An Efficiency Perspective on the Gains from Mergers and Asset Purchases

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Abstract

A rational, efficiency-based view of acquisitions implies that larger transactions generate greater gains for the acquirer and the seller. We test this prediction and find a positive relationship between acquirer abnormal returns and transaction size scaled by the acquirer size. This relationship holds for many classes of acquisitions, including asset purchases and mergers that target private firms. We find a similar relationship between total abnormal returns and relative transaction size. The results suggest that, in general, acquisitions help shift capital to more productive owners. Furthermore, we present evidence demonstrating that the average acquirer captures a significant portion of the total gains generated from an acquisition.

KEYWORDS: acquisitions, efficiency gains, capital reallocation

Do acquisitions lead to gains for acquirers and where do they come from? These questions have been vigorously debated since the pioneering work by Jensen and Ruback (1983).[1] A rational, efficiency-based argument suggests that the gains to the acquirer, as measured by the abnormal return, would increase with the transaction size relative to the size of the acquirer (relative transaction size). Simply put, if there were economic gains to be had from acquisitions, one would expect larger transactions to generate greater economic gains. We test whether such a relationship holds and investigate how it varies with acquirer and deal characteristics.

Mulherin and Boone (2000) argue that positive synergies from acquisitions would imply a positive covariation between total acquirer and seller abnormal returns and relative size. The formal models of Jovanovic and Rousseau (2002), Eisfeldt and Rampini (2006), Warusawitharana (2008), and Yang (2008) indicate that acquisitions can serve to shift capital to more productive owners. These models imply that the gains would be increasing in the transaction size and that the acquirer and the seller would share the gains from the acquisition. These ideas motivate our hypothesis that *acquirer gains from acquisitions, as measured by abnormal returns, increase with the relative transaction size.* We will subsequently discuss whether alternate models of acquisitions can generate this relationship.

We test this hypothesis by employing regressions of acquirer abnormal returns on the relative transaction size. A positive point estimate indicates that relatively large transactions generate greater gains for the acquirer. We interpret this as evidence that acquirers generate gains by increasing the value of the acquired assets, and that they capture some of these gains. We use the term 'efficiency gains' to refer to such gains. Interaction regressions test whether efficiency gains vary with acquirer and deal characteristics. We also perform an alternative test by regressing total abnormal returns on relative transaction size. This focuses on the total gains generated from the transaction while ignoring whether acquirers share these gains.[2]

We perform our analysis on a large data set of acquisitions obtained from the SDC Platinum database. We examine whether our hypothesis holds for all acquisitions as well as for mergers and asset purchases separately.[3] The prior literature suggests that acquirers generate greater gains from asset purchases than mergers (see Hite et al., 1987 and Andrade et al., 2001). We also examine whether other characteristics affect the relationship between acquirer returns and relative size.

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[1] See Jarrell et al. (1988); Mitchell and Lehn (1990); Eckbo et al. (1990); Andrade et al. (2001) and Mitchell et al. (2004).

[2] We thank the editor and a referee for highlighting this issue.

[3] An acquisition could be either a merger or an asset purchase. A merger involves a combination of two firms into one. An asset purchase involves a transfer of some assets from one firm to another. The legal distinction between these two types of acquisitions codifies this difference.

We find surprising power for our test. The regression coefficient for relative value varies with many characteristics known to affect acquirer returns. Interpreting a positive relative value coefficient as evidence of efficiency gains, we find that:

- Asset purchases generate efficiency gains for acquirers, but mergers do not.

- Mergers with private targets generate efficiency gains and mergers with public targets do not.

- Efficiency gains from mergers do not vary with whether the acquirer uses stock financing or not.

- Acquisitions, in particular mergers, by small firms generate higher efficiency gains than those by large firms.

These results demonstrate that efficiency gains to the acquirer vary sharply with acquirer and deal characteristics.

At first glance, these results appear to conflict with the view that acquirers, in general, do not capture much gains from acquisitions. One reason for the difference is that we perform our analysis on all acquisitions, while many papers focus only on mergers, which tend to be more visible transactions. While we also find that acquirers do not generate gains from mergers, this ignores the gains to be had from asset purchases as well as the variation within mergers. We also find that acquirers capture a significant portion of the total gains from acquisitions. Focusing only on transactions that generated positive abnormal returns for at least one participant, we find that mean acquirer's share of the total abnormal return from the transaction equals 40%. The large acquirer's share arises from the fact that although seller abnormal returns tend to be larger, they apply to a smaller equity total as the selling firm is typically much smaller than the acquiring firm. To the best of our knowledge, the existing literature has not documented the acquirer's share of abnormal returns from acquisitions.

We also investigate whether combined acquirer and seller abnormal returns vary with the relative transaction size with respect to the sum of the acquirer and seller equity values. This provides a test of whether acquisitions generate overall gains while ignoring the acquirers' share of these gains. We find a positive relationship between total abnormal return and relative size for asset purchases and mergers, consistent with the acquirer regressions. This indicates that acquisitions help shift capital to more productive owners in the economy. Combined with the evidence on the acquirer regressions, this suggests that sellers capture most of the gains from mergers while acquirers capture some, but not all, of the gains from asset purchases.

The reader may wonder about possible alternate explanations for the positive relationship between abnormal returns and relative size we interpret as evidence

of efficiency gains.[4] Models of acquisitions based on empire building (Jensen and Meckling, 1976), managerial hubris (Roll, 1986), or misvaluations (Shleifer and Vishny, 2003) do not imply a positive relationship between abnormal returns and transaction size. Alternative interpretations of the relative size coefficient include Asquith et al. (1983), who argue that it captures the effect of downward sloping demand curves for equity, and Martin (1996), who uses it as a measure of information asymmetries between acquirer and target. These interpretations would have difficulty explaining the sharp variation we find in the regression coefficient for relative size.

The paper is organized as follows. Section 2 discusses our identification of efficiency gains from acquisitions. Section 3 presents the data set and some initial findings. Section 4 presents the empirical analysis and Section 5 concludes.

1   Identifying efficiency gains

A rational efficiency-based argument states that acquisitions help shift assets to more productive owners. Assuming acquirers capture some of the gains, the productivity improvements imply that acquirer gains increase with the size of the acquisition. For example, consider a hypothetical firm that always increases the value of acquired assets by 5%. A larger acquisition by this firm will lead to a bigger increase in shareholder value, which would be reflected in a higher abnormal return. Thus, abnormal returns would covary positively with relative transaction value for all acquisitions made by this hypothetical firm, reflecting the increase in the value of the acquired assets. This intuition motivates using the sensitivity of acquirer abnormal returns to relative transaction size as a measure of efficiency gains from acquisitions.

1.1   Empirical implementation

The empirical analysis employs regressions of acquirer abnormal returns on relative transaction size. The acquirer abnormal return provides a noisy measure of the anticipated gains from the acquisition.[5] Consider running the following regression

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[4]Holmstrom and Kaplan (2001) argue that capital markets improve the efficiency of the allocation of capital to firms. Devos et al. (2009) use Value Line forecasts to examine the sources of gains from mergers, and find that most gains arise from capital reallocation. Kaplan (2000) details some case studies on the source of gains from acquisitions. Maksimovic and Phillips (2001) document that acquisitions lead to productivity improvements in manufacturing plants. Yan (2006) examines merger waves from an efficiency perspective.

[5]Kaplan and Weisbach (1992) show that acquirer abnormal returns are higher for *ex post* successful acquisitions.

on a sample of acquisitions:

$$AR_i = \beta RS_i + \gamma Z_i + \epsilon_i, \tag{1}$$

where AR_i denotes the abnormal return, RV_i measures relative transaction size, and Z_i denotes other controls for the ith acquisition. The relative (transaction) size is defined as the transaction value divided by the market value of the acquirer's equity. A positive β coefficient demonstrates efficiency gains in the sample.

The point estimate for β also has a simple economic interpretation. Consider an all equity firm. β measures the sensitivity of the firm's value to changes in the firm size from acquisitions. Assuming the abnormal return reflects the difference in the value of the acquired assets and the purchase price, β can be interpreted as percentage change in the value of the acquired assets. This analysis extends to a firm with debt if shareholders capture all the gains from the acquisition.

The empirical method employed in the study estimates efficiency gains assuming that acquisitions generate a proportional increase, β, in target value. A more plausible model of acquisitions would be one in which acquirers only elect to engage in acquisitions that generate gains greater than the fixed costs of the transaction.[6] In this case, an acquirer would require a higher percentage value increase from a small target than a large target before electing to acquire it. This effect weakens any positive relationship between abnormal returns and relative value that arises due to efficiency gains, thereby making our subsequent finding of a positive relationship all the more striking.[7]

One can extend the analysis to test whether efficiency gains vary with a characteristic X using an interaction regression. Augmenting the above regression with an interaction term for X times RS_i yields the following:

$$AR_i = \beta_1 RS_i + \alpha_1 X_i + \delta_1 (RS_i \times X_i) + \gamma_1 Z_i + \epsilon_i. \tag{2}$$

A statistically significant positive coefficient for δ_1 indicates that efficiency gains increase as the characteristic X increases. In addition, if the inclusion of the interaction term changes the α_1 coefficient to zero, one can infer that the characteristic X affects abnormal returns primarily due to differences in efficiency gains. Thus, our results inform the debate on the source of gains from acquisitions (see Bruner, 2004, Chapter 3 for a broad survey of the sources of gains from acquisitions).

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[6]These fixed costs could include restructuring costs and fees to lawyers, accountants, and investment bankers.

[7]We thank the editor for this observation.

One potential issue is the appropriate scaling for the transaction size. In most of the subsequent analysis, we follow the literature and scale by the market value of equity. An alternative method scales the transaction size by the market value of the firm.[8] The above reasoning applies for this measure as well, with positive coefficient values implying efficiency gains. However, the estimated coefficients will vary due to the presence of leverage in the sample. The coefficient will present a more accurate measure of efficiency gains if both shareholders and bondholders share the gains from the transaction. We tackle this issue by first reporting the results for scaling transaction value by equity value and then discussing the results for scaling by firm value in the robustness section.

1.2 Alternative explanations

Our analysis builds on the argument that a positive relative size coefficient captures efficiency gains from acquisitions. This subsection examines whether alternative theories of acquisitions imply a positive relative size coefficient. An empire-building hypothesis, such as in Jensen and Meckling (1976), predicts a negative relationship between the abnormal return and the relative transaction value. Empire-building managers would seek larger acquisitions even at the cost of potential shareholder losses. The free cash flow based theory of Jensen (1986) also implies a negative relationship between transaction size and abnormal returns. One can plausibly argue that managerial hubris would affect decision making regarding larger acquisitions more than smaller acquisitions (see Roll, 1986). This would lead to a negative relationship between abnormal returns and relative size. Therefore, a positive relative size coefficient would not be consistent with the agency based theories of acquisitions.

Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004) present merger models based on market misvaluation. These models suggest that transaction size would increase with the overvaluation of the acquirer. If the abnormal return captures the degree of overvaluation, then larger transactions would lead to lower abnormal returns. The technology based acquisition model of Braguinsky and Jovanovic (2004) and the search model of Rhodes-Kropf and Robinson (2008) do not make any predictions relating transaction size to the abnormal return. The property rights approach of Hart (1995) does not imply a relationship between abnormal returns and transaction size. The real options model of Morrelec and Zhdanov (2005) relates abnormal returns to the underlying cash flow process of the

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[8]The market value of the firm equals the book value of assets + market value of equity - book value of equity - deferred taxation.

firms, but not the relative transaction size. Thus, other models of acquisitions do not imply a positive relative size coefficient.

The above discussion demonstrates the robustness of our argument that positive relative size coefficients in acquisitions capture efficiency gains arising from reallocating capital to more productive owners. Other models of acquisitions do not make this prediction, and in particular, would have trouble explaining the sharp variation in the relative size coefficient observed across different acquisitions.

2   Data

This study uses data from the SDC Platinum Mergers and Acquisitions database to construct the sample. Thomson Financial Services maintains the database, which provides a comprehensive list of acquisitions by U.S. companies. The sample dates from 1/1/1985 to 12/31/2006. The sample includes transactions between listed firms, their subsidiaries, and private firms. The data set consists of all transactions identified as either mergers, acquisitions, acquisition of assets, or acquisition of certain assets by the SDC 'Form of the Deal' variable.[9] We treat the first two transaction types as mergers, and the last two types as asset purchases. The results rely on the accuracy of SDC in identifying transactions which combine two firms together (mergers) and those involving the acquisition of some part of a firm (asset purchases). A careful reading of news articles about a subsample of transactions revealed that the SDC classification scheme works well, except for transactions involving private firms. To mitigate this concern, we replicate the comparison after eliminating transactions with private targets and find similar results.

Our sample selection yields a large data set of acquisitions. While there are benefits to examining a broad sample, one may also be concerned about potential errors in the data set. A conversation with an SDC employee and examination of the data revealed that their coverage improved sharply beginning in 1985, leading us to begin our sample from then onwards. We rely on SDC for two variables that are central to our analysis: the transaction date and the transaction size. We check for the accuracy of this data by using Factiva® to search for news articles on 500 asset purchases.[10] We focus on asset purchases as this data may have more errors than the merger data. We found information on 388 transactions. The announcement dates found using Factiva® equal the date reported in SDC to within 1 business day in 92% of the matched transaction. The transaction value from Factiva® is within 5% of the SDC value in 88% of the matched transactions. This gives us comfort in the accuracy of the SDC data we use in our analysis.

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[9]We exclude transactions where a firm takes a minority interest in another.

[10]We thank David Cho for assisting with this task.

We match the SDC sample to CRSP and Compustat using Cusip numbers. The SDC sample includes information on the announcement date, participants' industry codes, the method of payment, number of bidders, whether it is a tender offer and whether it is a hostile bid. The final sample excludes records with missing transaction values. We also eliminate transactions with relative transaction size below the 5th percentile and above the 95th percentile. Our robustness checks include using different relative size cut-offs as well as Winsorizing relative size at different percentiles.

The study computes abnormal returns over a three-day window centered on the announcement date of the transaction. A three-day window captures both information leakages prior to the announcement, as well as the impact of deals announced after the close of trade. Abnormal returns are computed as the excess over the CAPM return, implemented using the equally weighted CRSP index as the market portfolio. The benchmark returns are computed from the daily returns over a one year period ending one month prior to the acquisition. Using the same data, we also construct and use as a control variable the stock price run-up in the period from one month to one week prior to the acquisition. We check the robustness of our results to different computations of benchmark returns.

2.1 Summary statistics

Table 1 presents the summary statistics for the variables used in the study. Panels A and B reports values for asset purchases and mergers, respectively. The study defines the relative transaction size as the transaction size scaled by the market value of equity.[11] The firm characteristics are computed as of the end of the fiscal year prior to the transaction, thereby ensuring that these variables are predetermined. The regression specifications use industry median values of the firm characteristics to mitigate endogeneity concerns. The baseline results use industry median values of cash flow, Tobin's Q, and book leverage as control variables. Cash flow is defined as income before extraordinary items plus depreciation scaled by book assets and Tobin's Q equals the market value of assets scaled by book assets. A within industry dummy equals 1 if both the acquirer and the seller have the same 2-digit SIC classification code. The controls include these industry characteristics, a measure of industry M&A activity constructed following Schlingemann et al. (2002), a dummy variable for public targets, a dummy for high tech firms as in Loughran and Ritter (2004), the stock price run-up from a month to a week prior to the acquisition, and year and industry dummies. We also use as controls a dummy variable for tender

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[11]We compute market value of equity using CRSP data on share prices and shares outstanding 2 days prior to the announcement date.

Table 1: Summary statistics for acquirers in mergers and asset purchases

The table reports the summary statistics for the independent variables used in the study. The sample of acquisitions is obtained from the SDC Platinum database and dates from 1/1/1985 to 12/31/2006. Mergers include transactions identified as mergers or acquisitions by the 'Form of the Deal' variable in SDC, and asset purchases include transactions identified as acquisition of assets and acquisition of certain assets. The sample includes only transactions for which SDC reports a deal value. Section 2 details the variable construction. The study obtains firm characteristics from CRSP and Compustat. The table reports the industry median values for the firm characteristics, which subsequently function as controls in the regressions.

Panel A: Asset purchase acquirers

Variable	Mean	Std. Dev	N
Relative size	0.129	0.176	7956
Log size	5.683	1.961	7956
Stock dummy	0.054	0.226	7956
Public target	0.003	0.057	7956
Tobin's Q	1.546	0.465	7956
Cash flow	0.066	0.064	7952
Leverage	0.193	0.146	7956
Industry M&A	0.049	0.059	7956
Same industry	0.61	0.488	7956

Panel B: Merger acquirers

Variable	Mean	Std. Dev	N
Relative size	0.194	0.235	4394
Log size	5.943	2.105	4394
Stock dummy	0.367	0.482	4394
Public target	0.407	0.491	4394
Tobin's Q	1.65	0.535	4394
Cash flow	0.058	0.075	4387
Leverage	0.158	0.144	4394
Industry M&A	0.06	0.07	4394
Same industry	0.584	0.493	4394

offers, a dummy variable for hostile bids, and the number of public bidders for the acquisition.[12] Boone and Mulherin (2007) demonstrate that the number of bidders far understates the level of competition among bidders.

Comparison of the values in Panels A and B of Table 1 reveals that there are few differences in acquirer characteristics between mergers and asset purchases.[13] Acquirers in both transactions have similar values for firm size, industry median Q, cash flow and leverage. Asset purchases are relatively smaller than mergers, which would be consistent with these transactions being acquisitions of parts of firms. There are more mergers involving high-tech firms. A substantially larger fraction of mergers involves pure stock transactions, suggesting that market timing matters less for asset purchases. Most asset purchases involve subsidiaries of firms, whereas few mergers do. In general, the results indicate many similarities and a few differences between mergers and asset purchases.

2.2   Univariate analysis

This study argues that the covariation of abnormal returns with relative transaction size provides a measure of efficiency gains from acquisitions. Table 2 presents the mean abnormal return for all acquisitions, asset purchases, and mergers sorted by the relative transaction size. The relative transaction size bins are constructed using the 33rd and 67th percentiles as cutoff values.

Panels A and B present the mean abnormal returns for acquirers and the mean total abnormal returns for acquirers and sellers, respectively. The total abnormal return equals the sum of the acquirer and seller abnormal returns weighted by their respective equity values. On average, asset purchases lead to higher gains to the acquirer (1.25%) than mergers (0.47%).[14] These values qualitatively match the findings of Hite et al. (1987) and Slovin et al. (2005), who document significant gains to buyers from asset purchases. On the other hand, mergers generate higher total abnormal returns than asset purchases, suggesting that sellers capture a substantially greater portion of the gains from mergers than asset purchases.

The results reveal a clear increase in the mean abnormal return with the relative transaction size, for both the acquirer and total abnormal returns. The acquirer returns increase with relative size for asset purchases much more sharply than for mergers. The mean abnormal return difference between asset purchases in the

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[12]The tender offer dummy applies only for either all acquisitions or the merger sample as none of the asset purchases involve a tender offer.

[13]Harford (2005) and Warusawitharana (2008) present logistic regressions on the determinants of firms' decisions to engage in mergers and asset purchases.

[14]We find a negative value-weighted mean abnormal return for large mergers, consistent with the findings of Moeller et al. (2005).

Table 2: Abnormal returns by relative size of the transaction

The table reports the mean percentage abnormal return around a 3-day window for acquirers in mergers and asset purchases. The sample of acquisitions is obtained from the SDC Platinum database and dates from 1/1/1985 to 12/31/2006. The categorization of deals into mergers and asset purchases follows the SDC variable 'Form of the Deal'. The abnormal returns are computed over a 3-day window around the announcement date. The benchmark returns are computed using the CAPM over a window of (-274, -23) days prior to the announcement. Panel A reports the mean abnormal returns for acquirers involved in asset purchases and mergers. The table reports results for 3 bins, categorized by relative deal size and separated into the entire sample, the sample of asset purchases, and the sample of mergers. The cutoff values are set at the 33rd and 67th percentiles of the distribution for the relative size of the transaction. Panel B reports the same results for total abnormal returns computed as the value-weighted sum of acquirer and seller abnormal returns.

Panel A: Acquirer abnormal returns

Relative size bins	Transaction type		
	All transactions	Asset purchases	Mergers
Small	0.16	0.08	0.38
Medium	0.97	1.06	0.44
Big	1.78	2.61	0.58
Total	0.97	1.25	0.47

Panel B: Total abnormal returns

Relative size bins	Transaction type		
	All transactions	Asset purchases	Mergers
Small	0.09	0.15	0.41
Medium	0.65	0.06	0.61
Big	1.87	2.71	2.46
Total	0.87	0.58	1.16

largest and smallest bins is an economically significant 2.53%. On the other hand, we find a more uniform increase in the total abnormal return with both mergers and asset purchases.

The univariate statistics reveal sharp differences in the mean abnormal returns with the relative transaction size. Such univariate statistics fail to control for other variables. We subsequently employ linear regressions to formally test the hypotheses that acquirer and total gains from acquisitions vary with relative transaction size.

2.3 Acquirer's share of the gains from acquisitions

The efficiency-based models of acquisitions that motivate our analysis imply that acquirers capture a portion of the gains from acquisitions. The literature suggests that sellers capture most, if not all, of the gains from acquisitions. We document that this is, in fact, not true and that acquirers capture a significant portion of the gains from acquisitions.

To compute the acquirer's share, we eliminate transactions for which the seller is not a publicly traded firm. This reduces our sample size substantially from 12,339 to 3,401. We compute the total gain from the acquisition as the sum of the abnormal return times shares outstanding for the acquirer and the seller. We then drop 507 transactions where both the acquirer and the seller abnormal returns are negative. We assign an acquirer's share of 0 [1] for transactions where the acquirer has a negative [positive] abnormal return and the seller a positive [negative] return. The acquirer's share for transactions with positive returns for both parties is defined as the fraction of the total gains accruing to the buyer.

The mean (median) value of the acquirer's share equals 40% (18%), indicating that acquirers capture a substantial portion of the total gains from acquisitions.[15] The estimate is likely to be a lower bound of the true share as the above construction discards transactions with private targets, which generate higher gains for acquirers, due to the lack of seller stock price data. The acquirers capture a large share even though seller abnormal returns are substantially larger, on average, due to the fact that acquiring firms tend to be much larger than targets. Thus, the acquirer abnormal returns applies to a much larger equity base than the seller abnormal return, resulting in a fairly even sharing of the total abnormal return.

Figure 1 plots the histogram for the acquirer's share. The first and last columns correspond to transactions where the acquirer's share equals 0 and 1, respectively. The figure demonstrates that acquirers' shares, conditional on a positive value, are

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[15]The mean (median) value of the acquirer's share increases to 45% (42%) when we limit the sample to transactions to those with only positive total abnormal returns.

Figure 1: Histogram of acquirer's share of the total abnormal return

The figure plots the acquirer's share of the total abnormal return for transactions that generated a positive abnormal return for the acquirer or the seller. The figure excludes 507 transactions with negative abnormal returns for both the acquirer and the seller. The acquirer's share equals 0 or 1 for transactions with positive abnormal returns for only the seller or the acquirer, respectively. These transactions are shown in the first and last columns. The acquirer's share when both abnormal returns are positive is defined as the acquirer's abnormal return times equity value divided by the sum of the acquirer and seller's abnormal return times equity value. These transactions are plotted in the columns in between the first and the last columns.
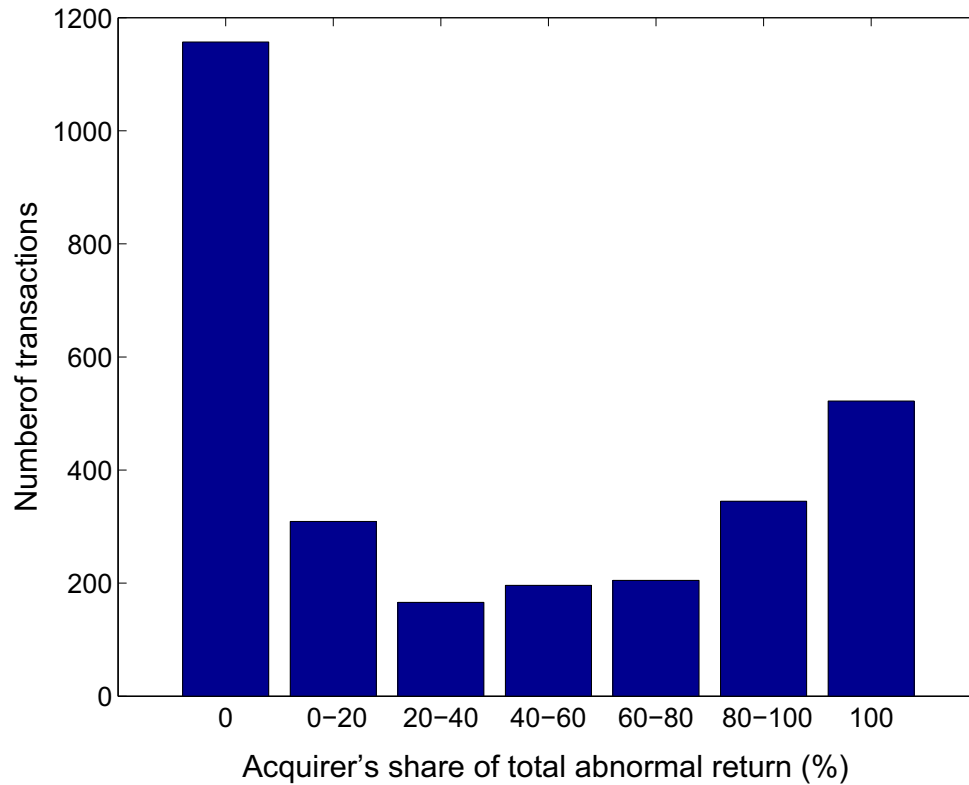
fairly uniformly distributed and demonstrates that acquirers capture a significant portion of the total gains from acquisitions. This supports our analysis on whether acquirer gains are related to gains from shifting capital to more productive owners.

3   Results

The empirical analysis examines whether the relationship between abnormal returns and relative size varies across acquirer and deal characteristics. The results also provide rough estimates of the level of efficiency gains from different acquisitions.

3.1   Are there efficiency gains?

The initial analysis focuses on establishing the presence of efficiency gains in acquisitions. We carry out this analysis for all acquisitions, as well as for mergers and asset purchases, separately. We consider mergers and asset purchases separately as, based on previous results, one may expect a transfer of assets via an asset purchase to be more influenced by efficiency considerations than combining two firms into one via a merger.

Table 3 presents the results of a regression of acquirer abnormal return on relative transaction size for various samples. The statistically significant and positive coefficient on relative value indicates that acquisitions, as a whole, generate efficiency gains. A 1% increase in the firm size via an acquisition increases the share price of the acquirer by 0.035%.[16] This translates to an economically meaningful average increase in the value of the acquired assets of 3.5%.

Separating the sample into mergers and asset purchases reveals significant differences in efficiency gains from these types of acquisitions. Increasing the size of the firm by 1% via an asset purchase leads to an increase in the acquirer abnormal return of 0.062%. This corresponds to an increase in the value of the acquired assets of 6%. On the other hand, mergers do not result in efficiency gains for acquirers. This may be either due to target shareholders obtaining all the gains from the merger, or due to the greater complexity involved in integrating two firms together. We do not find a significantly positive impact of stock financing for asset purchases as documented by Slovin et al. (2005).

The absence of a significant negative coefficient on relative size for mergers rejects the hypothesis that empire-building managers engage in value-destroying mergers. If empire-building drives all mergers, then we would expect a negative coefficient on relative value. The negative coefficient on public targets for mergers

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[16]This equals the point estimate on relative size times 0.01.

Table 3: Relative transaction size and abnormal returns

The table reports the results of a regression of acquirer abnormal return on relative size of the transaction and various controls for all transactions, and for the merger and asset purchase subsamples. Section 2 details the construction of the sample. The dependent variable is the abnormal return to the acquirer over a 3-day window around the announcement date. The regressors include unreported year dummies and a stock price run-up variable. The standard errors adjust for heteroskedasticity. $^{+}$, * and ** denote statistical significance at the 10%, 5% and 1% level, respectively.

	All transactions	Asset purchases	Mergers
Relative size	3.516	6.155	0.596
	(0.417)**	(0.551)**	(0.633)
Stock dummy	-0.489	0.193	-0.966
	(0.210)*	(0.417)	(0.273)**
Public target	-2.931	-2.859	-2.892
	(0.242)**	(0.836)**	(0.439)**
Log size	-0.175	-0.132	-0.237
	(0.035)**	(0.042)**	(0.064)**
High-tech	-0.324	0.034	-0.819
	(0.173)$^{+}$	(0.221)	(0.279)**
Number of bidders	0.308	-1.631	0.349
	(0.492)	(1.408)	(0.495)
Tender offer	1.671	-	1.265
	(0.350)**	-	(0.357)**
Hostile flag	0.385	0.903	0.434
	(0.738)	(1.477)	(0.840)
Tobin's Q	-0.532	-0.599	-0.485
	(0.225)*	(0.272)*	(0.397)
Cash flow	-1.678	-1.650	-1.817
	(1.264)	(1.575)	(2.135)
Leverage	-1.181	-1.483	-0.385
	(0.619)$^{+}$	(0.743)*	(1.138)
Industry M&A	0.044	1.666	-1.138
	(1.332)	(1.601)	(2.308)
Same industry	0.087	0.107	0.159
	(0.131)	(0.157)	(0.234)
Observations	12339	7952	4387
Adjusted R-squared	0.034	0.030	0.051

supports the findings of Chang (1998) and Fuller et al. (2002) that mergers involving private targets generate higher abnormal returns. The negative coefficient on leverage matches the findings of Amira et al. (2008).

3.2 Efficiency gains within mergers and asset purchases

Augmenting the previous regression with interaction terms reveals further variation in efficiency gains within mergers and asset purchases.

Table 4: Interactions of relative transaction size and abnormal returns

The table reports the results of a regression of acquirer abnormal return on relative size of the transaction, interactions of the relative size with log asset size, stock payment dummy and public target dummy, and various unreported controls for all transactions, and the mergers and asset purchase subsamples. Section 2 details the construction of the sample. The dependent variable is the abnormal return to the acquirer over a 3-day window around the announcement date. The regressors include unreported control variables, year dummies and a stock price run-up variable. The standard errors adjust for heteroskedasticity. $^{+}$, * and ** denote statistical significance at the 10%, 5% and 1% level, respectively.

	All transactions	Asset purchases	Mergers
Relative size	8.585	8.142	8.751
	(1.203)**	(1.622)**	(1.858)**
Log size	-0.110	-0.090	-0.149
	(0.039)**	(0.046)$^{+}$	(0.073)*
Stock dummy	-0.159	0.280	-0.535
	(0.238)	(0.483)	(0.313)$^{+}$
Public target	-0.912	-2.835	-0.845
	(0.259)**	(0.826)**	(0.467)$^{+}$
Log size $\times$ relative size	-0.464	-0.381	-0.497
	(0.200)*	(0.272)	(0.300)$^{+}$
Stock dummy $\times$ relative size	-1.743	-0.995	-1.512
	(1.252)	(4.206)	(1.328)
Public dummy $\times$ relative size	-8.261	-0.099	-8.565
	(0.951)**	(3.561)	(1.338)**
Observations	12339	7952	4387
Adjusted R-squared	0.048	0.030	0.071

Table 4 presents the results of regressing the acquirer abnormal return for the various samples on relative size, interactions of relative size with various variables, and additional control variables. The unreported control variables include deal characteristics, firm size, acquirer industry characteristics, stock price run-up, and year dummies. The standard errors adjust for heteroskedasticity and the use of predetermined industry characteristics mitigates endogeneity concerns.

The interaction regressions reveal that stock financing by the acquirer plays no role in efficiency gains from acquisitions. This is consistent with the intuition that market participants consider stock financing to be evidence of a potentially overvalued stock price. Thus, the use of stock financing is not informative about the merits of the transaction itself.

The interaction coefficient for acquirer firm size times relative size is negative and significant for all acquisitions and the merger subsample. This suggests that acquirers capture less efficiency gains as their own firm size increases. Moeller et al. (2004) demonstrate that returns to acquisitions decrease with firm size. They search for potential explanations for this finding and conclude by arguing that managerial hubris and empire-building have a greater impact on acquisitions by large firms. Our results indicate that a decrease in efficiency gains accounts for some, but not all, of the impact of firm size on acquirer returns.

In a similar vein, we find that efficiency gains vary with whether the target is publicly held or not. This difference is both economically and statistically significant. However, this matters only for mergers and not asset purchases. The results suggest that variation in efficiency gains may account for the finding of Hansen and Lott (1996), Chang (1998), and Fuller et al. (2002) that mergers targeting public firms have lower returns. This may also be a result of acquiring firms capturing a liquidity discount when acquiring privately owned firms as argued by Officer (2007).

3.3 Split sample analysis

One concern with the previous analysis is that it lumps together a large number of acquisitions over a long time period during which acquisition activity varied substantially. Table 5 examines whether our results are sensitive to the sample period by replicating the analysis of Table 3 for two subsamples.[17] The first set of results includes acquisitions prior to 1996/01/01 and the second set includes those made afterwards. The difference in the sample size reflects increased acquisition activity in the second time period.

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[17]We thank a referee for suggesting this analysis.

Table 5: Relative transaction size and abnormal returns - sample splits

The table reports the results of a regression of acquirer abnormal return on relative size of the transaction and various controls for all transactions, mergers, and asset purchases after separating the sample into two equal time periods. Section 2 details the construction of the sample. The dependent variable is the abnormal return to the acquirer over a 3-day window around the announcement date. The regressors include unreported year dummies and a stock price run-up variable. The standard errors adjust for heteroskedasticity. $^+$, * and ** denote statistical significance at the 10%, 5% and 1% level, respectively. 'All' and 'AP' refers to results for all transactions and asset purchases, respectively.

| | 1985 - 1995 | | | 1996 - 2006 | | |
	All	AP	Mergers	All	AP	Mergers
Log size	-0.28	-0.16	-0.42	-0.27	-0.10	-0.45
	(0.05)**	(0.06)*	(0.09)**	(0.04)**	(0.05)$^+$	(0.07)**
Relative size	2.71	5.31	0.00	2.44	6.64	-0.98
	(0.65)**	(0.84)**	(1.01)	(0.53)**	(0.71)**	(0.78)
High-tech	0.12	0.64	-0.51	-0.56	-0.20	-0.88
	(0.28)	(0.37)$^+$	(0.43)	(0.22)*	(0.27)	(0.36)*
Stock dummy	-0.79	-0.12	-0.89	-1.45	0.19	-1.58
	(0.28)**	(0.57)	(0.37)*	(0.27)**	(0.55)	(0.37)**
Number of bidders	0.53	-1.99	0.82	-1.24	3.69	-0.91
	(0.59)	(1.28)	(0.60)	(0.67)$^+$	(0.34)**	(0.69)
Tender offer	-0.36	-	0.13	-0.54	-	-0.03
	(0.46)	-	(0.51)	(0.38)	-	(0.42)
Hostile flag	-0.52	-	-0.09	1.09	0.94	1.82
	(0.71)	-	(0.71)	(1.06)	(1.48)	(1.44)
Tobin's Q	-1.00	-1.13	-0.82	-0.42	-0.47	-0.39
	(0.38)**	(0.43)**	(0.69)	(0.28)	(0.34)	(0.49)
Cash flow	-4.37	-3.51	-4.58	-0.24	-1.18	0.06
	(2.50)$^+$	(3.15)	(3.93)	(1.47)	(1.79)	(2.56)
Leverage	-0.11	0.64	-1.49	-1.47	-2.17	0.06
	(0.98)	(1.20)	(1.72)	(0.80)$^+$	(0.94)*	(1.51)
Industry M&A	-2.01	2.05	-5.89	0.03	1.30	-0.02
	(2.53)	(3.13)	(4.52)	(1.53)	(1.83)	(2.61)
Same industry	0.50	0.37	0.69	-0.08	0.01	-0.18
	(0.20)*	(0.24)	(0.36)$^+$	(0.17)	(0.20)	(0.31)
Observations	3854	2430	1424	8485	5522	2963
Adjusted R-squared	0.04	0.05	0.05	0.02	0.03	0.03

The results demonstrate that our main findings on efficiency gains remain essentially unchanged across the two time periods. As before, we find evidence of efficiency from all acquisitions. However, these arise primarily from asset purchases. The point estimates suggest that an asset purchase increases the value of the acquired assets by about 5-7%.

3.4 Total abnormal returns and relative size

The previous analysis focused on the relationship between acquirer abnormal returns and relative size. Those results test the joint hypothesis that acquisitions generate gains by shifting capital to more productive owners, and that acquirers capture some of these gains. A regression of the total abnormal return on relative size tests the broader hypothesis that acquisitions generate efficiency gains while ignoring whether acquirers share these gains.

Table 6 presents the results of this regression for all acquisitions, asset purchases, and mergers. We construct the total abnormal return as the weighted sum of the abnormal returns for the acquirer and the seller, where the weights reflect the respective market values of equity. The relative size equals transaction size scaled by the sum of the acquirer and seller market values of equity. Our sample size drops substantially as the construction of the total abnormal return requires data on the seller's stock price, which is not available for private targets.

The relative size coefficients are significantly positive for both asset purchases and mergers. This indicates that acquisitions, in general, generate economic gains. Mulherin and Boone (2000) find a similar result for their sample. Compared to the results for the acquirer regression, the increased point estimate suggests that sellers also benefit from acquisitions. In particular, the coefficient for mergers now becomes significantly positive, suggesting that sellers manage to capture most of the gains from these transactions. Overall, the results support our argument that acquisitions generate gains by shifting assets to more productive owners.

3.5 Robustness

We examine the robustness of our findings by varying the dimensions of our tests. Our results remain robust to computing abnormal returns using the following approaches: using returns over a 5 day window; computing excess returns over the value-weighted index; and using the Fama-French model as the benchmark. Our baseline sample selection eliminates transactions with relative size lesser than the 5th percentile and greater than the 95th percentile. The robustness checks we perform on the relative size cutoffs include eliminating only deals outside the 2.5th

Table 6: Relative transaction size and total abnormal returns

The table reports the results of a regression of total abnormal returns on transaction size scaled by the sum of the acquirer and seller equity values and various controls for all transactions, and for the merger and asset purchase subsamples. Section 2 details the construction of the sample. The dependent variable is the weighted sum of the abnormal return to the acquirer and the seller over a 3-day window around the announcement date. The weights equal the relative market values of equity prior to the acquisition. The regressors include unreported year dummies and a stock price run-up variable. The standard errors adjust for heteroskedasticity. $^+$, * and ** denote statistical significance at the 10%, 5% and 1% level, respectively.

	All transactions	Asset purchases	Mergers
Relative size	7.284	14.318	5.787
	(0.984)**	(3.060)**	(1.149)**
Stock dummy	-2.025	-0.224	-2.034
	(0.310)**	(0.843)	(0.369)**
Log size	-0.064	0.055	-0.153
	(0.047)	(0.058)	(0.082)$^+$
High-tech	-0.123	0.589	-0.616
	(0.249)	(0.336)$^+$	(0.364)$^+$
Number of bidders	-0.331	-2.457	-0.458
	(0.509)	(0.505)**	(0.527)
Tender offer	1.440	-	1.463
	(0.308)**	-	(0.367)**
Hostile flag	0.955	-1.475	1.207
	(0.687)	(1.667)	(0.740)
Tobin's Q	-1.631	-0.882	-2.348
	(0.357)**	(0.400)*	(0.585)**
Cash flow	-4.523	-2.495	-6.619
	(1.749)**	(1.903)	(2.890)*
Leverage	-1.409	-1.221	-1.927
	(0.963)	(1.233)	(1.475)
Industry M&A	1.152	0.825	1.562
	(2.001)	(2.404)	(2.933)
Same industry	0.013	-0.255	0.382
	(0.198)	(0.235)	(0.317)
Observations	3401	1704	1697
Adjusted R-squared	0.075	0.049	0.099

and 97.5th percentile, and Winsorizing the entire sample at the 2.5% and 5% cut-offs. Our results are not affected significantly by these changes. The robustness checks also include modifying the regression specification by adding industry median values of cash holdings and sales growth as well as dummy variables for the 48 Fama-French industries. This does not impact the coefficients on the variables of interest.

Our relative transaction size definition scales the transaction value by the market equity value of the acquirer. An alternative scaling method would be to use the market value of the firm as a scaling variable. The argument presented in Section 2 also applies with this variable, but the coefficients differ due to the presence of leverage and gains to the bondholders from the acquisition. Table 7 reports the results of replicating the analysis in Table 3 with transaction size scaled by the market value of the firm. The analysis reveals the same pattern of efficiency gains from acquisitions as before: efficiency gains arise from asset purchases but not mergers. The higher point estimate of relative value may be due to the mechanical result of using a larger variable as the denominator. The higher point estimate would give a more accurate measure of the degree of efficiency gains if debt and equity holders shared these gains equally, although this is unlikely in practice. Replicating the results in the other tables using the relative value variable generates mostly similar findings.

The study relies on the classification by SDC of acquisitions to separate mergers from asset purchases. This classification may fail for private targets. SDC sometimes classifies an acquisition of an entire private firm as an asset purchase. We eliminate potential classification biases by repeating our analysis after eliminating all deals with private targets. Eliminating private targets has little impact on the relative size coefficient for asset purchases. However, the coefficient for mergers become negative, consistent with the previous findings of negative efficiency gains from mergers with public targets.

The gains to acquirers may reflect fire sales by distressed firms. In particular, fire sales imply that larger transactions lead to lower returns for the seller. In unreported results, we examine this hypothesis by regressing the seller abnormal return from asset purchases on the seller's relative transaction value. The positive and significant coefficient on relative value indicates that most asset sales are not forced sales. This indicates that the gains we document do not come at the expense of the target firms.

Table 7: Relative transaction size defined using the market value of the firm

The table reports the results of a regression of acquirer abnormal return on the size of the transaction relative to the market value of the acquiring firm and various controls for all transactions, and for the merger and asset purchase subsamples. Section 2 details the construction of the sample. The dependent variable is the abnormal return to the acquirer over a 3-day window around the announcement date. The regressors include unreported year dummies and a stock price run-up variable. The standard errors adjust for heteroskedasticity. $^+$, * and ** denote statistical significance at the 10%, 5% and 1% level, respectively.

	All transactions	Asset purchases	Mergers
Log size	-0.248	-0.064	-0.434
	(0.034)**	(0.043)	(0.060)**
Relative size	4.152	9.811	-0.949
	(0.631)**	(0.892)**	(0.902)
High-tech	-0.364	-0.024	-0.678
	(0.172)*	(0.220)	(0.274)*
Stock dummy	-1.115	0.068	-1.222
	(0.201)**	(0.411)	(0.270)**
Number of bidders	-0.302	-1.745	0.027
	(0.468)	(1.364)	(0.473)
Tender offer	-0.449	-	0.093
	(0.282)	-	(0.315)
Hostile flag	-0.241	0.846	-0.079
	(0.569)	(1.520)	(0.570)
Tobin's Q	-0.639	-0.769	-0.448
	(0.222)**	(0.270)**	(0.386)
Cash flow	-1.572	-2.070	-1.839
	(1.256)	(1.564)	(2.126)
Leverage	-1.136	-1.392	-0.610
	(0.621)$^+$	(0.741)$^+$	(1.138)
Industry M&A	0.049	1.438	-0.627
	(1.298)	(1.580)	(2.227)
Same industry	0.086	0.122	0.030
	(0.129)	(0.156)	(0.229)
Observations	12383	8051	4332
Adjusted R-squared	0.022	0.031	0.033

4   Conclusion

This study argues that a positive relationship between abnormal returns and relative transaction size reflects gains from shifting capital to more productive owners via acquisitions. We examine this relationship using direct regressions as well as interactions including interactions terms with relative size. Using this method, we find that acquisitions, and in particular, asset purchases, generate efficiency gains to the acquirer. We also document variation in such gains with the size of the acquiring firm and whether the targeted firm is public or not.

The regression coefficient on relative size can be interpreted as a measure of the increase in value captured by the acquirer. Using this interpretation, we find that the acquirer captures an increase in the value of the acquired assets of about 3.5% to 4.2%. However, this gain arises solely from asset purchases and not mergers. These results suggest that acquiring managers are less influenced by efficiency considerations when evaluating mergers between two firms compared to when evaluating a purchase of some division or subsidiary of a firm. Further research into why efficiency gains vary across mergers and asset purchases may prove fruitful.

We extend our analysis by documenting that acquirers captures a significant portion of the total abnormal returns generated by acquisitions. Furthermore, a regression of total abnormal return on relative size reveals that the total gains from the transaction also increase with transaction size. Our findings highlight the role of a well-functioning acquisitions market in improving capital allocation in the economy.

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