts. Each of the methods is used in a range of univariate and multivariate tests. From a pragmatic perspective, it is clear that methods involving the harmonic mean, geometric mean and median, or discounts calculated using the logarithmic discount provide much more stable results. They are less affected by outliers and less affected by various data management tactics.

Positive evidence that asset characteristics influence the discount

In Chapter 3, I demonstrated that the reported discounts could be attributable to companies in the sample with low or negative income. The importance of the target's income status is consistent with the proposition presented in Chapter 2, namely that differences in the underlying asset values are an equally legitimate explanation for the presence of discounts. I also demonstrate that the asset's size, measured by market value, and leverage are related to the size of the discount. These results are consistent with the theoretical analysis of breakeven discounts presented in Chapter 2. This reinforces the conclusion that, in order to correctly calculate discounts, it is necessary to make allowance for asset characteristics. I demonstrate the application of the Warranted Value (multiple regression) method as a practical way to introduce asset characteristics in a systematic way.

The evidence in favour of the liquidity pressure induced fire sale is ambiguous

Officer (2007) found that target parents had lower than industry profitability and higher gearing, which is in line with empirical evidence. He found only three variables were correlated with discounts in a multivariate model: the Commercial Interest Rate, the parent company's stock price performance in the previous twelve months and a term reflecting the interaction between prior twelve month stock price performance and whether the subsidiary sold was classified as core. I argue this evidence does not unambiguously support the liquidity pressure induced fire sale conclusion of Officer (2009), for two reasons.

Firstly, these results are just as consistent with arguments that the underlying value of assets being sold is less than public market peers, as much as they are with a liquidity pressure argument. It is tempting to assume the sale process itself leads to discounts, and there is some evidence in support of the fire sale hypothesis in relation to equipment assets, although Ang and Mauck (2011) provide some counter arguments. However, in the context of business segments we can draw on the analysis of Boone and Mulherin (2007, 2008, 2009), who document a process preceding many public takeovers that is very similar to the process used to sell subsidiaries. This process involves an auction with a limited number of bidders or a private negotiation. Outcomes for either process are similar, suggesting an effective sale process does not require a full open auction. Consequently, even if a firm is under financial pressure, an effective asset sales market may still provide the vendor with the opportunity to achieve fair value for the asset.

Secondly, my analysis demonstrates that the 30% discount is high relative to alternative sources of funding. I demonstrate that, if the motive is purely financing, then asset sales are inefficient. On a comparable basis, the discount required to breakeven on alternative equity issuance methods is under the 30%. Even PIPES transactions don't report discounts on that scale. This view is further confirmed by the fact that no research, to my knowledge, has directly tested for the link between the seasoned equity market, one of the most viable sources of new equity for a listed firm, and discounts.

Both these arguments highlight the important role that financial markets and asset markets play in assessing the relationship between liquidity pressure and fire sales. I propose that an argument in support of liquidity pressure induced fire sales requires testing of a transmission mechanism by which liquidity pressure manifests itself in a fire sale. In this thesis I suggest that such a mechanism requires the simultaneous presence of three conditions. These are liquidity pressure on the vendor, adverse financial markets conditions and adverse asset market conditions.

I addressed this question by, firstly testing for a relationship between each of these conditions and discounts, and secondly, testing whether their combined presence has any impact on discounts.

Examining each of the conditions separately failed to find any significant links with discounts. First, I directly tested for the link between target parent financial pressures leading to the discount. For liquidity pressures to be seen as leading to the discount, three conditions must be in place, simultaneously. The target parent must have a need for the funds. Comparing a number of measures of financial constraints for the year prior to announcement relative to the year following completion, I find that the Whited-Wu measure of financial constraints improves, gearing reduces and the level of capital investment is reduced. However I find no significant relationship between these variables and reported discounts. The second condition is testing for the impact of external market conditions. For public companies, an SEO would be the main alternative funding source if the motivation for the asset sale is purely financially motivated. Discounts should increase as external conditions worsen. In testing for the impact of external market conditions, I introduce a new measure, the SEO Index, which measures the level of issuance activity and equity pricing. I find no evidence of a relationship between discount and equity market conditions. I also used various measures of use of proceeds and find no difference in discounts across different use of proceeds. Finally, I test for fire sale conditions and find that neither discounts nor announcement returns are affected by whether the buyer is from the same industry as the target.

I then test for the combined presence of these conditions using an Interaction variable. I find, using a multivariate model, a significant relationship between the interaction term and discounts, which supports the proposition for the transmission mechanism suggested in this thesis. However, this result does not explain the widespread discounts reported by Officer (2007), because the proportion of firms where the three conditions occur simultaneously constitute a small proportion of the sample. As far as I am aware, this is a new approach to testing for the fire sale impact, and may provide a useful methodology for understanding the transmission mechanism by which financial pressure translates into selling assets at less than underlying value.

<u>No evidence of a link between discounts and market responses</u>

I directly tested for a relationship between discounts and announcement returns to acquirers and target parents. That acquirers of private targets earn significantly positive announcement returns is well accepted. A common, but untested, assumption is that these returns are at least partially attributable to buying the assets cheaply. For target parents, evidence on announcement effects of asset sales suggests that target parents earn zero to positive announcement returns, partly depending on the use of proceeds. While an announcement return will incorporate multiple effects, including use of proceeds, one could assume that an unanticipated sale of an asset at a 30% discount to its underlying value would attract a negative response. I find no relationship between discounts and announcement period abnormal returns for buyers or target parents. Furthermore, I find no relationship between the allocation of combined announcement returns (dollar abnormal returns) between buyer and seller, and the discounts. These results obtain under both univariate and multivariate testing, where variables measuring liquidity pressure and governance factors have been included as control variables.

6.2 Contributions of this research

This research makes several contributions to the divestments literature. First, based on a systematic review of prior research I develop arguments demonstrating that the a priori expectation on subsidiary sales should be that discounts do exist, because the underlying value of subsidiaries being sold is lower than public market comparables. This is reinforced by my modelling of the divestment decision which demonstrates that, even for assets that might have the same relative value as public market peers, the impact of alternative use of proceeds, or alternative sources of funding, can explain why a value maximising management may still sell an asset at a discount. To my knowledge, I am the first to explicitly model the divestment pricing decision that incorporates the impact of divestments on the rest of the business.

Second, I highlight the significant measurement issues inherent in this area of research. My research shows the impact that selection of averaging methods and bias calculations can have a significant effect on results, and the conclusions which can be drawn. While it may be difficult to make recommendations about whether there is one right combination of methods, the fact that outcomes and conclusions are sensitive to measurement choices made limits the robustness of conclusions. Furthermore, in applying the multiples I demonstrate the importance of making allowance for low income or negative income assets. These are often omitted from samples or can have indirect consequences on results. For example, in this area of research which relies heavily on the Enterprise Value to Sales multiple, failure to allow for the presence of low or negative income targets can lead to distorted results. More generally, my research supports a number of authors who argue in favour of making adjustments for underlying asset values when using multiples as a valuation methodology.

Third, this research demonstrates the behaviour of several different methods for calculating discounts. This research used four measures of discounts throughout the analysis. Each combination of Harmonic Mean/Percent Discount, Harmonic Mean/Logarithmic Discount and Geometric Mean/Logarithmic Discount has proponents, while the Arithmetic Mean/Percent Discount has little theoretical support but is intuitively easiest to apply. Based on the application in this sample, the Harmonic Mean/Logarithmic Discount and Geometric Mean/Logarithmic Discount appear to offer practical advantages. First, they behave consistently with each other. While the Harmonic Mean/Logarithmic Discount generally produced smaller (less negative) discounts than the Geometric Mean/Logarithmic Discount they both responded similarly to various sample changes, and the regression coefficients for the two variables were almost always of the same sign and often quantitatively close. Second, raw data needed minimal adjustment to produce “sensible” results. Both the Arithmetic Mean and Harmonic Mean, when used in conjunction with the Percent Discount, produce sizable and intuitively unsound premia unless more aggressive data adjustments, such as truncation or dropping observations, are implemented. Unfortunately, as indicated, these adjustments can have a significant influence on the results and risk changing the key conclusions. As a practical conclusion, the Harmonic and Geometric Means, and Median, used in conjunction with Logarithmic Discount would appear to be a sensible base case model.

Fourth, I use a number of innovative measures to test the hypotheses. I introduce a new measure of secondary equity market activity, and demonstrate the use of valuation methodology that allows the calculation of discounts while incorporating asset specific factors. Furthermore, to the best of my knowledge, I am the first to directly test for the relationship between discounts and announcement returns to acquirers and target parents. I also apply a range of existing corporate finance tools to address the problem at hand. Specifically I use the Whited-Wu (2006) index as a more appropriate measure of financial constraints; measures of blockholder ownership as surrogates for governance, and use the Rhodes-Kropf, Robinson and Viswanathan (2005) valuation methodology to incorporate asset specific characteristics into the valuation of private targets.

Finally, this thesis presents a viable alternative narrative to that of the liquidity pressure induced fire sale scenario and, at a minimum, suggests caution in attributing the presence of discounts to liquidity pressure. The results suggest that divestments and their pricing are the result of a complex interplay of a number of factors, including business portfolio mix, the impact on the rest of the business, and the cost of alternative funding sources. While asset sales may coincide with poor financial performance this is not a surprise. Barraclough, Robinson, Smith and Whaley (2013) attempt to reconcile the apparent consistently poor returns to acquirers of public targets, with the continued prominence of acquisitions in everyday business strategy. This research addresses a similar question. My research contributes to our understanding of divestment process by demonstrating that discounts that may be reported are consistent with an efficient market for corporate control. This conclusion is based on the results which suggest that reported discounts are more likely attributable to differences in underlying asset characteristics, or are at least within the bounds of transactions costs and benefits of viable alternative strategies. It explains why divestments continue to be an important part of business strategy.

6.3 Limitations and Further research

The generalizability of this research is limited by the lack of availability of financial data for subsidiaries, thus limiting the scope to undertake valuations or adjust multiples based on asset specific characteristics. The Thomson Financial SDC data base includes financial data on only one third of subsidiary sale transactions which have reported any transaction multiples. In turn, the majority of subsidiary sale transactions do not even report transaction multiples. Rodrigues and Stegemoller (2007) highlight the impact that FASB and SEC rulings can have on disclosure of even sizable private transactions. More generally, along with other studies on announcement returns to buyers of private assets, it possibly leads one to ask: exactly what conclusions can be drawn about the value implications of asset sales, when there is limited data with which to make an asset specific valuation?

This research has not explicitly examined the potential impact of equity market mispricing on the divestment decision, and its pricing impact. If management considers equity markets to be undervaluing their stock, then they may be more inclined to sell assets. If mispricing is equally pervasive across both equity and asset markets, and across all firms, the analysis in this thesis would still hold. For mispricing to explain reported discounts would require differential mispricing to be in place between equity and asset markets, and firm level equity and assets. Even if proven, such a result still accords with the central proposition of this research, that factors other than financial constraints are at play.

While this research has contributed to a better understanding of the pricing dynamics of divestment transactions, no positive results emerged to contribute to a better understanding of the listing effect. One difference between the sale of public companies and subsidiaries is who initiates the deal. In the context of public market acquisitions, Masulis and Sinsir (2013) document lower CARs and multiples in target initiated transactions, Dimopoulis and Sacchetto (2012) document the impact that target resistance has on transaction outcomes, while Barraclough, Robinson, Smith and Whaley (2013) utilise the probability of completion to help explain announcement returns. Each of these characteristics is systematically different between private and public transactions, and might constitute a useful line of research to help not only explain the listing effect but also the pricing of subsidiary trade sales.

Appendices

Appendix 1: Descriptive Statistics of Discounts

Appendix 2: Graphical analysis of discounts

Appendix 3: Analysis of discounts calculated using comparable weighted by size

Appendix 4: Descriptive Statistics of Independent variables

Appendix 5: Chapter 4 and 5 results calculated using Ordinary Least Squares on adjusted sample data

Appendix 1: Descriptive Statistics of Discounts

Table A1.1
Descriptive Statistics for Independent Variables
Discounts: raw

This table presents descriptive statistics for the discount used in the statistical analysis. For each transaction, an average of peer group multiples is calculated using either the arithmetic, harmonic or geometric mean, and median. Discounts are calculated either as percentage difference between peer group average and private transaction multiple, or the natural logarithm of the ratio of private transaction multiple to peer group average. For each transaction, an average of peer group multiples is calculated as the average of Deal Value to Sales ratio, Deal Value to EBIT ratio and Deal Value to Net Assets ratio. Discounts are either raw, with no adjustments to the observations, or the sample has been adjusted as follows: the Arithmetic Mean are calculated by excluding any acquisition premia in excess of 100% and excluding comparables where Peer Acquisition multiple > 2*Average. Discounts calculated using the harmonic or geometric mean are winsorized at the 99% percentile

Variable	Number of Observations	Mean	Median	Standard Deviation	Kurtosis
Arithmetic Mean / Percent Discount	285	53.27	-0.3599	593.11	258.06
Harmonic Mean / Percent Discount	285	61.00	0.2254	603.72	239.07
Median / Percent Discount	285	55.05	-0.0687	594.49	256.03
Arithmetic Mean / Logarithmic Discount	285	0.3032	0.1418	1.54	12.00
Harmonic Mean / Logarithmic Discount	285	-0.0175	-0.1261	1.58	11.97
Median / Logarithmic Discount	285	0.0045	-0.1450	1.57	11.72

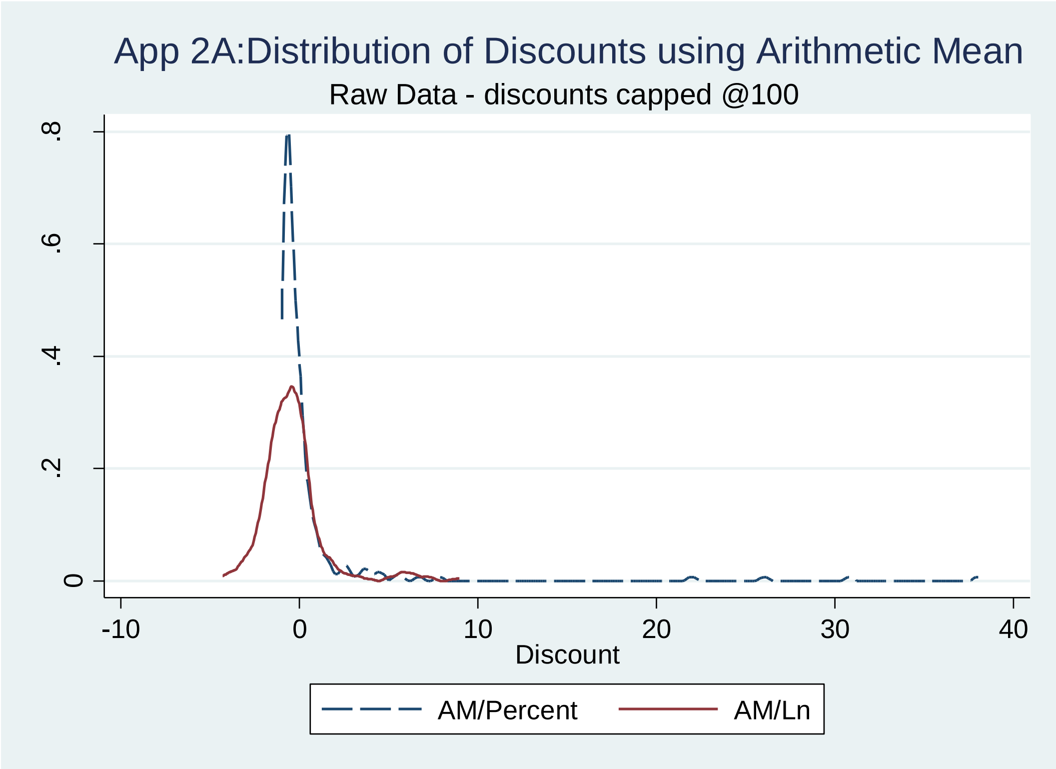
Table A1.1
Descriptive Statistics for Independent Variables
Discounts: adjusted sample

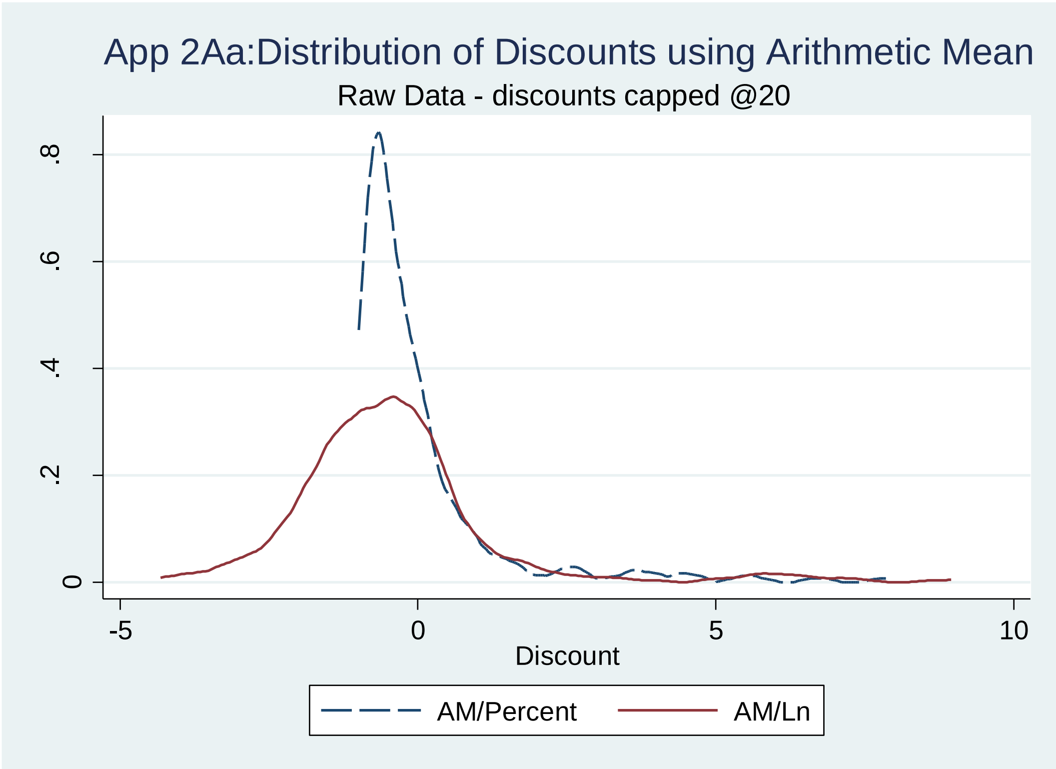
This table presents descriptive statistics for the discount used in the statistical analysis. For each transaction, an average of peer group multiples is calculated using either the arithmetic, harmonic or geometric mean, and median. Discounts are calculated either as percentage difference between peer group average and private transaction multiple, or the natural logarithm of the ratio of private transaction multiple to peer group average. For each transaction, an average of peer group multiples is calculated as the average of Deal Value to Sales ratio, Deal Value to EBIT ratio and Deal Value to Net Assets ratio. Discounts are either raw, with no adjustments to the observations, or the sample has been adjusted as follows: the Arithmetic Mean are calculated by excluding any acquisition premia in excess of 100% and excluding comparables where Peer Acquisition multiple > 2*Average. Discounts calculated using the harmonic or geometric mean are winsorized at the 99% percentile

Variable	Number of Observations	Mean	Median	Standard Deviation	Kurtosis
Arithmetic Mean / Percent Discount	251	-0.2757	-0.3258	0.4226	2 .56
Harmonic Mean / Percent Discount	285	4.36	0.2255	25.40	136.91
Median / Percent Discount	285	3.66	-0.0687	25.06	145.55
Arithmetic Mean / Logarithmic Discount	285	0.2120	0.1418	1.21	6.34
Harmonic Mean / Logarithmic Discount	285	-0.1039	-0.1261	1.25	6.55
Median / Logarithmic Discount	285	-0.0868	-0.1450	1.25	6.45

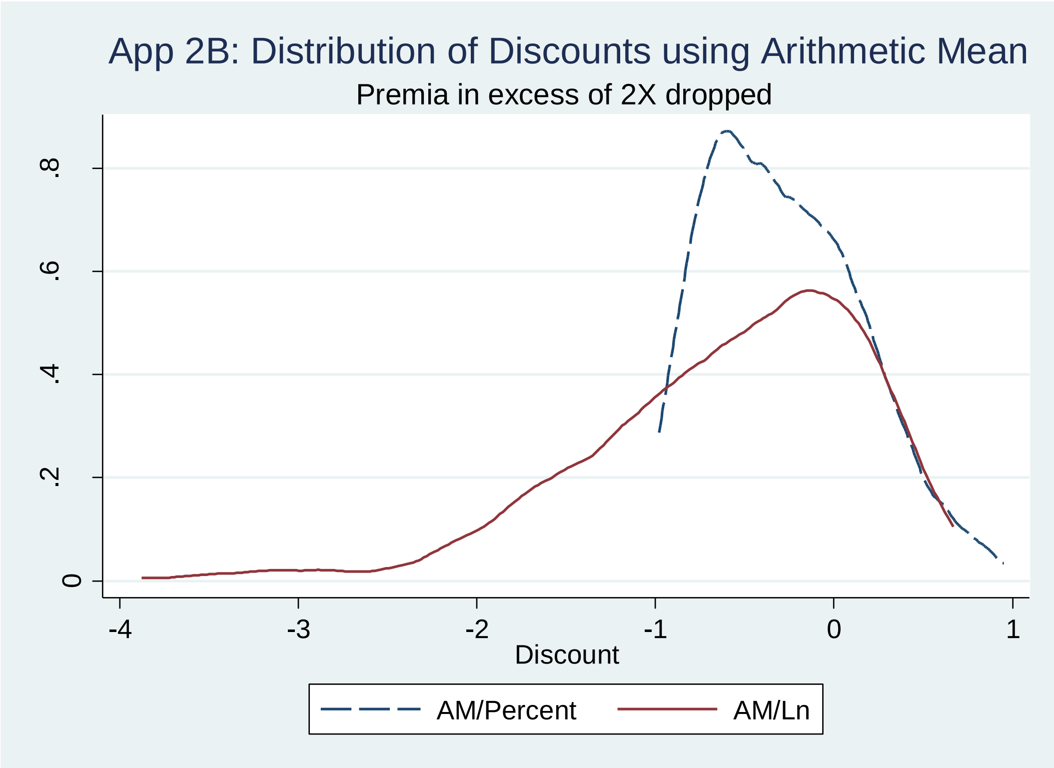
Appendix 2: Graphical analysis of discounts

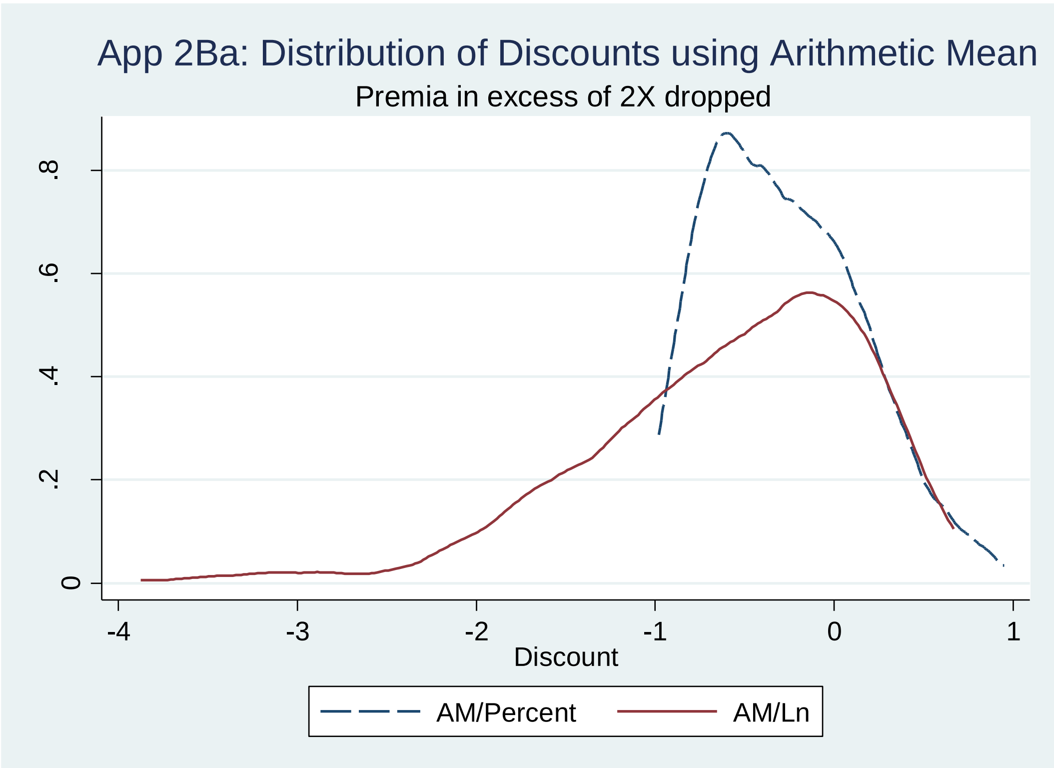
Graphs showing Arithmetic Mean Discounts: raw data



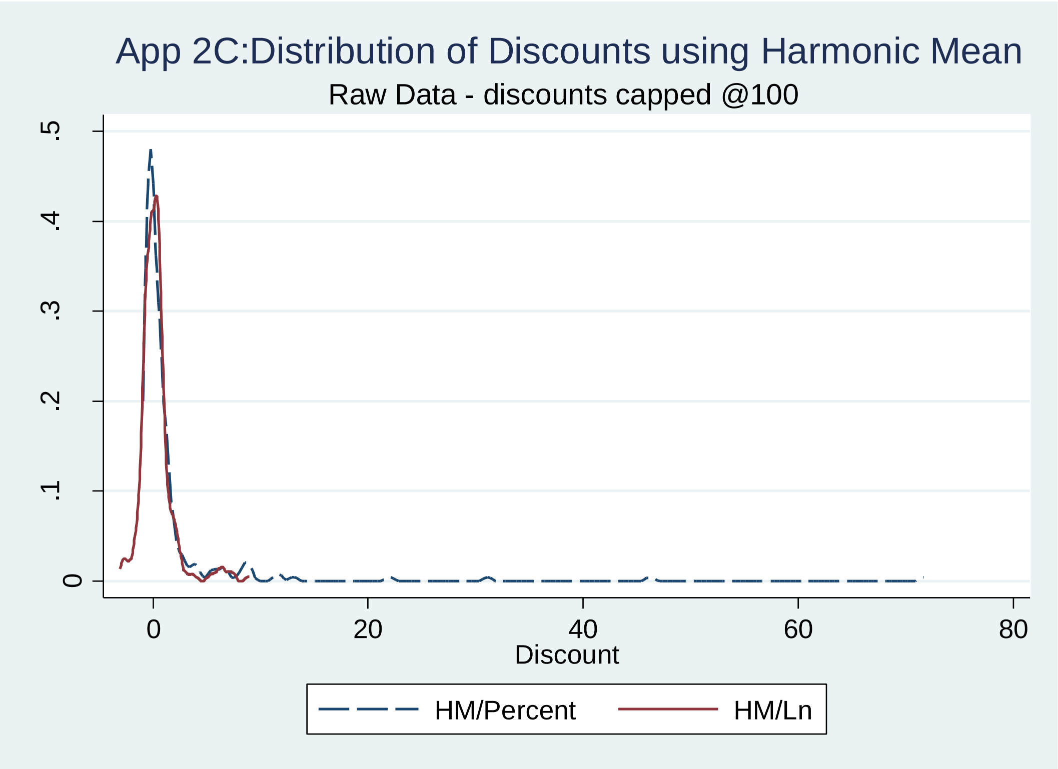


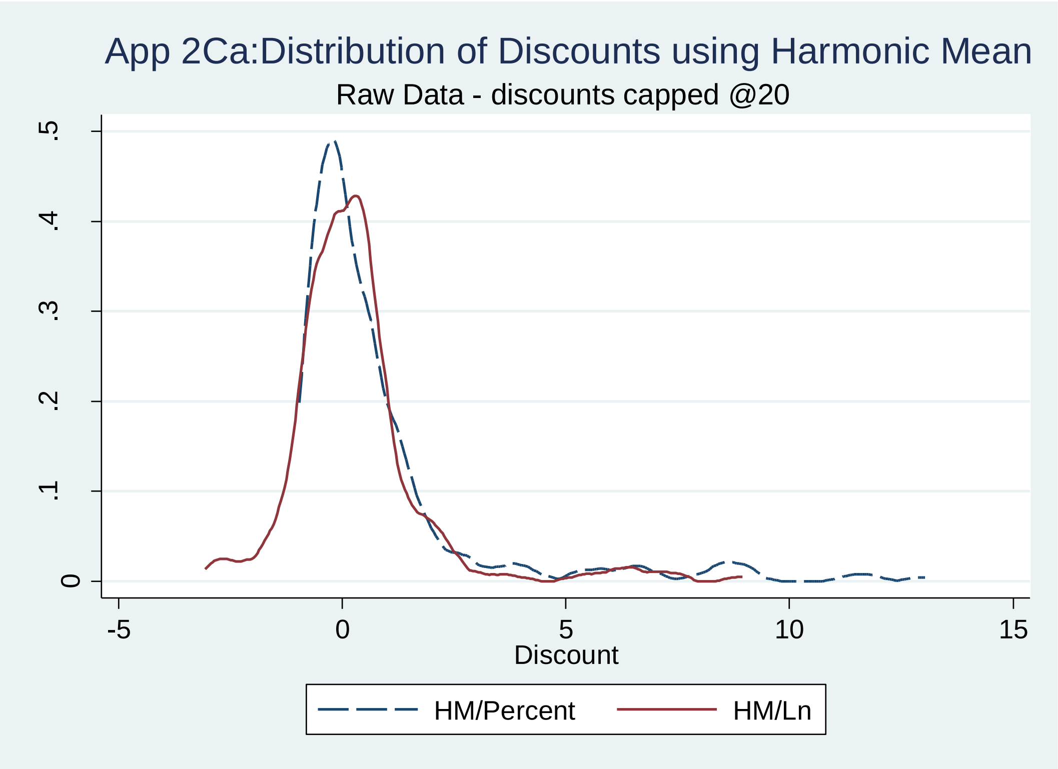
Graphs showing Arithmetic Mean Discounts: outliers dropped, following Officer (2007)



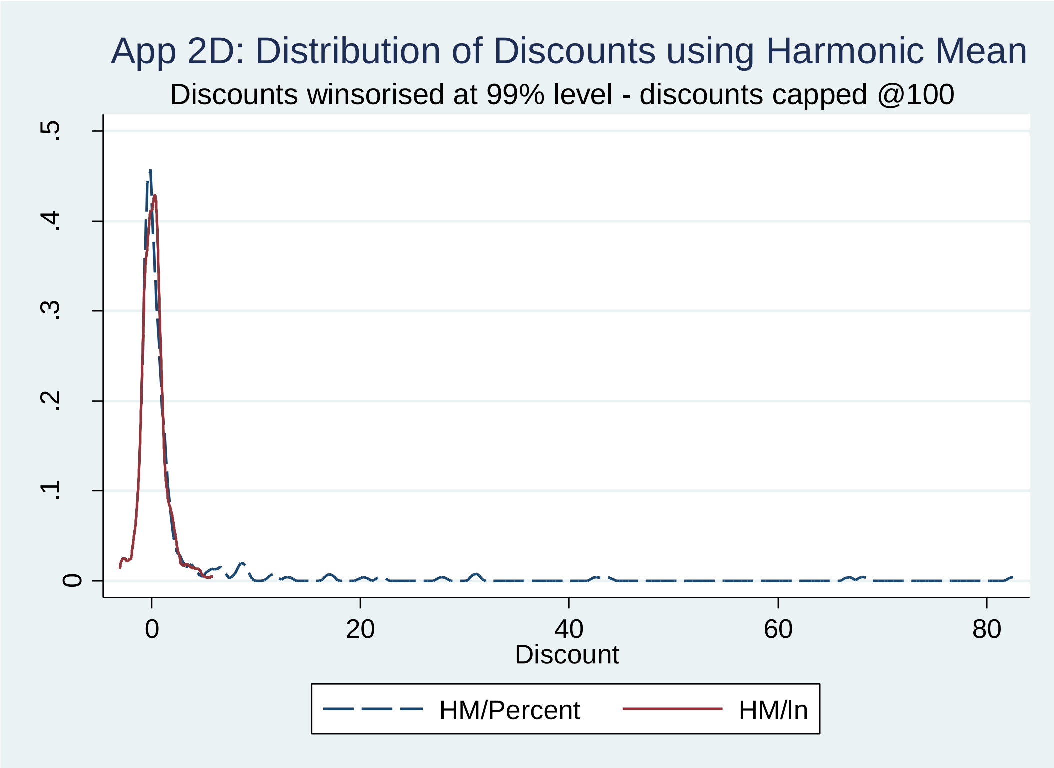


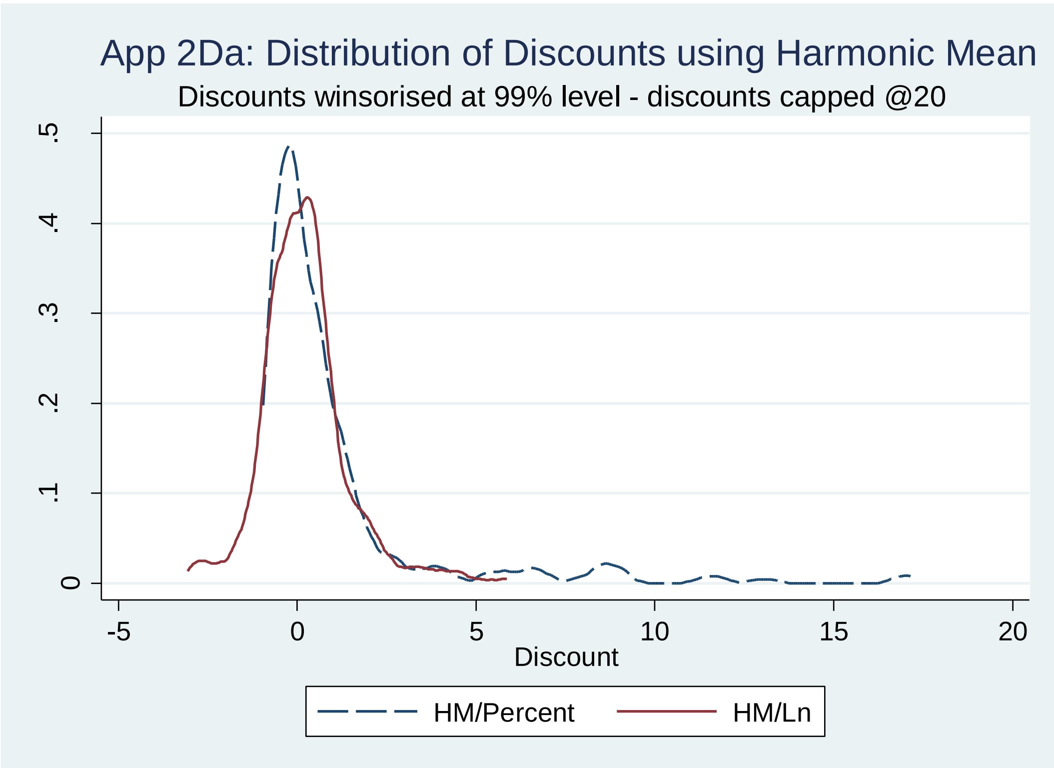
Graphs showing Harmonic Mean Discounts: raw data



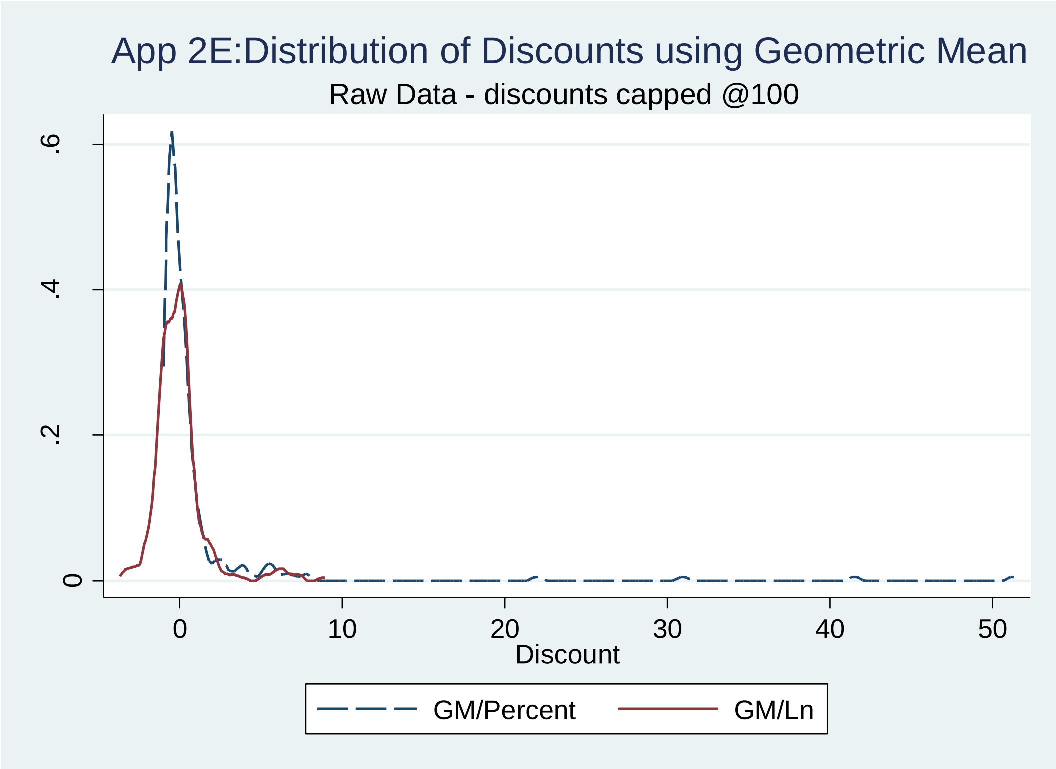


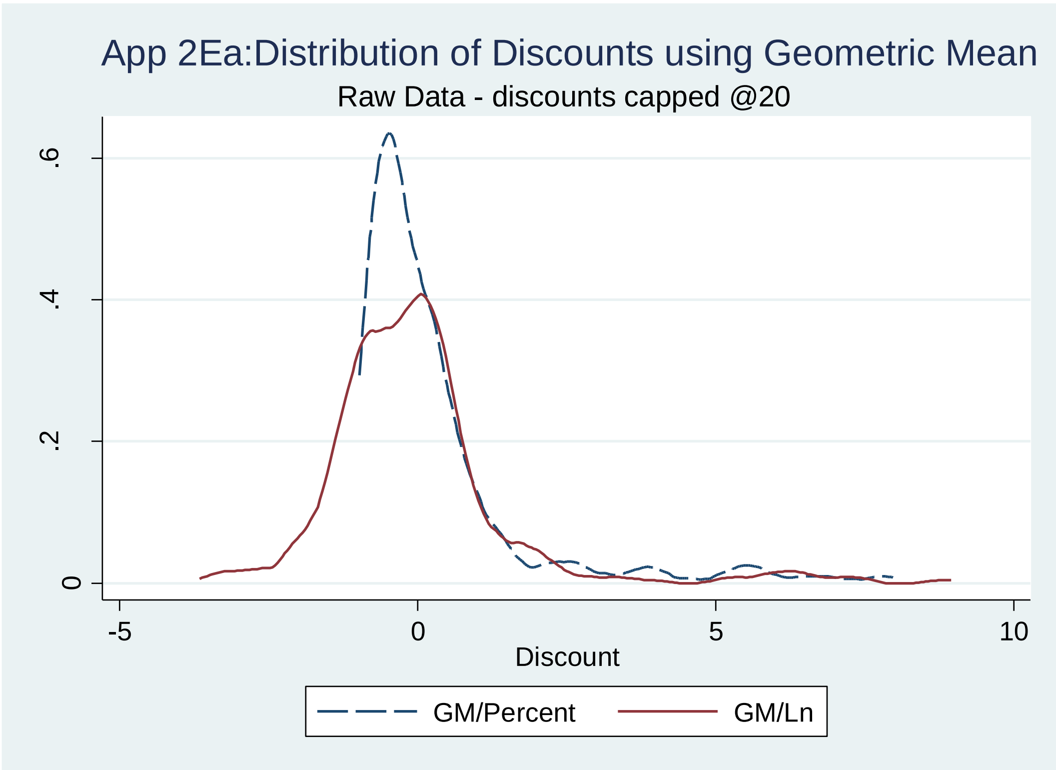
Graphs showing Harmonic Mean Discounts: discounts winsorised @99%



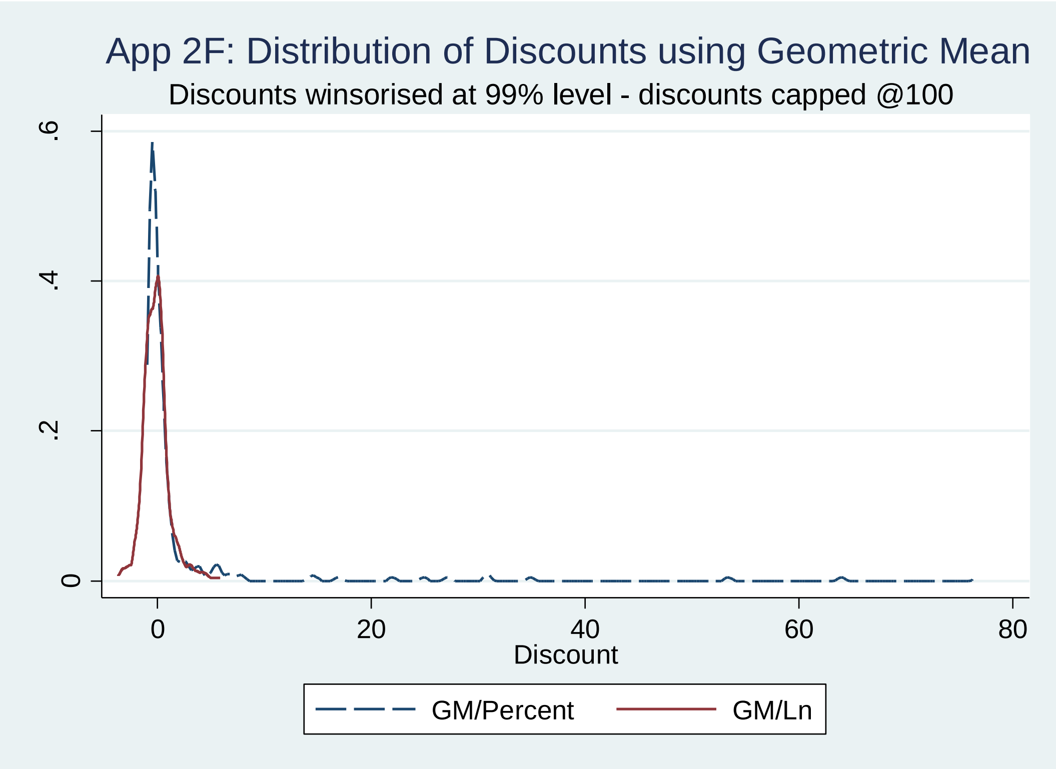


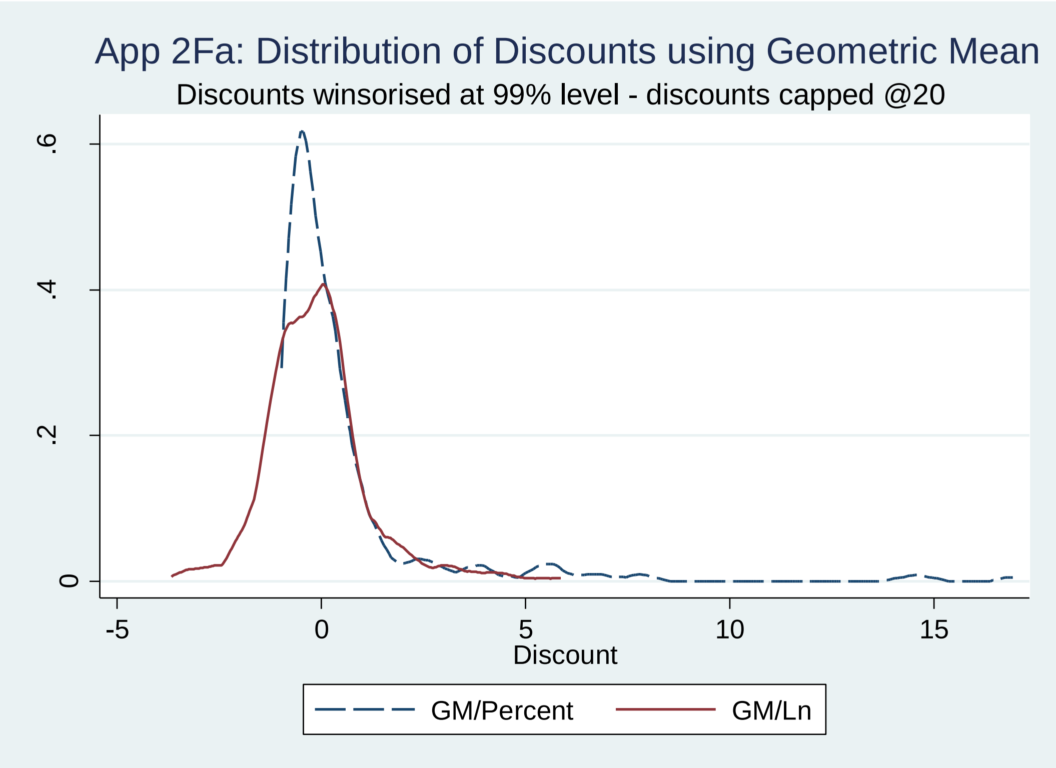
Graphs showing Geometric Mean Discounts: raw data



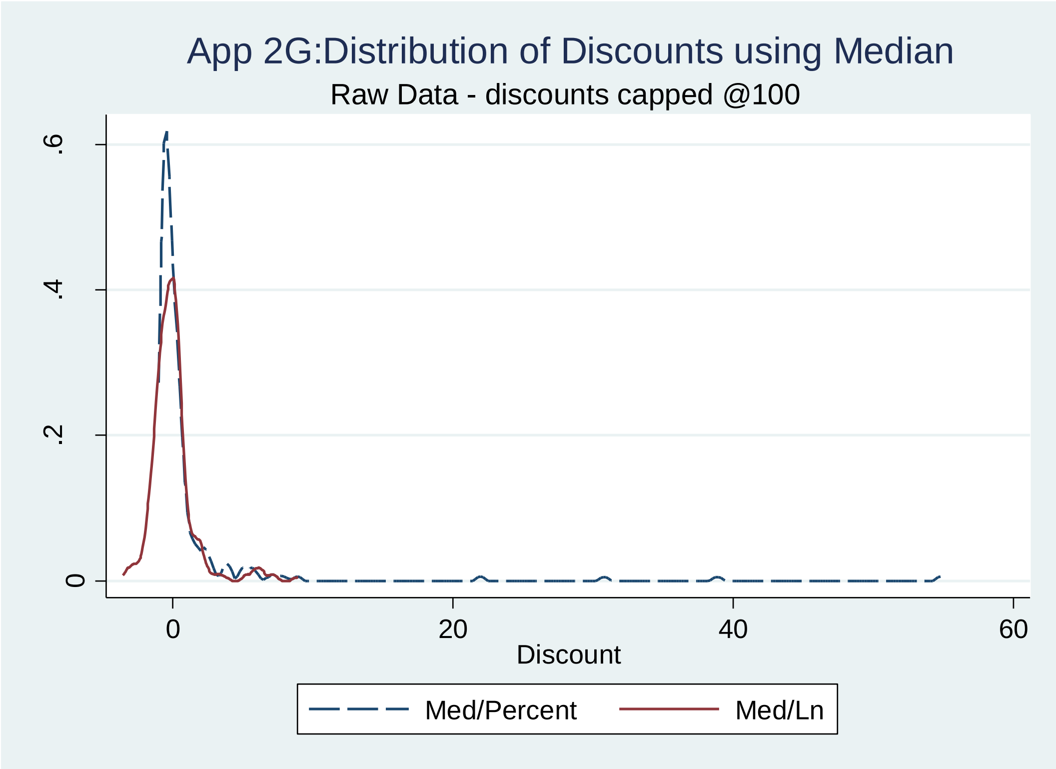


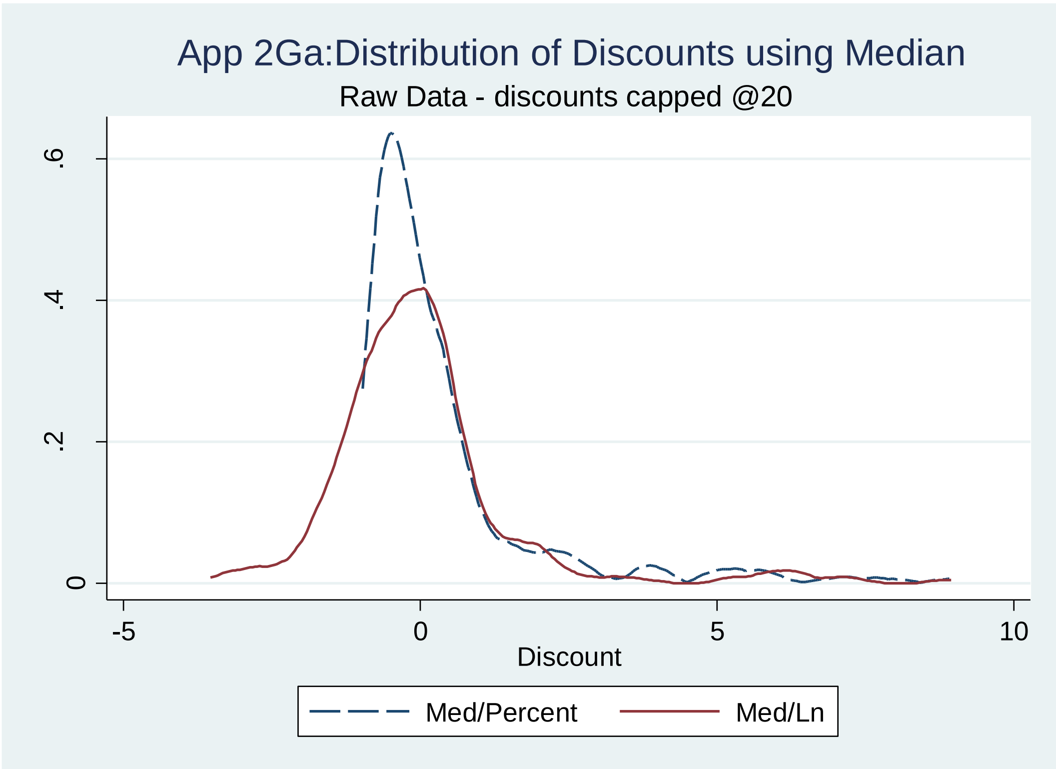
Graphs showing Geometric Mean Discounts: winsorised at 99%



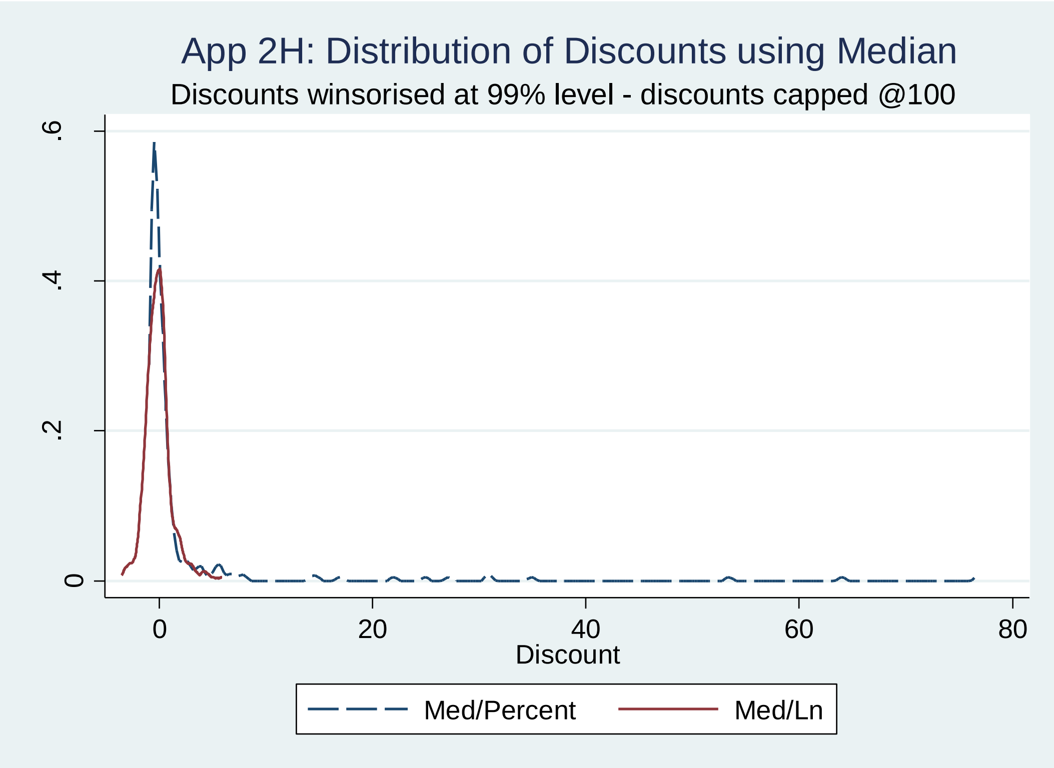


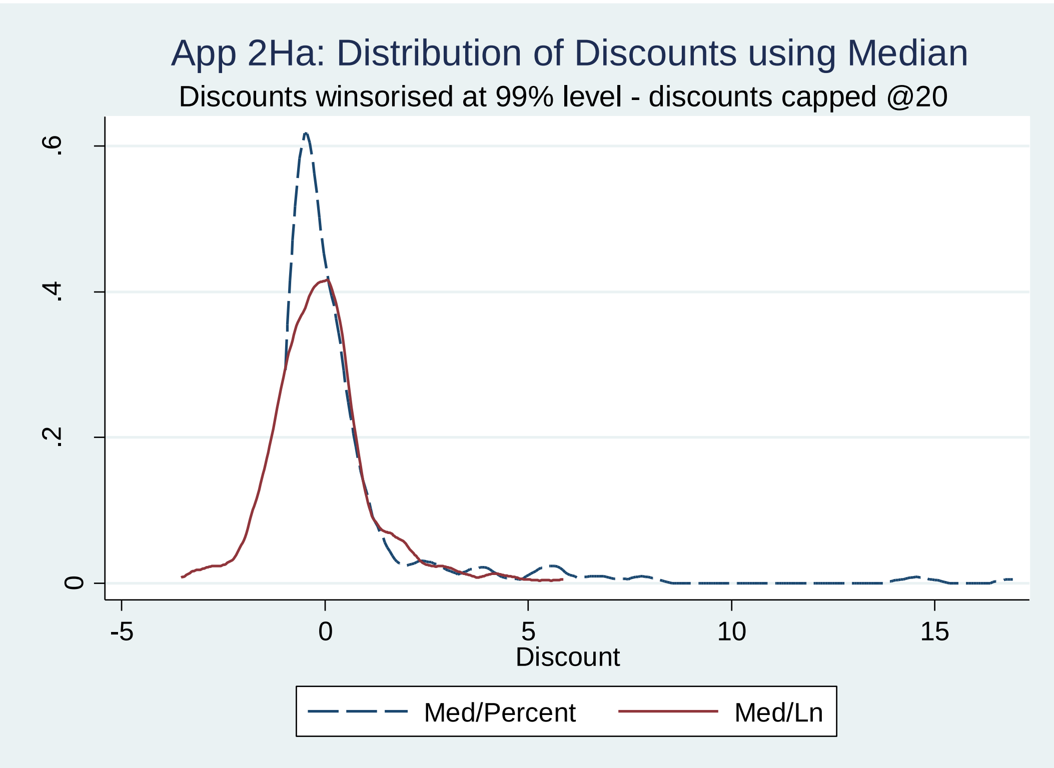
Graphs showing Median Discounts: raw data





Graphs showing Median Discounts: winsorised at 99%





Appendix 3: Analysis of discounts calculated using comparable weighted by size

Tables 3,1, 3.2 and 3.3 presented results where multiples for comparable companies were calculated using simple averages. This Appendix reports the same analysis but with the averages of comparable companies are calculated using weighted averages.

Table A3.1

Arithmetic Mean/Percent Discount

Means and medians for discounts calculated using different criteria for excluding extreme transactions. For each transaction, an average of peer group multiples is calculated using the arithmetic mean. Discounts are calculated as percentage difference between peer group average and private transaction multiple. Mean is the simple average of discounts for the sample. Median is the median of the sample. Discounts are calculated as the average of Deal Value to Sales ratio, Deal Value to EBIT ratio and Deal Value to Net Assets ratio. Numbers in brackets are standard errors. Testing for differences to zero were carried out using a two-tailed t-test for means and Wilcoxon signed rank test for medians. Significant differences at 1%, 5% and 10% levels are represented by ***,** and * respectively.

Panel A: impact of dropping observations

		Observations	[A] Only private sale outliers excluded		[B] Public market acquisition outliers also excluded	
			Mean	Median	Mean	Median
[A]	Raw data	285	53.1547 (35.1357)	-0.3701*** -3.943	53.1547 (35.1329)	-0.3701*** -3.943
[B]	Multiple is 20X that of average	275	-0.0443 (0.0739)	-0.4249*** -5.566	-0.0216 (0.0737)	-0.3701*** -5.094
[C]	Drop if multiple is 5X average	269	-0.2025*** (0.0474)	-0.4486*** -6.564	-0.1456*** (0.0466)	-0.3399*** -5.539
[D]	Drop if multiple is 2X average	255	-0.4285*** (0.0262)	-0.5345*** -11.342	-0.2925*** (0.0263)	-0.3447*** -9.149

Table A3.1 (cont)
Arithmetic Mean/Percent Discount

Means and medians for discounts calculated using different criteria for excluding extreme transactions. For each transaction, an average of peer group multiples is calculated using the arithmetic mean. Discounts are calculated as percentage difference between peer group average and private transaction multiple. Mean is the simple average of discounts for the sample. Median is the median of the sample. Discounts are calculated as the average of Deal Value to Sales ratio, Deal Value to EBIT ratio and Deal Value to Net Assets ratio. Numbers in brackets are standard errors. Testing for differences to zero were carried out using a two-tailed t-test for means and Wilcoxon signed rank test for medians. Significant differences at 1%, 5% and 10% levels are represented by ***,** and * respectively.

Panel A: impact of dropping observations

		Observations	[A] Only private sale outliers excluded		[B] Public market acquisition outliers also excluded	
			Mean	Median	Mean	Median
Panel B: impact of truncating observations						
[E]	Truncate at 99 percentile	285			3.1427** (1.4725)	-0.3481*** 3.571
[F]	Truncate at 95 percentile	285			0.7351** (0.3155)	-0.3093*** -2.978

Table A3.2
Discounts using Harmonic and Geometric Means

Means and medians for discounts calculated. For each transaction, an average of peer group multiples is calculated using the harmonic or geometric mean. Discounts are calculated either as percentage difference between peer group average and private transaction multiple. Or the natural logarithm of the ratio of private transaction multiple to peer group average. Mean is the simple average of discounts for the sample. Median is the median of the sample. Discounts are calculated as the average of Deal Value to Sales ratio, Deal Value to EBIT ratio and Deal Value to Net Assets ratio. Numbers in brackets are standard errors. Testing for differences to zero were carried out using a two-tailed t-test for means and Wilcoxon signed rank test for medians. Significant differences at 1%, 5% and 10% levels are represented by ***,** and * respectively.

		Observations	[A] Harmonic Mean/Percent Discount		[B] Harmonic Mean/Logarithmic Discount		[C] Geometric Mean/Logarithmic Discount	
			Mean	Median	Mean	Median	Mean	Median
[A]	Raw Data	285	59.9013* (35.7917)	0.1356*** 4.807	0.2385*** (0.0911)	0.0561 1.031	-0.0740 (0.0942)	-0.2312*** -3.905
[B]	Truncate at 99 percentile	285	4.1463*** (1.4959)	0.1379*** 4.808	0.1473** (0.0715)	0.0561 1.016	-0.1599 (0.0747) **	-0.2312*** -3.865
[C]	Truncate at 95 percentile	285	1.4205*** (0.3263)	0.1518*** 4.945	0.0933 (0.0612)	0.0561 0.968	-0.1114*** (0.0639)	-0.2152*** -3.780

Table A 3.3
Discounts for different multiples

Discounts of sale of subsidiaries relative to comparable public market transactions. Discounts are the average of discounts calculated using DV to sales, DV to EBIT, DV to assets and DV to Income, where available. A negative value represents a discount relative to average of public market comparables. Discounts cacilaued using the Arithemtic Mean exclude

Comparables measured by:	[A] Deal Value to Sales		[B] Deal Value to EBIT		[C] Deal Value to Assets		[D] Average	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Panel A: Discount measured by % discount								
Arithmetic	-0.3177*** (0.0308)	-0.3929***- -8.512 [229]	-0.2231*** (0.0604)	-0.3254*** -3.501 [77]	-0.2676*** (0.0474)	-0.3672*** -4.791 [85]	-0.2925*** (0.0263)	-0.3447*** -9.149 [251]
Harmonic	5.1598** (2.0816)	0.0345*** 3.331 [273]	3.6347*** (1.3021)	0.1549*** 3.106 [99]	2.3460** (0.9369)	0.0883*** 2.777 [113]	4.1463*** (1.4959)	0.1379*** 4.808 [285]
Panel B: Discount measured by logarithm								
Harmonic	0.1710** (0.0799)	0.0339 0.883 [273]	0.2628* (0.1381)	0.1441 1.626 [99]	0.2066** (0.1133)	0.0846* -2.775 [113]	0.1473** (0.0715)	0.0561 1.016 [285]
Geometric	-0.1776** (0.0823)	-0.2610*** -3.859 [273]	-0.0143 (0.1423)	-0.1245 -0.785 [99]	-0.0122 (0.1153)	-0.1298 -0.847 [113]	-0.1599** (0.0743)	-0.2312*** -3.865 [285]

Appendix 4: Descriptive Statistics of Independent variables

Table A4.1
Descriptive Statistics for Independent Variables
Asset Specific Characteristics

This table lists the independent variables used in the research. Variables are sorted by their usage in the main body of the thesis. Relevant inputs into each variable have been included where relevant. Detailed definitions are included in the text, Size is the natural logarithm of the transaction value, Industry Leverage is the median Debt to Assets ratio of the 2 digit SIC industry code of segment to which the sold asset belonged. Segment ROI-Industry Median ROI is the EBIT divided Total Assets ratio of the segment to which the sold asset belonged. Tgt Income Status is an Indicator variable with a value of one if target EBIT in the prior twelve months was positive, and zero if target EBIT was negative in the preceding twelve months.

Variable	Number of Observations	Mean	Median	Standard Deviation	Kurtosis
Transaction Value ($m)	389	806.20	225.00	3856.25	301.74
Size (ln)	389	5.60	5.41	1.21	3.9
EBIT last Twelve Months ($m)	180	52.52	13.89	127.80	22.65
Target Income Status	180	0.82	1	0.38	3.84
ROI Diff	260	-0.0021	-0.0120	0.1388	10.11
Industry Leverage	268	0.0918	0.1624	0.1852	1.74

Table A4.2 List of Variables and expected relationship with Discounts Financial Constraints					
This table lists the independent variables used in Chapters 4 and 5. Relevant inputs into each variable have been included where relevant. Detailed definitions are included in the text, The Whited-Wu and Hadlock-Pierce indices are calculated in the year prior to announcement. Use of proceeds are change in Capital Expenditure, Interest Bearing Debt and Shareholder Distributions, each scaled by the target parent company's Total Assets, from the year prior to announcement to the year following completion. Pre-Announcement rating is a numerical equivalent of S&P long term rtaings, with AAA=1; a BBB+ =8. Consideration and ratings are both Indicator variables taking on a value of 1 if Consideration is cash or rating is investment grade respectively.					
Variable	Number of Observations	Mean	Median	Standard Deviation	Kurtosis
Whited-Wu Index	322	-0.4114	-0.4185	0.1303	6.27
Hadlock-Pierce Index	322	-4.36	-4.65	0.8322	20.64
Use of Proceeds: Investment	322	-0.0216	-0.0007	0.1022	6.99
Use of Proceeds: Debt	322	-0.0309	-0.0019	0.2209	15.32
Use of proceeds: Distributions	322	0.0098	0	0.1189	140.09
Pre-announcement rating	236	8.45	8	3.73	3.54
Ratings = 1 if Investment Grade	389	0.4576	0	0.4988	1.02
Consideration Indicator = I if cash	289	0.6711	1	0.4706	1.53

Table A4.3
List of Variables and expected relationship with Discounts
Market Access

This table lists the independent variables used in Chapters 4 and 5. Relevant inputs into each variable have been included where relevant. Detailed definitions are included in the text,. SEO Liquidity Index is calculated for each two digit SIC code, and measures equity issuance in previous twelve months scaled by median equity issuance over the sample period for that industry. SEO Discount Index measures the effective discount on equity issues in each two digit SIC code. It does not make allowance for wealth transfers from existing to new shareholders. Number of Blockholders is the number of institutional blockholders in each target parent, disclosed in Thomson Reuters ShareOwnership Summary, extracted from SEC 13F filings. Credit Spread is the average over previous twelve months of five year BBB bond spread less five year Treasuries. Both items extracted from the United States Federal Reserve Selected Interest Rates file.

Variable	Number of Observations	Mean	Median	Standard Deviation	Kurtosis
SEO Liquidity Index	385	8.48	1.08	58.31	102.12
SEO Discount Index	335	-1.89	-0.9485	10.26	308.78
Number of Blockholders	354	1.66	1	1.45	4.42
Credit Spread	389	2.67	2.25	0.9928	3.53

Table A4.4
List of Variables and expected relationship with Discounts
Fire sale Conditions

This table lists the independent variables used in Chapters 4 and 5. Relevant inputs into each variable have been included where relevant. Detailed definitions are included in the text. Acquirer and target matching SIC code equals 1 if acquirer has same 2 digit SIC code as target. Orphan Asset equals 0 if Target's 2 digit SIC code does not match either the parent or the acquirer. Target Parent Abnormal return x SIC match where SIC match equals 1 if SIC code of target matches that of parent. Asset liquidity index measures acquisition activity in the same 2 digit SIC code as target. Target parent abnormal return measures target parent excess return in twelve months prior to transaction. Relative Whited-Wu index measures ratio of Acquirer's Whited-Wu index value relative to target parents' in year preceding announcement of transaction. Pressure to sell equals 1 if target parent has announced accounting loss or major write-offs in fiscal year prior to transaction. Ln Ownership measures percent of institutional ownership in target parent. Concentration measures Herfindahl Index value of institutional ownership.

Variable	Number of Observations	Mean	Median	Standard Deviation	Kurtosis
Acquirer has non-matching SIC Code	389	0.5553	1	0.4976	1.049
Target SIC code does not match Acquirer or Parent =1	389	0.3265	0	0.4695	1.54
Industry Asset Liquidity Index	364	1.65	1.17	2.16	89.45
Target Parent Abnormal Share price performance in previous twelve month	351	-0.1334	-0.0526	0.5440	16.82
Pressure to Sell	330	0.4394	0	0.4971	1.06
Acquirer Whited-Wu Index relative to Target Parent's Whited-Wu Index	293	0.8918	0.8687	0.6486	82.61
Relative Institutional Ownership	320	1.56	1	6.49	265.98
Relative Concentration of Institutional Ownership	324	2.00	1.045	2.95	27.63

Table A4.4

List of Variables and expected relationship with Discounts

Fire sale Conditions

This table lists the independent variables used in Chapters 4 and 5. Relevant inputs into each variable have been included where relevant. Detailed definitions are included in the text. Acquirer and target matching SIC code equals 1 if acquirer has same 2 digit SIC code as target. Orphan Asset equals 0 if Target's 2 digit SIC code does not match either the parent or the acquirer. Target Parent Abnormal return x SIC match where SIC match equals 1 if SIC code of target matches that of parent. Asset liquidity index measures acquisition activity in the same 2 digit SIC code as target. Target parent abnormal return measures target parent excess return in twelve months prior to transaction. Relative Whited-Wu index measures ratio of Acquirer's Whited-Wu index value relative to target parents' in year preceding announcement of transaction. Pressure to sell equals 1 if target parent has announced accounting loss or major write-offs in fiscal year prior to transaction. Ln Ownership measures percent of institutional ownership in target parent. Concentration measures Herfindahl Index value of institutional ownership.

Variable	Number of Observations	Mean	Median	Standard Deviation	Kurtosis

Table A4.5

List of Variables and expected relationship with Discounts

Interaction Variables

This table lists the independent variables used in Chapters 4 and 5. Relevant inputs into each variable have been included where relevant. Detailed definitions are included in the text, Each interaction term is set to 1 if three conditions are met. Term_1 is Whited-Wu Index< median, SEO Volume Index<median; Term_2 is Debt Change < median and SEO Discount Index<media. Term_3 is Debt change< median and Credit Spread > median. Term_4 is Whited-Wu Index< median and Credit Spread> median. The third item in every term is that the two digit SIC code of target should not match that of the acquirer.

Variable	Number of Observations	Mean	Median	Standard Deviation	Kurtosis
Interaction Term_1	395	0.0658	0	0.2483	13.27
Interaction Term_2	395	0.0861	0	0.2808	9.72
Interaction Term_3	395	0.0684	0	0.2527	12.70
Interaction Term_4	395	0.0759	0	0.2653	11.25

Table A4.6
List of Variables and expected relationship with Discounts
Control Variables

This table lists the independent variables used in Chapters 4 and 5. Relevant inputs into each variable have been included where relevant. Detailed definitions are included in the text, Marginal Tax Rate is non-parametric MTRINT rate available on Compustat. Herfindahl Index is calculated based on segment sales revenue for target parent for the fiscal year prior to announcement of sale. Herfindahl Index: change is change in value of H from year prior to the announcement Herfindahl Index. Institutional Ownership is percent of ownership in target parent, and Concentration is Herfindahl Index based on ownership shares by institutions. Target / Parent matching SIC code equals 1 if target 2 digit code matches parent. Transaction Size is log of Transaction Value. Relative Size is Transaction value divided by Enterprise Value of target parent. Target parent Tobin's Q is Enterprise value divided by Total Assets. Enterprise value is Total Assets less book value of equity plus market value of equity, in year prior to the announcement of sale. -

Variable	Number of Observations	Mean	Median	Standard Deviation	Kurtosis
Marginal Tax Rate	324	0.2971	0.3413	0.0897	5.31
Target Parent Diversification [[Herfindahl Index = 1 if single segment]	389	0.6964	0.7122	0.3034	1.79
Percent of Institutional ownership	351	0.6218	0.6386	0.2174	3.33
Concentration of institutional ownership	354	0.0801	0.0474	0.1364	32.32
If target SIC code matches target parent = 1	389	0.4242	0	0.4949	1.09
Transaction Size	389	5.60	5.42	1.21	3.90
Relative Size	332	0.1001	0.0381	0.2699	167.78
Tobin's Q	332	1.83	1.46	1.26	20.28

Appendix 5: Chapter 4 and 5 results calculated using Ordinary Least Squares on adjusted sample data

Discounts calculated using the Arithmetic Mean have dropped outliers where the multiple is twice that of comparable peers. Discounts calculated using harmonic or Geometric Mean are winsorised at the 99th percentile. These analyses differ to those in the main thesis, which use raw discounts bit robust regression procedures to address the question of outliers. This is done to preserve consistency with Officer (2007).

Table A5.1
Asset Specific characteristics and discounts
[OLS version of Table 3.8]

This table reports results of regressing alternative specifications of discounts as the independent variable against asset specific characteristics. Estimation uses ordinary least squares. Discounts calculated using the Arithmetic Mean are calculated by excluding any acquisition premia in excess of 100% and excluding comparables where Peer Acquisition multiple > 2*Average. Discounts calculated using the harmonic or geometric mean are winsorized at the 99% percentile. Size is the natural logarithm of the transaction value, Industry Leverage is the median Debt to Assets ratio of the 2 digit SIC industry to which the segment to which the sold asset belonged. Segment ROI-Industry Median ROI is the EBIT divided Total Assets ratio of the segment to which the sold asset belonged. Numbers in round brackets are the standard errors of the regression coefficient. Significance levels are represented by ***, ** and * at the 1%, 5% and 10% levels respectively.

	Arithmetic Mean / Percent Discount	Harmonic Mean / Percent Discount	Harmonic Mean / Logarithmic Discount	Geometric Mean / Logarithmic Discount
Constant	-0.6317*** (0.1421)	-4.6682 (11.3760)	-0.9945** (0.3855)	-1.3884*** (0.3822)
Size	0.0517** (0.0251)	1.4331 (2.0057)	0.1849*** (0.0676)	0.1883*** (0.0673)
Industry Leverage	0.5859*** (0.1743)	13.5646* (10.1214)	1.0365** (0.4326)	1.5916*** (0.4158)
Segment ROI – Industry median ROI	-0.4829** (0.2186)	-6.9568 (3.6368)	-1.3736** (0.4326)	-1.6981*** (0.4943)
Observations	185	203	203	203
R^2	0.17	0.02	0.12	0.19

Table A5.2

Regression Results for Liquidity Pressure Hypothesis variables

[OLS Version of Table 4. 6]

This table reports results of regressing alternative specifications of discounts as the independent variable against asset specific characteristics. Estimation uses ordinary least squares. Discounts calculated using the Arithmetic Mean are calculated by excluding any acquisition premia in excess of 100% and excluding comparables where Peer Acquisition multiple > 2*Average. Discounts calculated using the harmonic or geometric mean are winsorized at the 99% percentile. Whited-Wu index is value of index in year prior to announcement. SEO Volume Index is equity issue activity in same two digit SIC code as target period in preceding twelve months, scaled by activity over whole period. Credit spread is the average difference between Baa bonds and Five Year Treasuries in the preceding twelve months.. Number of Blockholders is the number of Blockholders in parent company. Relative Ownership Concentration is ratio of concentration of institutional shareholders in acquirer divided by those in the target parent. Acquirer & target matching SIC is set to one when acquirer and target have the same 2 digit SIC code. Interaction term is set to one when measures of target parent liquidity are poor, equity market conditions are poor and the target and acquirer have different 2 digit SIC codes. Size is the natural logarithm of Transaction value. Relative Size is the Transaction Value divided by the sum of the target parent's equity market value and book value of debt. Tobin's Q is the sum of target parent parent's equity market value and book value of debt divided by total assets.

Results over page

Table A5.2 (cont) Regression Results for Liquidity Pressure Hypothesis variables [OLS Version of Table 4. 6]				
	Arithmetic Mean / Percent Discount	Harmonic Mean / Percent Discount	Harmonic Mean / Ln Discount	Geometric Mean / Ln discount
Whited-Wu Index	0.529	-23.358	1.366	1.430
	(0.117)	(33.835)	(1.000)	(1.034)
SEO Volume Index	-0.001***	-0.010	-0.001	-0.001
	(0.000)	(0.010)	(0.001)	(0.001)
Credit Spread	-0.009	0.012	0.145	0.144
	(0.031)	(2.437)	(0.105)	(0.114)
Twelve Month Abnormal return	0.057	-1.857	-0.028	-0.009
	(0.069)	(1.834)	(0.181)	(0.194)
Number of Blockholders	0.001	2.708	0.065	0.046
	(0.028)	(2.234)	(0.075)	(0.081)
Acquirer & Target matching SIC Code	-0.87	4.494	0.044	-0.007
	(0.076)	(3.821)	(0.181)	(0.193)
Relative Ownership Concentration	0.020	-0.171	0.077***	0.065***
	(0.029)	(0.502)	(0.022)	(0.024)
Interaction Term_1	-0.274**	1.683	-.573	-0.481
	(0.117)	(3.957)	(0.454)	(0.461)

Table A5.2 (cont) **Regression Results for Liquidity Pressure Hypothesis variables** **[OLS Version of Table 4. 6]**				
	Arithmetic Mean / Percent Discount	Harmonic Mean / Percent Discount	Harmonic Mean / Ln Discount	Geometric Mean / Ln discount
Size	0.098***	-1.045	0.245***	0.261***
	(0.034)	(3.956)	(0.077)	(0.079)
Relative Size	0.251	-7.704	0.114	-0.085
	(0.263)	(8.664)	(0.588)	(0.614)
Tobin's Q	-0.017	-0.076	-0.031	-0.070*
	0.024	(0.487)	(0.039)	(0.040)
Constant	-0.515*	-5.339	-1.125**	-1.327**
R^2	0.11	0.03	0.10	0.09
Number of observations	167	195	195	195

Table A5.3 **Regression Results for Acquirer CARs** **[OLS version of Table 5.4, using discounts adjusted for outliers]**								
Results for ordinary least squares regression for each combination of averaging and discount method. Coefficient values for each variable in first row. Estimation uses ordinary least squares. Dependent variable is Acquirer CAR, calculated on a -1/+1 window around announcement date. Excess returns are adjusted for market movements and target parent's Beta. Discounts calculated using Arithmetic Mean are calculated by excluding any acquisition premia in excess of 100% and excluding comparables where Peer Acquisition multiple > 2*Average. Discounts calculated using harmonic or geometric mean are winsorized at the 99% percentile. Relative Size is the Transaction Value divided by the target Parent's Equity market value. Relative institutional ownership and relative Whited-Wu index are relevant values for the acquirer divided by relevant values for the target, both measured prior to the transaction. Size is the natural logarithm of the transaction value. . White adjusted robust standard errors in brackets in second row..								
	Arithmetic Mean / Percent Discount		Harmonic Mean / Percent Discount		Harmonic Mean / Ln Discount		Geometric Mean / Ln discount	
	Co-efficient	Std Err	Co-efficient	Std Err	Co-efficient	Std Err	Co-efficient	Std Err
Size	-0.008	(0.014)	0.003	(0.005)	0.003	(0.005)	-0.002	(0.005)
Relative Institutional ownership concentration	0.0085**	(0.003)	0.003	(0.003)	0.003	(0.003)	0.003	(0.003)
Relative Size	0.063	(0.055)	0.039	(0.055)	0.039	(0.054)	0.030	(0.055)
Relative WW Index	0.001	(0.006)	-0.003	(0.005)	-0.003	(0.004)	-0.003	(0.005)
Discount	-0.0122	(0.014)	0.000	(0.000)	-0.001	(0.005)	-0.002	(0.005)
Constant	-0.053		-0.009		-0.009		-0.010	
R^2	0.06		0.02		0.02		0.02	
Number of observations	158		182		182		182	

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