

The Impact of the Transfer of Intangible Assets on the Valuation Effects of High-Tech Cross-Border Mergers and Acquisitions

by

Andrew John Sinclair

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Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners

I understand that my thesis may be made electronically available to the public.

Abstract

The technology industry is characterized by a greater than usual reliance on intangible assets. During the tech bubble many firms were valued entirely on intangible assets and growth prospects. In the aftermath of the bubble, intangible assets still play an important role as the innovative performance of a firm's human capital and the value of its patents creates much of the value of high-tech firms. The problem of transferring human capital and knowledge may be further exacerbated when the firms belong to separate national cultures. Investor perception of acquisition announcements may be more favourable if the target workforce is much smaller relative to the bidder, and thus easier to integrate. Also, perceptions may be favourable when the target has a high ratio of intangible assets to total assets, as this may be a proxy for the relative value of the extractible intangible assets. This study uses a sample of 61 acquisition announcements between 1991 and 2004, where both acquirer and target are high-tech firms and accounting and trading data is available from three years prior to three years after the acquisition announcement. There is weak evidence to support the employee ratio hypothesis for bidder returns, and no evidence to support the intangible assets to total assets hypothesis for either bidder or target returns. Additionally, it is found that average bidder abnormal returns during the announcement period (as measured from one day prior to the announcement acquisitions to one day afterwards) are negative but not significantly different from zero, and that average target abnormal returns are positive and significant. Average wealth gains to bidders are negative and to targets are positive over the window from five days prior to the acquisition announcement to five days afterwards. Furthermore, combined wealth gains are negative, indicating the synergistic gains from high-tech cross-border acquisitions are offset by high premiums paid by the bidders for the targets. Relatedness, a lack of tender offers, and non-US acquirer status are demonstrated to be related to negative returns to bidders, whereas tender offers, US-acquirer status, and termination provisions are shown to be related to increased returns to target shareholders. In the long-run, it is found that acquirers experience superior operating cash flow returns when compared to their industry peers, however, the acquirer experiences diminished performance when compared to the combined performance of the pre-acquisition acquirer and target firms.

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Dedication

I dedicate my thesis to my friends and family, for always making me laugh.

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Introduction

The technology industry is one characterized by rapid technological change and success is highly reliant on innovation. Firms need to strategically manage their assets in order to maintain a competitive position. Mergers and acquisitions (M&A) are important tools for companies seeking to very quickly enter a new business or product line in a short amount of time.

Acquisitions give companies access to patents, knowledge, and a pool of human capital. The technology industry is a time-sensitive industry; technologies have a short half-life and become obsolete quickly. The time-sensitive nature of technological capabilities highlight the importance of an efficient acquisition, otherwise potentially valuable knowledge or capabilities could be lost. When acquiring a technological target, transferring its technological and innovative capabilities is very important. This involves integrating the target in a manner that is both quick and retains as much of the valuable human capital as possible.

This reliance on human capital and intangible assets creates a high degree of asymmetric information that makes it difficult for market participants to value acquisitions. Technology firms have highly specialized knowledge, which may be difficult to understand and value. The important technological capabilities reside in the codified knowledge owned by the target, and the innovative and tacit knowledge of the target's human capital. Valuation at the acquisition announcement of these assets will be difficult, and it is quite dependent on the ability of the acquirer to extract this information. Being able to assimilate codified and tacit knowledge is a difficult process, but is related to the acquisition process. Retention of human capital will be key in assimilating this knowledge, as tacit knowledge resides within the social complexities of the

human capital, and codified knowledge can be explained and understood with the assistance of the creators of that knowledge.

The valuation of technology targets is even more obscured in the case of cross-border deals. The issues of asymmetric information and employee retention are further augmented by geographical and cultural distances. Assets may be more difficult to evaluate and monitor when they are geographically distant, resulting in increased costs associated with valuing these assets. Cultural differences may also affect the ability to manage a foreign workforce, which may adversely affect the post-acquisition integration process. Transferring knowledge may also prove to be more difficult since a common culture may provide a foundation that allows for better communication of complex ideas. There also exists uncertainty over regulations in different countries that may affect the integration and ownership of assets.

Taking all of these ideas into account, this study investigates whether cross-border acquisitions of high technology targets creates value for acquirers and targets, and attempts to identify factors that may be related to value creation. 61 high-tech cross-border acquisition announcements are studied between 1991 and 2004. There have been no restrictions placed on the acquirer or target nation. It is found that acquirers experience insignificant negative cumulative abnormal returns (CARs) in the window surrounding (one day prior to one day after) the acquisition announcement. Targets on the other hand, experience significantly positive cumulative abnormal returns during the same window. For acquirers, it was found that not having tender offers, cash payments, or not being in the US are associated with significant negative CARs. Targets experience significantly higher CARs when the deal is a tender offer as opposed to a merger. On average, wealth gains were \$-305.1 million (median \$-1.0 million) to acquirers and \$23.2 million (median \$21.9 million) to targets, with combined wealth gains of \$-

281.9 million (median \$21.4 million) over the period of five days prior to the acquisition announcement to five days afterwards. This figure may suggest cross-border technology acquisitions are value destroying endeavours, but the figure may be affected by some large losses as more than half of the deals (36) have positive combined wealth gains and the median value for combined wealth gains is \$21.4 million. The cross-sectional analysis of the regression model indicates that tender offers, cash payments, US acquirers, and termination provisions are significant factors related to target returns. The model has an adjusted R-squared of 44.6% and is significant at the 1% level.

Tender offers, cash payments, and termination provisions have been found in previous work to be important in some cases and not in others. The negative wealth gains is at odds with evidence from Eun, Kolodny, and Scheraga (1996) that found on average between 1979 and 1990, deals involving foreign acquirers of US targets had combined wealth gains of \$68 million.

This thesis also investigates the relationship between acquisitions and long term operational performance. Following Healy, Palepu, and Ruback (1992), industry-adjusted cash flow returns in the three years following the merger are regressed against combined cash flow returns prior to the merger, and in another case, against combined announcement window returns (from five days prior to the acquisition announcement to five days after) as well. Consistent with Healy et al. (1992), merged firms exhibit significantly higher returns when compared to their respective industries. It is also shown that there is a significantly positive relationship to premerger operating performance, but inconsistent with the previous study, a significant negative relationship between announcement window returns is observed.

This thesis is organized as follows. Section I provides a review of the literature. Section II develops the hypotheses and describes control variables used in this study. Section III describes the data, sampling methodology, and the final sample. Section IV outlines the analysis methodology, while Section V provides empirical results. Finally, Section VI discusses conclusions.

I. Literature Review

The literature review can be broken down into four categories. The first category contains studies that look specifically at cross-border technology acquisitions. This specific research topic is fairly new and there is only one paper on this topic in the extant literature. The second and third categories look at papers dealing with the constituents of the first category: acquisitions of technology firms, and cross-border acquisitions respectively. The final category deals more with mergers and acquisitions in general and also some important modelling and sampling techniques that should be taken into account.

A. Cross-Border Technology Acquisitions

Studies in the area of cross-border technology acquisitions have only been conducted fairly recently. The first such study, and the one most closely related to this study, was conducted by Benou, Gleason and Madura (2007). Their research takes the premise that foreign high tech firms will exhibit a high degree of asymmetric information, and hypothesizes that media exposure and reputable investment banking advisors can help mitigate investors' scepticism of the valuation of the acquisitions. The researchers used the SDC database to identify 503 instances where a US acquirer had acquired foreign targets over the period from 1985 to 2001. These 503 acquisitions also had the caveat that acquirer stock price data were available on CRSP. Over the entire 503 firm set and in the window of (-1, +1) days, the results showed insignificantly positive returns. However, when the target had high credibility (as measured by the investment bank reputation) and high visibility (as measured by the firm's media exposure), the acquirer exhibited significantly positive returns. This appears to lend credibility to the authors' hypotheses.

B. Acquisitions of Technology Firms

The extant research on acquisitions of technology firms is still fairly recent. Kohers and Kohers (2000) studied high-tech bidders, as determined by the “high-tech flag” in the SDC database. This was one of the few studies that have found positive and significant abnormal returns to bidders. Also, their results are independent of the type of payment (cash versus stock), which is also uncommon. Some key factors identified were: time period of acquisitions, ownership structure of acquirer, ownership status of target, and high-tech affiliation of acquirer. A possible criticism of this research may be the reliance on the high-tech flag from the SDC database. While constructing the database for this thesis, it was found that the high-tech flag was not robust and included many firms that were in fact not related to the high-tech industry whatsoever.

In a follow-up paper, Kohers and Kohers (2001) study the post acquisition performance of acquirers that purchase high-tech targets. When compared to a control group, their sample performs poorly over the three-year period following the acquisition announcement. When considering these two studies together, the authors conclude that high-tech acquisitions create excessive enthusiasm in the financial markets, which overestimate the value of the benefits of the acquisition to the bidder.

Ranft and Lord (2000) conducted survey based research designed to identify factors that are correlated with post acquisition retention of employees. They hypothesize that the driving forces behind technology acquisitions is the desire to enhance the bidder’s strategic technology capabilities. They claim that these capabilities are likely intertwined in the tacit knowledge of the target firm’s human capital. The study indicates that retention of the target’s human capital, and the knowledge that resides within, plays an important role in a successful merger.

In a study that examines the relatedness (as measured by the firms' three-digit SIC codes) of deals and post acquisition technological performance, Hagedoorn and Duysters (2002) discuss that when compared to unrelated deals, related deals tend to show superior economic performance because of the synergistic gains from economies of scale and scope. Taking this idea further, they show that related deals improve the technological performance of acquirers as measured by the number of patents filed in the post-acquisition years. Cloudt, Hagedoorn, and Van Kranenburg (2006) return to this topic and find the relationship is curvilinear. It is optimal to acquire firms that are related, but performance suffers when there exists too much overlap in the businesses of the two firms.

Chaudhuri and Tabrizi (1999) and Prentice and Fox (2002) investigate the difficulties in valuing high-tech assets. The former study concludes that high-tech targets are difficult to value, especially if they have low-visibility in the financial media. The latter study concludes that high-tech firms must be evaluated on intangible assets such as human capital and intellectual property. This emphasis on human capital is similar to the Ranft and Lord (2000) paper.

For a source that discusses some of the general issues associated with the valuation of intangible assets, please refer to Lev (2001).

C. Cross-Border Acquisitions

The literature on cross-border acquisitions is far more robust. The first study was conducted by Doukas and Travlos (1988). The main results of their research showed that firms already operating abroad, but not in the target's country, experienced significant and positive returns. Firms already operating in the target country, or those expanding abroad for the first time, had insignificant negative and positive abnormal returns respectively.

Chatterjee, Lubatkin, Schweiger and Weber (1992) conduct a survey study investigating the relationship between perceptions of cultural difference and shareholder gains. They find a strong inverse relationship and provide evidence on the importance of cultural difference on cross-border mergers and acquisitions.

The first study to consider both target and acquirer returns in cross-border M&A was conducted by Mathur, Rangan, Chhachhi, and Sundaram (1992). They found significant positive abnormal gains to targets, and insignificant abnormal returns to acquirers. These results are generally consistent with most M&A studies in general. The authors conclude that either investors do not price positively the benefits of foreign direct investment (FDI), or that the costs associated with the acquisition process and the premium paid outweighs the positive FDI benefits.

However, a study by Markides and Ittner (1994) found that international acquisitions created value for the bidder. The study looked at 276 US acquisitions of non-US targets between 1975 and 1988. They noted that factors that played an important role in their analysis were relatedness, concentration and advertising intensity of bidder's industry, bidder's prior international experience, bidder's current profitability, tax regulations, and the strength of the US dollar.

In a similar study, Cakici, Hessel, and Tandon (1996) investigate shareholder wealth gains for 195 foreign firms that acquired US targets in 1983 to 1992. They found that foreign acquirers have significant and positive abnormal returns of nearly 2% over the interval of ten days prior to the announcement, to ten days afterwards. Also, US acquirers have abnormal returns not significantly different from zero in the same period. Additionally, bidder returns were found to

not be related to the relative size of the target to the bigger, the extent of overseas exposure, the target's R&D intensity, industry factors, or the strength of the dollar.

Eun, Kolodny, and Scheraga (1996) were one of the first to investigate combined wealth gains in cross-border acquisition announcements. They looked at announcements of foreign acquirers of US targets between 1979 and 1990. On average, acquisitions produced combined wealth gains of \$68 million, which the authors conclude indicated cross-border acquisitions are synergy-creating activities. They found Japanese acquisitions had the largest wealth gains, where on average wealth gains of \$398 million were split with 43% to targets and 57% to acquirers.

In a study that focused on Dutch acquirers between 1990 and 1996, Corhay and Rad (2000) looked at acquisitions involving foreign targets. They found weak evidence that acquisitions are wealth creating, especially when the target is located in the US. For western European targets, benefits are larger for acquirers having less international exposure and making acquisitions outside their main activities.

Aw and Chatterjee (2004) conduct a three-way comparison of UK acquirers with UK targets, US targets, and Continental Europe targets between 1991 and 1996. The study looks at long-term cumulative abnormal returns over two years and finds that acquiring large targets yields significantly negative CARs to acquirers. It is also found that UK acquirers perform best with UK targets, then less well with US targets, and then even less well with Continental Europe targets.

Related to this last point, Sie and Yakhlef (2004) theorize knowledge transfer as an alternative motive for M&A. They claim effective knowledge transfer is a source of value creation and leads to financial success. Also, given the importance of knowledge transfer, researchers are

converging on the idea that a common culture is one of the important factors to knowledge transfer and financial success.

D. General M&A Papers

To augment this research, a selection of papers on M&A in general is reviewed. It should be noted that the general literature on M&A is extremely broad and only a small subset will be discussed here. For an overview on the extant M&A literature, please refer to Betton, Eckbo, and Thorburn (2008).

Singh and Montgomery (1987) investigate whether related deals create higher value and find that they produce greater dollar gains, and acquirers experience higher gains, compared with unrelated deals.

Travlos (1987) was the first to look into the method of payment and found significant differences in abnormal returns between all cash and all stock offers. The author finds these results are independent of the type of takeover bid (merger versus tender) and of bid outcome.

Healy, Palepu, and Ruback (1992) analyse corporate performance for sample of the largest 50 US mergers between 1979 and 1984. They find that merged firms tend to experience superior operating cash flow returns relative to their industry, particularly when deals involve firms with overlapping businesses. They also find a strong positive relationship between abnormal stock returns during the acquisition announcement period and postmerger increases in cash flow returns.

Barber and Lyon (1996 and 1997) discuss robust sampling techniques for ensuring well-specified test statistics for accounting-based measures of operating performance and cumulative abnormal returns in event studies. They find that for accounting-based measures, test statistics

are only well-specified when sample firms are matched to a group of control firms based on pre-event performance. For long run (one to five year) event study CARs, they find sample firms must be matched to control firms based on size and book-to market ratios in order to have well-specified test statistics.

In an interesting paper, Schwert (1996) investigates the relationships between premiums in takeover bids and the pre-announcement price run-ups for publicly traded targets between 1975 and 1991. He finds there is an insignificant correlation between the run-up prior to the acquisition announcement and the mark-up in the post-acquisition price movement. This means there is little substitution between run-up and mark-up prices, and that the run-up is added cost to the acquirer.

Loughran and Vijh (1997) study five-year excess returns and look for a relationship between the form of payment and returns to acquirers. They analyse 947 acquisitions between 1970 and 1989 and find that for all stock mergers, acquirers experience long term returns of -25%. For all cash mergers, acquirers fare much better, earning long term returns of 61.7%. They also find the deals characterized by a high target to acquirer size ratio earn significant negative excess returns.

To address the robustness issues raised by Barber and Lyon (1996 and 1997), Ran and Vermaelen (1998) use methodology that is robust to their criticism. They demonstrate that bidders in mergers tend to underperform, yet bidders in tender offers tend to overperform during the three years after the acquisition is announced. The authors attribute this underperformance to poor post-acquisition performance of low book-to-market (“glamour”) firms, and interpret this as evidence that both the market and management are overly optimistic when extrapolating the bidder’s past performance for assessing the desirability of the acquisition.

Mitchell and Stafford (2000) provide another counter argument for long-term studies. The main idea here is that most methodology at the time involved calculating multiyear buy-and-hold abnormal returns, but this makes the crucial mistake of assuming independence of multi-year abnormal returns. After accounting for the positive-correlations from abnormal returns, the study finds acquirer long-term CARs are not significantly different from zero.

Highlighting the importance of termination provision fees, Bates and Lemmon (2003) find that the existence of provision fees is related to higher target CARs. They examined deals between 1989 and 1998, and found fee provisions tend to have greater negotiated takeover premiums. Also, target-payable fees are observed more frequently when bidding is costly and the potential for third parties to acquire sensitive information is significant.

Finally, Moeller, Schlingemann, and Stulz (2004) study 12,023 acquisitions by public firms between 1980 and 2001. They find that on average, the abnormal return is 1.1%, but that acquiring firms lost \$25.2 million at the announcement of the deal. Also, returns are roughly 2% higher for small acquirers, and for these, returns are not dependent on form of financing or whether the target is public or private.

II. Hypotheses

For cross-border high-tech acquisitions, a key driver of success is the ability to efficiently integrate the target's human capital and knowledge base into the intangible assets of the acquirer. In this study, two factors that may facilitate knowledge transfer, retention of human capital, and the value of the transferable knowledge are considered. The first factor is the ratio of employees of the target to the acquirer, and the second is the ratio of target intangible assets to total assets.

A. Employee Ratio

Employee ratio gives an indication of the digestibility of the target firm. Ranft and Lord (2000) find that for high-tech firms, retaining key individuals within whom important tacit knowledge lies is very important for a successful acquisition. The larger the target firm, the more difficult it will be to integrate everyone, and the higher chance that important human capital, which was paid for as part of the acquisition premium, will be lost to competitors. For example, this was a major concern during the proposed Microsoft-Yahoo acquisition. It was suspected that Microsoft would have a difficult time retaining many top engineers and that if the acquisition went through, many valuable employees would leave for rival Google.¹

What is now needed is a means of linking employee ratio to expected performance. A low employee ratio may indicate the size of the human capital of the target to the acquirer is quite small and thus easily digestible, but at the same time, the value to the acquirer is quite small. Similarly, if the employee ratio is high, it may be difficult to integrate the target firm, but in a larger employee base, there may be more value. For example, it may be more valuable to retain 20% of a larger employee base than 80% of a smaller employee base.

¹ Delaney, K.J., R.A. Guth, M. Karnitschnig. "Microsoft Makes Grab for Yahoo", February 2, 2008. *Wall Street Journal*. Retrieved on August 27, 2009 from <<http://online.wsj.com/article/SB120186587368234937.html>>

This raises some concerns about the relationship between employee ratio and performance, especially if the nature of technological knowledge is taken into account. Technological knowledge is, to a large extent, highly codified. It resides in patents, computer code, and mathematical formulas. In the realm of cross-border acquisitions, this may place less of an importance on the impact of a common culture. The literature on cross-border acquisitions stresses the importance a common culture plays in the transfer of knowledge through the communication of ideas. In the case of technology firms, the common language may be the codified language that technology is written in.

For these reasons, this study makes the simplifying assumption that digestibility is the most important implication of employee ratio of the target to the acquirer, and that the relationship between employee ratio and performance is inversely proportional. Hence, the *Employee Ratio Hypothesis* is as follows:

H1: The share price response of the bidder and target will be more favourable when the ratio of target employees to acquirer employees is lower.

For each deal, the employee ratio is taken to be the ratio of the target employees to the acquirer employees, where each value is taken at the respective firm's prior fiscal year-end to the announcement date.

If there is evidence to support the hypothesis, it would give credibility to the simplifying assumption that performance is inversely proportional to the employee ratio, and thus, the digestibility of the target firm. If however, there is no evidence to support the hypothesis, then perhaps the relationship is curvilinear, or perhaps the integration of human capital is less important as long as valuable codified knowledge can be acquired.

B. Target Intangible to Total Asset Ratio

The target intangible to total asset ratio, or TIA ratio, seeks to quantify in a comparable way the amount of intangible assets of the target firm. Much of the value of high-technology companies lies in its intangible assets, which includes legal intangibles – such as patents, and competitive intangibles – such as the knowledge stored within the collective human capital of the company. A study by Prentice and Fox (2002) concluded that intangible assets are of utmost importance to high-technology firms, and these firms must be evaluated on their intangible assets.

The TIA ratio links directly with one of the contentious issues of the employee ratio. For the employee ratio, it was mentioned that it should be considered in conjunction with the value of the human capital, as the interaction of these two may have complicated results. The TIA ratio and employee ratio may be correlated; while the univariate analysis examines the impact of these factors independently, the cross-sectional analysis includes both variables and therefore provides meaningful inferences.

Now, consider what the TIA ratio implies. The higher the ratio, the more intangible assets the firm has relative to the size of its total assets. If this were a simple metric, it would be straightforward to analyse, but the value of intangible assets is a highly debateable figure. It is obscured by the high degree of asymmetric information that is characteristic of technology firms. Another simplifying assumption that must be made is that while intangible assets are subject to a high degree of asymmetric information, and may not accurately reflect true values, it must be assumed that there is a high degree of correlation between the reported and actual intangible values. This is akin to assuming there is some random deviation for each reported intangible value, but on average, the discrepancy is about the same.

Thus, with the assumption that a higher TIA ratio is desirable because the target contains more legal and competitive intangible assets, the second hypothesis relating to the *Target Intangible Assets to Total Asset Ratio Hypothesis* is as follows:

H2: The share price response of the bidder and target will be more favourable when the ratio of target intangible assets to total assets is higher.

For each target, this ratio is the value of the intangible assets divided by the total assets, and these values are taken as at the prior fiscal year-end to the acquisition announcement date.

If there is evidence to support the hypothesis, then it indicates that within the world of the simplifying assumptions, higher TIA ratios are related to better announcement window performance. It is important to note that this study is looking only at event-window returns.

C. Long-Term Operational Performance

Healy, Palepu, and Ruback (1992) find increased operational performance for merged firms in the years following an acquisition. In particular, deals with overlapping businesses perform particularly well. Given that this study focuses on deals between firms, which are both in the high-tech industry, it is reasonable to expect a significantly positive industry-adjusted cash flow returns for merged firms in the sample and for a positive relation between announcement returns and post-merger cash flow performance. This leads to the third hypothesis:

H3a: Merged firms have increases in post-merger operating cash flow returns in comparison with their industries.

H3b: There is a positive relation between combined bidder and target announcement returns and post-merger operating cash flow returns of the merged firms.

Consistent with the findings of Barber and Lyon (1996), the long-term cash flow returns are adjusted for each firm's specific industry.

D. Control Variables

When testing for the effects of employee ratio and TIA ratio, other characteristics that could affect the abnormal returns of the acquirer and target at the time of the acquisition announcement are taken into account. These control variables have been found to be of some importance in prior studies, and while there may be some differing results due to the nature of the sample, it is still prudent to control for these effects.

1. Related Industry

There have been conflicting studies on the topic of how related industries affect M&A performance. Doukas and Travlos (1988) suggest that cross-border acquisitions are more favourable when diversified across industries. However research by Markides and Ittner (1994) and Singh and Montgomery (1987) suggests cross-border acquisitions in the same industry will yield more favourable results. Specifically dealing with technological acquisitions, Hagedoorn and Duysters (2002) demonstrate that when compared to unrelated deals, related deals tend to show superior economic performance because of synergistic gains from economies of scale and scope. Following up on this work, Cloudt, Hagedoorn, and Van Kranenburg (2006) discover a curvilinear relationship between relatedness and performance, in that, when firms are too similar there is too much of an overlap of similar skills. It should also be noted, that Puranam (2001) mentions that absorbing technological innovation is a very complicated problem and that without a sufficiently skilled workforce the technology may not be completely absorbed. Given how difficult it is assigning a true value to an overseas target, it may be the case that related acquirers may have the upper hand with regards to valuing these assets. To model this, a dummy variable

called RELATED is used and set to 1 if the bidder is in the same four-digit SIC industry classification as the target, and 0 otherwise. It may be the case that using 4-digit SIC codes falls into the trap Cloudt, Hagedoorn, and Van Kranenburg (2006) mention, which is when firms are too closely related the acquisition does not perform as well as expected.

2. Relative Size of Target

The extant literature on the importance of relative size has revealed many conflicting results. Markides and Ittner (1994) find that the relative size of the target is significant and positively related to the gains to foreign bidders. On the other hand, Cakici, Hessel, and Tandon (1996) and Corhay and Rad (2000) find no relationship between relative size and bidder returns. To complicate matters even more, Eun, Kolodny, and Scheraga (1996) find a significant and negative relationship between relative size and acquirer returns. In the specific case of high-technology acquisitions, Hennart and Reddy (1999) mention that firms acquiring large targets may be faced with a “digestibility” issue. This occurs when they are only interested in a fraction of the target firm’s business, but must absorb the entire business. However, a counter point to this could be that given the large technology firms may have more visibility, there would be less asymmetric information obscuring the true value of the assets. For this study, a variable called MVRATIO is used to proxy for relative size, defined as the ratio of the market value of the target to the acquirer, as at 41 days prior to the acquisition announcement.

3. Existence of Tender Offer

In a study that examined the three-year long term performance of acquirers, Ran and Vermaelen (1998) found that bidders that made tender offers tend to overperform, and those that do not tend to underperform in the three year period following the acquisition announcement. Interestingly, Travlos (1987) finds no relationship between the existence of tender offers and

abnormal returns to bidders. In this study, a dummy variable named TENDER is set to 1 if there exists a tender offer as part of the acquisition announcement, and 0 otherwise.

4. Technology Bubble

The technology bubble that collapsed in March of 2001 was a defining moment for the technology industry. It caused a paradigm shift in how the industry was viewed by investors. Benou, Gleason, and Madura (2007) mention that the crash wiped out an estimated \$5 trillion in investor wealth, and created general scepticism towards the technology industry. Due to this scepticism, high-technology cross-border acquisitions valuations may be adversely affected by market sentiment, resulting in lower expected returns during the post-bubble era. For this study, a dummy variable called BUBBLE is set to 1 for acquisition announcements occurring after March 2001, and 0 otherwise. This will monitor any structural breaks that may occur in the post bubble era.

5. Cash Payments

Studies by Travlos (1987), Brown and Ryngaert (1991), and Loughran and Vijh (1997) find that when the consideration for the acquisition is all cash, these deals lead to significant positive returns to bidders. These studies also give evidence that all stock mergers fare significantly poorly. A later study by Kohers and Kohers (2000) focussed specifically on the technology industry and found significant and positive returns to bidders, but that this was independent of the method of payment used. It is a bit difficult here to make a prediction on whether this will be significant or not for the current sample under study. The studies that found all cash deals to be a significant indicator did not focus on the technology industry, and the study that did find no relation between all cash deals and returns. For this study, a dummy variable called CASH is set equal to 1 if the consideration is all cash, and 0 otherwise.

6. US Domiciled Acquirers and Targets

Most studies have anchored either the acquirers or targets as US domiciled firms. For acquirers, Cakici, Hessel, and Tandon (1996) find returns are not significantly different from zero. Markides and Ittner (1994) find significantly positive returns. In a related study to this, Benour, Gleason, and Madura (2007) find insignificantly positive returns to US domiciled acquirers engaged in cross-border acquisitions of technology firms. As for targets, being domiciled in the US reduces asymmetric information substantially, and thus, should allow acquirers and investors to more accurately value the target. With the reduction in asymmetric information allowed by US domiciled firms, this study expects that for deals that include US domiciled acquirers or targets, returns should be positively affected. A dummy variable called USACQ is set equal to 1 if the acquirer is domiciled in the US, and 0 otherwise. A second dummy variable called USTAR is set equal to 1 if the target is domiciled in the US, and 0 otherwise.

7. Termination Provision

A study by Bates and Lemmon (2003) finds that the existence of termination provisions is related to higher target abnormal returns. Termination provisions allow targets to be compensated in the event that the acquirer backs away from completing the deal. By ensuring a deterrent to cancelling the deal, the target effectively increases the probability that the deal will be completed, thus reducing the uncertainty. The target's stock price thus increases much closer to the proposed takeover price, allowing for greater target returns in the acquisition announcement window. For these reasons, this study expects there to be a significant and positive relationship between termination provisions and target returns. For bidder returns however, this termination provision is a zero-sum game, and the benefit that has been transferred

to the target must be taken from the bidder, so this study expects bidder returns to be adversely affected by the existence of a termination provision. For this study, a dummy variable called TERMPROV is set equal to 1 if a termination provision exists and 0 otherwise.

E. Long-Term Operational Performance

Healy, Palepu, and Ruback (1992) find increased operational performance for merged firms in the years following an acquisition. In particular, deals with overlapping businesses perform particularly well. Given that this study focuses on deals between firms, which are both in the high-tech industry, it is reasonable to expect a significantly positive industry-adjusted cash flow returns for merged firms in the sample. Consistent with the findings of Barber and Lyon (1996), the long-term cash flow returns are adjusted for each firm's specific industry.

III. Data and Sample

Data on cross-border mergers and acquisitions in the technology industry has been acquired from the Thomson Financial Securities Data Corporation (SDC) International M&A database. First, all cross-border acquisitions between January 1, 1990 and December 31, 2004 are selected using an SDC cross-border deal identifier. This initial search yields 113,724 acquisitions, and the sample used in this study is formed by subjecting the initial search to the following criteria:

- Each acquirer and target belongs to the high-tech industry as determined by each firm's four-digit SIC code. The SIC codes of interest begin with 357*, 367*, 369*, and 737*.
- Prior to the acquisition bid, the acquirer holds less than 50% of the shares of the target, and at the announcement of the acquisition the acquirer is seeking to own between 50% and 100% of the shares of the target. This ensures the sample contains acquirers seeking to gain a majority controlling interest in the target firm.
- Each deal entry includes the value of the deal in millions of US dollars.
- Each acquirer and target is a publicly traded company. This was chosen to ensure trading data could be found for both acquirers and targets.

After applying these criteria, the sample decreases to 296 deals. Table I details exactly how the SDC database has been broken down into this sample. Upon further inspection, 16 of these deals are misclassified as cross-border deals and are removed, resulting in 280 deals. This SDC dataset contains deal specific information such as announcement date, acquirer and target country, deal value, tender offer indicator, cash payments indicator, termination provision indicator, etc.

Table I. Breakdown of SDC Extract

This table describes how the Thomson Financial SDC database is broken down to arrive at a database consisting of the announced cross-border high-tech acquisitions between publicly traded firms between 1990 and 2004.

Request	Hits	Request Description
1	-	Date Announced: 1/1/1990 to 31/12/2004
2	113,724	Select All Cross Border Deals
3	17,434	Select Acquirer in High Tech based on SIC codes: 3571, 3575, 3572, 3578, 3577, 3579, 3672, 3671, 3674, 3676, 3675, 3677, 3679, 3678, 3691, 3692, 3694, 3695, 3699, 7372, 7371, 7374, 7373, 7375, 7376, 7378, 7377, 7379
4	10,212	Select Target in High Tech based on SIC codes: 3571, 3575, 3572, 3578, 3577, 3579, 3672, 3671, 3674, 3676, 3675, 3677, 3679, 3678, 3691, 3692, 3694, 3695, 3699, 7372, 7371, 7374, 7373, 7375, 7376, 7378, 7377, 7379
5	8,417	Percent of Shares Acquirer is Seeking to Own after Transaction: 50 to 100
6	8,080	Percent of Shares Held by Acquirer at Announcement: 0 to 50
7	3,478	Select Deals where a Deal Value is Reported
8	2,736	Select only Publicly Traded Acquirers
9	296	Select only Publicly Traded Targets

The SDC database is then merged with the Datastream database to attach trading and accounting data to each deal. Only deals where there existed trading and accounting data for three years prior to the announcement and three years after the announcement were considered since cash flow return and market value data is required to test the third hypothesis, which pertains to long term performance of the acquirer. This specification brings the final sample down to 61 transactions.

Table II lists the acquisitions by year. Over 88% of announcements occur after 1997, which coincides with the internet revolution and the beginnings of the technology bubble. Table II

clearly shows that the peak year did not occur during the bubble, but rather in 2003 once the global economy had recovered.

Table II. Sample Characteristics – Annual Breakdown

This table provides the sample breakdown by year of acquisition announcement. These are high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisitions announcement.

<i>Panel A. Distribution of Acquisitions by Year</i>		
Year	Number of Deals	Percent of Total
2004	9	14.75%
2003	13	21.31%
2002	7	11.48%
2001	7	11.48%
2000	8	13.11%
1999	5	8.20%
1998	5	8.20%
1997	3	4.92%
1996	0	0.00%
1995	1	1.64%
1994	2	3.28%
1993	0	0.00%
1992	0	0.00%
1991	1	1.64%
Total	61	100.00%

The breakdown of deals by acquirer nation raises some interesting results. Altogether there are 14 unique acquirer nations, and acquirers seem to be concentrated in the English speaking nations. Figure I.A demonstrates that 58% of acquirers are located in the United States, Canada, or the United Kingdom. Table III Panel A lists the acquirer nations, and we see the top three acquirers are the United States (18 deals), Canada (11 deals), and the Netherlands (7 deals). Following next in order are the United Kingdom, Germany, Switzerland, and France. All acquirers are North American or Western European firms, except for four acquirers from Hong Kong, Japan, South Korea, and Taiwan.

Figure I.A Sample Characteristics – National Breakdown by Acquirer

This figure provides the sample breakdown by country of acquirer. These are high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement.

Distribution by Acquirer Nation

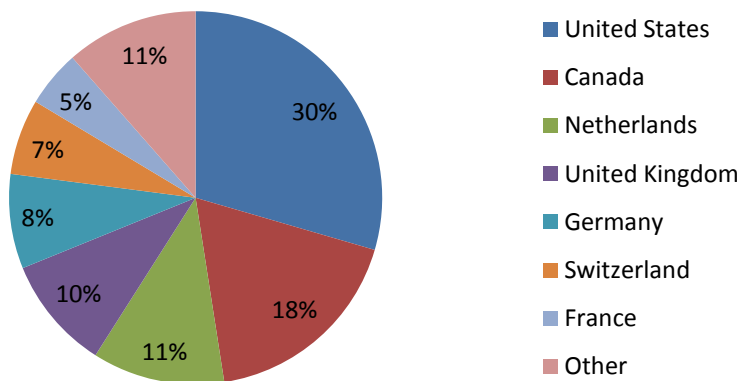


Table III. Sample Characteristics – National Breakdown

This table provides the sample breakdown by country of acquirer (Panel A), and by country of target (Panel B). These are high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisitions announcement.

<i>Panel A. Distribution of Acquisitions by Acquirer Country</i>		
Country	Number of Deals	Percent of Total
United States	18	29.51%
Canada	11	18.03%
Netherlands	7	11.48%
United Kingdom	6	9.84%
Germany	5	8.20%
Switzerland	4	6.56%
France	3	4.92%
Other	7	11.48%
Total	61	100.00%

<i>Panel B. Distribution of Acquisitions by Target Country</i>		
Country	Number of Deals	Percent of Total
United States	25	40.98%
United Kingdom	8	13.11%
Canada	7	11.48%
France	4	6.56%
Germany	3	4.92%
Norway	3	4.92%
Netherlands	2	3.28%
South Africa	2	3.28%
Other	7	11.48%
Total	61	100.00%

Figure I.B Sample Characteristics – National Breakdown by Target

This figure provides the sample breakdown by country of target. These are high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement.

Distribution of Target Nations

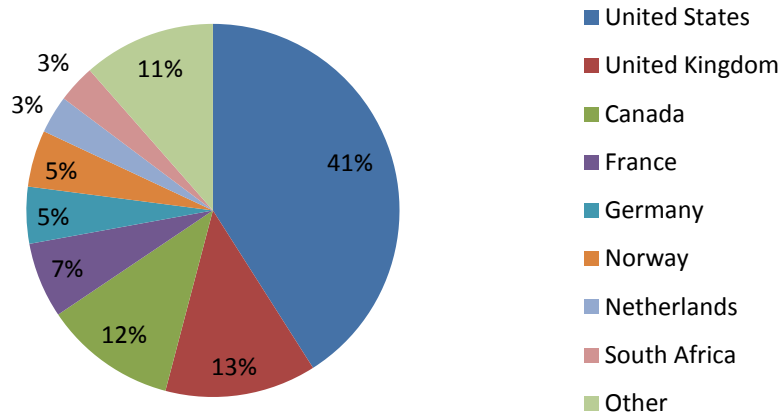


Table III Panel B and Figure I.B break down deals by target nation. The top three target nations are all English speaking nations, and account for 66% of all target nations. The United States is the target nation in 25 acquisitions, which represents 41% of all deals. Next, the United Kingdom and Canada account for 8 and 7 deals respectively, followed by France, Germany, Norway, the Netherlands, and South Africa. Much like the case with acquirer nations, target nations are largely dominated by North American and European firms, except for a handful of deals in South Africa, Mexico, Singapore, and South Korea. In total there are 15 unique target nations, and there are 21 unique nations among acquirers and targets covered by this study.

Further descriptive statistics are provided by Table IV This table describes the breakdown of targets and acquirers by their industry, as classified by their four-digit SIC code. Panel A describes the target industry, and it is shown that over 26% percent of targets are located in the Prepackaged Software industry. Most of the higher density industries are all related to either the

computer software or hardware industries. For example, these industries focus on programming, system design and database (information retrieval) management, and electronic components.

Table IV. Descriptive Statistics by Sector and Payment Structure

This table provides information regarding the breakdown of the sample by target industry (Panel A), acquirer industry (Panel B), and method of acquisition payment (Panel C). Industrial Group was determined by the four-digit SIC codes and were retrieved from the SDC database. These are high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement.

<i>Panel A. Target Industrial Group</i>		
Group	Number of Deals	Percent of Total
Prepackaged Software	16	26.23%
Computer integrated systems design	6	9.84%
Computer programming services	5	8.20%
Information retrieval services	5	8.20%
Semiconductors and related devices	4	6.56%
Electronic components	4	6.56%
Electronic computers	3	4.92%
Other	15	24.59%
Total	61	100.00%

<i>Panel B. Acquirer Industrial Group</i>		
Group	Number of Deals	Percent of Total
Prepackaged Software	16	26.23%
Radio & TV broadcasting & communications equipment	5	8.20%
Information retrieval services	5	8.20%
Household audio and video equipment	4	6.56%
Semiconductors and related devices	4	6.56%
Computer integrated systems design	4	6.56%
Computer peripheral equipment	3	4.92%
Computer facilities management services	3	4.92%
Other	17	27.87%
Total	61	100.00%

<i>Panel C. Method of Acquisition Payment</i>		
Method of Payment	Number of Deals	Percent of Total
Cash	25	40.98%
Combination	14	22.95%
Stock	9	14.75%
No Data	13	21.31%
Total	61	100.00%

Table IV Panel B describes the acquirer industry and while the Prepackaged Software industry is still dominant at 26%, there are a few changes with the other top industries. Programming and informational retrieval services are still important, but the electronic component industries have been replaced by consumer electronics industries, such as TV and Radio.

Panel C of Table IV describes the method of payment for these deals. 41% of deals are paid for entirely in cash, 15% are paid for using stock only, 23% are paid for using a combination of stock and cash, and unfortunately, for 21% of deals there is no information regarding the type of consideration used.

Additional descriptive statistics are provided in Table V. This table provides details (means and medians) of operating characteristics for firms in our sample. All values, except deal and market value, have been winsorized at the 1.635% level. What this means for the sample, is that the most extreme values have been replaced with the second largest and smallest values. The aim of this is to eradicate any outliers. According to SDC, the mean and median of the deals in the sample under study are \$731 million USD and \$226 million USD respectively. In the measures of operating performance there is usually a substantial difference of about an order of magnitude between targets and acquirers. Important variables considered in this table include market value, cash and equivalents, total assets, total intangibles, short term debt, working capital, long term debt, capital expenditure, net sales, net cash flow from financing activities, change in cash, net margin, return on equity, net income to common shareholders, EBIT, and number of employees. The poor operating performance figures for targets (net margin, ROE, and net income) may be an indication of firms that are young in its lifecycle, and these targets may be attractive because of perceived potential synergies.

Table V. Descriptive Statistics for Participants in High-Tech Cross-Border Acquisitions

This table provides details (means and medians) of operating characteristics for firms in our sample. Deal value has not been winsorized, nor has the market value of firms. All other values have been winsorized at the 3.27% level (the smallest/largest value is replaced with the next smallest/largest). These firms are all involved in high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement. All values (except transaction value) are in year 2000 USD figures.

Variable	Bidder Mean (Median)	Target Mean (Median)
Transaction Value (\$Mil)	731(226)	731(226)
Market Value (\$Mil)	16,300(3,077)	1,387(175)
Cash and Equivalents (\$Mil)	2,003(274)	86(25)
Total Assets (\$Mil)	14,018(2,200)	1,149(135)
Total Intangibles (\$Mil)	2,080(435)	231(16)
Short Term Debt (\$Mil)	688(29)	58(1.5)
Working Capital (\$Mil)	1,805(183)	54(24)
Long Term Debt (\$Mil)	2,134(183)	172(0.6)
Capital Expenditure (\$Mil)	738(79)	34(3)
Net Sales (\$Mil)	12,059(1,928)	945(90)
Net Cash Flow – Financing (\$Mil)	157(0.5)	31(-0.2)
Inc/Dec in Cash (\$Mil)	290(19)	-15(-2)
Net Margin (%)	5.8(5.1)	-18.1(-0.2)
Return on Equity (%)	2.1(9.0)	-33.5(1.8)
Net Income to Common (\$Mil)	517(109)	-8(0.06)
EBIT (\$Mil)	930(178)	30(3)
Employees	60,667(15,385)	5,784(582)

IV. Methodology

A. Cumulative Abnormal Returns

The abnormal returns of cross-border acquisition announcements on the common stock of acquirers and targets are being estimated using the following standard market model for stock returns (measured in USD):

$$(1) \quad AR_{it} = r_{it} - (\alpha_i + \beta_i r_{m,t})$$

where r_{it} is the rate of return on stock i on day t , and $r_{m,t}$ is the rate of return on the local market index on day t . The coefficients α_i and β_i are the intercept and slope respectively, derived from ordinary least squares estimates of the market model regression. The regression has been run using an estimation period from $t = -281$ days to $t = -41$ days from the day of the acquisition announcement, $t = 0$. The day $t = 0$, is reported in the SDC database as the acquisition announcement date. Cumulative abnormal returns (CARs) are calculated for several intervals of interest around the acquisition announcement date. CARs for a specific interval are defined as the sum of the abnormal returns during that period:

$$(2) \quad CAR_{i(t_1, t_2)} = \sum_{t=t_1}^{t_2} AR_{it}$$

where t_1 and t_2 are the bounds of the interval of interest.

For a sample of N firms, the average CAR is defined as:

$$(3) \quad CAR = \frac{1}{N} \sum_{i=1}^N CAR_i.$$

CARs of various intervals are considered. In the results section below, CARs from (-40, +40) are plotted and stratified based on certain deal characteristics. Also, CARs surrounding the announcement date are calculated and tested for statistical significance.

The cross-sectional abnormal returns to targets and acquirers are explained by analysing the following linear regression model:

$$(4) \quad CAR_i = f \left(\begin{array}{l} RELATED_i, MVRATIO_i, TENDER_i, TIARATIO_i, EMPRATIO_i, \\ BUBBLE_i, CASH_i, USACQ_i, USTAR_i, TERMPROV_i \end{array} \right)$$

where:

CAR_i = cumulative abnormal returns for the bidder i in the interval (-1, +1) surrounding the acquisition announcement day $t = 0$.

$RELATED_i$ = a dummy variable equal to 1 if the acquirer and target have the same four-digit SIC industry code.

$MVRATIO_i$ = the ratio of market values (41 days prior to the acquisition announcement) of the target to the acquirer.

$TENDER_i$ = a dummy variable equal to 1 if the acquirer issues a tender offer

$TIARATIO_i$ = the target firm's ratio of intangible assets to total assets as at the previous fiscal year end.

$EMPRATIO_i$ = the ratio of the number of employees of the target to the acquirer. These figures are taken from the previous fiscal year end.

$BUBBLE_i$ = a dummy variable set equal to 1 if acquisition announcement occurs after March 2000, which was the end of the technology bubble.

$CASH_i$ = a dummy variable set equal to 1 if the consideration for the acquisition is 100% cash.

$USACQ_i$ = a dummy variable set equal to 1 if the acquirer is domiciled in the United States.

$USTAR_i$ = a dummy variable set equal to 1 if the target is domiciled in the United States.

$TERMPROV_i$ = a dummy variable set equal to 1 if there exists a termination provision as part of the acquisition announcement.

For each deal, both acquirers and targets use the same independent variables. The only difference between the models is the dependent variable (CAR) will be target or acquirer specific.

B. Combined Wealth Gains

The method used in this study for calculating combined wealth gains follows that used by Eun, Kolodny, and Scheraga (1996). Wealth gains to each acquirer are measured by:

$$(5) \quad \Delta W_A = W_A \cdot CAR_A$$

where W_A is the market value of the acquirer stock in Year 2000 US dollars six days prior to the acquisition announcement, and CAR_A is the cumulative abnormal return to the acquirer from five days prior to the acquisition announcement to five days afterwards. Wealth gains to each target are measured by:

$$(6) \quad \Delta W_T = W_T \cdot CAR_T$$

where W_T is the market value of the target stock in Year 2000 US dollars six days prior to the acquisition announcement net of the value of the target's stock already owned by the acquirer, and CAR_T is the cumulative abnormal return to the target from five days prior to the acquisition announcement to five days afterwards. Combined wealth gains are then measured as the sum of the individual wealth gains:

$$(7) \quad \Delta W_C = \Delta W_A \cdot \Delta W_T.$$

C. Long-term Performance Measurement

In this study, long-term operational performance is measured by cash flow returns following Healy et al. (1992). Cash flow returns are defined as the ratio of a pro forma operating cash flow measure and the market value of assets as at the beginning of the year. The pro forma operation cash flow measure is set equal to sales less cost of goods sold, less selling and administrative expenses, plus depreciation. The market value of assets is set equal to the sum of the market value of equity and the total net debt of the firm.

At each time period, these cash flow returns are then adjusted by subtracting the mean industry cash flow returns for each firm's industry. For premerger cash flow returns there is a further step. Combined target and acquirer industry-adjusted cash flow returns are taken into consideration, and are combined based on an average weighting, which depends on the relative size of the acquirer to the target.

Two simple regression models are used to model the relationship between post-merger cash flow returns with premerger cash flow returns, and acquisition announcement window abnormal stock returns following Healy et al. (1992). In the first model:

$$(8) \quad CFr_{post,i} = \alpha + \beta CFr_{pre,i} + \varepsilon_i$$

where $CFr_{post,i}$ is the median combined industry-adjusted cash flow returns in the post-merger period for deal i , and $CFr_{pre,i}$ is the median combined industry-adjusted cash flow returns in the premerger period for deal i .

The second model incorporates the combined unexpected merger announcement asset returns:

$$(9) \quad CFr_{post,i} = \alpha + \beta_1 CFr_{pre,i} + \beta_2 \partial V_i + \varepsilon_i$$

where ∂V_i is the unexpected asset returns as measured by the combined cumulative abnormal returns of the target and acquirer from five days prior to the announcement to five days afterwards. The CARs are combined by weighting each CAR by the relative market values of each firm in the deal.

In both of these models, α measures the abnormal industry-adjusted return. That is, α is the expected abnormal industry-adjusted return to the acquire that is attributed solely to the fact a merger has occurred. The β_j 's measure the correlation between each independent variable and the postmerger industry-adjusted cash flow returns.

One caveat of this model is that there is an intrinsic issue with using the operating cash flow returns. Since the denominator is the market value of assets, as a function of the market value of equity, then a post-merger decrease in market value of equity, combined with maintaining

constant cash flows, will force cash flow returns to increase, making the post-merger returns questionable. Further research needs to be conducted to account for changes in market value of assets by using industry adjusted market values of assets. Currently, the industry adjusted cash flow returns tries to address this issue, but it may not be robust.

V. Results

The results of the analysis are divided into measurements of valuation effects for participants in cross-border high-tech mergers and acquisitions, and the explanation of the variation of those effects.

A. Gains to Bidders of High-Tech Cross-Border Targets

To assess how the market values the prospect of cross-border tech acquisitions, event CARs are calculated for the bidding firms in the sample. Table VI Panel A describes the average gains to bidders during windows around the acquisition announcement.

Table VI. Valuation Effects for Full Sample

This table provides the results from the event study analysis for the full sample of acquisition announcements. Panel A covers the returns to acquirers and Panel B details the returns to targets. A market model has been utilised with a 170 day estimation period (from day -281 to day -41) for parameter estimation. These firms are all involved in high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement. The *Window* column is listed in terms of days from the announcement date.

<i>Panel A. Acquirer Cumulative Abnormal Returns</i>			
Window	CAR (%)	P-Value	Pos:Neg
(0, 0)	-0.95	0.9206	30:31
(-1, 0)	-1.25	0.9684	28:33
(-1, +1)	-1.54	0.9679	26:35

<i>Panel B. Target Cumulative Abnormal Returns</i>			
Window	CAR	P-Value	Pos:Neg
(0, 0)	12.30	0.0000	50:11
(-1, 0)	13.93	0.0000	51:10
(-1, +1)	17.77	0.0000	51:10

Table VI Panel A shows that both on the announcement day and during a two and three-day window around the announcement day, returns to bidders are negative, but not statistically significantly different from zero. This is consistent with the extant literature, which predicts neutral or negative abnormal returns for bidders of foreign high-tech firms.

For a graphical representation of the acquirer CARs from 40 days before the acquisition announcement to 40 days after, please see Figure II.A and Figure II.B.

Figure II.A Plot of all Acquirer CARs

This figure provides a plot of all acquirer CARs from (-40, +40). These are high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement. Note the significant noise present in the sample data.

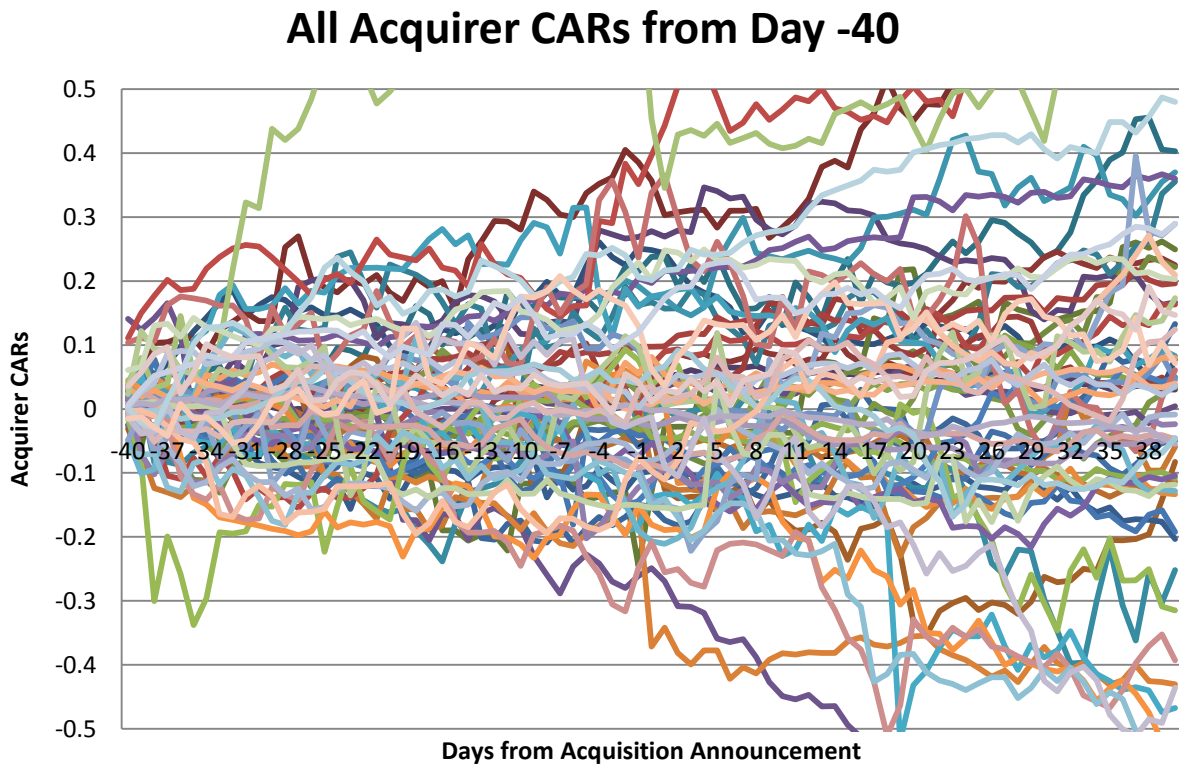
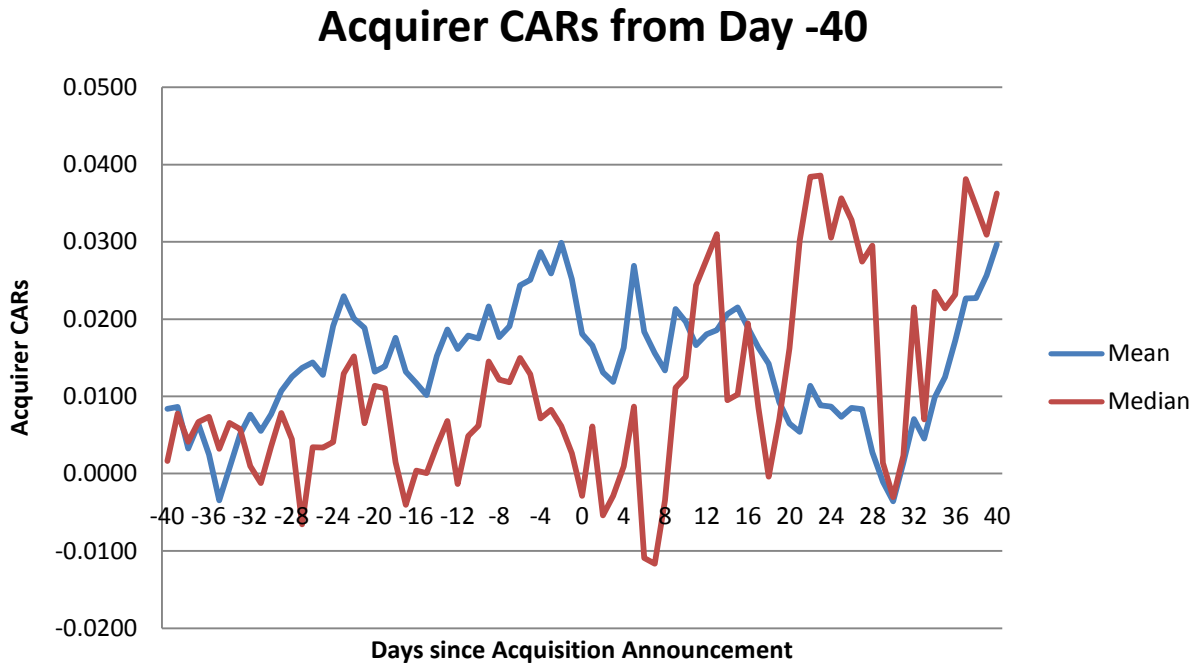


Figure II.B Plot of Average Acquirer CARs

This figure provides a plot of average acquirer CARs from (-40, +40). These are high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement.



Over the longer time horizon, CARs from 40 days prior to the announcement to a time near the announcement window are positive, but not significantly different from zero. Mean and median CARs generally move in tandem, with mean CARs skewing slightly higher.

B. Gains to Targets of High-Tech Cross-Border Acquisitions

In the case of targets however, it is expected that targets experience significant shareholder gains at an acquisition announcement. Table VI Panel B describes the average gains to targets during windows around the acquisition announcement.

During the three- and two-day announcement windows, target shareholder gains are significantly positive with CARs of 17.8% and 13.9% respectively. This is consistent with

findings by Benou, Gleason, and Madura (2007), who find CARs of 14.4% and 12.7% during the same windows.

For a graphical representation of the target CARs from 40 days before the acquisition announcement to 40 days after, please see Figure III.A and Figure III.B.

Figure III.A Plot of all Target CARs

This figure provides a plot of all target CARs from (-40, +40). These are high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement. While this sample data is quite noisy, the clear jump at the announcement date is still recognizable.

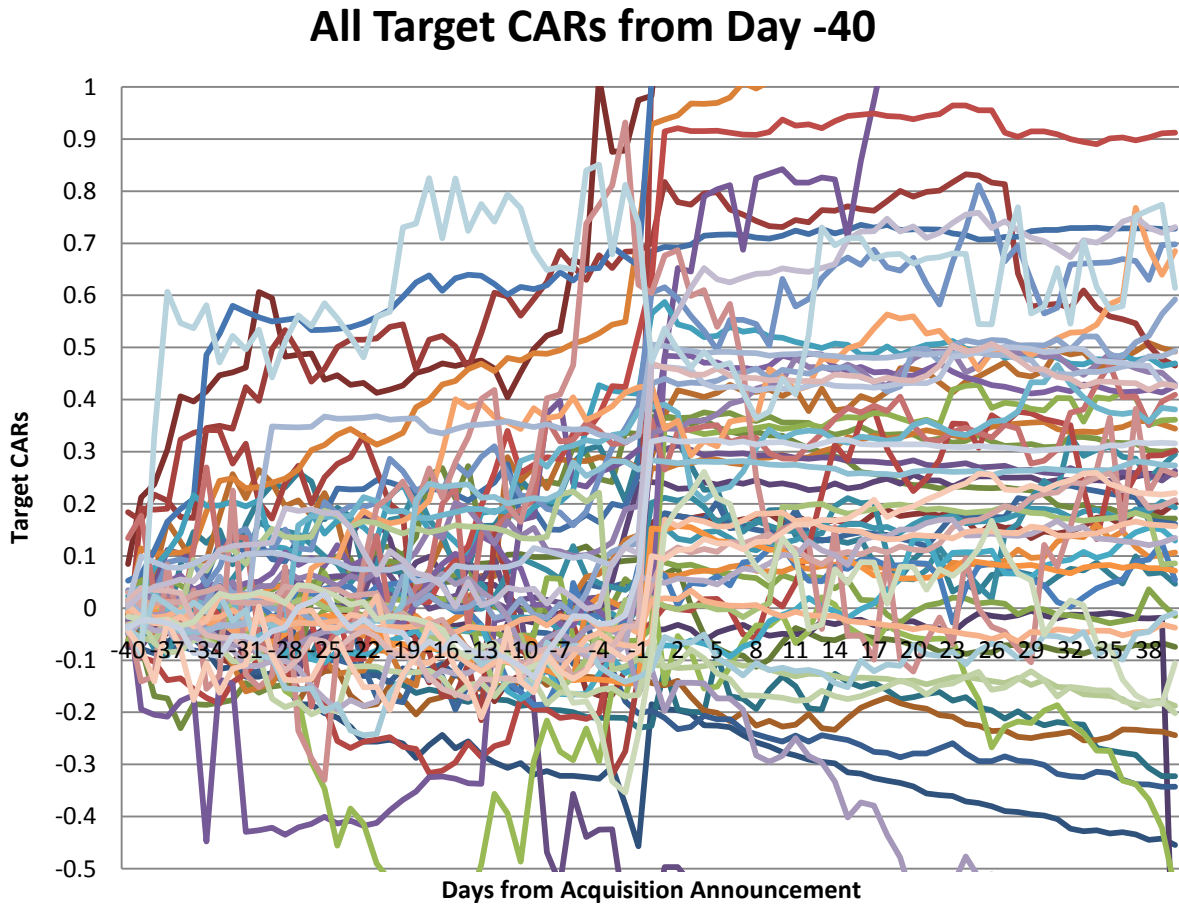
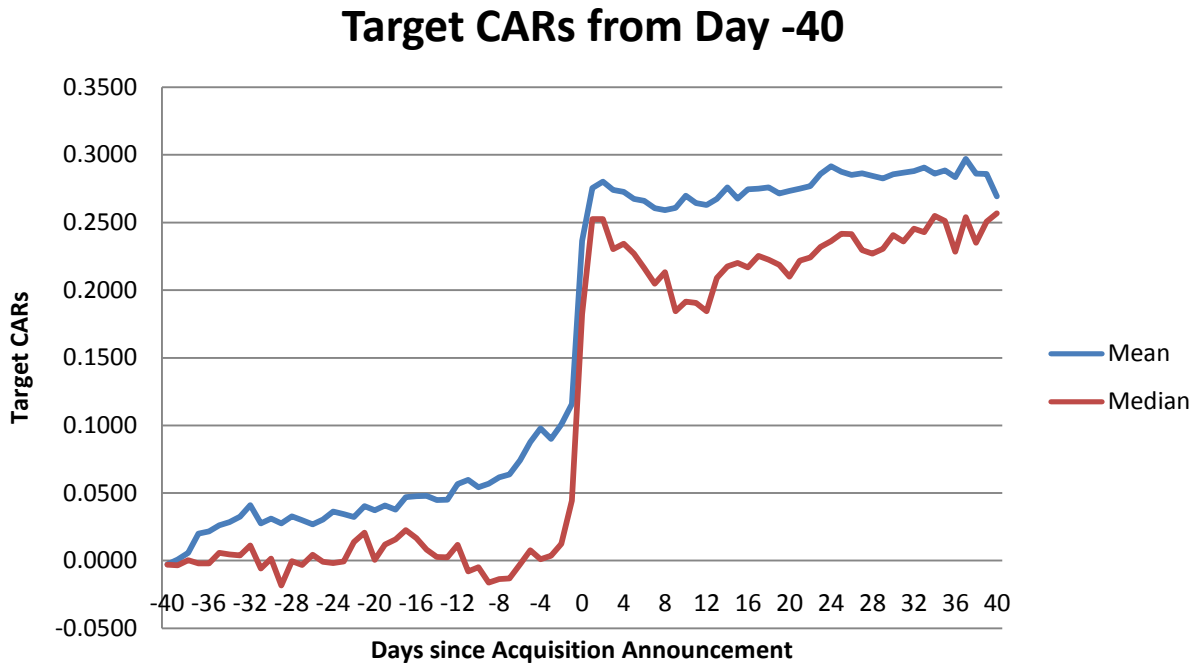


Figure III.B Plot of Average Target CARs

This figure provides a plot of average target CARs from (-40, +40). These are high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement.



Over the longer time horizon, target CARs from 40 days prior to the announcement to a time near the announcement window are positive, and significantly different from zero. Mean CARs exhibit a run-up trend that median CARs do not have. Also, there is a sizable post announcement drop-off in median CARs that is not present in mean CARs.

C. Combined Wealth Gains to Bidders and Targets

Eun, Kolodny, and Scheraga (1996) were one of the first to conduct analysis on combined wealth gains to bidders and targets in cross-border acquisition announcements. They found on average acquisitions created combined wealth gains of \$68 million, indicating cross-border acquisitions are synergy-creating activities.

In this study, combined wealth gains are calculated for each acquisition. Table VII shows the result of this analysis, and all figures are in year 2000 US dollars. The precise methodology used for calculating wealth gains is described in the caption to Table VII.

Table VII. Wealth Gains for Full Sample

This table provides the wealth gains for the sample of 61 cross-border technological acquisitions. All gains stated are in millions of year 2000 US dollars. These firms are all involved in high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement. The *Window* column is listed in terms of days from the announcement date.

N	Acquirer		Target		Combined	
	Mean (Median) Gain	Positive Gain	Mean (Median) Gain	Positive Gain	Mean (Median) Gain	Positive Gain
61	-305.1	30	23.2	49	-281.9	36
	-1.0		21.9		21.4	

For each of 61 acquisitions, wealth gain to acquirer (ΔW_A) = $W_A \cdot CAR_A$; wealth gain to target (ΔW_T) = $W_T \cdot CAR_T$; and combined wealth gain = $W_T + W_A$. Where W_A = market value of acquirer's stock in terms of Year 2000 US dollars, six days prior to the acquisition announcement made by the acquiring firm; W_T = market value of target's stock six days prior to the acquisition announcement, net of value of target's stock owned by the acquirer; CAR_A = cumulative abnormal return to the acquiring firm from five days prior to the acquisition announcement to five days after the acquisition announcement; and CAR_T = cumulative abnormal return to the target firm from five days prior to the acquisition announcement through five days after acquisition announcement. This is identical to the method used by Eun, Kolodny, and Scheraga (1996).

Wealth gains to acquirers are negative at \$-305.1 million, wealth gains to targets are positive at \$23.2 million. The combined wealth gains do not agree with the Eun, Kolodny, and Scheraga (1996) study as they are negative at \$-281.9 million. This may indicate that the market views high-tech cross-border acquisitions as value destroying endeavours, and that the synergistic gains to the acquirer are not perceived to recoup the premiums paid in the acquisition price. The median wealth gains are significantly different from mean wealth gains for acquirers and combined firms. It appears a few large losses to acquirers have skewed the means. The medians indicate acquirers have slightly negative wealth gains, and that acquisition announcements produce positive combined wealth gains in 59% of deals under consideration. Taken together, it

appears that in slightly more than half of all deals, the market views high-tech cross-border acquisitions as value creating endeavours, but there are a small number of deals where the market believes the acquisition will destroy significant value for the acquirer.

D. Employee Ratio

One of the aims of this paper is to investigate the relevance of the ratio of target employees to acquirer employees at the announcement of a high-tech cross-border acquisition. Table VIII describes abnormal returns for both acquirer and targets stratified by the employee ratio of the firms involved in the deal.

Table VIII. Cumulative Abnormal Returns of Subsample Partitioned by Employee Ratio

This table provides the results from the event study analysis for a subsample of acquisition announcements where the sample is partitioned based on which quartile the deal's employee ratio belongs to. Panel A describes acquirer CARs, whereas Panel B reports target CARs. A market model has been utilised with a 170 day estimation period (from day -210 to day -41) for parameter estimation. These firms are all involved in high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement. The *Window* column is listed in terms of days from the announcement date. In this analysis, only deals where employee ratios were available – that is, only 39 of the 61 deals under study fell in this category.

<i>Panel A. Employee Ratio – Acquirer CARs</i>				
Window	CAR – Q1 N = 9	CAR – Q2 N = 11	CAR – Q3 N = 10	CAR – Q4 N = 9
(0, 0)	-0.24%	-0.07%	-2.89%	0.73%
(-1, 0)	-0.03%	0.53%	-2.83%	1.19%
(-1, +1)	-0.39%	0.75%	-2.00%	-1.82%

<i>Panel B. Employee Ratio – Target CARs</i>				
Window	CAR – Q1 N = 9	CAR – Q2 N = 11	CAR – Q3 N = 10	CAR – Q4 N = 9
(0, 0)	11.40% **	10.49% **	11.76% *	9.07% **
(-1, 0)	13.10% ***	14.07% **	11.05% *	11.49% **
(-1, +1)	14.07% **	14.09% **	17.59% **	21.30% ***

*** Significant at the 1.00% level
 ** Significant at the 5.00% level
 * Significant at the 10.00% level

Employee data were obtained during the data collection process outlined above, and these figures come from the Datastream database. Employee figures are as of each firm's fiscal year end just prior to the acquisition announcement. The deals in the sample have a mean employee ratio of 36.28%, and a median ratio of 10.58%.

To examine whether employee ratio produces a valuation effect, the sample is stratified along quartiles of the employee ratio. The figures of interest are the abnormal returns to shareholders of the bidding firm. Table VIII Panel A reports that for each window and quartile under consideration, the returns to bidder shareholders in high-tech cross-border acquisitions are not significantly different from zero. In the case of returns to target shareholders, Table VIII Panel B shows the abnormal returns in all situations considered are significantly positive and, at least in the (-1, +1) day window, increasing with employee ratio.

The *Employee Ratio Hypothesis* stated that the share price response of the bidder and target will be more favourable when the ratio of target employees to acquirer employees is lower. In this case it is shown for acquirers that returns are not significantly different than zero, however, another important aspect is whether the mean significantly changes across quartiles. Table IX Panel A reports a test of means of acquirer CARs between each quartile and the remaining sample.

Table IX. CARs of Subsample Partitioned by Employee Ratio – Test of Means

This table provides the results from the event study analysis for a subsample of acquisition announcements where the sample is partitioned based on which quartile the deal's employee ratio belongs to. Panel A describes the test of means for acquirer CARs of each quartile versus the rest of the sample, whereas Panel B does the same for target CARs. A market model has been utilised with a 170 day estimation period (from day -210 to day -41) for parameter estimation. These firms are all involved in high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the announcement. The *Window* column is listed in terms of days from the acquisition announcement date. In this analysis, only deals where employee ratios were available – that is, only 39 of the 61 deals under study fell in this category.

Panel A. Employee Ratio – Acquirer CARs Test of Means

Window	Test of Means – Q1 N = 9	Test of Means – Q2 N = 11	Test of Means – Q3 N = 10	Test of Means – Q4 N = 9
(0, 0)	0.33472	0.544038	-2.08262**	1.149009
(-1, 0)	0.195442	0.672333	-1.97869***	1.056592
(-1, +1)	0.286798	1.238937	-0.87468	-0.69025

Panel B. Employee Ratio – Target CARs Test of Means

Window	Test of Means – Q1 N = 9	Test of Means – Q2 N = 11	Test of Means – Q3 N = 10	Test of Means – Q4 N = 9
(0, 0)	0.182802	-0.06065	0.295049	-0.42439
(-1, 0)	0.146986	0.434675	-0.36383	-0.2338
(-1, +1)	-0.52005	-0.58973	0.202784	0.946283

*** Significant at the 1.00% level

** Significant at the 5.00% level

* Significant at the 10.00% level

For acquirers, the negative returns seen in the third quartile for windows (0, 0) and (-1, 0) have significantly different means when compared to the remaining sample at the 5.00% level. This may provide weak evidence to support the Employee Ratio Hypothesis, as the hypothesis predicts returns will be relatively poorer as the ratio of target employees to acquirer employees increases. A possible explanation as to why the third quartile has significantly different means, but the fourth quartile does not, may be because when firms acquire very large firms the digestibility issue is countered by the significantly increased market share and the benefits associated with a dominant market position.

Table IX Panel B indicates that for target returns, the means do not vary significantly across quartiles. In the case of returns to target shareholders of high-tech cross-border acquisition announcements, there is no evidence to support the hypothesis that the market will value more digestible target firms as indicated by a lower employee ratio.

E. Target Intangible Assets to Total Assets Ratio

This study also aims to investigate the role played by the intangible assets of the target firm. As a proxy for the relative level of intangibles of the target firm, the ratio of the target intangible assets to target total assets (TIA ratio) is used. Table X reports abnormal returns for both acquirer and targets stratified by the ratio of target intangible assets to total asset.

Table X. CARs of Subsample Partitioned by TIA Ratio

This table provides the results from the event study analysis for a subsample of acquisition announcements where the sample is partitioned based on which quartile the deal's ratio of target intangibles to total assets belongs to. Panel A describes acquirer CARs, whereas Panel B reports target CARs. A market model has been utilised with a 170 day estimation period (from day -210 to day -41) for parameter estimation. These firms are all involved in high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement. The *Window* column is listed in terms of days from the announcement date. In this analysis, only deals where target intangibles and total assets were available – that is, only 39 of the 61 deals under study fell in this category.

<i>Panel A. TIA Ratio – Acquirer CARs</i>				
Window	CAR – Q1 N = 9	CAR – Q2 N = 11	CAR – Q3 N = 9	CAR – Q4 N = 10
(0, 0)	-0.43%	-0.62%	-2.37%	0.68%
(-1, 0)	-0.21%	0.16%	-2.04%	0.62%
(-1, +1)	-1.28%	0.08%	-3.40%	0.97%

<i>Panel B. TIA Ratio – Target CARs</i>				
Window	CAR – Q1 N = 9	CAR – Q2 N = 11	CAR – Q3 N = 9	CAR – Q4 N = 10
(0, 0)	8.55%**	11.72%**	15.01%**	7.62%**
(-1, 0)	10.04%**	12.80%**	15.56%**	11.53%**
(-1, +1)	20.43%**	17.03%**	18.67%***	11.00%*

*** Significant at the 1.00% level
 ** Significant at the 5.00% level
 * Significant at the 10.00% level

Target intangible assets and total assets data were obtained during the data collection process outlined above, and these figures come from the Datastream database. These figures are as of each firms' fiscal year end just prior to the acquisition announcement. The results show that the deals in the sample have a mean target intangible asset to total asset ratio of 20.48%, and a median ratio of 18.55%.

To examine whether employee ratio produces a valuation effect, the sample is stratified along quartiles of the TIA ratio. The figures of interest are the abnormal returns to shareholders of the

bidding firm. Table X Panel A reports that for each window and quartile under consideration, the returns to bidder shareholders in high-tech cross-border acquisitions are not significantly different from zero. In the case of returns to target shareholders, Table X Panel B shows the abnormal returns in all situations considered are significantly positive.

The *Target Intangible Assets to Total Asset Ratio Hypothesis* stated that the share price response of the bidder and target will be more favourable when the ratio of target intangible assets to total assets is higher. In this case it is shown for acquirers that returns are not significantly different than zero, and returns to target shareholders are significantly different from zero. However, another important aspect is whether the mean significantly changes across quartiles. Table XI Panel A reports a test of means of acquirer CARs between each quartile and the remaining sample.

Table XI. CARs of Subsample Partitioned by TIA Ratio – Test of Means

This table provides the results from the event study analysis for a subsample of acquisition announcements where the sample is partitioned based on which quartile the deal's ratio of target intangibles to total assets belongs to. Panel A describes the test of means for acquirer CARs of each quartile versus the rest of the sample, whereas Panel B does the same for target CARs. A market model has been utilised with a 170 day estimation period (from day -210 to day -41) for parameter estimation. These firms are all involved in high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement. The *Window* column is listed in terms of days from the announcement date. In this analysis, only deals where target intangibles and total assets were available – that is, only 39 of the 61 deals under study fell in this category.

<i>Panel A. TIA Ratio – Acquirer CARs Test of Means</i>				
Window	Test of Means – Q1 N = 9	Test of Means – Q2 N = 11	Test of Means – Q3 N = 9	Test of Means – Q4 N = 10
(0, 0)	0.180823	0.020427	-1.45134	1.188787
(-1, 0)	0.073053	0.439285	-1.22291	0.700233
(-1, +1)	-0.32056	0.692099	-1.83664*	1.327233

<i>Panel B. TIA Ratio – Target CARs Test of Means</i>				
Window	Test of Means – Q1 N = 9	Test of Means – Q2 N = 11	Test of Means – Q3 N = 9	Test of Means – Q4 N = 10
(0, 0)	-0.56152	0.305606	1.140314	-0.86511
(-1, 0)	-0.57949	0.088922	0.736285	-0.24049
(-1, +1)	0.767294	0.087242	0.407727	-1.24209

*** Significant at the 1.00% level
 ** Significant at the 5.00% level
 * Significant at the 10.00% level

For both acquirers and targets the test of means reveals no significant differences between CARs in different quartiles. Thus, it appears there is no evidence to support the hypothesis that returns to shareholders of targets and acquirers will be higher when the ratio of target intangible assets to total assets is higher.

F. Stratification of Full Sample

The regression of the previous section highlighted a few factors that may be of some importance when considering returns to shareholders in high-tech cross-border acquisitions. To

investigate these factors on the full sample, the sample has been stratified along these control variables and their means are compared.

Table XII reports the acquirer CARs stratified by tender offers, cash payments, US acquirers, and termination provisions.

Table XII. CARs of Acquirer Subsample Partitioned by Tender Offers, Cash Payments, US Acquirers, and Termination Provisions

This table provides the results from the event study analysis for a subsample of acquisition announcements. **Acquirer CARs** are stratified as follows: Panel A by whether a tender offer was made; Panel B by whether the consideration was a 100% cash payment or not; Panel C by whether the Acquirer is domiciled in the US; and Panel D by whether a termination provision was present. A market model has been utilised with a 170 day estimation period (from day -210 to day -41) for parameter estimation. These firms are all involved in high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement. The *Window* column is listed in terms of days from the announcement date.

<i>Panel A. Tender Offers</i>			
Window	CAR – Tender Offer N = 32	CAR – No Tender Offer N = 29	Test of Means (t-Values)
(0, 0)	-0.24%	-1.74%	-1.07
(-1, 0)	-0.16%	-2.45%**	-1.69*
(-1, +1)	-0.24%	-3.49%**	-2.26**
<i>Panel B. Cash Payments</i>			
Window	CAR – Cash Payments N = 25	CAR – Non Cash Payments N = 36	Test of Means (t-Values)
(0, 0)	-0.09%	-1.55%	-1.21
(-1, 0)	-0.63%	-1.68%	-0.84
(-1, +1)	-0.33%	-2.37%*	-1.30
<i>Panel C. US Acquirer</i>			
Window	CAR – US Acquirer N = 18	CAR – Non US Acquirer N = 43	Test of Means (t-Values)
(0, 0)	0.51%	-1.56%*	-1.42
(-1, 0)	0.37%	-1.93%**	-1.57
(-1, +1)	0.33%	-2.32%**	-1.47
<i>Panel D. Termination Provision</i>			
Window	CAR – Termination Provision N = 21	CAR – No Termination Provision N = 40	Test of Means (t-Values)
(0, 0)	-2.32%	-0.23%	1.19
(-1, 0)	-2.78%*	-0.45%	1.40
(-1, +1)	-2.98%	-0.78%	1.07
*** Significant at the 1.00% level			
** Significant at the 5.00% level			
* Significant at the 10.00% level			

In the window (-1, 0) and (-1, +1), deals without tender offers have significantly negative abnormal returns to shareholders at the 5.00% level. Additionally, a test of means indicates these negative CARs are significantly different from deals with tender offers at the 10.00% and 5.00% levels respectively.

Non-cash payments result in significantly negative CARs at the 10.00% level for the window (-1, +1), but the mean of these CARs is not significantly different from CARs to acquirers when the deal consideration is 100% cash.

When a deal involves a non-US acquirer, the CARs to acquirers are significantly negative across all windows under consideration. Deals with a termination provision have significantly negative returns to acquirer shareholders at the 10.00% level in the window (-1, 0). The test of means reveals none of these are significantly different from their counterparts however.

Returns to targets are significantly different from zero across all stratifications, as can be seen in Table XIII, which is consistent with the extant literature.

Table XIII. CARs of Target Subsample Partitioned by Tender Offers, Cash Payments, US Acquirers, and Termination Provisions

This table provides the results from the event study analysis for a subsample of acquisition announcements. **Target CARs** are stratified as follows: Panel A by whether a tender offer was made; Panel B by whether the consideration was a 100% cash payment or not; Panel C by whether the Acquirer is domiciled in the US; and Panel D by whether a termination provision was present. A market model has been utilised with a 170 day estimation period (from day -210 to day -41) for parameter estimation. These firms are all involved in high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement. The *Window* column is listed in terms of days from the announcement date.

<i>Panel A. Tender Offers</i>			
Window	CAR – Tender Offer N = 32	CAR – No Tender Offer N = 29	Test of Means (t-Values)
(0, 0)	18.23%***	5.76%**	-2.69***
(-1, 0)	20.72%***	6.43%**	-2.69***
(-1, +1)	26.18%***	8.49%**	-3.19***
<i>Panel B. Cash Payments</i>			
Window	CAR – Cash Payments N = 25	CAR – Non Cash Payments N = 36	Test of Means (t-Values)
(0, 0)	12.64%**	12.06%***	-0.10
(-1, 0)	13.28%**	14.38%***	0.17
(-1, +1)	18.63%***	17.17%***	-0.22
<i>Panel C. US Acquirer</i>			
Window	CAR – US Acquirer N = 18	CAR – Non US Acquirer N = 43	Test of Means (t-Values)
(0, 0)	17.72%***	10.03%***	-1.41
(-1, 0)	19.32%***	11.67%***	-1.47
(-1, +1)	19.42%***	17.07%***	-0.43
<i>Panel D. Termination Provision</i>			
Window	CAR – Termination Provision N = 21	CAR – No Termination Provision N = 40	Test of Means (t-Values)
(0, 0)	18.45%***	9.07%***	-1.53
(-1, 0)	20.47%***	10.49%***	-1.39
(-1, +1)	27.52%***	12.65%***	-1.99*
*** Significant at the 1.00% level			
** Significant at the 5.00% level			
* Significant at the 10.00% level			

In the case of tender offers, the existence of tender offers produces significantly higher returns to target shareholders than otherwise. The test of means reveals that across all windows under consideration the means are significantly different at the 1.00% level.

Stratification by cash payments yields target CARs that are not significantly different across any window, which is consistent with the discussion in the next section on the graph of target CARs partitioned by cash payment status (Figure VI.B).

US acquirers do experience higher acquirer CARs, but the test of means reveals these are not significantly different from the case with non-US acquirers. This is also the case for deals with a termination provision, except during the window (-1, +1) where the test of means reveals the average CARs are significantly different at the 10.00% level.

G. Cross Sectional Regression Results

In this section CARs are stratified by different control variables for a visual representation of how CARs differ. In the end of the section, the cross-sectional regression results are reported in Table XIV.

Figure IV.A plots acquirer CARs stratified by whether the deals were related or not, and Figure IV.B does the same for target CARs.

Figure IV.A. Plot of Average Acquirer CARs Stratified by Related Status

This figure provides a plot of average acquirer CARs from (-40, +40) stratified by whether the target and acquirer belong to the same 4-digit SIC industry classification. These are high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement.

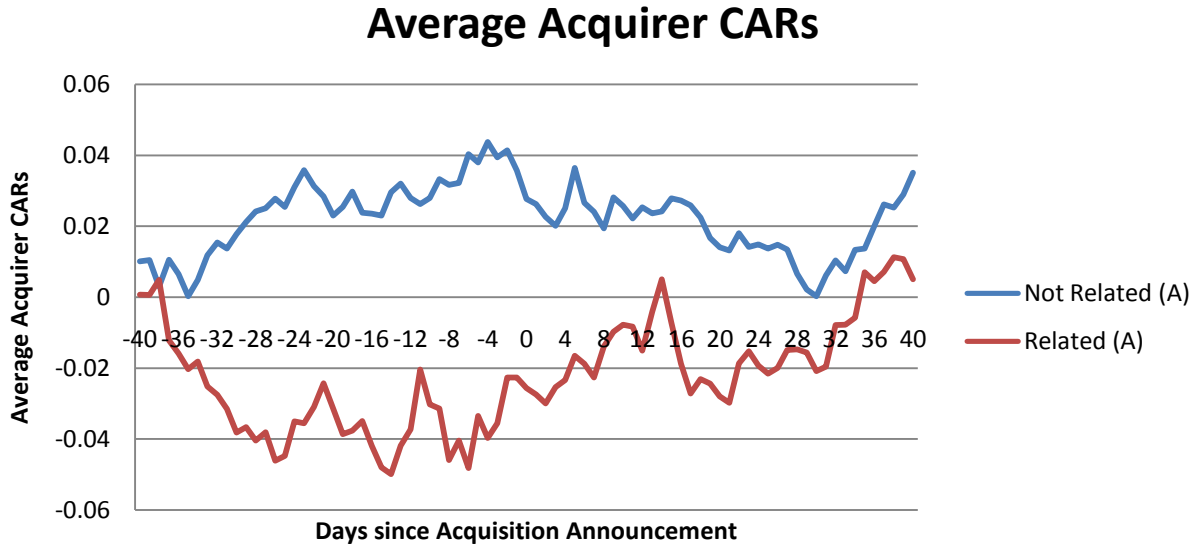
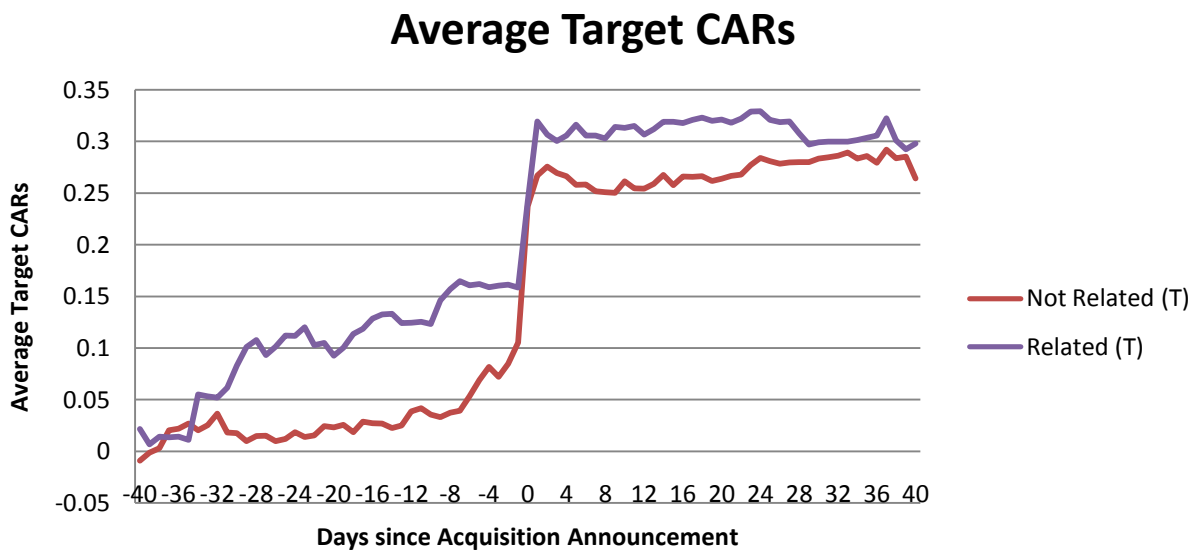


Figure IV.B. Plot of Average Target CARs Stratified by Related Status

This figure provides a plot of average target CARs from (-40, +40) stratified by whether the target and acquirer belong to the same 4-digit SIC industry classification. These are high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement.



Acquirer CARs stratified by relatedness appear to behave quite similarly around the acquisition announcement; Target CARs however, seem to exhibit a greater pre-announcement run-up and higher overall announcement window CARs.

Figure V.B plots target CARs for the entire sample and the higher returns to target shareholders is clearly evident.

Figure V.A. Plot of Average Acquirer CARs Stratified by Tender Offers

This figure provides a plot of average acquirer CARs from (-40, +40) stratified by whether or not a tender offer was made. These are high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement.

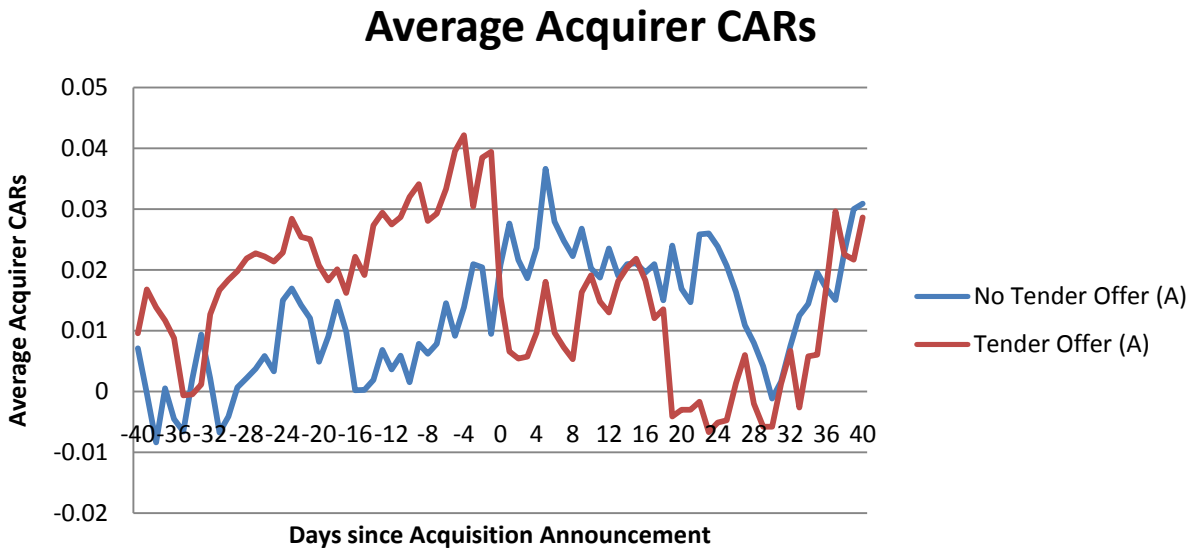
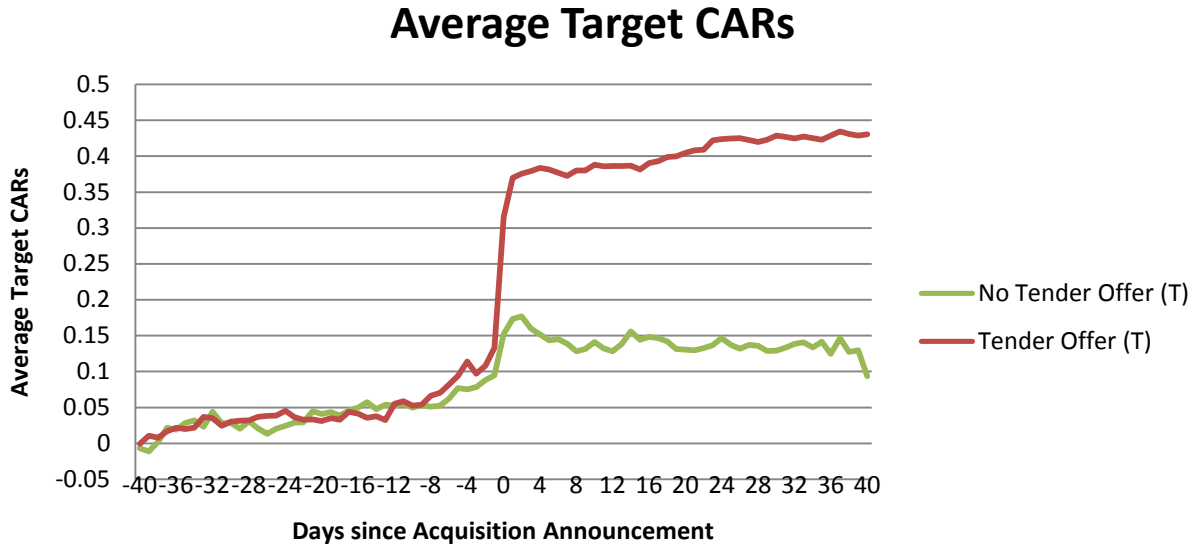


Figure V.B. Plot of Average Target CARs Stratified by Tender Offers

This figure provides a plot of average target CARs from (-40, +40) stratified by whether or not a tender offer was made. These are high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement.



From Figure V.A, there may be an indication that deals with no tender offers provide superior acquirer CARs around the acquisition announcement. This can be seen because the no tender offer line increases around time zero, yet the tender offer line decreases.

Figure V.B clearly demonstrates the superior target CARs in deals where a tender offer is made. The presence of a tender offer does not seem to affect the pre-acquisition run-up.

Figures VI.A and VI.B plot average acquirer and target CARs stratified by the type of payment used in the deal.

Figure VI.A. Plot of Average Acquirer CARs Stratified by Payment Consideration

This figure provides a plot of average acquirer CARs from (-40, +40) stratified by the type of consideration announced. These are high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement.

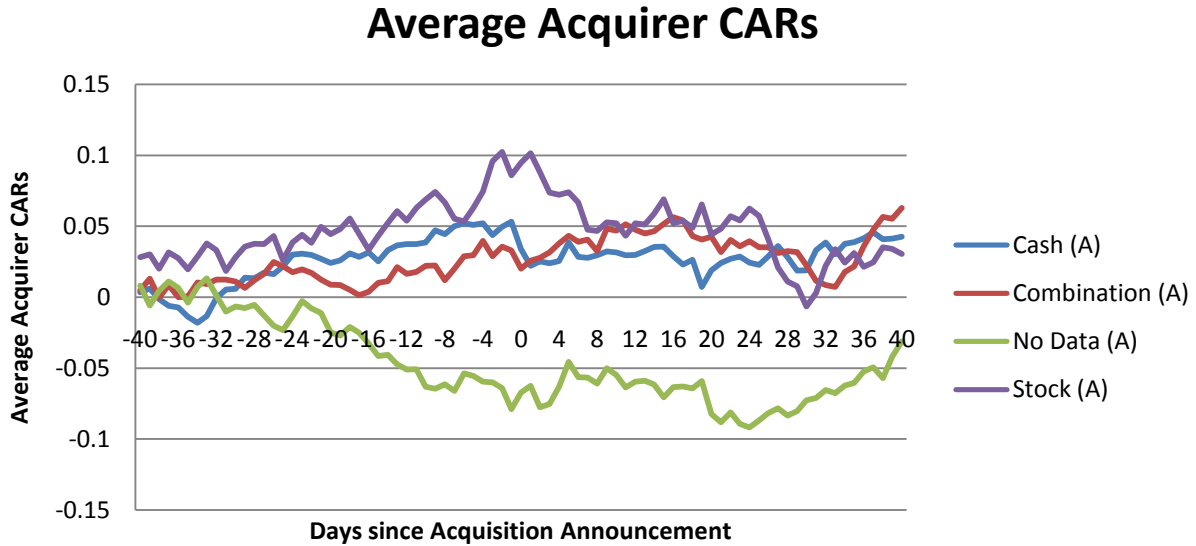
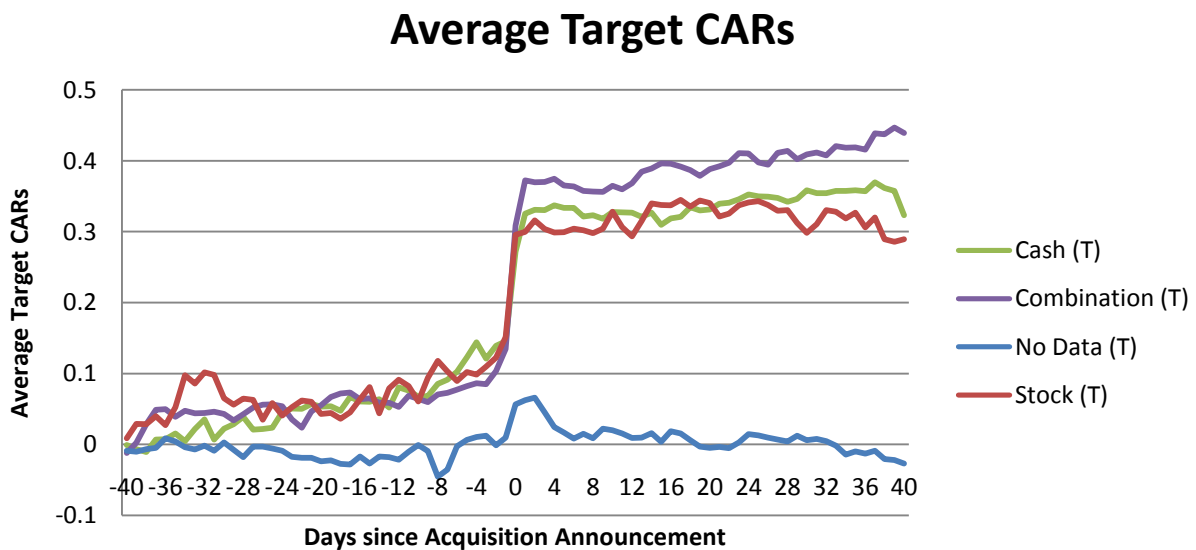


Figure VI.B. Plot of Average Target CARs Stratified by Payment Consideration

This figure provides a plot of average target CARs from (-40, +40) stratified by the type of consideration announced. These are high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement.



From Figure VI.B it is evident that cash, combination, and stock deals perform about the same, and that it is deals with no information that perform adversely. It may be the case that by stratifying the sample into cash payments and non-cash payments, the deals with no information play too important a role in determining the significance of cash payments in the regression model. There are 25 cash deals, 14 combination deals, nine stock deals, and 13 deals that have no information regarding payments.

Most of the extant literature anchors either the acquirer or target as US domiciled firms.

Figure VII.A and VII.B displays acquirer and target CARs as stratified by US acquirer status.

Figure VII.A. Plot of Average Acquirer CARs Stratified by US Acquirer Status

This figure provides a plot of average acquirer CARs from (-40, +40) stratified by whether the acquirer in the acquisition is based in the US. These are high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement.

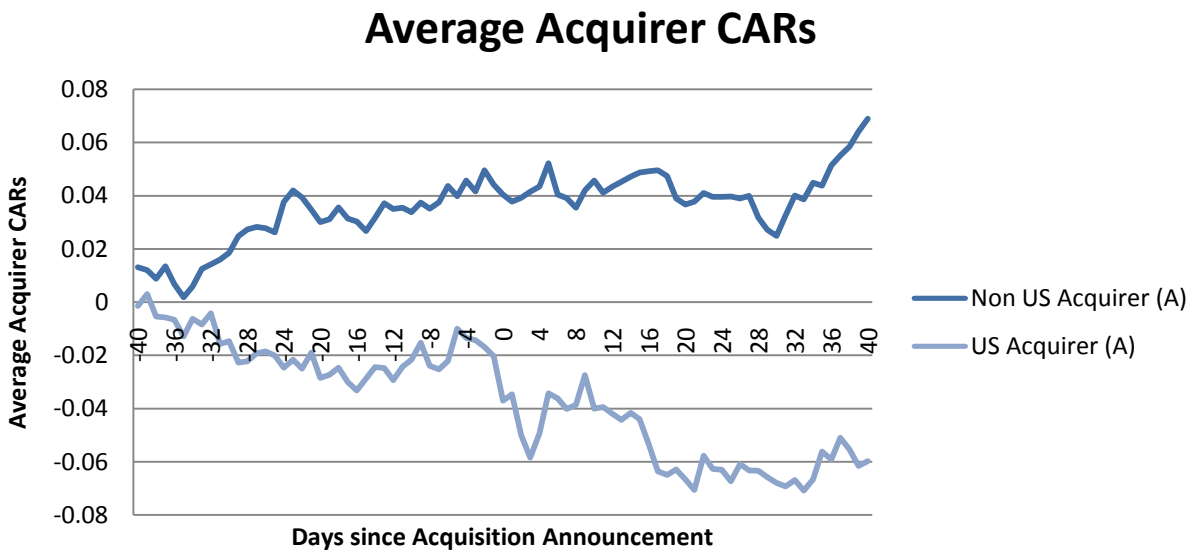
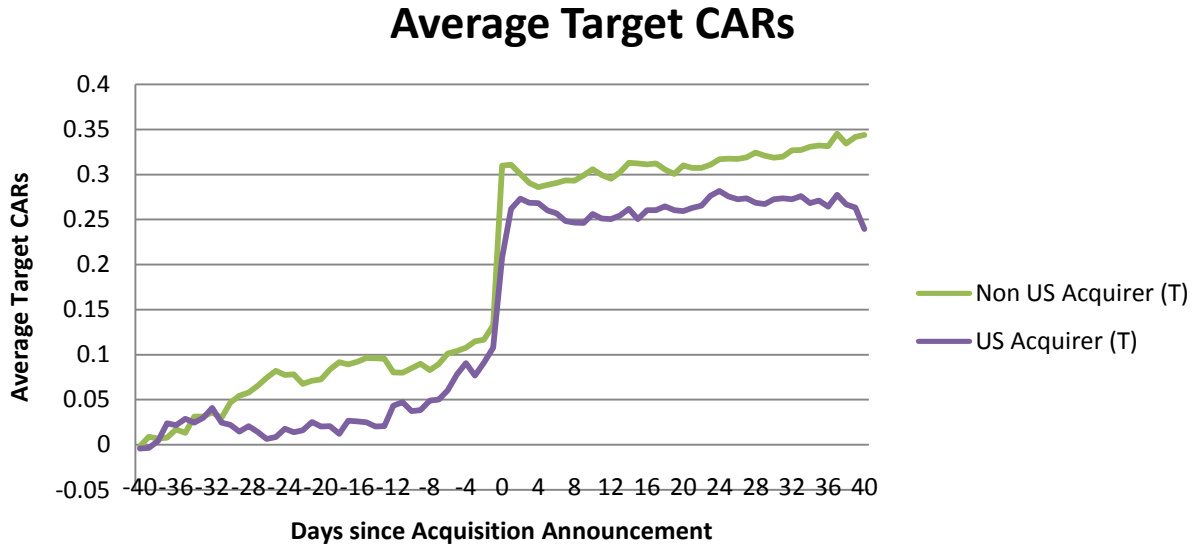


Figure VII.B. Plot of Average Target CARs Stratified by US Acquirer Status

This figure provides a plot of average target CARs from (-40, +40) stratified by whether the acquirer in the acquisition is based in the US. These are high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement.



US acquirer status seems to have an effect on acquirer CARs measured from 40 days prior to the acquisition announcement, but the behaviour around the time zero (the acquisition announcement) may not be significantly different. In the case target CARs, performance seems to be similar whether the acquirer is domiciled in the US or not.

This study considers both the results of regressing bidder and target announcement period CARs on various target, bidder, and deal characteristics. However, it is found that regressing bidder CARs produced a model with only relatedness (based on having the same 4-digit SIC code) being significant at the 10.00% level, and the entire model is insignificant based on its F-statistic.

The results for target CARs are reported in Table XIV. It should be noted that the regression was conducted with the 39 deal sample, and the figures in this section were created with the full

61 point sample. The reason for the difference is because the regression requires both the employee ratio and the TIA ratio. The data to create these values were only available for 39 deals.

Table XIV. Cross-Sectional Analysis of Valuation Effects for Targets

This table provides multivariate regression specifications to explain the valuation effects from high-tech cross-border acquisitions. The dependent variable is (-1, +1) cumulative abnormal returns. RELATED is a dummy variable equal to 1 if the acquirer and target have the same 4-digit SIC industry code. MVRATIO is the ratio of market values (41 days prior to the acquisition announcement) of the target to the acquirer. TENDER is a dummy variable equal to 1 if the acquirer issues a tender offer. IARATIO is the target firm's ratio of intangible assets to total assets as at the previous fiscal year end. EMPRATIO is the ratio of the number of employees of the target to the acquirer and is taken from the previous fiscal year end. BUBBLE is a dummy variable set equal to 1 if the acquisition announcement occurs after March 2000. CASH is a dummy variable set equal to 1 if the consideration for the acquisition is 100% cash. USACQ and USTAR are dummy variables set equal to 1 if the acquirer and target are domiciled in the US respectively. TERMPROV is a dummy variable set equal to 1 if there exists a termination provision in the acquisition announcement. These firms are all involved in high-tech acquisitions announced between 1991 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the acquisition announcement.

Variable	Parameter Estimate	Standard Error	p-Value
RELATED	-0.03231	0.03744	0.3955
MVRATIO	-0.00564	0.01252	0.6558
TENDER	0.15755***	0.04769	0.0026
IARATIO	0.08608	0.10593	0.4233
EMPRATIO	-0.01926	0.03275	0.5611
BUBBLE	0.00091634	0.05167	0.9860
CASH	-0.16148***	0.04439	0.0011
USACQ	0.11181**	0.04876	0.0296
USTAR	-0.03659	0.06036	0.5493
TERMPROV	0.12841**	0.05901	0.0383
Adjusted R²		44.60%	
F		4.06***	
N		39	
*** Significant at the 1.00% level			
** Significant at the 5.00% level			
* Significant at the 10.00% level			
Note: Here we have N = 39 which is less than our full sample of 61 because not all targets had intangible assets and employee data.			

The model is significant at the 1.00% level and consistent with the two hypotheses this study puts forth, that the coefficient for employee ratio is negative, and for TIA ratio it is positive. However, these coefficients are insignificantly different from zero.

The coefficient for relatedness is negative and may seem to contradict findings by Hagedoorn and Duysters (2002), Singh and Montgomery (1987), and Markides and Ittner (1994). But the

basis for relatedness is taken to be the four-digit SIC code, which is the closest match for industry available. Cloudt, Hagedoorn, and Van Kranenburg (2006) find that for technological firms, there is a curvilinear relationship between relatedness and performance. That is, it is optimal to acquire related firms, but when the firms are too related nothing new or innovative is being introduced and there is too much overlap, thus performance suffers. By defining relatedness based on the four-digit SIC code, this study may have defined relatedness to be on the down slope of the curvilinear relationship, resulting in a negative coefficient in the bidder regression model.

As predicted by the hypothesis, the coefficient for the employee ratio variable is negative, while the coefficient for the TIA ratio is positive. However, both of these coefficients are insignificantly different from zero.

Benou, Gleason, and Madura (2007) found that the control variable BUBBLE is significant in three out of the four models they were testing. They found the internet bubble is negatively correlated with bidder CARs, however in this case the coefficient was positive, but insignificantly different from zero.

Significant variables appear to be the presence of tender offers, cash payments, whether the deal involves a US acquirer, and the presence of a termination provision.

Ran and Vermaelen (1998) found that bidders with tender offers will on average over perform in the long term, and this study finds that the presence of tender offers is related to higher announcement period returns for target shareholders and is significant at the 1.00% level.

Travlos (1987) and Loughran and Vijh (1997) find that cash payments lead to higher returns to bidding shareholders. The results from the regression indicate that for targets, cash payments

result in higher returns to target shareholders. This may not actually be the case however, as an inspection of Figure VI.B may indicate.

The presence of a termination provision has been found to be an important factor in target shareholder returns in a study by Bates and Lemmon (2003). This study finds further evidence of this as the coefficient of the termination provision in the regression model is positive and significant at the 5.00% level.

US acquirer status may seem like an important factor for acquirer CARs, but the regression model uses CARs from one day prior to the acquisition announcement to one day afterwards. In this window the movement is not substantially different.

For targets however, the regression model indicates that US acquirer status is significant at the 5.00% level and positively affect abnormal returns to target shareholders. This is not reflected in Figure VII.B and may be a result of the different samples, as the regression is built on the subsample of 39 firms whereas the graphs are built on the full 61 firm sample.

H. Long-Term Industry-Adjusted Cash Flow Returns

This study also considers the long-term operational performance of the acquiring firm. Pro forma industry-adjusted cash flow returns are calculated for each deal, and consistent with Healy, Palepu, and Ruback (1992), these abnormal returns are significantly positive.

Table XV presents the results from calculating the industry-adjusted abnormal cash flow returns. This sample contains only 26 deals of the original 61 because market value data for the industry adjustment was only available for deals completed between 2001 and 2004. Also, only completed deals fall under consideration for this part of the analysis.

Table XV. Median Operating Cash Flow Return on Actual Market Value of Assets

This table provides median operating cash flow returns on actual market value of assets for 26 combined target and acquirer firms in the years surrounding mergers announced between 2001 and 2004. Panel A describes pre- and post-merger operation cash flow returns, whereas Panel B presents abnormal industry-adjusted post-merger operating cash flow returns. Operating cash flow return on assets is sales minus cost of goods sold, minus selling and administrative expense, plus depreciation, divided by the market value of assets. Industry adjusted cash flow returns are computed for each firm and year as the difference between the sample firm value in that year and the average values for other firms in the same industry, as defined by the sample firm's three-digit SIC classification. Premerger returns for the combined firm are weighted averages of target and acquirer returns, where the weights are the relative asset values of the two firms each year. These firms are all involved in high-tech acquisitions announced between 2001 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the announcement. In this analysis, industry information is only available for deals announced between 2001 and 2004. Also, only deals that are completed are considered, which leaves 26 deals for this analysis.

<i>Panel A. Pre- and Post-merger Operating Cash Flow Returns</i>			
Year Relative to Merger	Firm Median	Industry Adjusted – Median	Industry Adjusted – % Positive
-3	10.5%	17.3%	92.3%
-2	14.1%	25.2%	88.5%
-1	9.4%	26.3%	88.5%
1	15.7%	16.2%	96.2%
2	15.4%	19.3%	100%
3	14.4%	17.5%	96.2%

<i>Panel B. Abnormal Industry-Adjusted Post-merger Operating Cash Flow Returns</i>			
$CFr_{post,i} = 8.3\% + 0.52^{***} CFr_{pre,i}$	$R^2 = 47.6\%$	$F\text{-statistic} = 21.8^{***}$	$N = 26$
<p>$CFr_{post,i}$ is the median industry-adjusted cash flow return for firm i in the three years prior to the merger. $CFr_{pre,i}$ is the median industry-adjusted cash flow return for firm i in the three years after the merger.</p> <p>*** Significant at the 1.00% level ** Significant at the 5.00% level * Significant at the 10.00% level</p>			

Panel A of Table XV demonstrates that for this particular sample, conducting a merger has a strong effect on long term cash flow returns. At first glance, the median cash flow returns seem to verify the hypothesis that merged firms exhibit superior operating performance since returns increase in the post-merger period. Also, industry adjusted returns in the post-merger period are significantly different from zero, which is consistent with the hypothesis. However, looking at the industry adjusted medians, the returns clearly decrease in the post-merger period. This is

counter-intuitive to hypothesis H3a, but it could be the case that firms that engage in acquisitions are performing exceptionally well relative to their industry, but over time the firms are unable to maintain their competitive advantage relative to their industry, thus having a smaller industry adjustment in the post-merger years.

Panel B of Table XV describes the appropriateness of the first long-term cash flow returns model under consideration. The intercept of the model, 8.3% is not significantly different from zero, but the correlation coefficient between premerger and post-merger cash flow returns is positive and significantly different from zero, with a coefficient of 0.52. It is difficult to interpret the magnitude of this coefficient, but it being positive and significant is consistent with hypothesis H3b, that there is a positive relationship between post-merger and pre-merger operating cash flow returns. The model describes 47.6% of the variation and the model is internally consistent with an F-statistic of 21.8.

Panel A of Table XVI considers the second regression model, which includes the combined unexpected asset returns during the announcement window from five days prior to the acquisitions to five days after.

Table XVI. Test of the Relation Between Unexpected Asset Returns and Cash Flow Returns

This table provides median operating cash flow returns on actual market value of assets for 26 combined target and acquirer firms in the years surrounding mergers announced between 2001 and 2004. Panel A presents abnormal industry-adjusted post-merger operating cash flow returns and its relationship to premerger operating cash flow returns and unexpected asset returns. Operating cash flow return on assets is sales minus cost of goods sold, minus selling and administrative expense, plus depreciation, divided by the market value of assets. Industry adjusted cash flow returns are computed for each firm and year as the difference between the sample firm value in that year and the average values for other firms in the same industry, as defined by the sample firm's three-digit SIC classification. Premerger returns for the combined firm are weighted averages of target and acquirer returns, where the weights are the relative asset values of the two firms each year. Unexpected asset returns are the weighted sum of acquirer and target abnormal returns from five days prior to the acquisition announcement to five days afterwards. The returns are weighted by the relative market value of the acquirer and target. These firms are all involved in high-tech acquisitions announced between 2001 and 2004 where deals were listed in SDC and both target and bidder had trading and accounting data in Datastream in the (-3, 3) year window surrounding the announcement. In this analysis, industry information is only available for deals announced between 2001 and 2004. Also, only deals that are completed are considered, which leaves 26 deals for this analysis.

Panel A. Abnormal Industry-Adjusted Post-merger Operating Cash Flow Returns

$$CFr_{post,i} = 6.2\% + 0.52^{***}CFr_{pre,i} - 0.56^*\Delta V_i \quad R^2 = 53.6\% \quad F\text{-statistic} = 13.3^{***} \quad N = 26$$

$CFr_{post,i}$ is the median industry-adjusted cash flow return for firm i in the three years prior to the merger. $CFr_{pre,i}$ is the median industry-adjusted cash flow return for firm i in the three years after the merger. ΔV_i is the combined change in equity value of the target and acquirer during the period of five days prior to the acquisition announcement to five days after. It is weighted by the relative market value of each firm five days prior to the acquisition.

*** Significant at the 1.00% level

** Significant at the 5.00% level

* Significant at the 10.00% level

Including the combined change in equity value of the target and acquirer appears to have increased the power of the model with an improved R-squared. The correlation between premerger and post-merger abnormal cash flow returns is still consistent with the previous model. However, the correlation is negative and significant between the combined change in market value and the cash flows in the post merger period. This is inconsistent with the Healy, Palepu, and Ruback (1992) paper, and could indicate that the high-tech industry exhibits a degree of asymmetric information. It may imply that investors tend to overvalue deals they think will go well, and undervalue those they think will not.

VI. Conclusions

High-tech cross-border acquisitions are unique in that much of the value of targets resides in the difficult to value intangible assets of the firm. Not only is it difficult to value these assets, but also it is difficult to transfer this knowledge from the target to the acquirer.

This study attempts to identify key factors that may give the market clues as to whether or not the intangible assets of the target can be integrated efficiently into the acquirer.

The *Employee Ratio Hypothesis* speculates that while technological knowledge is highly codified, much of the valuable knowledge still resides in the tacit knowledge of the human capital. It would then be advantageous to retain a large portion of the target human capital. A simplifying assumption is made that larger relative workforces will be more difficult to extract the important knowledge from, and the hypothesis expects an inverse relationship between the ratio of target employees to acquirer employees and the announcement period returns to shareholders.

For acquirers, the results demonstrate only weak evidence that the third quartile of employee ratios had substandard performance relative to the rest of the sample. This may indicate that while it is easier to retain the entire workforce of smaller firms, the large firms of the fourth quartile may only require a fraction of the workforce to be retained. For targets there does not seem to be any indication that relative workforce size plays a role in abnormal returns to shareholders.

The *Target Intangible Assets to Total Asset Ratio Hypothesis* speculates that since much of the value of technology companies lies in their intangible assets, such as patents and human

capital, that companies with higher ratios of intangible assets to total assets represented more value to acquiring firms.

For both targets and acquirers there is no evidence to support this claim. When considering acquirer CARs between (-1, +1) the third quartile of TIA ratios yield negative CARs that differ significantly from the remaining sample at the 10.00% level. All other CARs in the periods under consideration do not yield means that differ significantly across quartiles, and for acquirers, none of the CARs differ significantly from zero.

The difficulties expected in high-tech cross-border acquisitions related to knowledge transfer and the integration of intangible assets do not seem to have materialised. This may be due to the highly codified nature of technological knowledge – that the common culture revolves around the language of highly codified technical knowledge. It may also be due to the nature of the sample. The majority of deal participants were from English speaking nations, and a common language eliminates a major hurdle in integrating a target's workforce and knowledge base.

When considering performance over longer time horizons, high-tech cross-border deals exhibit industry-adjusted cash flow returns are positive and very significant when compared to industry averages. Post-merger performance is positively and significantly related to pre-merger performance, which is consistent with the hypothesis that there exists a positive relationship between pre- and post-merger performance. Furthermore, there exists evidence that there is a negative relationship between announcement window returns and operating performance, perhaps indicating that deals investors view favourably are actually overvalued, and those deals that investors discount are undervalued.

The area of high-tech cross-border acquisitions still has much to be explored, particularly in how different national cultures can affect efficient communication of ideas, and thus the transfer of valuable intangible assets. ■

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