Return to Invested Capital and the Performance of Mergers and Acquisitions*

Jun "QJ" Qian
Shanghai Advanced Institute of Finance
Shanghai Jiaotong University
jqian@saif.sjtu.edu.cn

Julie Lei Zhu
Shanghai Advanced Institute of Finance
Shanghai Jiaotong University
lzhu@saif.sjtu.edu.cn

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Abstract

We evaluate the efficiency of capital deployment for acquiring firms *before* M&As, and link this ex ante measure to firms' post-acquisition performance. We construct the efficiency measure as the residual from regressions of firms' return on assets, net of cost of capital, on invested capital and other firm characteristics for each industry and year. A higher residual thus indicates that a firm generates higher net returns on investment than its industry peers in a given year. Acquirers with higher residuals have higher announcement returns and better long-run operating and stock performance than acquirers with lower residuals. The hedge portfolios based on the measure also generate significant abnormal returns.

Keywords: Merger and acquisition, net returns on assets, invested capital, residual, stock returns.

***JEL* Classifications: G14, G34, M41.**

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1. Introduction

Large-scale mergers and acquisitions (M&As) require substantial capital. While good M&As lead to growth and value creation, bad M&As generate massive losses for acquiring firms' shareholders (e.g., Moeller, Schlingemann, and Stulz, 2005). Before approving an M&A deal—granting managers the power to deploy resources and capital to an acquisition—what should the shareholders be concerned about? In this paper, we propose that one factor should be the firm's efficiency in capital deployment. If capital has been directed to productive projects and created positive (net) returns for shareholders in the past, a strong indicator of effective management, investors should have confidence in management to continue the process of value creation. If, however, capital has been misallocated to negative-NPV projects, shareholders should be cautious in approving the new M&A deal to avoid possible further losses.

An extensive strand of literature focuses on the valuation of acquirers at the time of the M&A transaction, and establishes the links among valuation, characteristics of M&A deals and performance of merged firms.[1] However, the prior literature generally takes valuation as given without examining acquirers' performance in creating values for their shareholders leading up to the M&As—the focus of our paper. Such a study can also reveal whether the recognition of capital deployment efficiency is a source of market (mis-)valuation.

We develop a parsimonious measure to evaluate acquiring firms' efficiency in capital deployment before M&As. Specifically, we compare the rate at which an acquiring firm's invested capital generates net returns—returns on assets (ROA) *in excess of* weighted average cost of capital (WACC)—relative to industry peers in a given year. A firm's invested capital includes all the long- and short-term capital raised from equityholders and debtholders. The main hypothesis is that acquirers that generate higher net returns than their peers are expected to continue to deliver superior returns to their shareholders in the upcoming M&A transaction,

[1] For example, Shleifer and Vishny (2003) argue that overvalued (undervalued) acquirers are more likely to use stock (cash) to purchase targets' assets, and such stock-based (cash-based) acquisitions tend to underperform (outperform) the market in the long-run. Empirical evidence has provided support for these arguments.

whereas acquirers that underperform their peers are likely to repeat subpar performance in the pending M&A deal. We test this hypothesis by examining whether the net return on investment of an acquiring firm, constructed *before* the M&A deal announcement date, can predict the firm's post-acquisition operating and stock performance. If better ex-ante efficiency is associated with better post acquisition performance, then this positive association would validate both our measure and the hypothesis on the *persistence* of management effectiveness in capital usage. Such a positive link would also imply that investors and the market do not fully recognize how efficiently acquirers have been in utilizing capital before the M&A deal.

Our sample includes more than 1,500 completed M&A deals over the period 1980-2005. We first regress firms' ROA, net of WACC, on current and lagged total invested capital while controlling for firm age, size, financing constraints and growth opportunities. We run regressions by industries for a given year, using *all* Compustat firms. We obtain residual estimates for each acquiring firm in our sample as of the fiscal year-end before the deal announcement date. Therefore, firms with higher residuals generate higher net returns on investment than their industry peers in a given year.

We then run two sets of tests. First, we examine whether the market differentiates acquirers with higher net returns on investment from those with subpar returns at the time of the M&A deal announcement. Second, we examine whether the net return on investment prior to the acquisition can predict long run post-acquisition operating and stock performance of the merged firms. The dependent variables in the tests are: a) the merged firm's announcement period abnormal returns, b) the post-acquisition return on assets (ROA), and c) the merged firm's long-run abnormal buy-and-hold stock returns (BHARs). The main explanatory variable in these regressions is the firm-specific residual estimates from the net returns on invested capital regressions, constructed at the fiscal year-end before the M&A deal announcement date.

We find that acquirers with high residuals have significantly higher announcement period returns than acquirers with low residuals. This result suggests that, triggered by the

M&A deal announcement, the market adjusts its valuation of acquirers with different levels of net returns to invested capital. While the direction of the market adjustment is correct, the magnitude is too small, in that the residuals also strongly predict both the operating performance and the long-run abnormal stock returns of post-merger firms. During the three years after acquisition, the merged firms with high residuals generate significantly higher long run abnormal stock returns for their shareholders, as measured by BHARs and calendar time abnormal returns. Furthermore, high residual acquirers have significantly higher long run operating performance, as measured by ROA, than that of low residual acquirers.

Taken together, the results confirm the validity of our ex-ante efficiency measure in assessing management effectiveness prior to M&A deals, and support the hypothesis that such management effectiveness persists. The results also imply that investors and the market do not fully understand how acquirers have differed in their capacity for delivering net returns to investment before M&As. For practical purposes, this measure can be used by the Board of Directors and shareholders of acquiring firms to make prudent decisions before approving large-scale M&A deals. This measure can also be used to investigate management effectiveness in other corporate events, such as seasoned equity offerings (SEOs).

To demonstrate the economic significance of the predictive power of the pre-acquisition returns on investment measure, we calculate hedge returns based on this measure and compare them to returns from a strategy based on the market-to-book (M/B) of acquirers before M&As. A strategy of shorting low-residual acquirers and going long on high-residual acquirers yields abnormal returns of 6.9% in the first year, 19.3% in two years, and 22.8% in the three years post acquisition. These returns are comparable to those from hedging portfolios of long low-MTB acquirers and short high-MTB acquirers, a strategy that the literature has shown to consistently generate abnormal returns.

Prior work (e.g., Ang and Cheng, 2003; Rhodes-Kropf, Robinson, and Viswanathan, 2004; Dong, Hirshleifer, Richardson, and Teoh, 2006) has examined (mis-)valuations of

merging firms (at the time of the M&A deal) and their impact on deal characteristics and subsequent performance. In addition, Bouwman, Fuller and Nain (2009) find that post-merger operating performance is negatively related to the valuation level of the market, so that merged firms perform worse during high-valuation periods.[2] Our paper builds on this line of research and explores possible channels of (mis-)valuation of acquiring firms. In particular, our results suggest that investors' failure in recognizing the differences in acquirers' efficiency in capital deployment can lead to misvaluations before M&As. Moreover, previous papers use analysts' forecasts of future earnings as model inputs to derive firms' intrinsic value. By contrast, we use *realized* earnings to obtain the ex-ante measure that evaluates managerial efficiency in capital deployment; this approach should introduce less bias than earnings forecasts in the empirical tests and is therefore a more reliable measure.

A few papers link cross-sectional variations in post-merger performance to certain firm characteristics. For example, Harford (1999) and Oler (2008) find that higher levels of acquirers' cash holdings before acquisitions are associated with worse announcement returns and post-merger performance.[3] The main result of our paper, the impact of ex-ante net return to investment on post-merger performance, is robust to the inclusion of acquirers' accruals and cash holdings and of other factors that have been shown to influence performance.

The rest of the paper is organized as follows. Section 2 defines the efficiency measure of capital deployment and describes the empirical methodologies. Section 3 presents the empirical results on the association between the net return on investment and the post-acquisition performance of merged firms. It also reports results on a number of robustness checks. Finally, Section 4 concludes. Appendix A contains explanations of variables used in the paper.

[2] In addition, using a sample of seasoned equity offerings (SEOs) in the 1980s, Loughran and Ritter (1997) find that the operating performance of issuing firms peaks around the time of the offering but deteriorates afterwards. They conjecture that the issuers are investing in what the market views as positive-NPV projects, but in fact these projects have negative NPVs. The authors do not, however, provide evidence to support this conjecture.

[3] Erickson and Wang (1999) and Louis (2004) find that stock acquirers underperform cash acquirers because stock acquirers inflate accruals in the quarter immediately prior to the acquisition. Gong, Louis, and Sun (2008) show that the post-merger underperformance can be explained by lawsuits aimed at pre-acquisition earnings management.

2. Empirical Methodologies

We first define the measure of net return to investment for acquiring firms before M&As. We then describe the empirical procedure in examining the relation between the pre-merger net returns to investment and post-acquisition performance. We also provide explanations of the key variables measuring the short-run and long-run stock performance and operating performance of the merged firms.

2.1 Measure of Efficiency in Capital Deployment

As stated earlier, our main hypothesis is that managerial ability in deploying capital to productive projects and creating value for shareholders persists, so that firms that generate higher net returns from investment are expected to continue to deliver superior returns in the pending M&A deals. Thus, our goal is to construct an efficiency measure of capital usage before firms launch a large-scale acquisition, and link this ex ante measure to ex post performance of the firms. A key for the construction of net return to investment is to incorporate the cost of capital into the valuation process. Our measure also intends to capture managerial efficiency in utilizing all the short- and long-term capital raised, and not just long-term capital (e.g., as measured by CAPEX). Hence, we construct the net return, or ROA in excess of WACC, of a firm's invested capital, including all the equity and debt capital.[4] Instead of using forecasted future cash flows net of initial investment costs (e.g., in the case of calculating project NPVs), we use realized earnings in excess of the cost of capital to measure net returns from invested capital. The use of realized earnings can avoid the (possible) biases in forecasts of earnings and cash flows, and is therefore more reliable in deriving our ex ante efficiency measure.

To assess how much value has been created from the firm's available resources, we

[4] This approach is similar to the concept of residual earnings: the residual earnings of an investment project are the same as the NPV of the project using discounted cash flow methods, and includes a charge for capital employed against earnings (e.g., Ohlson, 1995; Feltham and Ohlson, 1995; Penman, 2003). The residual-income valuation models have been used to estimate firms' intrinsic value (e.g., Frankel and Lee, 1997).

compare the firm's net returns on invested capital with that of a benchmark—returns of industry peers during the same period; we also adjust a firm's return on assets by industry mean ROA. Specifically, we estimate a firm-specific model of industry-adjusted ROA in excess of WACC as a linear function of the firm's invested capital over the previous three years and the firm's size (in log), age, growth opportunities (as measured by market-to-book ratios, or MTB) and financing constraints (as proxied by leverage), as follows:

$$ADJAbn_{ROA_{i,t}} = \beta_0 + \beta_1 * InvestCap_{t-1} + \beta_2 * InvestCap_{t-2} + \beta_3 * InvestCap_{t-3} + \beta_4 * Age_{t-1} + \beta_5 * Leverage_{t-1} + \beta_6 * LnSize_{t-1} + \beta_7 * MTB + \varepsilon_{i,t} \quad (1)$$

where $ADJAbn\_ROA_{i,t}$ is industry-adjusted "abnormal" returns on assets for firm *i* in year *t*. We use Fama French 48 industry classification to calculate industry mean ROA and use industry adjusted abnormal ROA as the dependent variable. We estimate Eq. (1) for each industry-year, based on the 2-digit SIC codes for all the industries with at least 15 observations in a given year.

We define "normal" return on assets (ROA) as NOPAT (net operating profits) scaled by the average assets of the current and previous years; NOPAT is earnings adding back net financing expenses, where earnings is net income minus preferred dividends and after-tax special items; and net financing expense is equal to after-tax net interest expense plus preferred dividends. WACC is calculated as follows: (1) Following Dong et al., (2006), we calculate cost of equity using the CAPM, where the stock beta is estimated using the past 60 monthly returns (at least 24 months returns); the market risk premium assumed in CAPM is the average premium over the risk-free rate for the CRSP value-weighted index over the preceding 30 years; we winsorize the cost of equity estimates to lie between the range of 3-30%; (2) we infer the after-tax cost of debt from interest expenses, total interest-bearing debt, and the tax rate, and (3) we use the market value of equity and book value of total debt as weights in the WACC formula. Finally, abnormal ROA ($Abn\_ROA_{i,t}$) is then calculated as ROA minus WACC, minus mean industry ROA.

The main independent variables in Eq. (1) are one-, two-, and three-year lagged invested capital ($InvestCap_{t-1}, InvestCap_{t-2}, InvestCap_{t-3}$). Invested capital is defined as the sum of long-term debt, short-term debt, minority interests, and common equity, scaled by average assets. We also control for firm size ($LnSize_{t-1}$), firm age (Age_{t-1}), MTB (MTB) and leverage ($Leverage_{t-1}$) at the beginning of the year, all of which can affect firms' ROA. The predicted value from this regression is the estimate of the average industry-year abnormal rate of return on capital; the residual estimate is the firm-specific measure of value added in a given year. The interpretation of the residual estimate is intuitive: a positive residual indicates that a firm earns a higher abnormal return on all the capital used than its industry peers do in a given year, while a negative residual shows that the firm earns a lower abnormal return from its capital than its industry peers in a given year.

2.2 Performance Measures of Merged Firms

Announcement Period Returns and Long-run Abnormal Returns

Following Brown and Warner (1985), we use the modified market model to estimate abnormal announcement period returns. We calculate daily abnormal returns for an acquirer by deducting the equally-weighted index return from the acquirer's raw return (results are similar when using value-weighted index return):

$$AR_{it} = R_{it} - R_{Mt},$$

where R_{it} is firm *i*'s daily stock return on date *t* and R_{Mt} is the return for the equally-weighted CRSP index. We calculate cumulative abnormal returns (CARs) by summing the abnormal daily returns over a three-day event window around the M&A deal announcement date.

To measure the long-run stock performance of merged firms, we follow the literature on long-run event studies and use the "buy-and-hold" returns of a sample firm less the "buy-and-hold" return of a properly chosen benchmark portfolio. The buy and hold abnormal return, or BHAR, is calculated as:

$$BHAR_{iT} = \prod_{t=s}^{s+T}(1 + R_{it}) - 1 - R_{pT},$$

where R_{it} is the month *t* return for firm *i*, R_{pT} is the benchmark portfolio return, and *T* is the time horizon over which returns are calculated. We use the characteristic-based portfolio constructed in Daniel, Grinblatt, Titman, and Wermers (1997) and Wermers (2004, hereafter DGTW) as our benchmark portfolio. The DGTW benchmark portfolio for a given stock during a given month is constructed to directly match *that* stock's three main characteristics: size, (industry-adjusted) market-to-book (M/B) ratio, and past momentum. Therefore, DGTW form benchmarks that directly match the characteristics of the stocks being evaluated. This approach can be contrasted with the alternative "factor-based" approach that forms factor portfolios based on characteristic-sorted stocks; returns on these factor portfolios are then used as regressors in a traditional three- or four-factor model.[5]

There are several advantages of using the DGTW benchmark portfolios. First, empirical evidence suggests that the characteristics of stocks provide better ex-ante forecasts of the cross-sectional patterns of future stock returns (see, for example, Daniel and Titman, 1997). Second, characteristic matching also does a better job of matching future realized returns; that is, the average fraction of the variance of the stock returns explained by the benchmark is higher and the standard error of the estimates of the stock's abnormal performance is lower. Therefore, characteristic matching should have more statistical power than factor-based models do to detect abnormal performance (Wermers (2004)).

Post-acquisition Operating Performance

In constructing the ex-ante efficiency measure of capital usage, we use NOPAT scaled by average assets minus WACC as the abnormal returns ROA, then regress this variable on invested capital and firm controls. To be consistent, we also use NOPAT scaled by average assets as ROA to measure the post-acquisition operating performance. It is useful to discuss the

[5] The benchmarks are available at http://www.smith.umd.edu/faculty/rwermers/ftpsite/Dgtw/coverpage.htm.

implications that the differences in accounting and payment methods in M&As have for using NOPAT as a measure of post-acquisition operating performance. Since NOPAT is defined as earnings adding back net financing expenses, it is not affected by the methods of payment in acquisitions. As discussed in Healy, Palepu, and Ruback (1992), if an acquisition is financed by debt and cash, its post-acquisition income will be lower than if it is financed by stock, because income is computed after deducting interest expenses. We also exclude the period between the M&A deal announcement and the completion date from the post-acquisition period to account for the differences in the timing of consolidating targets under the purchase or pooling method. Under purchase accounting, earnings are usually lower in the year of M&A deal completion because the target's financial statements are consolidated with those of the acquirer from the date of deal completion. Under pooling accounting, however, financial statements are consolidated from the beginning of the year, which can be much earlier than the M&A deal completion date.

NOPAT, in contrast, is not immune to the differences in depreciation and amortization expenses, which are generally higher under purchase accounting than under the pooling method. The purchase method restates the assets and liabilities of the target firm at their market values and records any difference between the purchase price and the market value of the target's identifiable assets and liabilities as goodwill. No such re-valuation (and no goodwill) is recorded under the pooling method. To ensure that our results are not driven by differences in accounting and payment methods, we include, as controls in regressions, an indicator for the pooling method and another indicator that equals one if more than 50% of the consideration for acquisition is paid for with the acquirer's stock.

2.3 Regression Framework for Post-merger Performance

To examine the link between the ex-ante measure of value creation and the ex-post performance of the merged firms, we run multivariate regressions to control for factors that may

impact a firm's (abnormal) performance. The dependent variables are the three-day CARs, the one-, two-, and three-year post-acquisition BHARs, and ROA. For stock performance, we estimate the following model:

$$AR = \beta_0 + \beta_1 * Residual + \beta_2 MTB + \beta_3 * SmallAcquirer + \beta_4 * Accruals + \beta_5 * NOA + \beta_6 * AcquirerCash + \beta_7 * RelativeSize + \beta_8 * Diversify + \beta_9 * Pooling + \beta_{10} * Stock + \beta_{11} * Tender + \beta_{12} * PreAnnReturn + \varepsilon \quad (2)$$

In Eq. (2), AR is the three-day CARs or the one-, two-, and three-year post-acquisition BHARs of acquirers. $Residual$ is each acquiring firm's residual estimate from Eq. (1), and is our ex-ante efficiency measure of capital deployment. MTB is the acquirer's market to book ratio, calculated one quarter before the M&A announcement date. It is included in the model because prior literature (e.g., Rau and Vermaelen, 1998) find that high-MTB, "glamour" acquirers tend to underperform low-MTB value acquirers post acquisition. Moeller, Schlingemann, and Stulz (2004) show that smaller acquirers tend to have higher announcement period returns. Therefore, we include $SmallAcquirer$ as a control variable, defined as an acquiring firm with market capitalization below the 25th percentile of NYSE firms as of the fiscal year-end immediately before the M&A announcement date. Prior literature also finds that acquirers in stock acquisitions show higher abnormal accruals before the acquisition announcement relative to cash acquirers; and that the high abnormal accruals are related to lower post-acquisition returns (Erickson and Wang, 1999; Louis, 2004). Accordingly, we control for $Accruals$ and net operating assets (NOA), which are the balance sheet representation of the cumulative accruals. Finally, we control for acquirers' pre-announcement cash levels ($AcquirerCash$), as Harford (1999) finds that cash-rich acquirers have lower announcement returns, and Oler (2008) finds that an acquirer's cash level is associated with worse long-term post-acquisition stock returns.

Previous research has demonstrated that the relative size of an acquisition to the size of the acquirer affects the acquirer's post-acquisition returns (Asquith, Bruner, and Mullins, 1983).

Therefore, we include $RelativeSize$, defined as the transaction value divided by the acquirer's market capitalization at the end of fiscal year immediately before the deal announcement date.[6] We also include an indicator, $Diversify$, which equals one if the target and acquirer have different two-digit SIC codes and zero otherwise. As discussed above, we include a $Pooling$ indicator that equals one if the acquirer uses the pooling method. $Stock$ is an indicator that equals one if more than 50% of the deal is paid for with the acquirer's stock. This is included because Bhagat et al. (2005) find that stock-based deals experience a negative announcement period return; and, Loughran and Vijh (1997) show that stock deals have worse long run post-acquisition returns. $Tender$ is a dummy variable that equals one if the acquisition is a tender offer and zero otherwise. Jagadeesh and Titman (1993) documents that the pre M&A announcement price run-up leads to short-term price momentum, and DeBondt and Thaler (1985) documents that price reverses in the long run. Therefore, we include $PreAnnReturn$, the mean pre-announcement return of acquirers from 200 days to 31 days prior to the deal announcement date to account for short-run price momentum. In addition, as recommended by Peterson (2009), we include year indicators and cluster standard errors by year to control for the cross-correlation among acquiring firms each year.[7] This approach, along with calculating abnormal returns based on DGTW benchmark portfolios, generates unbiased standard errors according to Petersen (2009).

In the regression model for long-run operating performance, in addition to including all the variables in Eq. (2), we also control for matching non-acquirers' post-acquisition operating performance to ensure that the results are not driven by the (possible) mean reversion properties of operating performance. Freeman, Ohlson, and Penman (1982) and Nissim and Penman (2001) both show that extreme values of operating performance, such as sales growth or return

[6] We also use the sizes of the acquirer and target separately, as in Schwert (2000); results are very similar.

[7] Table 6 in Petersen (2009: p.472) shows that the "Fama-MacBeth standard errors are close to the standard errors clustered by time, as both methods are designed to account for dependence in the time dimension."

on assets, are strongly mean-reverting in subsequent periods. To find matching non-acquirers, we follow the procedure used in the long-run stock performance literature and match each acquirer with a non-acquirer, chosen on the basis of firm (asset) size, industry, and MTB (Barber and Lyon, 1997; Kothari and Warner, 1997). Specifically, the candidate matching firms for an acquirer are those listed on the AMEX, NYSE, or Nasdaq with the same 2-digit SIC codes and with asset size at the end of fiscal year before the deal announcement date that is 50% to 200% of the asset size of the acquirer. From this set of firms, those that have not made an acquisition during the three years prior to and three years after the deal announcement year are ranked based on their MTB. The firm with the closest MTB is chosen as the matching non-acquirer.

3. Data and Empirical Results

From the Securities Data Company's (SDC) U.S. M&A database, we identify all completed acquisitions during 1980-2005, based on standard sample selection criteria.[8] As is common practice, we exclude financial institutions and regulated utility firms. In addition, if an acquirer announces multiple M&A deals in the same year, we only keep the deal with the largest transaction value. Finally, we only include deals in which sufficient Compustat data is available to calculate the summary statistics shown in Table 1 and to generate the net returns to investment.[9] This procedure yields a sample of 1,507 M&A deals, for which we analyze the ex-ante efficiency measure in capital usage and ex post operating performance and abnormal stock returns.

Table 1 reports summary statistics of all the acquirers: Panel A reports firm characteristics and Panel B reports deal characteristics. Panel A shows that the average MTB

[8] Our sample selection criteria include: The deal value is at least $10 million; both acquirer and target are public firms and the acquirer is listed on NYSE, AMEX or Nasdaq; the acquisition is announced during the sample period of 1980-2005; all partial acquisitions (i.e., acquiring less than 100% of the target assets) are excluded.

[9] These variables include net operating assets (NOA), accruals, and the acquirer's cash, invested capital, size, leverage, M/B, and age at the fiscal year-end prior to the M&A deal announcement date.

ratio of acquirers is 2.25. The acquirers' accounting ratios show that these acquirers are well established and in the middle of their life cycle, with average acquirers' age of 16. Panel B shows that about 33% of the deals are tender offers, while 47% of the deals are paid for with the acquirer's stock. About 18% of the deals use the pooling method to account for the acquisitions.[10] Overall, the summary statistics (Table 1) are similar to those in recent studies (e.g., Bouwman, Fuller, and Nain, 2007; Oler, 2008).[11]

[Insert Tables 1 and 2 here.]

As discussed in Section 2, we run the abnormal ROA-invested capital regressions as specified in Eq. (1) to obtain the residual estimates for each acquiring firm. Acquirers with positive residuals earn higher excess returns from their invested capital relative to industry peers prior to the M&A deal. The regressions are run by year and industry, where industry classifications are based on Fama-French 48 industries. We report the regression results by Fama-French 12 industries (firms from utilities and financials are dropped) in Table 2 for brevity.

From Table 2, firm size is a significant factor of net return to investment in all industries, suggesting that larger firms generate higher returns to investment. The coefficients on MTB are negative and significant for many industries (while it is positive and significant in the energy industry), suggesting growth firms tend to have lower investment returns. Coefficients on leverage are positive, but statistical significance is weak. The lagged, one-year invested capital is positively associated with net return on investment in almost all the industries, indicating that firms earn higher net returns when they raise more (invested) capital in the previous year. The coefficients on lagged two and three year invested capital are similar to those of lagged one year invested capital, but are generally smaller in magnitude. Finally, the average R squared ranges from 10% to 31.8% across the industries, indicating that our regression model analyzing

[10] SFAS 141 requires all firms to use the purchase method for acquisitions initiated after June 30, 2001.

[11] See Brunner (2002) for a comprehensive survey of the studies examining shareholder returns for M&A.

abnormal returns on invested capital is well specified.

[Insert Figure 1 here.]

Figure 1 describes the distribution of the residual estimates of the sample acquiring firms. The residual estimates range from -0.94 to 0.90, with the mean of 6%, median of 3% and the standard deviation of 0.19. More than one-fifth of the acquirers have a residual estimate of around 0, suggesting they earn the same level of net returns on investment as the industry average. Based on the smooth distribution of the residual estimates centering around 0, we use the continuous variable of residual in our regressions of post-acquisition performance below.[12]

In the rest of this section, we present results from multivariate regression analyses on the announcement period (event) returns, post-acquisition long-run abnormal stock returns and operating performance, and a number of additional results and robustness checks.

3.1 Announcement Period Returns and Post-acquisition Long-run Abnormal Returns

The dependent variable in Column 1, Table 3 is the three-day CAR of the acquiring firms. As has been found in prior research (e.g., Servaes, 1991; Rau and Vermaelen, 1998), the market responds negatively to stock acquisitions and when the target is large relative to the acquirer. The announcement period return is higher if the acquirer experiences larger pre-announcement stock returns, consistent with the short-term stock price persistence documented in Jagadeesh and Titman (1993). Announcement returns do not seem to be affected by the acquirer's M/B ratio at the time of the acquisition announcement. We also find that the announcement returns decrease in the level of the acquirer's cash holdings, consistent with Harford (1999), which interprets this result as the market taking cash-rich acquirers to have more severe agency problems, as indicated by Jensen (1986) and Gao, Harford and Li (2013). Finally, the announcement returns also decrease in the acquirers' accruals, an indicator of weak

[12] We also find that acquirers with high residuals are more likely to pursue related acquisitions, use cash as the method of payment, and acquire targets that are small relative to their size. We use M&A deal characteristics and the residual estimate obtained prior to the M&A deal announcement as explanatory variables in our analyses of post-acquisition performance.

earnings quality, but the relation is not statistically significant.

[Insert Table 3 here.]

After controlling for acquiring firm and M&A deal characteristics, we find that the residual estimate is positively related to the announcement period return, and it is significant at the 1% level. In fact, as the residual estimate increases by one standard deviation (19%), the acquirer's CAR rises by almost 2%. This result suggests that market reacts favorably to high residual acquirers, which have been generating superior net returns to invested capital than their peers leading up to the M&A deal.

The next three columns of Table 3 report the regression results for the buy-and-hold abnormal returns (BHAR), adjusted by the DGTW benchmark return, calculated over the one-year, two-year, and three-year windows post acquisition. The long-run abnormal returns are lower for acquirers with greater pre-announcement price run-ups, consistent with prior studies (Rau and Vamaelen, 1998; Jagadeesh and Titman, 1993). We also find acquirer's M/B ratio at the time of the acquisition announcement is negatively associated with long-run abnormal returns post acquisition (significant at 10% over the two-year horizon, in Column 3). Once again, after controlling for firm and deal characteristics, we find that high-residual acquirers have significantly higher post-acquisition returns than low residual acquirers over all three windows after the deal completion date. All the results are significant at the 1% level. These results suggest that the pre-acquisition net return on investment measure is an important predictor for long-run post-acquisition stock performance.

Combining the announcement period results with the long-run abnormal returns results, we conclude that the market, triggered by an M&A deal announcement, *partially* recognizes high residual acquirers' high efficiency in capital deployment. While the direction of the adjustment (during the announcement period) is correct, its magnitude is too small, in that high residual acquirers continue to outperform the low-residual acquirers during the three years after the acquisition.

3.2 Post-acquisition Operating Performance

Table 4 reports results for operating performance (ROA) of acquiring firms in the one-, two- and three-years after the acquisitions. Operating performance is worse if the acquirer is small, has large (pre-announcement) cash holdings, and uses stock as the main method of payment. The relation between cash level and long-run post-acquisition operating performance is consistent with the findings of Oler (2008).[13] The ROA of matching non-acquirers in the post-acquisition period is positively and significantly related to the acquirers' post-acquisition ROA, which illustrates the success of the matching procedure. Operating performance is also better if the acquirer has higher pre-acquisition MTB and uses the pooling method. The result for the pooling method is consistent with earlier discussions of the differences between the pooling and purchase accounting methods; in particular, acquirers generally have higher post-acquisition earnings if they use the pooling rather than the purchase method.

As in the stock return regressions (Table 3), post-acquisition operating performance is significantly better for high residual acquirers; all results are significant at the 1% level (Columns 1-3). When the residual estimate increases by one standard deviation (19%), the acquirer's ROA during the first year after deal completion rises by 10% (0.546 * 0.19, Column 1). Given that the mean ROA of merged firms is 12.8% during the same year, the positive effect of pre-merger net returns on investment on post-acquisition ROA is also economically significant.[14]

[Insert Table 4 here.]

To further gauge the economic significance of the ex-ante investment efficiency measure, we compare the hedge return strategy based on the measure to a well-known strategy

[13] See, Almeida, Campello, and Hackbarth (2011), for an alternative explanation. They argue that acquirers may pursue liquidity-driven mergers even if these deals do not have operational synergy.

[14] We find a positive but statistically weak relation between acquirers' ROA during the last fiscal year prior to deal announcement (industry adjusted) and merged firms' ROA after deal completion. The pre-merger ROA of acquiring firms does not predict their announcement period returns of the long-run post-acquisition abnormal returns. By contrast, our residual estimates, which take into account of the cost of capital and are obtained from a parsimonious regression model, strongly predict both the operating and stock performance of the merged firms.

based on acquirers' MTB ratios. We calculate the returns to trading strategies and report the results in Table 5. The strategies call for taking a long position on high-residual or low MTB acquirers and a short position on low-residual or high MTB acquirers. An acquirer falls into the low-residual (or high MTB) group if its residual estimate (or MTB) is in the bottom (top) quintile of all acquirer residual estimates (or MTB) one year before the acquisition announcement. The positions are formed on the day of M&A deal completion and closed out 12 months (Column 1), 24 months (Column 2), and 36 months (Column 3) after the deal completion date. As discussed in Section 2 above, we calculate abnormal returns using the DGTW benchmark portfolio that matches acquirers on size, MTB, and momentum.

[Insert Table 5 here.]

Table 5, Panel A shows that the investment strategy of high- vs. low- residuals produces an abnormal return of 6.9% during the first year, 19.3% in the first two years, and 22.8% in the first three years after M&A deal completion. Panel B presents the hedge returns based on the investment strategy of MTB ratios. The mean abnormal return from this strategy is 10.6% in the first year, 22.9% in the first two years, and 12.4% in the first three years post acquisition. These results are consistent with the findings in Rau and Vermaelen (1998), which show that the high-M/B glamour acquirers significantly underperform the low-MTB value acquirers post acquisitions. The comparison of the results from Panels A and B reveals that the strategy of going long on high-residual and short on low-residual acquirers generates comparable or higher returns than the MTB-based strategy, especially over the three-year post-acquisition window. The comparison also illustrates that the economic importance of the net investment return measure as a strong predictor of the long run merged firms' stock performance.

In summary, results from Tables 3-5 show that the ex-ante investment efficiency measure strongly predicts the post-acquisition stock and operating performance of acquiring firms, validating both the measure itself—as an assessment of overall management effectiveness in capital deployment—and the hypothesis on which the measure is based—the persistence of

management's effectiveness (or lack of it) in capital usage. Acquirers that generated higher net investment returns than their peers before acquisitions are expected to continue to deliver superior returns to their shareholders after the M&A transaction, while acquirers that underperformed their peers are likely to repeat the subpar performance.

3.3. Additional Results and Robustness Tests

In this subsection, we discuss results from a number of additional tests and robustness checks on the methodology of calculating hedge returns, sample period, and different specifications of constructing the ex-ante investment efficiency measure.

Calendar-time Results

The hedge return results in Table 5 are based on an event-time approach. That is, abnormal returns are calculated across M&A transactions for one- to three-year windows after the completion of these transactions, even though the acquisitions occur at different (calendar) times. This approach weights different acquisitions equally and implicitly tests a strategy of investing equal amounts in each acquisition. One potential problem with this approach is that the significance of long-run returns can be overstated because of cross-correlations among returns (Bernard, 1987; Mitchell and Stafford, 2000; Kothari and Warner, 2004). In a multivariate setting, the cross-correlation problem can be addressed by adding year fixed effects and cluster standard errors by year, as we have done in Table 3. However, this problem cannot be handled in a similar fashion in the hedge return setting as shown in Table 5. An alternative approach is to use calendar-time returns: tracking the performance of an event portfolio in calendar time. This technique weighs each month equally and tests a strategy of investing equal amounts in acquisitions each month. Thus, this approach is immune to the potential cross-correlation problem. We track the performance of an event portfolio in calendar time relative to an asset pricing model. In addition, we recalculate the abnormal returns for the strategy of going short on low-residual acquirers and long on high-residual acquirers using the calendar-time

approach.

[Insert Table 6 here.]

For each month during our sample period, we create high- and low-residual *event* portfolios as follows: the high-residual (low-residual) portfolio consists of all the acquirers that completed an acquisition within the previous one, two, or three years. Portfolios are rebalanced monthly to drop all the acquirers that reach the end of their one-, two-, or three-year period and add all the acquirers that have just completed an M&A transaction. The portfolio excess returns are then regressed on the Fama-French (1993) factors and the Carhart (1997) momentum factors. To estimate the difference between the returns of high- and low-residual event portfolios, we create a dummy variable D_{low} that equals one if the event portfolio return is a low residual return and zero otherwise. A pooled portfolio regression is estimated as follows:

$$R_{p,t} - R_{f,t} = a_p + b_p\left(R_{m,t} - R_{f,t}\right) + s_p\, SMB + h_p\, HML + m_p\, MOM + \delta_1\, D_{low} + \delta_2\, D_{low} \times \left(R_{m,t} - R_{f,t}\right) + \delta_3 D_{low} \times SMB + \delta_4\, D_{low} \times HML + \delta_5\, D_{low} \times MOM + e_{p,t}$$

Where $R_{p,t}$ is the event portfolio return, $\left(R_{m,t} - R_{f,t}\right)$ is excess market return over the risk free rate, SMB is small minus big stock portfolio, HML is high MTB minus low MTB stocks, and MOM is the momentum factor. The intercept captures the event portfolio excess returns. The coefficient on D_{low} captures the difference between low- and high-residual event portfolios.

Panel A of Table 6 presents the regression results for the event portfolios. We find that the coefficient on D_{low} is -1.75% for the acquirers who completed an acquisition within the prior 12 months, -1.83% and -1.78% in the prior 24 and 36 months respectively. The coefficients are all significant at less than 1% level, suggesting that high residual acquirers experience significantly higher long-run abnormal returns than low residual acquirers.

In addition, we calculate mean abnormal monthly returns from long and short portfolios consisting of acquirers that completed acquisitions within the previous one-, two-, and three-year windows. Panel B of table 6 shows that the strategy generates significant abnormal returns

in all three years, with abnormal return of 1.46% per month for the first year, which corresponds to 17.52% over one year (1.46% × 12), 1.71% per month for the first two years and 2.20% per month for the first three years. Overall, the results using the calendar-time approach corroborate the results of using the event-portfolio approach in Table 5, and confirm that acquirers' ability to generate positive returns from invested capital prior to the M&A deal is an important predictor of post-acquisition stock returns.

We have shown in different tests with different dependent variables that the investment efficiency measure is an important predictor for acquirers' post-acquisition performance. All the results presented so far are based on the sample period of 1980-2005. It is well established, however, that acquisitions tend to cluster in time (see, for example, Holmstrom and Kaplan, 2001). The number of deals is much greater in the late 1990s than in other periods. Moreover, Moeller, Schlingemann, and Stulz (2005) show that shareholders of acquiring firms experience much greater losses in the late 1990s than in other periods. To rule out the possibility that our findings are driven by the deals made in the 1990s, we split the sample period into two sub-periods: acquisitions announced from 1980 to 1994 and from 1995 to 2005. We rerun stock return and operating performance regressions for each of these sub-periods. Panel A of Table 7 reproduces the main results from Tables 3 and 4. Panels B and C show that there are some differences among the sub-periods. It is clear that the main results on the positive relation between the ex-ante efficiency measure and ex-post acquirer performance are not driven by any particular sample period. In fact, the measure remains a strong predictor for post-acquisition performance in each sub-period.

Since NOPAT, the measure for operating performance, is not immune to the differences in depreciation expenses due to the use of pooling or purchase accounting, we rerun the regression of post-acquisition operating performance using an alternative measure: earnings before interest, taxes, depreciation, and amortizations (EBITDA). The advantage of using EBITDA is that it excludes the effects of interest expenses and taxes, goodwill, and depreciation

and is therefore unaffected by the accounting method and the method of financing (cash, debt, or equity). Panel D of Table 7 shows that the results of using EBITDA are very similar.

[Insert Table 7 here.]

4. Summary and Concluding Remarks

Prior literature has shown that large-scale M&As can lead to substantial losses for acquiring firms' shareholders despite "due diligence" effort before completing M&A deals. This paper offers another factor that the acquiring firm's shareholders and Board of Directors should consider—the firm's efficiency in utilizing capital leading up to the proposed M&A transaction. If management has allocated capital to productive projects and created positive net returns, shareholders should have confidence in management to deploy more capital to the next acquisition project. However, if management has misallocated capital to negative-NPV projects, shareholders should be cautious in approving the new M&A deal to avoid more losses.

Our measure of investment efficiency of an acquiring firm is the net return on invested capital—all the long-term and short-term equity and debt capital—relative to industry peers in a given year. Specifically, we first regress firms' ROA net of WACC on lagged invested capital and other firm characteristics for each industry and year, and then obtain residual estimates for each acquirer. Higher residuals indicate that acquiring firms generate higher net returns on investment than their industry peers in a given year.

We find that acquirers with higher residuals experience higher announcement period returns than those with lower residuals. This is consistent with the notion that triggered by the M&A deal announcement, the market adjusts its valuation of acquirers with different levels of prior investment returns. While the direction of the market adjustment is correct, the magnitude is too small, as the residuals also strongly predict both the operating performance and the long-run abnormal stock returns of post-merger firms. Hedge portfolios based on shorting the low-residual acquirers and going long on the high-residual acquirers generate substantial abnormal

returns.

The fact that better ex-ante net returns on investment is associated with better post-acquisition performance supports the hypothesis that management effectiveness in deploying capital persists. That is, acquirers that generate higher net returns than their peers are expected to continue to deliver superior returns to their shareholders in the new M&A transaction. This positive link also indicates that investors and the market do not fully recognize the differences in management's ability to efficiently deploying capital before the acquisition. In practice, this measure can be used by an acquiring firm's Board of Directors and/or shareholders to make more prudent decisions in assessing M&As.

Overall, this paper contributes to the literature on market efficiency around corporate events by introducing a new measure of investment efficiency and by documenting a positive link between this ex-ante measure and the ex-post acquisition performance. This measure and similar methodologies can be used to investigate management effectiveness around other corporate events.

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APPENDIX A
Definitions of Variables

NOPAT	Net operating profit is defined as earnings adding back net financing expense. Earnings is equal to net income minus preferred dividend and after-tax special item; net financing expense is equal to after-tax net interest expense, plus preferred dividends.
ROA	Return on assets is defined as NOPAT scaled by average assets for the last two years.
ADJAbn_ROA	The abnormal return on assets is defined as ROA minus WACC, adjusted by industry mean ROA. Industry classification is based on Fama French 48 industries.
InvestCap	Invested capital is defined as the sum of long-term debt, short-term debt, minority interest, and book value of common equity, scaled by average assets.
AcquirerCash	The acquirer's cash and short-term investments at the end of fiscal year immediately prior to the acquisition announcement divided by average assets for the last two years.
Age	The number of years a firm has been in Compustat until the end of the year prior to acquisition announcement.
Leverage	The sum of long-term and short-term debt divided by total assets.
LnSize	The logarithm of total book assets as of the end of fiscal year immediately prior to the acquisition announcement.
Residual	The residual estimate from Equation (1).
MTB	The acquirer's market-to-book (M/B) ratio at one quarter prior to acquisition announcement
SmallAcquirer	An indicator variable equal to one if an acquirer's market capitalization is below the 25th percentile of NYSE firms and zero otherwise.
Accruals	Total accruals are defined, following Fairfield, Whisenant, and Yohn (2003), as: ACC = ΔWC – DEP, where: ΔWC = change in working capital = change in accounts receivable + change in inventories + change in other current assets – change in accounts payables – change in other current liabilities; and DEP is depreciation and amortization.
NOA	The net operating assets are calculated, following Fairfield, Whisenant, and Yohn (2003), as:

	NOA = AR + INV + OTHERCA + PPE + INTANG + OTHERLTA –AP – OTHERCL –OTHERLTL, where: AR is accounts receivables, INV is inventory, OTHERCA is other current assets, PPE is net property, plant, and equipment, INTANG is intangibles, OTHERLTA is other long-term assets, AP is accounts payable, OTHERCL is other current liabilities, and OTHERLTL is other long-term liabilities.
Stock	An indicator variable equal to one if more than 50% of the consideration is paid using the acquirer's own stock and zero otherwise.
Diversify	An indicator variable equal to one if the acquirer and target are not in the same primary industry, defined as 2-digit SIC code, and zero otherwise.
RelativeSize	The transaction value divided by the acquirer's market capitalization at the end of fiscal year prior to acquisition announcement.
WACC	Weighted average cost of capital is calculated by (1) estimating a CAPM cost of equity using the past 60 monthly returns, (2) inferring after-tax cost of debt from interest expense, total interest-bearing debt, and the tax rate, and (3) using market value of equity and book value of total debt for their relative weights. I estimate β using at least 24 months and up to 60 months of lagged returns. β below 0.4 are set to 0.4 and above 3 are set to 3.
Pooling	An indicator variable equal to one if an acquisition is accounted for under pooling and zero otherwise.
PreAnnReturn	Acquirer's average stock return measured over 200 days to 31 days before the announcement date.
Announcement return	The cumulative abnormal returns (CARs) is the sum of abnormal daily returns over a three-day event window around the M&A deal announcement date.
BHAR	The "buy-and-hold" returns of a sample firm less the "buy-and-hold" return of a properly chosen benchmark portfolio. We use the characteristic-based portfolio constructed in Daniel, Grinblatt, Titman, and Wermers (1997) and Wermers (2004, hereafter DGTW) as our benchmark portfolio. The DGTW benchmark portfolio for a given stock during a given month is constructed to directly match *that* stock's three main characteristics: size, (industry-adjusted) market-to-book (M/B) ratio, and past momentum.

Table 1 Summary Statistics

This table shows firm characteristics (Panel A) and acquirer's deal characteristics (Panel B) during the sample period of 1980 to 2005. The summary statistics are based on a sample of 1,507 acquisitions with non-missing deal characteristics and have sufficient Compustat data to calculate the necessary accounting variables in Panel A as well as the residual estimates. All the accounting variables in Panel A are measured at the fiscal year-end before the deal announcement date. Acquisitions are included in this sample if (a) the acquirer is a U.S. firm listed on NYSE, AMEX, or Nasdaq, (b) both acquirer and target are public firms, (c) deal value is at least $10 million, (d) the acquirer obtains 100% of the target assets, (e) the method of payment is cash, stock, or a mixture of the two, and (f) the deal is announced during 1980-2005. If an acquirer announces multiple deals in the same year, the deal with the largest transaction value is retained. See Appendix A for all variable definitions.

Panel A: Firm Characteristics

MTB		Accruals		NOA		Acquirer Cash		Invest Cap		Size		Leverage		Age	
Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
2.25	1.71	0.04	0.04	0.90	0.84	0.13	0.06	0.77	0.76	7232.7	1521.0	0.23	0.22	16.4	15

Panel B: Deal Characteristics

Relative Size		Diversify		Pool		Stock		Tender		Small Acquirer		Deal Value	
Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
0.37	0.16	45%	--	18%	--	47%	--	33%	--	17%	--	1706.9	250

Table 2 Regression Results of Residual Estimates

This table reports results of the regressions of industry adjusted abnormal return on assets on invested capital and other variables:

$$ADJAbn\_ROA_{i,t} = \beta_0 + \beta_1 * InvestCap_{t-1} + \beta_2 * InvestCap_{t-2} + \beta_3 * InvestCap_{t-3} + \beta_4 * Age_{t-1} + \beta_5 * Leverage_{t-1} + \beta_6 * LnSize_{t-1} + \beta_7 * MTB_{t-1} + e_{i,t}$$

See Appendix A for variable definitions. The regressions are run by industry and year, where industry classification is based on Fama French 48 industries. The table presents 10 industries for brevity. Utility and financial industries are dropped. t-statistics are provided in parentheses. *, **, and *** indicate significance at the 1%, 5%, and 10% levels, respectively.

Fama French 12 Industries	InvestCap1	InvestCap2	InvestCap3	Size	Leverage	Age	MTB	Intercept	Obs	Average R-squared
Business Equipment	0.164**	0.036	0.083*	0.027***	0.149	0.002	-0.007***	-0.224***	16,330	0.141
	(2.676)	(1.492)	(1.904)	(4.632)	(1.261)	(1.091)	(5.769)	(3.211)		
Chemicals and Allied Products	0.318*	0.058*	0.011*	0.026***	0.311	0.002	-0.007*	0.354*	2,598	0.318
	(2.007)	(1.961)	(1.764)	(3.123)	(1.228)	(1.106)	(2.238)	(2.068)		
Consumer Durables	0.005*	0.013	0.018	0.012*	0.070	0.001	-0.021**	-0.108	2,707	0.224
	(1.957)	(1.516)	(1.421)	(1.781)	(1.163)	(0.706)	(2.340)	(1.386)		
Energy	0.071*	0.262	0.060	0.019**	0.217	0.002	0.014***	-0.601*	6,152	0.151
	(1.683)	(1.207)	(0.967)	(2.505)	(.916)	(.807)	(4.190)	(1.819)		
Healthcare, Medical Equipment, and Drugs	0.193*	0.012	0.017*	0.049***	0.280*	0.006*	-0.007***	-0.511**	7,766	0.228
	(1.856)	(1.483)	(1.921)	(4.071)	(2.031)	(1.657)	(3.516)	(2.769)		
Manufacturing	0.062**	0.045*	0.026	0.015***	0.077*	0.001	-0.005**	-0.019***	13,813	0.100
	(2.524)	(1.734)	(1.610)	(4.236)	(1.945)	(1.177)	(2.445)	(3.416)		
Consumer Non-Durables	0.102	0.046	0.083	0.019***	0.041	0.000	0.003	-0.202*	5,925	0.114
	(1.519)	(1.189)	(1.489)	(3.536)	(1.132)	(1.110)	(1.201)	(2.203)		
Other	0.067**	0.070*	0.056*	0.028***	0.132*	0.000	-0.007***	-0.161***	15,051	0.167
	(2.349)	(1.834)	(2.262)	(6.237)	(2.038)	(.708)	(3.841)	(3.354)		
Wholesale, Retail, and Some Services	0.752***	0.285*	0.156*	0.020***	0.089	0.001	0.006*	-0.417***	11,952	0.130
	(3.178)	(2.042)	(1.961)	(5.661)	(.991)	(.759)	(1.811)	(5.350)		
Telephone and Television Transmission	0.213	0.062	0.248	0.035***	0.156	-0.001	-0.001	-0.313**	2,754	0.269
	(1,561)	(1.062)	(1.460)	(3.976)	(1.269)	(.667)	(1.261)	(2.329)		
Average	0.177*	0.089	0.076*	0.025***	0.152	0.002	-0.003**	-0.308**	___	0.184
	(2.131)	(1.552)	(1.676)	(3.976)	(1.397)	(.979)	(2.861)	(2.791)		

Table 3 Regression Analysis of Short-run and Long-run Abnormal Returns

This table reports results on regressions of acquirers' three-day announcement returns (calculated using the CRSP equally weighted index) and BHARs for the three years post acquisitions on the variables. See Appendix A for variable definitions. Standard errors are clustered by year. Industry and year dummies are included but not reported. Robust t-statistics are provided in parentheses. *, **, and *** indicate significance at the 1%, 5%, and 10% levels, respectively.

VARIABLES	(1) Announcement Returns	(2) BHAR Year +1	(3) BHAR Year 1& 2	(4) BHAR Year 1, 2, & 3
Residual	0.099***	0.413***	1.499***	1.624***
	(4.33)	(2.72)	(2.77)	(2.76)
SmallAcquirer	-0.001	-0.065	0.001	-0.070
	(-0.17)	(-1.64)	(0.01)	(-1.03)
RelativeSize	-0.021***	0.009	0.039	0.027
	(-3.87)	(0.22)	(0.47)	(0.24)
Diversify	-0.002	-0.025	-0.024	0.022
	(-0.58)	(-0.83)	(-0.57)	(0.38)
Pooling	-0.001	0.028	-0.003	0.072
	(-0.20)	(0.63)	(-0.04)	(1.05)
Stock	-0.029***	0.022	-0.075	-0.171***
	(-5.84)	(0.58)	(-1.48)	(-3.00)
Tender	0.003	0.002	-0.035	-0.081
	(0.53)	(0.04)	(-0.44)	(-0.93)
PreAnnReturn	0.061**	-0.512***	-0.642**	-0.741***
	(2.49)	(-4.00)	(-2.70)	(-3.38)
MTB	-0.005**	-0.013	-0.054*	-0.054
	(-2.26)	(-0.97)	(-1.87)	(-1.53)
Accruals	-0.002	-0.243	0.219	0.569
	(-0.08)	(-1.39)	(0.74)	(1.39)
NOA	0.000	-0.003	-0.002	0.003
	(0.02)	(-0.55)	(-0.33)	(0.33)
AcquirerCash	-0.030*	0.024	0.374	0.389
	(-1.95)	(0.24)	(0.64)	(0.62)
Constant	0.065***	-0.022	0.100	-0.204
	(9.55)	(-0.07)	(0.96)	(-1.30)
Year & Industry Fixed Effects	Yes	Yes	Yes	Yes
Observations	1,478	1,427	1,394	1,315
Adjusted R-squared	0.10	0.05	0.05	0.05

Table 4 Regression Analysis of Post-acquisition Operating Performance

This table reports regressions of acquirers' ROA for the three years post acquisitions on the variables. Match_ROA is ROA for matching non-acquirers. For each acquirer, we find a matching non-acquirer using the following procedure: Candidate matching firms for an acquirer are those listed on the AMEX, NYSE, or Nasdaq with the same 2-digit SIC codes and with asset size at the end of fiscal year before the deal announcement date that is 50% to 200% of the asset size of the acquirer. From this set of firms, those that have not made an acquisition during the three years prior to and three years after the deal announcement year are ranked based on their M/B. The firm with the closest MTB is chosen as the matching non-acquirer. See Appendix A for all the other variable definitions. Industry and year dummies are included but not reported. t-statistics are provided in parentheses. *, **, and *** indicate significance at the 1%, 5%, and 10% levels, respectively.

VARIABLES	(1) ROA Year +1	(2) ROA Years 1& 2	(3) ROA Years 1, 2, & 3
Residual	0.546***	0.534***	0.396***
	(9.99)	(6.02)	(5.07)
SmallAcquirer	-0.031***	-0.058***	-0.049***
	(-3.53)	(-4.52)	(-3.47)
RelativeSize	-0.037***	-0.035***	-0.028**
	(-4.57)	(-3.16)	(-2.64)
Diversify	-0.011**	-0.013**	-0.007
	(-2.33)	(-2.42)	(-1.19)
Pooling	0.044***	0.034**	0.028**
	(4.68)	(2.63)	(2.19)
Stock	-0.026***	-0.029***	-0.037***
	(-3.10)	(-3.89)	(-4.43)
Tender	-0.004	-0.006	-0.007
	(-0.69)	(-0.75)	(-0.82)
PreAnnReturn	-0.026	-0.010	-0.055
	(-0.61)	(-0.20)	(-1.56)
MTB	0.012***	0.010*	0.009*
	(3.72)	(1.82)	(1.87)
Accruals	-0.143***	-0.108	-0.020
	(-4.19)	(-1.40)	(-0.26)
NOA	0.000	0.002	0.003*
	(0.21)	(0.98)	(2.02)
AcquirerCash	-0.155***	-0.109***	-0.116***
	(-6.86)	(-4.29)	(-4.18)
Match_ROAYear+1	0.136***		
	(6.80)		
Match_ROAYear+2		0.022	
		(0.51)	
Match_ROAYear+3			0.073**
			(2.15)
Constant	0.124***	0.163***	0.224***
	(6.78)	(8.09)	(4.89)
Year & Industry Fixed Effects	Yes	Yes	Yes
Observations	1,424	1,348	1,224
Adjusted R-squared	0.30	0.23	0.23

Table 5 Hedge Returns to Investment Strategies based on Acquirer's Residuals and M/B

Panel A shows returns to a strategy of shorting all low-residual acquirers and going long on all high-residual acquirers. Panel B shows returns on a strategy of shorting all high-M/B acquirers and going long on all low-M/B acquirers. For each year, acquirers are sorted into quintiles by their MTB at the fiscal quarter-end preceding the acquisition announcement date. The quintile with the lowest (highest) MTB is defined as "low-MB" ("high-MB") acquirers. Low- (high-) residual firms are identified as using bottom (top) quintiles of acquirers' residual estimates in the fiscal year-end prior to acquisition announcement. Abnormal returns are calculated using the DGTW benchmark portfolio matched to each acquirer on size, industry-normalized M/B, and momentum. Positions are taken on the day following the target delisting and are closed out one year, two years, and three years later. See Appendix A for variable definitions.

Panel A Long High-Residual and Short Low-Residual Acquirers

	Year 1	Year 1& 2	Year 1,2, & 3
Panel B	Return	Return	Return
Long	0.5%	4.1%	0.5%
Short	−6.4%	−15.2%	-23.3%
Long-Short	6.9%	19.3%	22.8%
p-value	0.08	<0.00	<0.00

Panel B Long Low-MTB and Short High-MTB

	Year 1	Year 1& 2	Year 1,2, & 3
Panel A	Return	Return	Return
Long	7.5%	15.4%	15.7%
Short	-3.1%	-7.5%	0.03%
Long-Short	10.6%	22.9%	12.4%
p-value	0.01	< 0.00	0.23

Table 6 Long-run Stock Returns in Calendar-Time Returns

This table presents stock return results on calendar-time portfolios. Panel A presents a pooled portfolio regression:

$$R_{p,t} - R_{f,t} = a_p + b_p\left(R_{m,t} - R_{f,t}\right) + s_p\, SMB + h_p\, HML + m_p\, MOM + \delta_1\, D_{low} + \delta_2\, D_{low} \times \left(R_{m,t} - R_{f,t}\right) + \delta_3 D_{low} \times SMB + \delta_4\, D_{low} \times HML + \delta_5\, D_{low} \times MOM + e_{p,t}$$

Where the dummy variable D_{low} equals one if the event portfolios is a low residual return and zero otherwise. Difference in the performance of high- and low- residual acquirers is captured by the coefficient δ_1. Low- (high-) residual firms are identified by using top (bottom) quintile of all acquirers' residual estimates in the fiscal year-end prior to acquisition announcement. Each month from 1980-2005, a portfolio is formed based on acquirers' residual estimates and from all sample firms that completed an acquisition in the previous one year (1st column), in the previous two years 2nd column), and the previous three years (3rd column). t-statistics are provided in the parenthesis. *, **, and *** indicate significance at the 1%, 5%, and 10% levels, respectively. Panel B presents abnormal returns on the investment strategy of shorting all low-residual acquirers and going long on all high-residual acquirers. Abnormal returns are calculated using the DGTW benchmark portfolio matched each acquirer on size, industry-normalized M/B, and momentum.

Panel A

VARIABLES	(1) Prior 12 months	(2) Prior 24 months	(3) Prior 36 months
$R_{m,t} - R_{f,t}$	0.109***	0.050*	0.042*
	(2.62)	(1.90)	(1.95)
SMB	-0.043	-0.029	-0.034
	(-0.79)	(-0.85)	(-1.22)
HML	0.036	0.020	0.008
	(0.57)	(0.49)	(0.24)
MOM	0.048	0.028	0.013
	(1.29)	(1.17)	(0.68)
D_{low}	-1.754***	-1.836***	-1.781***
	(-5.23)	(-8.59)	(-10.33)
D_{low} *x* $(R_{m,t} - R_{f,t})$	0.102	0.047	0.002
	(1.29)	(0.92)	(0.04)
D_{low} *x SMB*	0.104	0.069	0.024
	(1.04)	(1.09)	(0.46)
D_{low} *x HML*	0.253**	0.114	-0.031
	(2.05)	(1.45)	(-0.49)
D_{low} *x MOM*	-0.087	-0.117***	-0.040
	(-1.23)	(-2.60)	(-1.11)
Intercept	1.322***	1.472***	1.474***
	(7.83)	(13.66)	(16.98)
Observations	601	601	601
Adjusted R-squared	0.06	0.13	0.17

Panel B

High vs. Low Residuals

	Prior 12 months Monthly Return	Prior 24 months Monthly Return	Prior 36 months Monthly Return
long	0.42%	0.42%	0.40%
short	-1.05%	-1.29%	-1.80%
Long-Short	1.46%	1.71%	2.20%
p-value	0.05	<0.00	<0.00

Table 7 Regressions Relating Residuals to Post-acquisition Performance: Robustness Tests

This table reports the coefficients on the residual variable for different regression specifications and using subsamples. Panel A reproduces the benchmark results from Tables 3 and 4. In the other panels, we vary either the sample period or the specification. All regressions include the same set of explanatory variables as those reported in Tables 3 and 4.

Explanatory Variables	BHAR Year +1	BHAR Year1&2	BHAR Year1,2,&3	ROA Year +1	ROA Year1&2	ROA Year1,2,&3
Panel A: Full sample (Replication of Tables 3 and 4)						
Residual	0.413***	1.499***	1.624***	0.546***	0.534***	0.396***
	(2.72)	(2.77)	(2.76)	(9.99)	(6.02)	(5.07)
Panel B: Sub-period 1980-1994						
Residual	0.871**	2.407**	3.324***	0.526***	0.587***	0.387**
	(2.17)	(2.56)	(4.22)	(5.21)	(3.67)	(2.66)
Panel C: Sub-period 1995-2005						
Residual	0.180**	1.312**	1.322**	0.564***	0.553***	0.393***
	(2.60)	(2.82)	(2.73)	(9.33)	(5.31)	(6.18)
Panel D: Use EBITDA/Avg Assets as ROA						
Residual	----	----	----	0.541***	0.531***	0.389***
	----	----	----	(9.66)	(5.91)	(4.93)

Figure 1 Histogram of Residual Estimates of Acquiring Firms

This figure plots the frequency distribution of residual estimates of the 1,507 sample acquiring firms. The residuals are obtained from regression residual of regressing industry adjusted abnormal return on assets on invested capital and other variables:

$$ADJAbn\_ROA_{i,t} = \beta_0 + \beta_1 * InvestCap_{t-1} + \beta_2 * InvestCap_{t-2} + \beta_3 * InvestCap_{t-3} + \beta_4 * Age_{t-1} + \beta_5 * Leverage_{t-1} + \beta_6 * LnSize_{t-1} + \beta_7 * MTB_{t-1} + e_{i,t}$$

See Appendix A for variable definitions. The regressions are run by industry and year, where industry classification is based on Fama French 48 industries.