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Bargaining power and industry dependence in mergers ☆

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ABSTRACT

In contrast to the widely held belief that targets capture the lion's share of merger gains, I show that the average dollar gains to targets are only modestly more than the dollar gains to acquirers. To help explain the variation in merger outcomes, I present empirical evidence in support of a new hypothesis that a target's relative scarcity (proxied by its market power) and product market dependence (proxied by customer–supplier relations) help to explain its share of the total merger gains. These results provide new evidence for an unexplored role of product markets on bargaining outcomes in mergers.

1. Introduction

Though a large literature examines the separate returns to bidders and targets in mergers, relatively little attention has been focused on how the total gains from a merger are divided between firms. Yet, bargaining outcomes are important. Mergers represent the largest single transaction of a firm, and the division of the gains is the leading priority for both firms involved. Prior research has investigated the division of gains primarily through the lens of agency problems. For instance, it has been shown that larger managerial ownership increases premiums (Stulz, 1988; Stulz, Walkling, and Song, 1990; Song and Walkling, 1993; Moeller, 2005) and that managers trade premiums for private benefits (Wulf, 2004; Hartzell, Ofek, and Yermack, 2004). Similarly, a line of research has found conflicting evidence on the relation between target premiums and governance provisions (Varaiya, 1987; Field and Karpoff, 2002; Subramanian, 2003; Bates, Becher, and Lemmon, 2008).

In contrast to an agency-based explanation, I propose that the division of gains in mergers is determined in part by customer–supplier relations in the product market. A standard theoretical argument is that a greater share of the joint gains in a merger is captured by the firm with the greater outside option, or next best alternative (Whinston, 2003). In vertical mergers, the next best alternative is likely affected by the intensity and asymmetry of the product market relations between the two firms. For instance, in the merger negotiations between

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a supplier and a customer, the supplier could threaten to withhold its product to the customer if it did not receive a certain share of the merger gains. The greater is the value of the input required by a customer from a certain supplier, the greater is the dependence of the customer on the supplier and, hence, the weaker is the customer's bargaining position. Likewise, the greater the extent to which a particular customer's purchases account for the total sales of a supplier's product, the greater is the dependence of the supplier on the customer.[1]

The relative strength and asymmetry of these product market relations partially determines bargaining power. In particular, a customer could be equally dependent upon a supplier as the supplier is upon the customer. Alternatively, a customer could be highly dependent upon a supplier's inputs, but the supplier could have such a large customer base that this particular customer represents only a small fraction of its total sales. In a sample of vertical mergers over 1980–2008, I find strong empirical evidence consistent with the hypothesis that customer–supplier relations help explain the division of total merger gains.

To test my hypothesis, I first define a new measure of the division of gains in mergers as the difference in the abnormal announcement dollar returns between the target and the acquirer, normalized by the sum of the pre-merger market values of the two firms. Making inferences about bargaining outcomes from percentage returns and premiums is misleading because acquirers are typically much larger than targets. Instead, the comparison of a target's share of the combined abnormal dollar returns to the acquirer's share is more useful than a comparison of percentage abnormal returns to measure the division of total gains.[2] Using this measure, I find that targets gain only modestly more than acquirers, on average. In particular, for each dollar of aggregate pre-merger market equity of the merger partners, targets gain about 3.5 cents more than acquirers in abnormal announcement dollar returns. Moreover, significant variation exists in the division of gains. In more than a quarter of mergers, acquirers have greater dollar gains than do targets. These empirical findings are in sharp contrast to the popular view that targets always capture the lion's share of merger gains.

Next, to measure target–acquirer vertical relations, I rely on industry input–output data provided by the US Bureau of Economic Analysis (BEA). Distinguishing between forward vertical mergers (supplier buys a customer) and backward mergers (customer buys a supplier), I calculate the percentage of input costs to output revenues for each industry pair in a merger. The greater is the ratio of one industry's inputs to another industry's outputs, the more dependent is the customer on the supplier industry. Second, I calculate each customer industry's purchases as a share of the total revenue of a supplying industry. The greater is the share from a particular industry, the more dependent is the supplier on this customer industry. Because these measures are at the industry level, I do not necessarily capture existing trading relations. However, I argue that industry-level dependencies are more relevant because I am interested in capturing potential trading relations, not only existing relations.

The relative strengths of these dependencies are mitigated by the substitutability of inputs and the competitive intensity of the opposing industry. In this vein, Rhodes-Kropf and Robinson (2008) present a matching model of mergers in which the relative scarcity of each firm determines its negotiating position, which is identified by the firm's market-to-book (M/B) ratio. In the case of vertical mergers specifically, scarcity means that if a customer can easily switch to a different input or a different supplier of the same input, then the supplier is less scarce and the customer is less dependent upon it. Thus greater market power of a supplier of a unique input is associated with stronger dependency of the customer on the supplier. In the converse relation, in which a supplier is dependent upon a buyer, the occurrence of substitute customers is less common because firms likely sell their products to all customers possible.[3]

I account for the relative scarcity of each firm using measures of its profitability, its market-to-book ratio, its industry concentration, and the variability of profitability within its industry. I also control for the product similarity measure developed in Hoberg and Phillips (2010a, 2010b). This measure provides a symmetric distance between two firms based on 10-K text-based product market descriptions. Because it is a symmetric measure, it is unlikely to explain the cross-sectional variation in the division of gains, but it provides an alternative measure of firm-relatedness.

Controlling for a host of deal-level variables, I find empirical evidence that product market relations help explain the division of gains in mergers. First, the greater is a target industry's reliance on its acquirer's industry, either as a supplier or a customer, the smaller is the target's dollar gain relative to the acquirer. Second, a firm that is more scarce, as proxied by its market-to-book ratio and profitability at the firm and industry level, receives greater gains relative to its merger partner. These results hold after controlling for the absolute and relative sizes of the merging firms, their prior returns, investments, durable assets, and deal characteristics such as form of

[1] Bargaining power in horizontal mergers is likely to be determined in part by a different form of industry dependence, namely, vulnerability to a price war (Saloner, 1987). In this case, both government antitrust regulation and the presence of multi-market competition (Kim and Singal, 1993) create problems with empirical identification of industry dependence. Therefore, I focus on vertical mergers in this paper.

[2] Though most papers on the division of merger gains study premiums, a few papers account for the relative size of the firms: Malatesta (1983), Bradley, Desai, and Kim (1988), Stulz, Walkling, and Song (1990), Bates, Lemmon, and Linck (2006), and Bates, Becher, and Lemmon (2008).

[3] One example in which this situation would occur is if the supplier provides its product to multiple customers with different elasticities of demand, but resale prevents price discrimination. In this scenario, a supplier could optimally sell only to the low elasticity customers at high prices, forgoing the sales to the high elasticity customers (Perry, 1989). The greater is the loss of revenue from switching to the high elasticity customers, the greater is the dependence of the supplier on the low elasticity customer base.

payment, the use of termination fees, and acquirer toeholds, as well as year and industry fixed effects.

In mergers in which acquirers have negative abnormal returns, other factors more likely affect the division of gains, such as agency concerns. Therefore, to minimize the effect of omitted variables, I run the analysis in the subsample in which both the acquirer and the target have positive returns. This allows me to use a different dependent variable: the percentage of total dollar gains that is captured by the target when both firms have positive abnormal dollar returns, akin to splitting a pie. I find that the results hold using this direct measure of the division of dollar gains. I also control for possible selection bias in this subsample using two-stage Heckman models and find similar results. In addition, I re-run the original tests using the original dependent variable in this subsample and find that product market relations are still significant.

As a supplemental test of the role of product markets on the division of gains in mergers, I analyze whether deals are renegotiated after the initial offer to favor the target or the acquirer. In ordered logit models I find a positive relation between the likelihood of a price improvement and the importance of the target industry as a customer of the acquirer industry. Likewise, I find a negative relation between price improvements and the importance of the acquirer as a supplier. This provides additional evidence not based on announcement returns that supports the hypothesis that product market relations affect negotiation outcomes.

The economic magnitude of the effect of interindustry dependencies and relative scarcity on target gains is substantial. A single standard deviation increase in the percentage of acquirer inputs used by the target industry reduces the normalized difference in target and acquirer dollar gains by 1.2 percentage points. This is a large effect in comparison with the median of 2.2 and the average of 3.1 in forward mergers. As a second example of the economic significance of the results, in backward mergers, increasing an average acquirer's price–cost margin 1 standard deviation decreases the target's relative gain by 1.2 percentage points, compared with the median of 2.9 and the mean of 3.9. However, an interesting result is that the product market relations impact the division of gains only in forward mergers, not in backward mergers. This is not the same as saying only downstream product market relations matter. In fact, both directions of trade flows matter in forward mergers. Instead, I find that the ultimate owner, whether it is a customer or supplier, affects the role of product market relations on the division of gains.

I address possible confounding explanations of the division of gains. First, a firm's profitability and market-to-book ratio could proxy for better access to advisers or deeper cash reserves, rather than the scarcity of its assets. Though I control for the absolute and relative sizes of merging firms in the analysis, I also run additional tests that include firms' cash holdings and the number of merger and acquisition (M&A) advisers and the value of the fees they receive as measures of the resources of a firm. I find no significant differences from the main results. A second concern could be that, though exogenous, the input–output relations explain the overall size of the gains in vertical mergers, not the division of gains. If this is true, then the appearance of greater target gains relative to the acquirer could simply reflect lower total gains. Regressions of the industry relations on the total combined announcement returns show that this is not the case.

This paper contributes to multiple areas of growing research interest in finance. First, the impact of product market interactions on the financial decisions of firms has been studied in various contexts, most notably capital structure decisions (Maksimovic and Phillips, 2001; MacKay and Phillips, 2005; Shahrur, 2005; Campello, 2006; Fee, Hadlock, and Thomas, 2006). To my knowledge, this paper is the first to suggest and provide empirical evidence that product market relations affect the division of gains in mergers. Second, the relation between the negotiation process and the outcomes of mergers has received considerable attention recently (Hotchkiss, Qian, and Song, 2005; Boone and Mulherin, 2006; Povel and Singh, 2006; Officer, 2003, 2004). This paper adds to this literature by examining the role of product markets in the negotiation process. Finally, this paper is related to new research that investigates vertical relations in mergers (Fan and Goyal, 2006; Becker and Thomas, 2008; Bhattacharyya and Nain, 2011; Kedia, Ravid, and Pons, 2008; Ahern and Harford, 2010). This is an important, though relatively unexplored topic: Ahern and Harford (2010) report that roughly half of mergers involve firms that are vertically related, rather than firms that are horizontally related.

The rest of the paper is organized as follows. Section 2 describes the data and methods for measuring the division of gains and the calculation of the explanatory variables. Section 3 presents empirical evidence on the division of gains in mergers. Robustness checks are presented in Section 4. Last, Section 5 provides concluding remarks.

2. Data and methodology

Data on mergers are from the Securities Data Corporation (SDC) US Mergers and Acquisitions database. I include both completed and incomplete merger announcements between January 1, 1980 and December 31, 2008 when the transaction value of the deal is at least $1 million and both firms are publicly traded in the US.[4] Acquirers must own less than 50% of the target before the deal and more than 50% after. Both acquirers and targets must be public firms with data available on the Center for Research in Security Prices (CRSP) and Compustat databases and have a stock price of at least $1, 10 days before the announcement. These restrictions yield a sample of 4,102 mergers.

2.1. Measures of the division of gains in mergers

Merger outcomes are measured using the difference between the target's and the acquirer's abnormal dollar returns surrounding the announcement of the deal.

[4] Restricting attention to only completed deals does not qualitatively change any of the results of the paper.

Though premiums have been widely studied in prior research, Betton, Eckbo, and Thorburn (2008) find that bidder gains increase in target run-ups and premiums, suggesting that premiums could identify large combined gains rather than target bargaining power. In addition, even if premiums indicate which targets command a greater share of gains, they are less informative about how the division of gains is split between an acquirer and target within a merger, because they do not account for firm size. Instead, dollar returns are better suited for this purpose because they convert the gains of both the acquirer and target into a common currency.

To calculate abnormal dollar returns, I first estimate abnormal percentage returns in a three-day window surrounding the merger announcement using market-adjusted returns from the CRSP equally weighted index.[5] Using these estimates I then calculate abnormal dollar returns over the three days for each firm by multiplying the abnormal percentage returns by the firm's market equity on the prior day, following the method used in Malatesta (1983) and Moeller, Schlingemann, and Stulz (2004). Summing the daily dollar returns over the three-day event window generates cumulative abnormal dollar returns.

To measure the target's share of gains from a merger, it would be ideal to take the percentage of the total dollar returns contributed by the target, analogous to splitting a pie. However, because dollar returns could be negative for either or both firms, this procedure would produce misleading results. For instance, if the target dollar gain is \$100 and the bidder's is −\$99, then the target's percentage of the pie would be \$100/\$1=10,000%. The situation is even worse if the total gains are negative. To avoid this problem, I use the difference in dollar gains between the target and bidder, *Target Abnormal \$ Returns − Acquirer Abnormal \$ Returns*, divided by the sum of the acquirer's and target's market value of equity 50 trading days prior to the announcement date. I denote this variable as $\Delta\$CAR$ throughout the paper. This measure represents the relative gain of the target versus the acquirer for each dollar of total market value, without the concern that total gains could be negative. For robustness, I also identify a subsample of deals in which both target and acquirer dollar returns are positive. Within this subsample I am able to calculate the percentage of total gains captured by the target, without the distortions presented above, though with potential selection issues, which I discuss below.

2.2. Measures of industry relations in mergers

To test the hypothesis that customer–supplier relations influence the division of gains in mergers, in later tests I restrict attention to vertical mergers identified using the Use and Make tables provided by the US Bureau of Economic Analysis. These tables record the input and output (IO) commodity flows between close to 500 different industries. The use of industry-level data means that an acquirer and target in the sample might not actually trade vertically, but, rather, they are potential suppliers or customers. Prior literature has used actual trading partners to identify when upstream horizontal mergers could affect vertical partners (Fee and Thomas, 2004; Shahrur, 2005). However, the industry-level IO data are more relevant for my study because vertical relations affect the bargaining positions of firms even if the firms are only potential, but not existing, trading partners.

The BEA produces IO tables every five years, though the industry definitions change from report to report. Therefore, for consistency, I use the 1997 IO report, which roughly splits the sample period in half. Though IO relations are unlikely to change significantly over time, using only the 1997 data biases against finding significant relations between industries and the division of gains in mergers.[6]

To measure industry classifications for the sample firms, I match six-digit North American Industry Classification System (NAICS) codes provided by SDC to the IO industry codes using the concordance tables provided by the BEA.[7] Then, following Fan and Goyal (2006), for each IO industry pair I calculate the dollar value of the supplier industry's output required to produce one dollar of the customer industry's output. This represents the relative importance of a supplier industry's input to a customer industry's output. Unlike Fan and Goyal (2006), I also calculate the relative importance of a customer industry's purchases to a supplier industry's output. This is measured as the percentage of the supplier industry output purchased by the customer industry. These measures are

Relative importance of supplier to customer:

$$V_s = \frac{\$\ Supplier\ Input}{Total\ \$\ Customer\ Output} \tag{1}$$

and

Relative importance of customer to supplier:

$$V_c = \frac{\$\ Customer's\ Purchases}{Total\ \$\ Supplier's\ Sales} \tag{2}$$

To illustrate, take for example, the relation between the paperboard mills and gypsum products industries, which produces plaster and wall boards for construction. The BEA data report that the gypsum products industry has a total output of \$2,612 million and bought \$200 million in inputs from the paperboard mills industry. Thus

[5] Abnormal returns are also calculated using estimates from factor loadings on the daily Fama and French three-factor model over the period (−239, −6), relative to the announcement date for robustness. No qualitative differences are found. I also require a minimum of 100 non-missing observations in the estimation window (−239, −6) to calculate abnormal returns.

[6] In an earlier draft of this paper I matched industries to the most recent IO report. The results are qualitatively unchanged. See Ahern and Harford (2010) for a more detailed description of the IO tables.

[7] In an earlier draft of the paper, in addition to the primary NAICS codes provided by SDC, I recorded each firm's primary and secondary industry codes from the Compustat Segments database, which reports up to ten segments annually. This gave at most 21 unique industry codes (Standard industrial classification or NAICS) per firm. Then for each deal in the sample I computed IO relations for every combination of target and bidder industry codes and recorded the maximum relations. The results are qualitatively unchanged using simply the primary industry codes from SDC.

V_s, the relative importance of the paperboard mills industry (supplier) to the gypsum products industry (customer), is 0.077. In other words, for every dollar of output, the gypsum products industry used 7.7 cents of paperboard mills industry input. On the flipside, the paperboard mills industry sold a total of $41,576 million in output, which divided into the $200 million sold to the gypsum products industry yields a relative importance of the gypsum products industry (customer) to the paperboard mills industry (supplier) of V_c=0.0048. This means that for every dollar of the paperboard mills industry's sales, 0.48 cents were provided by the gypsum products industry.

Fig. 1 depicts the industry relations between the paperboard mills industry and the gypsum products industry. The top row lists the suppliers of the gypsum products industry in declining order of the percentage of the total purchases of inputs of the gypsum products industry. Nonmetallic minerals supplies the largest value of inputs to the gypsum products industry. The paperboard mills industry is the fourth largest supplier with 7.66% of total inputs. The bottom row lists the customers of the paperboard mills industry in declining order of the percentage of total sales. The paperboard containers industry is the largest customer of the paperboard mills industry. The gypsum products industry is the 25th largest customer with only 0.48% of total sales. The width of the lines in Fig. 1 connecting suppliers and customers is proportional to these ratios of input and output. Clearly the supply of the paperboard mills industry is more important to the gypsum products industry than are the purchases of the gypsum products industry to the paperboard mills industry. In the context of this study, because the paperboard mills industry is relatively less dependent upon the gypsum products industry, a paperboard firm would have more bargaining power in a merger, ceteris paribus.

I calculate V_s and V_c for both acquirers and targets, giving four measures of vertical relations: V_s and V_c assuming forward integration (acquirer is supplier) or backward integration (acquirer is customer). In the above example, the corresponding V_s and V_c assuming the paperboard mills industry is the customer and the gypsum products industry is the supplier are both zero. Thus, the vertical relation flows only in one direction, with the gypsum products industry as customer and the paperboard mills industry as supplier. Some industries have bilateral vertical relations in which each industry is both a supplier and customer (for example, the iron ore industry and the blast furnace industry).

I identify vertical mergers as mergers in which firms do not share the same IO industry code and have unambiguous vertical relations. In particular, I identify a merger as a forward vertical merger if the acquirer industry supplies more inputs to the target industry than the target industry supplies to the acquirer industry and the target industry buys more from the acquirer industry than the acquirer industry buys from the target, using the values of V_c and V_s. Therefore, it is clear that the acquirer is the supplier and the target is the customer in these

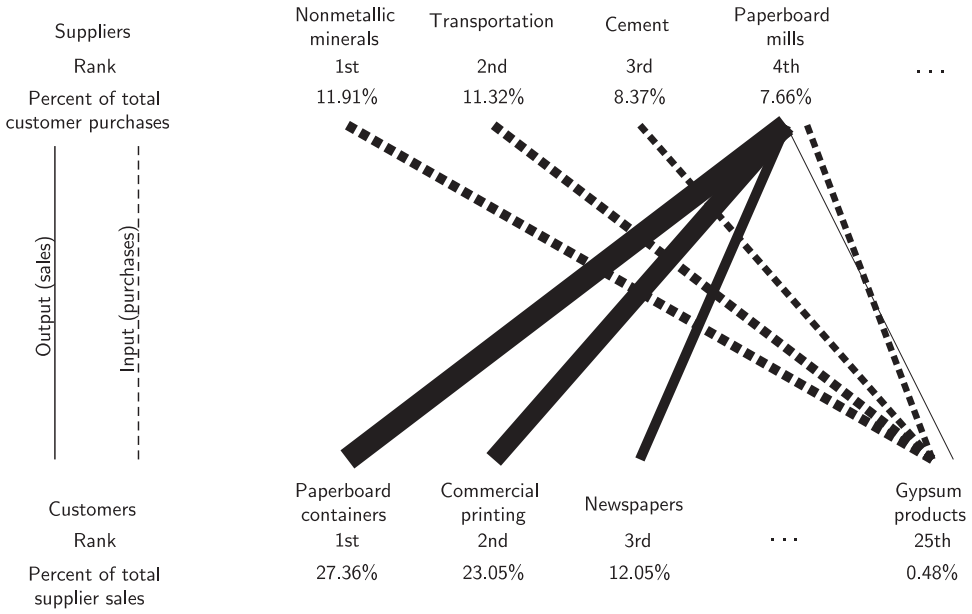

Fig. 1. Input/output relation between the paper mill industry and the gypsum products industry. This figure depicts the customers of the paper mill industry on the bottom row and the suppliers of the gypsum products industry on the top row, arranged from left to right in descending order of the percent of paper mill sales (bottom) and percent of total input purchases by the gypsum product industry (top). The width of the lines indicating output (solid) and input (dashed) are proportional to the percent of total supplier sales and percent of total customer purchases. The ranking of these industries is also listed. Percent of total customer purchases is the ratio of the dollar value of the inputs from each supplying industry to the total output of the gypsum products industry. Percent of total sales is the ratio of the dollar value of each customer industry purchases to the total sales of the paper mill industry. Thus the gypsum products industry relies more heavily on the inputs of the paper mill industry than the paper mill industry relies on the sales to the gypsum products industry. Data are from the US Bureau of Economic Analysis input/output tables.

mergers. A backward merger is characterized by the opposite relations: The target supplies more inputs to the acquirer than the acquirer supplies to the target, and the acquirer buys more from the target than the target buys from the acquirer. This definition rules out indeterminate vertical relations, such as if an acquirer both supplied more to a target than vice versa and also bought more from a target industry than the target industry bought from the acquirer industry.

Of the 4,102 mergers in the sample, there are 2,121 horizontal mergers, in which the acquirer and target share the same IO industry code. There are 1,357 vertical mergers with unambiguous vertical relations, of which 661 are forward mergers and 696 are backward mergers. This means 624 mergers have indeterminate vertical relations. The distribution of vertical and horizontal mergers is similar to the distribution presented in Ahern and Harford (2010) for a sample that includes private and subsidiary targets and acquirers.

2.3. Mitigating industry factors

As argued in the introduction, substitutability of suppliers and customers could mitigate dependence in vertical mergers. I have no direct measure of substitutability of inputs. To do so I would need to measure the marginal rate of technical substitution between all inputs in all industries. However, I use three reasonable proxies to capture the substitutability of inputs. Following Gaspar and Massa (2005) and Peress (2010), I calculate each firm's price-cost margin (PCM) as sales minus costs of goods sold (COGS) and general and administrative expenses (SGA), divided by sales. If COGS or SGA are unavailable I use operating income before depreciation, interest, and taxes divided by sales. This measure proxies for the scarcity of a firm's product because it measures the firm's ability to price above marginal cost. I also calculate a similar measure using the IO data, instead of at the firm level. The Use table records value added for each industry. This is the difference between sales and the sum of all intermediate inputs, taxes, and employee compensation. Thus, the value added is essentially the profit of the industry. I normalize the value added by the total output of the industry to measure the scarcity of the product at the industry level. Greater industry profits reflect that the industry's product has poor substitute products, hence the more difficult it is for a customer to switch to a different supplier. Scarcity could also be reflected in the heterogeneity of the product within an industry. To account for this, I calculate the standard deviation of the price–cost margin within each firm's two-digit Standard industrial classification (SIC) code. In addition, I include industry-level fixed effects at the 12-industry Fama and French level, to control for any time-invariant heterogeneity across industries.

Industry concentration is an alternative measure of the difficulty of switching suppliers within an industry. Concentration ratios computed using Compustat records are typically incomplete (MacKay and Phillips, 2005), so instead I use eight-firm concentration ratios as reported in the Economic Censuses published by the US Census Bureau in the same years as the IO data are published. Only manufacturing industries are covered in years 1982 and 1987, though 1992 and later include nonmanufacturing industries.[8]

In addition, I control for product market similarity using the dynamic text-based closeness measure developed in Hoberg and Phillips (2010a, 2010b), referred to as VIC in the Hoberg and Phillips data library. This measure, which I denote *HP product similarity*, is based on the similarities of the words used to describe a firm's product in its 10-K filings. Firms that have high similarity scores have product descriptions that are closely related. Hoberg and Phillips (2010b) show that industry definitions based on this closeness measure outperform standard industry definitions, such as SIC codes, in explaining cross-sectional variation in firm characteristics. In contrast to *HP product similarity*, the IO product market relations I use in this paper are not symmetric measures of distance, but rather allow for an asymmetric relation between two industries. The asymmetry is necessary to identify whether one industry is more dependent upon another and, hence, could have less bargaining power in a merger. In addition, the *HP product similarity* measure does not distinguish between horizontal and vertical relations between firms. Therefore, *HP product similarity* captures important industry relations that are complimentary to the IO customer–supplier relations.

The continuous similarity scores for the HP product similarity data were generously provided by Hoberg and Phillips for this paper. However, because their data series begin in 1996, I interpolate their measure back to 1980 if possible to avoid losing the majority of my observations. To interpolate the data, for each firm-pair in the data, I regress the similarity score on a constant and on the log of the calendar year. I do this for all firm-pairs with at least five years of data. I then use the fitted values to predict the similarity scores for the years 1980 to 1995. The log transformation ensures that I do not have negative scores, which would have no meaning as the scores are distances.

Finally, in the matching model of Rhodes-Kropf and Robinson (2008), a firm's market-to-book ratio captures its bargaining power. The values of firms with relatively more scarce assets are higher because investors anticipate that they will capture a larger share of gains if they are involved in a merger. The firms trade off the costs of searching for a higher quality (scarcer) merger partner against the smaller gains they will capture if matched with a higher quality firm with greater bargaining power. In the case that assets are complements, Rhodes-Kropf and Robinson show that, in equilibrium, firms endogenously match to other firms of similar bargaining strength and, hence the two firms' market-to-book ratios are equal. Empirically, this means that market-to-book would not have any predictive power to explain the division of gains in the cross-section. However, firms might not always be able to find perfect matches in reality. Therefore, M/B

[8] These data are available at http://www.census.gov/epcd/www/concentration.html

ratios of bidders and targets could capture relative scarcity. Therefore, I measure market-to-book ratios following Fama and French (1993) as an additional measure of scarcity, subject to the caveat that market-to-book has many other interpretations, such as a measure of over- or undervaluation.

2.4. Additional control variables

Target firms often commit to a negotiation strategy through the use of termination fees by imposing costs on themselves if they reject a bidder's offer. These commitments theoretically lead to more aggressive bidding by acquirers (Hotchkiss, Qian, and Song, 2005; Povel and Singh, 2006) and hence greater bargaining power for targets. Empirical evidence supports this hypothesis (Officer, 2003; Bates and Lemmon, 2003; Boone and Mulherin, 2006). To account for this, I use SDC's record of termination fees. If supply curves of target shares are upward-sloping, then an acquirer with a greater toehold could have a stronger bargaining position (Stulz, 1988). Stulz, Walkling, and Song (1990) report empirical evidence supporting this theory. However, toeholds could also lead to overbidding (Burkart, 1995; Singh, 1998). Also, a coinsurance effect of firm leverage could affect merger returns (Lewellen, 1971; Kim and McConnell, 1977). I also control for the form of payment used in a merger because it has been shown to have various effects on merger returns (Kaufman, 1988; Chang, 1998; Fuller, Netter, and Stegemoller, 2002). Other negotiation tactics exist beyond industry relations, such as preemptive bidding, which could affect bargaining, but these are not likely to be related to the vertical relations that exist between two firms.

In unreported robustness tests of all of the empirical specifications used in the paper, I also include variables related to agency costs and bidding competition, following the prior literature. I include a dummy for tender offers, a variable for the number of bidders, and a dummy variable from SDC that indicates if the target firm used any takeover defenses in the merger negotiation (including poison pills, a pacman defense, defensive recapitalization or repurchases, a scorched earth defense, reached out to white knight bidders, or implemented a voting rights plan). With a few exceptions, none of these variables is significant and the qualitative results of the paper are unchanged or, in some cases, strengthened.

3. Results

In this section, I first present summary statistics of the data. Then I present the main results.

3.1. Summary statistics

Table 1 presents summary statistics of the division of gains for the entire sample and for the horizontal and vertical subsamples separately. In the full sample of 4,102 mergers, for each dollar in combined pre-merger market equity of the acquirer and target, targets gain about 3.5 cents more than do acquirers, on average. The standard deviation is 6.39 and the interquartile range is 6.72, indicating considerable variation in this measure. In fact, in contrast to the notion that targets always capture the lion's share of the gain, in unreported tabulations, I find that, in about 27% of mergers, acquirers have greater dollar gains than do targets. Panel A of Fig. 2 presents a histogram of the distribution of the target's gain relative to the acquirer. The mode of the distribution is just slightly above zero.

The distribution of the relative gains of the target is consistent across horizontal and vertical mergers, both forward and backward. However the mean is considerably higher in backward mergers (3.9%) than in forward mergers (3.1%). In untabulated tests, I find that this difference is statistically significant at the 1.1% level. This implies that a target has greater gains relative to an acquirer in a vertical merger when the target is the supplier and the acquirer is the customer, relative to the opposite relation.

Panel B of Table 1 reports the summary statistics of the division of merger gains when both acquirer and target have positive gains. Panel B of Fig. 2 presents a histogram of the division of gains in this subsample. In this case, it makes sense to think of splitting a pie, and so the measure is the percentage of total dollar gains captured by the target. First, the distribution across merger types in this subsample is relatively stable, with 1,450 mergers, or 35% of all mergers, generating positive gains to both the acquirer and the target. Thirty-nine percent of forward mergers have positive gains for both firms, compared with 33% for backward mergers.

The most interesting result of Panel B is that acquirers capture more of the gains on average than do targets. This is evident in the histogram as well. The large number of mergers in which the target captures less than 5% of the combined gains is driven in part by deals in which targets are relatively small compared with acquirers and, hence, their dollar gains are also small. This emphasizes the point that percentage returns do not measure the division of gains. However, even if only mergers with a relative size above 5% are included, the division of gains still appear almost uniformly distributed.[9]

Panels C and D of Table 1 report cumulative abnormal percentage returns in the three-day announcement window for acquirers and targets by type of merger. Acquirers have an average return across all merger types of −1.3%, consistent with prior findings on acquisitions of public targets (Fuller, Netter, and Stegemoller, 2002). Average acquirer returns in vertical mergers (−1.56%) are less than in horizontal mergers (−1.24%), though unreported *t*-tests show the difference is not statistically significant. Acquirer returns in backward vertical mergers are lower than the returns in forward mergers, but this difference is also not statistically significant. Though acquirers average and median returns are negative, in unreported tests, roughly 40% of mergers yield positive returns to acquirers.

[9] All results in the paper are robust to excluding mergers under 5% in relative size.

Table 1
Summary statistics of the division of gains in mergers.

This table presents means, standard deviations, percentiles, and the number of observations for each variable. Δ$*CAR* is target $*CAR* − acquirer $*CAR* divided by the sum of acquirer and target market values 50 trading days before the merger announcement, in percent. CARs are cumulative abnormal returns over three days surrounding the announcement adjusted by the equally weighted Center for Research in Security Prices index. $*CAR*s are CARs scaled by market equity. Target percentage of gain when both firms have positive returns is the fraction of total dollar gains contributed by the target. Horizontal mergers are when acquirers and targets share the same US Bureau of Economic Analysis (BEA) input–output (IO) industry code. Vertical mergers (forward, backward) are when the acquirer and target do not share the same BEA IO industry code and either the acquirer supplies (more, less) to the target than the target supplies to the acquirer and the target buys (more, less) inputs from the acquirer than the acquirer buys from the target, in percentage of total inputs and total sales.

			Percentile					
Sample	Mean	Standard Deviation	10th	25th	50th	75th	90th	Number of Observations
Panel A: Target gain relative to the acquirer gain (Δ$*CAR*)								
All	3.52	6.39	−2.76	−0.16	2.54	6.56	11.51	4,102
Horizontal	3.61	6.16	−2.30	0.00	2.60	6.35	11.51	2,121
Vertical	3.53	6.43	−3.00	−0.24	2.59	6.61	11.44	1,357
Forward	3.11	6.12	−3.21	−0.42	2.20	6.10	10.83	661
Backward	3.94	6.69	−2.55	−0.15	2.92	6.96	12.36	696
Panel B: Target percentage of gain when both firms have positive returns								
All	44.12	29.43	4.77	17.30	43.61	69.13	86.77	1450
Horizontal	46.52	28.60	7.12	21.68	46.46	70.54	87.19	719
Vertical	41.40	29.38	4.08	15.55	37.89	65.36	84.81	492
Forward	42.39	28.81	5.00	17.63	39.03	65.65	85.03	258
Backward	40.32	30.03	3.02	14.97	34.52	63.70	84.81	234
Panel C: Acquirer cumulative abnormal return (*CAR*)								
All	−1.27	7.15	−8.73	−4.42	−0.99	1.78	5.55	4,102
Horizontal	−1.24	6.86	−8.28	−4.24	−1.07	1.57	4.95	2,121
Vertical	−1.56	7.05	−9.05	−4.57	−1.09	1.80	5.55	1,357
Forward	−1.25	6.93	−8.83	−4.45	−0.80	2.09	5.55	661
Backward	−1.85	7.15	−9.40	−4.75	−1.40	1.42	5.53	696
Panel D: Target cumulative abnormal return (*CAR*)								
All	19.80	23.24	−1.98	5.03	15.45	29.65	46.44	4,102
Horizontal	18.43	21.30	−1.95	4.58	14.34	27.50	43.68	2,121
Vertical	21.15	25.05	−1.92	5.97	17.14	31.96	49.20	1,357
Forward	20.13	22.63	−1.74	6.29	15.38	30.74	47.34	661
Backward	22.12	27.12	−2.41	5.57	18.96	32.78	51.95	696

Target abnormal returns are 19.8% on average, with targets in vertical mergers experiencing a 21.2% three-day abnormal return, compared with 18.4% for targets in horizontal mergers, a statistically significant difference. Target returns are slightly higher in backward mergers than in forward mergers, though the difference is not statistically significant. Unreported tabulations reveal that the average relative size of the target to the acquirer in horizontal mergers (41.1%) is significantly greater than in vertical mergers (36.0%), though no statistical difference exists between forward and backward vertical mergers. In addition, acquirers in horizontal mergers are on average statistically smaller and use less cash and more stock as payment than acquirers in vertical mergers. Acquirers in backward mergers are significantly larger than acquirers in forward mergers, though no statistical difference exists in target size or form of payment used.

Table 2 presents summary statistics of the customer–supplier industry relation variables for the sample of vertical mergers. In the 661 forward mergers, in which acquirers are suppliers and targets are customers in the product market, the average target purchases about 2.5% of the total sales of the acquiring firm's industry. These purchases represent about 3.0% of the total input costs of the target industry. Both of these numbers are substantial and large. Both Fan and Goyal (2006) and Kedia, Ravid, and Pons (2008) suggest that a 1% threshold is adequate to identify important vertical relations between industries. The distribution of these relations is skewed, as evident by the medians of 0.6 and 0.7 for target purchases as a percentage of acquirer sales and total target input costs. The distributions are similar in backward mergers, in which the acquirer is the customer and the target the supplier, though the averages are slightly higher. The average fraction of target industry sales attributable to the acquirer's industry's purchases is 4.3%. The percentage of acquirer industry inputs purchased from the target industry is 3.5% on average.

Table 3 lists the fifty industry-pairs that experienced the most vertical mergers over 1980–2008. Of the 1,357 vertical mergers in the sample, the top 50 industry-pairs account for 42%, out of a total of 688 industry-pairs that have at least one merger. Thus, consistent with Ahern and Harford (2010), vertical merger activity is concentrated in a few industry-pairs. The most active industry-pair is the management of companies and enterprises (supplier industry) and monetary authority and depository credit intermediation (customer industry). This represents the

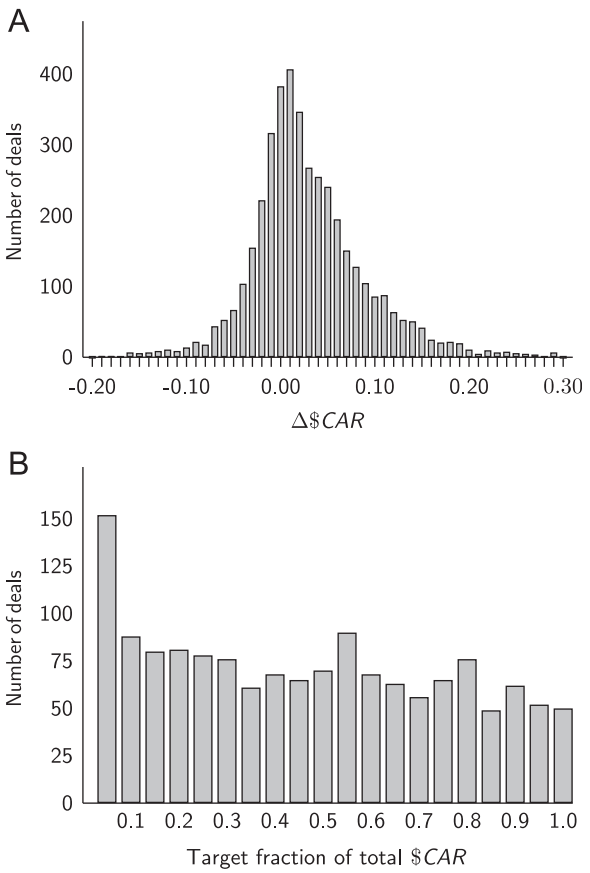

Fig. 2. Distribution of the division of merger gains. Panel A presents a histogram from 4,102 mergers over 1980–2008 of Δ$*CAR*, computed as target $*CAR* − acquirer $*CAR* divided by the sum of acquirer and target market values 50 trading days before the merger announcement. CARs are cumulative abnormal returns over three days surrounding the announcement adjusted by the equally weighted Center for Research in Security Prices index. $*CAR*s are abnormal percentage returns scaled by market equity. Panel B presents the histogram of target $*CAR*/(target $*CAR* + acquirer $*CAR*) in 1,450 mergers where both target and acquirer CARs are positive.

large number of bank mergers, in which the management of companies industry is primarily made up of firms that administer and hold bank assets and the monetary authority industry is composed of banks. The second most active industry-pair is software reproducing (supplier) and software publishers (customers). The software publishers provide documentation and support, as well as distribution of software. One input into their industry is software reproducing services.

3.2. The determinants of the division of gains in vertical mergers

Table 4 reports the first set of tests of the division of gains in vertical mergers. The sample includes only forward mergers, and the sample size is smaller due to data limitations. In particular, missing Compustat data needed to compute price-cost margins and market-to-book ratios as well as industry concentration ratios lead to the smaller sample size. The table reports ordinary least squares (OLS) coefficients from regressions on Δ$*CAR*, the target's gain relative to the acquirer's gain in forward mergers. The first column includes only the variables related to the scarcity of the firms: the input–output trading relations, the industry-level value added, the firm-level price–cost margin and market-to-book ratio, the HP product similarity measure, the industry concentration, and the industry standard deviation of price–cost margins. The second column adds year and industry fixed effects for both the acquirer and target. Standard errors are double-clustered by the acquirer and target IO industry code in all tests.

First, the greater are the target industry's purchases as a fraction of total acquirer sales, the greater is the target's gain relative to the acquirer. Likewise, the greater is the acquirer industry's input in the target industry's total production, the less is the target's gain relative to the acquirer. These coefficients are statistically significant in each of the four specifications reported in Table 4, consistent with the hypothesis that product market interactions affect the

Table 2
Summary statistics of the customer–supplier relations in vertical mergers.

This table presents means, standard deviations, percentiles, and the number of observations for each variable for 1,357 vertical mergers over 1980–2008. Vertical mergers (forward, backward) are those where the acquirer and target do not share the same US Bureau of Economic Analysis (BEA) input–output (IO) industry code and either the acquirer supplies (more, less) to the target than the target supplies to the acquirer and the target buys (more, less) inputs from the acquirer than the acquirer buys from the target, in percentage of total inputs and total sales. Target input/acquirer output is the industry-level percentage of dollars of target industry input for each acquirer industry output dollar. Target purchases/acquirer sales is the percentage of all acquirer industry sales purchased by the target industry. Data are from the 1997 BEA IO Use and Make tables.

			Percentile					
	Mean	Standard Deviation	10th	25th	50th	75th	90th	Number of Observations
Panel A: Forward mergers								
Target purchases/acquirer sales (percent)	2.478	8.331	0.013	0.090	0.562	1.605	5.565	661
Acquirer input/target output (percent)	3.039	8.997	0.021	0.104	0.741	1.632	6.691	661
Panel B: Backward mergers								
Acquirer purchases/target sales (percent)	4.274	12.630	0.016	0.116	0.668	3.244	7.720	696
Target input/acquirer output (percent)	3.472	9.311	0.022	0.093	0.544	2.458	7.661	696

Table 3
Mergers in the 50 most active vertically related industry pairs.

This table reports the 50 vertically related industry pairs with the most mergers during 1980–2008, in descending order. Industry definitions are from the US Bureau of Economic Analysis (BEA) input–output (IO) tables. Vertical mergers (forward, backward) are those in which the acquirer and target do not share the same BEA IO industry code and either the acquirer supplies (more, less) to the target than the target supplies to the acquirer and the target buys (more, less) inputs from the acquirer than the acquirer buys from the target, in percentage of total inputs and total sales.

Supplier industry	Customer industry	Number of mergers	Number of forward	Number of backward	Percent forward
Management of companies and enterprises	Monetary authorities and credit	108	79	29	73
Software reproducing	Software publishers	51	6	45	12
Nondepository credit intermediation	Monetary authorities and credit	38	13	25	34
Securities, commodities, investments	Monetary authorities and credit	29	4	25	14
Software reproducing	Custom computer programming services	24	10	14	42
Surgical and medical instruments	Pharmaceutical and medicine	23	3	20	13
Scientific research and development services	Pharmaceutical and medicine	20	6	14	30
Software reproducing	Computer systems design services	20	6	14	30
Electromedical apparatus	Surgical and medical instrument	18	16	2	89
Wholesale trade	Retail trade	17	8	9	47
Securities, commodities, investments	Insurance carriers	11	5	6	45
Telephone apparatus	Telecommunications	8	0	8	0
Other ambulatory health care services	Nursing and residential care facilities	7	3	4	43
Other computer related services	Software reproducing	7	7	0	100
Computer systems design services	Software publishers	7	0	7	0
Custom computer programming services	Software publishers	7	3	4	43
Insurance carriers	Offices of physicians, dentists, others	7	7	0	100
Software publishers	Other computer peripheral equipment	7	5	2	71
Scenic transportation and support	Truck transportation	7	3	4	43
Software reproducing	Electronic computer	7	2	5	29
Other computer peripheral equipment	Telephone apparatus	7	5	2	71
Other ambulatory health care services	Offices of physicians, dentists, others	6	6	0	100
Funds, trusts, and other financial vehicles	Insurance carriers	6	3	3	50
Analytical laboratory instrument	Pharmaceutical and medicine	6	5	1	83
Semiconductors and related device	All other electronic component	6	1	5	17
Broadcast and wireless equipment	Telephone apparatus	6	5	1	83
Oil and gas extraction	Petroleum refineries	6	2	4	33
Oil and gas extraction	Natural gas distribution	6	3	3	50
Oil and gas extraction	Power generation and supply	6	1	5	17
Insurance agencies, brokerages, and related	Insurance carriers	5	1	4	20
Insurance carriers	Other ambulatory health care services	5	0	5	0
Nondepository credit intermediation	Insurance carriers	5	1	4	20
Surgical appliance and supplies	Pharmaceutical and medicine	5	2	3	40
All other electronic components	Telephone apparatus	5	2	3	40
Electronic computer	Computer systems design services	5	3	2	60
Oil and gas extraction	Pipeline transportation	5	4	1	80
Hotels and motels, including casino hotels	Other amusement, gambling	4	2	2	50
Computer systems design services	Custom computer programming services	4	4	0	100
Computer systems design services	Broadcast and wireless equipment	4	1	3	25
Monetary authorities and credit	Insurance carriers	4	2	2	50
Data processing services	Business support services	4	3	1	75
Telecommunications	Retail trade	4	4	0	100
Radio and television broadcasting	Advertising and related services	4	4	0	100
Motion picture and video industries	Cable networks and program distribution	4	1	3	25
Motion picture and video industries	Radio and television broadcasting	4	1	3	25
Wholesale trade	Surgical and medical instrument	4	1	3	25
Broadcast and wireless equipment	Search, detection, and navigation instruments	4	1	3	25
Other computer peripheral equipment	Broadcast and wireless equipment	4	2	2	50
Pharmaceutical and medicine	Other ambulatory health care services	4	4	0	100
Drilling oil and gas wells	Support activities for oil and gas operations	4	4	0	100
Top 50 industry pairs		569	264	305	46
Total sample		1,357	661	696	49

bargaining positions of merging firms. Moreover, these results are economically meaningful. Taking the average value of the coefficients across the four specifications, a 1 standard deviation increase in the percentage of acquirer inputs used by the target reduces $\Delta\$CAR$ by 1.2 percentage points, compared with a median $\Delta\$CAR$ of 2.2% and a mean of 3.1% in forward mergers. For a 1 standard deviation increase in the percentage of acquirer sales accounted by target purchases, $\Delta\$CAR$ increases 1.1 percentage points.

The other variables that were predicted to affect the division of gains have mixed effects. Though the target industry's value added and market-to-book ratio are insignificant, the greater is the acquirer's industry value added and M/B, the smaller is the target's gain relative to

Table 4
Target's gain relative to acquirer's gain in forward vertical mergers.

This table presents coefficient estimates from ordinary least squares regressions on the target's gain relative to the acquirer's gain defined as target $*CAR* − acquirer $*CAR* divided by the sum of acquirer and target market values 50 trading days before the merger announcement. $*CAR*s are cumulative abnormal returns over three days surrounding the announcement adjusted by the equally weighted Center for Research in Security Prices index and scaled by market equity. All variables defined in Appendix A. Industry fixed effects are at the Fama and French 12-industry level. Constant is not reported. Data are from 1980 to 2008. *p*-Values are reported in parentheses from standard errors double-clustered by the acquirer and target US Bureau of Economic Analysis input–output industries. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

	(1)	(2)	(3)	(4)
Target purchases/acquirer sales	0.113**	0.104*	0.133***	0.156***
	(0.045)	(0.062)	(0.004)	(0.003)
Acquirer input/target output	−0.098**	−0.105**	−0.156**	−0.162**
	(0.019)	(0.032)	(0.016)	(0.015)
HP product similarity	0.040	0.052	0.018	0.032
	(0.437)	(0.420)	(0.753)	(0.547)
Target M/B	0.000	0.000	0.000	−0.001
	(0.964)	(0.840)	(0.845)	(0.637)
Acquirer M/B	−0.004**	−0.003	−0.004	−0.004
	(0.010)	(0.134)	(0.229)	(0.204)
Target price–cost margin	0.039	0.045	0.023	0.055
	(0.122)	(0.164)	(0.541)	(0.200)
Acquirer price–cost margin	0.023	0.035	0.031	0.020
	(0.542)	(0.321)	(0.608)	(0.703)
Target industry concentration	−0.011	0.004	0.007	0.012
	(0.454)	(0.884)	(0.734)	(0.565)
Acquirer industry concentration	0.036**	0.057***	0.038**	0.058**
	(0.034)	(0.005)	(0.044)	(0.025)
Target industry value added	−0.049	−0.045	−0.053	−0.052
	(0.126)	(0.303)	(0.310)	(0.315)
Acquirer industry value added	−0.050**	−0.047***	−0.054**	−0.061**
	(0.025)	(0.007)	(0.015)	(0.031)
Target industry std. dev. profitability	−0.010**	−0.004	−0.001	−0.002
	(0.023)	(0.507)	(0.869)	(0.750)
Acquirer industry std. dev. profitability	0.002	0.003	0.003	0.001
	(0.382)	(0.439)	(0.508)	(0.746)
Target market equity			0.001	0.001
			(0.201)	(0.286)
Acquirer market equity			0.000	0.000
			(0.848)	(0.651)
Target prior returns			−0.017	−0.019*
			(0.129)	(0.092)
Acquirer prior returns			−0.010	−0.020
			(0.519)	(0.199)
Relative size of merger			0.030**	0.030*
			(0.041)	(0.052)
Percentage stock			0.017*	0.015
			(0.087)	(0.171)
Target termination fee			0.004	0.004
			(0.681)	(0.706)
Toehold			0.090	0.137**
			(0.183)	(0.046)
Target leverage				0.000
				(0.994)
Acquirer leverage				−0.041
				(0.501)
Target R&D				0.083
				(0.269)
Acquirer R&D				−0.287***
				(0.003)
Target durable assets				−0.002
				(0.940)
Acquirer durable assets				−0.048
				(0.216)
Target industry fixed effects	No	Yes	Yes	Yes
Acquirer industry fixed effects	No	Yes	Yes	Yes
Year fixed effects	No	Yes	Yes	Yes
Adjusted R^2	0.051	0.080	0.137	0.151
Number of observations	312	312	247	245

the acquirer. These results support the idea that greater scarcity of assets, as proxied by profitability, engenders greater bargaining strength. The effect of the target's M/B ratio is insignificant, as is the HP product similarity. Acquirer industries that are more concentrated are associated with higher target gains, contrary to expectation.

Table 5
Target's gain relative to acquirer's gain in backward vertical mergers.

This table presents coefficient estimates from ordinary least squares regressions on the target's gain relative to the acquirer's gain defined as target $*CAR* − acquirer $*CAR* divided by the sum of acquirer and target market values 50 trading days before the merger announcement. $*CAR*s are cumulative abnormal returns over three days surrounding the announcement adjusted by the equally weighted Center for Research in Security Prices index and scaled by market equity. All variables defined in Appendix A. Industry fixed effects are at the Fama and French 12-industry level. Constant is not reported. Data are from 1980 to 2008. *p*-Values are reported in parentheses from standard errors double-clustered by the acquirer and target US Bureau of Economic Analysis input-output industries. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

	(1)	(2)	(3)	(4)
Acquirer purchases/target sales	0.005	−0.047	−0.041	−0.025
	(0.931)	(0.434)	(0.541)	(0.739)
Target input/acquirer output	0.064	0.039	−0.012	−0.012
	(0.191)	(0.591)	(0.868)	(0.879)
HP product similarity	−0.049	−0.026	−0.135*	−0.117
	(0.453)	(0.732)	(0.071)	(0.166)
Target M/B	−0.003*	−0.003*	−0.002	−0.001
	(0.081)	(0.086)	(0.186)	(0.271)
Acquirer M/B	0.004***	0.003***	0.005***	0.005***
	(0.004)	(0.003)	(0.000)	(0.000)
Target price–cost margin	0.055**	0.048	0.046**	0.049***
	(0.034)	(0.127)	(0.030)	(0.007)
Acquirer price–cost margin	−0.113***	−0.133***	−0.128***	−0.126**
	(0.003)	(0.000)	(0.009)	(0.040)
Target industry concentration	0.024*	0.027	0.011	0.018
	(0.085)	(0.113)	(0.542)	(0.347)
Acquirer industry concentration	−0.019	0.006	0.020	0.022
	(0.181)	(0.777)	(0.225)	(0.209)
Target industry value added	0.023	0.011	0.008	0.018
	(0.365)	(0.763)	(0.828)	(0.625)
Acquirerindustry value added	−0.008	−0.024	−0.005	0.021
	(0.812)	(0.561)	(0.923)	(0.742)
Target industry std. dev. profitability	0.014***	0.012*	0.011**	0.011**
	(0.000)	(0.055)	(0.037)	(0.031)
Acquirer industry std. dev. profitability	−0.002	0.003	−0.003	−0.003
	(0.691)	(0.532)	(0.560)	(0.637)
Target market equity			0.000	0.000
			(0.880)	(0.982)
Acquirer market equity			0.000**	0.000**
			(0.016)	(0.018)
Target prior returns			−0.038***	−0.041***
			(0.001)	(0.002)
Acquirer prior returns			0.001	0.001
			(0.913)	(0.958)
Relative size of merger			0.023***	0.022**
			(0.008)	(0.025)
Percentage stock			0.013	0.010
			(0.151)	(0.253)
Target termination fee			0.011*	0.013*
			(0.090)	(0.087)
Toehold			−0.068	−0.054
			(0.215)	(0.395)
Target leverage				0.024
				(0.659)
Acquirer leverage				−0.007
				(0.892)
Target R&D				−0.068
				(0.312)
Acquirer R&D				−0.043
				(0.688)
Target durable assets				0.008
				(0.814)
Acquirer durable assets				0.009
				(0.850)
Target industry fixed effects	No	Yes	Yes	Yes
Acquirer industry fixed effects	No	Yes	Yes	Yes
Year fixed effects	No	Yes	Yes	Yes
Adjusted R^2	0.058	0.084	0.171	0.154
Number of observations	335	335	293	288

There are other interesting results in Table 4. Absolute firm size is unrelated to Δ$*CAR*, indicating that the strong effect of acquirer size on acquirer returns (Moeller, Schlingemann, and Stulz, 2004) does not influence the division of gains. However, targets that are larger relative to the acquirer receive larger relative gains. In addition,

greater acquirer R&D expenses are significantly related to lower target gains.

Table 5 presents a similar analysis using only the sample of backward vertical mergers. In this setting, the vertical product market relations are insignificantly related to the relative gain of the target. However, the price–cost margins of the target and acquirer have strong effects on the division of gains, consistent with the notion that more scarce firms command greater bargaining power. In addition, the greater is the standard deviation of profitability in the target industry, the greater is the target's gain relative to the acquirer. This is consistent with the idea that the target is rare, with fewer industry rivals as substitutes. These effects are also economically substantial. Increasing an average acquirer's price–cost margin by 1 standard deviation decreases the target's relative gain, $\Delta\$CAR$, by 1.2 percentage points, compared with the median $\Delta\$CAR$ in backward mergers of 2.9%, and the mean of 3.9.

The interpretation of other results are less clear. For instance, market-to-book ratios have opposite signs of the predictions. For the most part, the HP product similarity measure is not significant, and neither are the industry-level value added variables. The control variables have similar effects as in the sample of forward mergers, though now acquirer research and development (R&D) is insignificant.

In additional tests, I run identical regressions as in Column 4 of Tables 4 and 5 in which I include a host of interaction terms between the various measures of product market relations and scarcity variables. In forward mergers, the interaction of acquirer M/B and the importance of the acquirer as a supplier is significant, and positive, contrary to expectation. Likewise, the interaction of target M/B and the importance of the target as a customer is positive and significant. In the sample of backward mergers, there are no significant interaction effects. However, in both samples, the main effects of the variables of interest remain unchanged from the primary specifications. These results are presented in Table B1.

These first set of results provides evidence that supports the hypothesis that a firm's bargaining power in mergers is related to its outside options. Targets that are less common, as measured at the firm level by price-cost margins and market-to-book ratios and at the industry level by industry value added and the importance of industry trading relations, capture larger announcement dollar gains relative to acquirers. In the next set of tests, I investigate these effects using a different measure of target gains.

3.3. The target's share of combined gains

It would be ideal to be able to measure the percentage of total dollar gains that a target receives, relative to an acquirer, as if dividing a pie into two pieces. In this subsection, I restrict attention to the cases in which this can be done: cases in which both acquirer and target firms have positive announcement returns. This restriction helps alleviate the concern that the results could be driven by omitted variables such as agency costs, for example.

Because I am restricting the sample by including only mergers in which both the acquirer and target experienced positive announcement effects, standard OLS regression estimates could be biased. Therefore, I also run Heckman two-stage selection models. The first-stage of the Heckman model estimates the probability of being included in this sample, conditioned on being a forward or backward merger. Fitted values of the first-stage estimation are converted into an inverse Mills ratio variable, λ. This variable is included in the second-stage estimation to control for the likelihood of entering the sample.

To identify the selection effect in the second-stage regression, there must be a set of excluded variables that are used as explanatory variables in the first-stage. In this case, the excluded variables should help explain variation in the likelihood that both acquirers and targets have positive returns, while not affecting the coefficients of interest in the second-stage through their absence. If there are no excluded variables, identification in the second-stage is produced only by the difference between linearity in the OLS regression and non-linearity in the first-stage probit regression. Therefore, I use payment method, target defenses, relative value, and firm sizes to estimate the first-stage probit model and do not include these variables in the second-stage regression, but instead focus on the variables of interest for this study. Payment method and target defenses have no significant effect on the division of gains in the prior tests, but they are likely related to individual returns, most notably the acquirer's. Firm sizes and relative value do have effects on the division of gains, but they are also highly related to individual acquirer and target gains, so I include them in the first-stage and omit them from the second-stage. If anything, their omission from the second-stage makes it harder to partial out the effect of the main results, thus biasing the tests against finding significant results. The results of the first-stage probit model are presented in Table B2 in Appendix B.[10]

Table 6 presents the estimates from both OLS and Heckman selection models for forward and backward vertical mergers separately, where the dependent variable is the fraction of total gains captured by the target, denoted in the table under "Fraction." In addition, I re-run the analysis from Tables 4 and 5 using the $\Delta\$CAR$ measure as the independent variable to ensure that those results hold in this subsample. Those specifications are denoted under "Relative Gains."

The results are largely consistent between the OLS and Heckman models. Consistent with the results on $\Delta\$CAR$ for forward mergers, the greater is the importance of the acquirer industry as a supplier, the smaller is the fraction of the total gains captured by the target. Likewise, the greater are the purchases of the target, the greater is the target's share of the total gains. These results hold in both the OLS and Heckman models, as well as in the robustness

[10] Though none of the coefficients in the first-stage probit regression in the forward mergers subsample is individually significant, the Wald χ^2 test shows that they are jointly different than zero at a significance level of 0.003.

Table 6
Target's gain in the subsample where both acquirers and targets have strictly positive gains.

This table presents ordinary least squares and Heckman regressions on samples when both acquirer and target gains are positive. The dependent variable is either the target's percentage of total dollar gains of the combined dollar gains of the acquirer and target or $CAR − acquirer $CAR divided by the sum of acquirer and target market values. First-stage probit estimates of the likelihood of sample inclusion are in Table A1. All variables defined in Appendix A. Industry fixed effects are at the Fama and French 12-industry level. Data are from 1980 to 2008. *p*-Values are reported in parentheses from standard errors double-clustered by the acquirer and target US Bureau of Economic Analysis input–output industries in OLS regressions. Constant is not reported. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

	Forward mergers				Backward mergers			
	OLS		Heckman		OLS		Heckman	
	Fraction	Relative gains	Fraction	Relative gains	Fraction	Relative gains	Fraction	Relative gains
Target purchases/acquirer sales	0.938**	0.213***	0.889***	0.217***				
	(0.038)	(0.002)	(0.007)	(0.001)				
Acquirer input/target output	−1.338***	−0.274***	−1.331***	−0.275***				
	(0.003)	(0.000)	(0.002)	(0.001)				
Acquirer purchases/target sales					0.130	−0.017	−0.017	−0.037
					(0.656)	(0.828)	(0.951)	(0.327)
Target input/acquirer output					0.717	0.115	0.595	0.098
					(0.154)	(0.200)	(0.396)	(0.316)
HP product similarity	0.018	−0.010	0.056	−0.013	0.181	0.016	−0.884	−0.131
	(0.931)	(0.913)	(0.757)	(0.702)	(0.830)	(0.897)	(0.141)	(0.115)
Target M/B	−0.011	0.000	−0.012	0.000	−0.017	−0.002	−0.016	−0.001
	(0.236)	(0.897)	(0.122)	(0.877)	(0.181)	(0.230)	(0.219)	(0.420)
Acquirer M/B	−0.019***	−0.004*	−0.019***	−0.004***	−0.026	−0.004	−0.057***	−0.008***
	(0.009)	(0.082)	(0.003)	(0.000)	(0.304)	(0.312)	(0.005)	(0.005)
Target price–cost margin	0.200	0.024	0.189	0.025	0.215	−0.001	0.212	−0.001
	(0.104)	(0.549)	(0.249)	(0.412)	(0.568)	(0.980)	(0.446)	(0.971)
Acquirer price–cost margin	−0.091	0.093*	−0.160	0.099**	−0.214	0.047	−0.205	0.048
	(0.523)	(0.068)	(0.448)	(0.012)	(0.636)	(0.598)	(0.606)	(0.381)
Target industry concentration	0.072	0.037	0.075	0.037*	0.033	0.025	0.088	0.032
	(0.483)	(0.240)	(0.479)	(0.068)	(0.804)	(0.242)	(0.576)	(0.140)
Acquirer industry concentration	0.388***	0.022	0.337**	0.026	0.164*	0.022***	0.133	0.018
	(0.000)	(0.627)	(0.027)	(0.369)	(0.094)	(0.000)	(0.462)	(0.481)
Target industry value added	−0.238	−0.051	−0.204	−0.054	−0.029	−0.006	−0.289	−0.042
	(0.499)	(0.296)	(0.334)	(0.178)	(0.956)	(0.931)	(0.358)	(0.331)
Acquirer industry value added	−0.412*	−0.104**	−0.374**	−0.107***	0.156	0.044	0.462	0.087*
	(0.062)	(0.028)	(0.027)	(0.001)	(0.685)	(0.529)	(0.178)	(0.069)
Target industry std. dev. profitability	−0.024	−0.006*	−0.021	−0.006	−0.040	−0.012*	−0.003	−0.007
	(0.550)	(0.071)	(0.418)	(0.233)	(0.489)	(0.080)	(0.967)	(0.437)
Acquirer industry std. dev. profitability	0.007	−0.005	0.005	−0.005	0.125	0.013	0.112	0.011
	(0.787)	(0.673)	(0.894)	(0.475)	(0.212)	(0.241)	(0.125)	(0.259)
Heckman's λ			0.198	−0.016			0.456***	0.063***
			(0.242)	(0.600)			(0.001)	(0.001)
Target, acquirer industry, and year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.399	0.212			0.042	0.130		
p-Value (χ^2)			< 0.001	< 0.001			0.005	0.006
Number of observations	137	137	516	516	117	117	568	568

check of the Δ$*CAR* in the smaller subsample. Acquirer industry value added is also negative and significant, as it was in Table 4. Also, the acquirer's market-to-book ratio is significantly negatively related to the target's gain in all specifications, consistent with Rhodes-Kropf and Robinson (2008).

The relative gains of targets in backward mergers is again unrelated to the product market relations and the regressions generally have few variables that are significant in any of the specifications. The acquirer's M/B ratio is negatively related to target gains as predicted, though the target's M/B is unrelated to target gains in backward mergers.

Using a more direct measure of the division of gains in mergers, these results provide further evidence that the bargaining power of a target is related to its relative scarcity. Moreover, they validate the use of Δ$*CAR* as a measure of the division of gains in mergers. However, there is a marked difference in the impact of product market relations on the division of gains for forward versus backward mergers.

3.4. Forward versus backward mergers

The results presented above indicate that product market relations are strongly related to the division of gains in forward vertical mergers, but unrelated in backward vertical mergers. To be clear, these results do not show that either upstream or downstream product market dependence is unrelated to merger outcomes, as both of these dependencies are found in forward mergers. Instead, this result implies that these dependencies

matter only if the bidder is the supplier and the target is the customer. When the bidder is the customer and the target is the supplier, these relations are unrelated to bargaining outcomes.

This difference is not predicted by theoretical models of vertical integration based on market power (Perry, 1989) or transaction costs (Klein, Crawford, and Alchian, 1978; Williamson, 1979). In these theories, the ultimate owner is irrelevant. To my knowledge, only the property rights theory of the firm (Grossman and Hart, 1986; Hart and Moore, 1990; Hart, 1995) predicts whether the bidder in a vertical merger is more likely to be a customer or a supplier. In particular, this theory predicts that if high contracting costs make common ownership more efficient than market transactions, the firm that suffers the lesser investment distortions from common ownership would acquire the other firm (Grossman and Hart, 1986). However, it is not clear from the theory why customer–supplier relations would matter for the division of gains in mergers only if the firm that had the lesser post-merger investment distortions, and hence was the acquirer, was the supplier and not the customer. The answer to this question is left as an area for future research.

4. Robustness checks

In this section, I provide a number of different robustness checks on the main results.

4.1. The relation between industrial relations and combined merger gains

A potential concern with the preceding results is that the industry relations used to capture bargaining strength could be related to the overall size of the combined gains. If the mergers that generate the greatest combined synergy gains are those in which the strongest vertical relations exist, then the prior results could explain the size of gains, rather than the division of gains.

Table 7 presents cross-sectional regressions using the same explanatory variables as in the main regressions of the paper, but where the dependent variable is the weighted abnormal dollar announcement returns, using the pre-merger market values of the acquirer and target as weights, as in Bradley, Desai, and Kim (1988). First, none of the IO vertical trading relations is significantly related to the combined gains, except *Acquirer purchases/Target sales* in backward mergers. This is consistent with Fan and Goyal (2006). They present evidence that vertical mergers generate higher combined announcement returns than horizontal mergers in a dummy variable regression, though they do not directly test the marginal effect of greater product market relations on combined gains. However, their reported coefficient on the dummy variable for vertical relations is almost identical whether vertical relations are measured using a 1% or a 5% threshold of customer–supplier relations.

Second, the results in Table 7 show that, except for weak significance for target industries in one specification of forward mergers, industry value added is also not related to combined returns. However, acquirer price–cost margins are related to combined gains, as is the standard deviation of profitability in the acquirer industry. The insignificant effect of the HP product similarity measure is consistent with the finding in Hoberg and Phillips (2010b), which finds only weak significance in a longer-event window, but none in the few days around the announcement. Variables that significantly impact combined returns were not significant in the division of gains regressions. Therefore, these results provide assurance that the product market variables that were significant in the main tests of the division of gains are not simply explaining the size of gains.

4.2. Renegotiation in mergers

The second robustness check I perform is to investigate bargaining in the context of renegotiation, instead of the division of announcement gains. If a merger price is amended following the initial announcement, it is expected to favor the firm with greater bargaining power. Deal amendments are recorded in the SDC database as either upward or downward revisions in the purchase price. In the full sample, there are 344 revisions, of which 61% are upward revisions. In the forward merger subsample, there are 37 instances of an upward amendment in price and 20 instances of a downward amendment. In backward mergers, there are 30 upward revisions and 24 downward revisions.

The initially contracted takeover price should reflect the bargaining strength of the two firms. However, renegotiated prices could mean that there has been a change in the negotiating environment. If new information is revealed after the initial bargaining process, the firms could wish to revise their contract. If there is a cost to renegotiation, then the offer might be revised only if the firm with a stronger bargaining position chooses to renegotiate. In this case, positive news about the target could lead to an increase in the takeover price if the target has greater bargaining power, and negative news could lead to a reduction in the price if the acquirer has greater bargaining power. Alternatively, revised offers could simply reflect the negotiation process itself.

To better understand this, I read news stories about the mergers and the revised offers. I can find news articles for 88 out of the 111 revisions, of which 56 are upward revisions (31 in forward mergers and 25 in backward) and 32 are downward revisions (15 in forward and 17 in backward). Of the 56 upward revisions, 10 were new bids following a target's rejection of the initial bid as too low, 23 were revisions in a bidding war, and 11 were part of a hostile takeover. In contrast, of the 32 downward revisions, 20 followed a substantial change in the market value of the acquirer or target and six followed legal problems that arose after the initial bid. These descriptions indicate that most of the revisions reflect an ongoing negotiation process.

To relate the price amendments to product market relations, I run ordered logistic regressions in which the dependent variable is 1 if the offer is revised upward, 0 if there is no revision, and -1 if the price is revised downward. The explanatory variables are as before, though I do

Table 7
Combined abnormal returns in vertical mergers.

This table presents coefficient estimates from ordinary least squares regressions on the combined cumulative abnormal return (CARs). The combined CAR is the weighted average of acquirer and target CAR by market equity. CARs are cumulative abnormal returns over three days surrounding the announcement adjusted by the equally weighted Center for Research in Security Prices index. All variables defined in Appendix A. Industry fixed effects are at the Fama and French 12-industry level. Data are from 1980 to 2008. Constant is not reported. *p*-Values are reported in parentheses from standard errors double-clustered by the acquirer and target US Bureau of Economic Analysis input–output industries. ***, **, and * indicate significance at the 1%, 5% and 10% levels.

	Forward mergers		Backward mergers	
	(1)	(2)	(3)	(4)
Target purchases/acquirer sales	0.062	0.014		
	(0.222)	(0.825)		
Acquirer input/target output	0.016	0.090		
	(0.832)	(0.341)		
Acquirer purchases/target sales			0.087	0.102*
			(0.128)	(0.075)
Target input/acquirer output			−0.015	−0.052
			(0.842)	(0.442)
HP Product similarity	0.038	0.043	−0.117	−0.077
	(0.562)	(0.516)	(0.183)	(0.417)
Target M/B	−0.001	0.000	−0.002	−0.002
	(0.775)	(0.997)	(0.368)	(0.499)
Acquirer M/B	0.001	0.002	−0.006*	−0.005
	(0.776)	(0.476)	(0.066)	(0.109)
Target price–cost margin	0.055	0.081*	−0.042	−0.034
	(0.176)	(0.072)	(0.202)	(0.468)
Acquirer price–cost margin	−0.097**	−0.128*	0.081	0.094*
	(0.036)	(0.058)	(0.121)	(0.057)
Target industry concentration	0.015	0.018	0.014	0.017
	(0.528)	(0.413)	(0.511)	(0.376)
Acquirer industry concentration	−0.066*	−0.066*	0.022	0.024
	(0.054)	(0.062)	(0.181)	(0.205)
Target industry value added	0.063	0.080*	−0.052	−0.040
	(0.109)	(0.052)	(0.244)	(0.387)
Acquirer industry value added	0.043	0.026	0.008	−0.028
	(0.186)	(0.522)	(0.826)	(0.502)
Target industry std. dev. profitability	−0.002	−0.001	−0.003	−0.005
	(0.801)	(0.875)	(0.635)	(0.309)
Acquirer industry std. dev. profitability	−0.010**	−0.010**	0.003	0.007
	(0.034)	(0.032)	(0.682)	(0.211)
Target market equity	0.001	0.000	0.003	0.003
	(0.410)	(0.823)	(0.351)	(0.410)
Acquirer market equity	0.000	0.000	0.000	0.000
	(0.371)	(0.498)	(0.525)	(0.697)
Target prior returns	−0.005	−0.004	0.002	0.004
	(0.680)	(0.759)	(0.887)	(0.761)
Acquirer prior returns	0.014	0.018	0.008	0.009
	(0.386)	(0.275)	(0.455)	(0.407)
Target leverage	0.020	0.013	0.045	0.017
	(0.655)	(0.805)	(0.230)	(0.649)
Target R&D	0.059	0.061	0.053	0.052
	(0.477)	(0.494)	(0.578)	(0.562)
Acquirer R&D	0.214	0.212	−0.072	−0.044
	(0.104)	(0.106)	(0.274)	(0.540)
Target durable assets	0.024	0.053**	−0.005	0.008
	(0.287)	(0.031)	(0.864)	(0.844)
Acquirer durable assets	0.050	0.045	−0.018	−0.041
	(0.195)	(0.319)	(0.633)	(0.331)
Relative size of merger		0.024		0.019*
		(0.150)		(0.070)
Percentage stock		−0.021*		−0.030**
		(0.087)		(0.034)
Target termination fee		0.000		−0.014
		(0.978)		(0.118)
Toehold		−0.082		0.010
		(0.317)		(0.917)
Target industry fixed effects	Yes	Yes	Yes	Yes
Acquirer industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Adjusted R^2	−0.026	−0.025	0.186	0.213
Number of observations	283	245	315	289

Table 8
Determinants of the revision of takeover price.

This table presents coefficient estimates from ordered logit regressions in which the dependent variable takes the value −1 if there was a downward revision in the takeover price, 0 if no revision, and +1 if a positive revision and ordinary least squares regressions with the same dependent variable. All variables are defined in Appendix A. Industry fixed effects are at the Fama and French 12-industry level. Data are from 1980 to 2008. *p*-Values are reported in parentheses from robust standard errors. ***, **, and * indicate significance at the 1%, 5% and 10% levels.

	Forward mergers		Backward mergers	
	Ordered logit (1)	OLS (2)	Ordered logit (3)	OLS (4)
Target purchases/acquirer sales	5.199***	0.653		
	(0.002)	(0.117)		
Acquirer input/target output	−4.440**	−0.724**		
	(0.025)	(0.011)		
Acquirer purchases/target sales			0.892	0.044
			(0.486)	(0.846)
Target input/acquirer output			−4.875*	−0.508
			(0.098)	(0.245)
HP product similarity	4.314***	0.804**	−1.964	0.078
	(0.008)	(0.011)	(0.436)	(0.806)
Target M/B	−0.028	−0.007	−0.104**	−0.006
	(0.708)	(0.358)	(0.016)	(0.362)
Acquirer M/B	−0.006	0.006	0.097*	0.009
	(0.942)	(0.466)	(0.098)	(0.265)
Target price–cost margin	0.332	0.097	−1.305	0.017
	(0.847)	(0.661)	(0.391)	(0.902)
Acquirer price–cost margin	1.044	−0.087	1.999	0.069
	(0.672)	(0.823)	(0.485)	(0.806)
Target industry concentration	0.292	0.098	1.487	0.204
	(0.780)	(0.350)	(0.106)	(0.118)
Acquirer industry concentration	1.307	0.253	0.702	0.087
	(0.334)	(0.151)	(0.440)	(0.495)
Target industry value added	3.079	0.302	0.036	0.132
	(0.247)	(0.253)	(0.983)	(0.494)
Acquirer industry value added	0.328	0.125	−1.232	0.008
	(0.882)	(0.558)	(0.505)	(0.973)
Target industry std. dev. profitability	−0.029	0.018	0.122	−0.012
	(0.933)	(0.607)	(0.306)	(0.604)
Acquirer industry std. dev. profitability	0.285	0.042**	−0.052	0.010
	(0.103)	(0.049)	(0.851)	(0.774)
Acquirer's CAR −42 to revision	2.079**	0.177	0.879	0.034
	(0.040)	(0.146)	(0.295)	(0.719)
Target market equity	−0.024	0.000	0.121	0.014
	(0.516)	(0.965)	(0.171)	(0.295)
Acquirer market equity	−0.002	0.000	−0.006	0.000
	(0.546)	(0.946)	(0.107)	(0.357)
Target prior returns	−0.002	−0.003	−0.474	−0.087
	(0.998)	(0.960)	(0.367)	(0.141)
Acquirer prior returns	−1.405**	−0.070	0.138	0.024
	(0.040)	(0.291)	(0.615)	(0.404)
Target leverage	−1.195	−0.220	−3.825**	−0.321
	(0.613)	(0.379)	(0.016)	(0.103)
Target R&D	4.195	0.284	2.204	0.176
	(0.342)	(0.506)	(0.329)	(0.535)
Target durable assets	0.492	−0.031	0.538	0.037
	(0.807)	(0.861)	(0.805)	(0.867)
Acquirer leverage	−2.536	−0.061	−2.882	−0.313
	(0.334)	(0.844)	(0.293)	(0.202)
Acquirer R&D	−12.071*	−1.002	−7.600**	−0.905*
	(0.054)	(0.203)	(0.041)	(0.058)
Acquirer durable assets	0.045	0.054	2.125	0.307
	(0.982)	(0.822)	(0.276)	(0.150)
Relative size of merger	−0.351	−0.067	0.140	0.039
	(0.470)	(0.179)	(0.783)	(0.437)
Percentage stock	−0.905*	−0.088	−0.605	−0.064
	(0.085)	(0.125)	(0.223)	(0.258)
Target termination fee	−0.895	−0.061	−0.169	0.006
	(0.121)	(0.293)	(0.728)	(0.906)
Toehold	7.490***	0.909***	3.747	0.549
	(0.000)	(0.004)	(0.134)	(0.162)
Target industry fixed effects	No	Yes	No	Yes
Acquirer industry fixed effects	No	Yes	No	Yes

Table 8 (*continued*)

	Forward mergers		Backward mergers	
	Ordered logit (1)	OLS (2)	Ordered logit (3)	OLS (4)
Year fixed effects	No	Yes	No	Yes
Adjusted R^2		0.097		−0.026
Pseudo-R^2	0.182		0.103	
Number of observations	245	245	288	288

not include year and industry fixed effects because they are likely to bias the coefficients in the logit model. Also, following Hotchkiss, Qian, and Song (2005), I include a measure of the target's abnormal stock returns from 42 days before the announcement date until one day before the revision. This controls for revisions caused by changes in market value. For mergers without a revision, I record the acquirer's abnormal returns from 42 days before the announcement until an average number of days beyond the announcement. The average is computed from the mergers with price amendments as the number of days from the announcement to the revision date divided by the total number of days between the announcement and the close of the merger.

Because a bidding war could may have different implications than legal issues, it would be useful to account for the causes of the price revisions in the tests. However, the causes of the revision are contingent upon having a revision. In the ordered logit tests, I exploit the variation between those deals with no revision and those with positive or negative revisions. This prevents me from including the cause of the revision as an explanatory variable.

The results are presented in Table 8. A positive coefficient indicates that an independent variable is associated with a higher likelihood of an upward revision in the offer price. In the forward merger sample, the results are consistent with the previous findings. The more the target purchases from the acquirer and the less that targets rely on acquirers as suppliers, the greater is the likelihood of a positive revision in the consideration paid to the target. As before, the results are insignificant or take the opposite sign as expected in the backward merger sample. As predicted, the greater is the acquirer's abnormal returns in the period before the revision, the greater is the likelihood of an upward revision in the takeover price. Also, the HP product similarity measure is positive and significant, indicating that the more similar are two firms' products, the more likely are they to have an upward revision in the takeover price. For additional robustness, I run identical OLS tests where I include industry and year fixed effects. The results presented in Columns 2 and 4 are largely unchanged.

4.3. Additional robustness checks

In prior research that uses the BEA IO industry codes, Fan and Lang (2000) and Acemoglu, Johnson, and Mitton (2009) exclude firms in the retail and wholesale industries because they are more broadly defined than most IO industry codes. In addition, in financial and insurance industries, the input–output and value added measures could be measuring something different than in manufacturing industries. Therefore, I re-run the analyses excluding firms in these industries. With few exceptions, the results are virtually unchanged. In some specifications, the statistical significance is reduced. However, it is only a slight difference, which could simply reflect the smaller sample size in the robustness checks.

Firms with better access to merger advisers could capture a larger share of merger gains. These firms could also be more profitable. In this case I could attribute profitability as a determinant of the division of gains, when, in fact, it is the advise given by professional negotiators. To address this, I record the number of advisers and the total fees paid from SDC data for the target and the acquirer. These data are not available for all deals in the sample, so the regressions have less power due to a smaller sample size. I also include cash holdings divided by assets as a measure of the resources of a firm. The inclusion of these measures does not change any of the qualitative results of the paper.

5. Conclusion

In contrast to the widely held belief that targets capture the lion's share of merger gains, I show that there is considerable variation in the division of gains in mergers and that the gains to targets are only modestly more than the gains to acquirers, on average. For each dollar in pre-merger combined market equity of the merging firms, targets gain about 3.5 cents more than acquirers on average. In addition, in the subsample in which both firms have positive announcement gains, acquirers capture 56% of the total gains on average.

Using a standard outside options argument, I show that the division of gains in vertical mergers is explained in part by product market relations between the bidder and the target. Firms that have more unique assets with fewer substitutes are predicted to capture a larger share of the merger gains. I proxy for a firm's bargaining power using its price–cost margin, its market-to-book ratio, its firm- and industry-level profitability, and its dependence on the industry of its merger partner as a supplier or as a customer.

The empirical results support the hypothesis. Targets in forward vertical mergers that are relatively more scarce and rely less on acquirers as suppliers or customers receive larger dollar gains from the merger relative to the acquirer's gain, as compared with the case in which targets rely on acquirers through the product market or have less scarce assets. In backward mergers, greater

scarcity of a firm leads to greater relative gains. I verify these results using the difference in abnormal announcement dollar gains, as well as using the target's percentage of gains when both firms have positive announcement returns and in the context of renegotiation of the takeover price. These results are robust to a number of controls including deal characteristics such as termination fees, form of payment, and toeholds, as well as the cash holdings of a firm and the use of M&A advisers.

This paper contributes to a growing field of research that is interested in understanding how product market interactions affect corporate decisions. The connection between customer–supplier relations and merger outcomes illustrates just one aspect of how the real economy influences financial decisions of firms. Understanding these connections is important because it emphasizes that operating and financial decisions are not likely to be made in isolation.

Appendix A

$\Delta\$CAR$: Target $\$CAR$ − Acquirer $\$CAR$ divided by the sum of acquirer and target market values 50 trading days before the merger announcement. CARs are cumulative abnormal

Table B1
Interaction effects in forward and backward mergers.
This table presents coefficient estimates from ordinary least squares regressions on the $\$CAR$ − acquirer $\$CAR$ divided by the sum of acquirer and target market values 50 trading days before the merger announcement. $\$CAR$s are cumulative abnormal returns over three days surrounding the announcement adjusted by the equally weighted Center for Research in Security Prices index and scaled by market equity. All variables are defined in Appendix A. Forward: indicates the variable used in the forward merger subsample. Backward: is analogous. Additional controls indicates the inclusion of all other controls from Tables 4 and 5. Industry fixed effects are at the Fama and French 12-industry level. Constant is not reported. Data are from 1980 to 2008. *p*-Values are reported in parentheses from standard errors double-clustered by the acquirer and target US Bureau of Economic Analysis input–output industries. ***, **, and * indicate significance at the 1%, 5% and 10% levels.

	Forward (1)	Backward (2)
Forward: target purchases/acquirer sales	0.302***	−0.021
or Backward: acquirer purchases/target sales	(0.007)	(0.802)
Forward: acquirer input/target output	−0.371***	−0.036
or Backward: target input/acquirer output	(0.002)	(0.696)
HP product similarity	0.027	−0.121
	(0.620)	(0.146)
Target M/B	−0.001	−0.002
	(0.803)	(0.163)
Acquirer M/B	−0.005	0.004***
	(0.143)	(0.001)
Target price–cost margin	0.062	0.049***
	(0.164)	(0.006)
Acquirer price–cost margin	−0.003	−0.109*
	(0.964)	(0.090)
Target industry concentration	0.005	0.019
	(0.842)	(0.339)
Acquirer industry concentration	0.061**	0.021
	(0.013)	(0.223)
Target industry value added	−0.050	0.028
	(0.303)	(0.446)
Acquirer industry value added	−0.066*	0.029
	(0.079)	(0.669)
Target industry std. dev. profitability	−0.007	0.010*
	(0.309)	(0.067)
Acquirer industry std. dev. profitability	0.001	−0.002
	(0.781)	(0.795)
Forward: target purchases/acquirer sales × target M/B	−0.064**	0.544
or Backward: acquirer purchases/target sales × acquirer M/B	(0.021)	(0.611)
Forward: acquirer input/target output × acquirer M/B	0.064**	0.191
or Backward: target input/acquirer output × target M/B	(0.047)	(0.199)
Forward: target purchases/acquirer sales × target PC margin	−0.129	−5.310
or Backward: acquirer purchases/target sales × acquirer PC margin	(0.756)	(0.514)
Forward: acquirer input/target output × acquirer PC margin	0.295	−6.229
or Backward: target input/acquirer output × target PC margin	(0.395)	(0.182)
Forward: target purchases/acquirer sales × target std. dev. profitability	0.006	0.028
or Backward: acquirer purchases/target sales × acquirer std. dev. profitability	(0.155)	(0.141)
Forward: acquirer input/target output × acquirer std. dev. profitability	0.000	−0.001
or Backward: target input/acquirer output × target std. dev. profitability	(0.895)	(0.899)
Additional controls	Yes	Yes
Target industry fixed effects	Yes	Yes
Acquirer industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Adjusted R^2	0.163	0.141
Number of observations	245	288

returns over three days surrounding the announcement adjusted by the equally weighted CRSP index. $CARs are CARs scaled by market equity. (Source: CRSP)

Acquirer input/target output: The fraction of total target industry inputs accounted for by the acquirer industry. Industries are defined at the BEA input–output level. (Source: US BEA input–output data)

Acquirer's CAR −42 to revision: The cumulative abnormal return of the acquirer from 42 days before the announcement of the merger until the average revision date. Abnormal returns are raw returns adjusted by the equally weighted CRSP index. The average revision date is found in the sample of stock price amendments by taking the average of the following ratio: the number of days from the announcement to the revision date/the total number of days from the announcement until the close of the merger. (Source: CRSP)

Durable assets: Property, plant, and equipment/assets. (Source: Compustat)

HP product similarity: The 10-K text-based variable industry similarity measure as developed in Hoberg and Phillips (2010a, 2010b). (Source: Gerard Hoberg and Gordon Phillips)

Industry concentration: The eight-firm concentration ratio of the firm's two-digit SIC code. Data are available every five years. (Source: Economic Censuses)

Industry std. dev. profitability: The standard deviation of the price–cost margin within a firm's two-digit SIC code in the prior year. (Source: Compustat)

Leverage: (Debt in current liabilities + long-term debt)/(total assets − common equity + market equity). (Source: Compustat)

M/B: Market-to-book calculated as in Fama and French (1993). (Source: Compustat and CRSP)

Market equity: Price times shares outstanding two days before the merger announcement. (Source: CRSP)

Percentage stock: The percentage of the transaction value paid in stock, compared with cash or other methods. (Source: SDC)

Price–cost margin: Sales minus costs of goods sold (COGS) and general and administrative expenses (SGA), divided by sales. If COGS or SGA are unavailable I use operating income before depreciation, interest, and taxes divided by sales. (Source: Compustat)

Prior returns: Buy-and-hold return of the CRSP equally weighted-adjusted firm return from −250 to −10 in daily event time. (Source: CRSP)

R&D: R&D/assets. If missing, set to zero. (Source: Compustat)

Relative size: The ratio of the transaction value to the acquirer market value at the announcement date. (Source: CRSP and SDC)

Target purchases/acquirer sales: The fraction of the acquirer's industry output purchased the target industry. Industries are defined at the BEA input–output level. (Source: US BEA input–output data)

Termination fee: Dummy variable equal to one if the merger agreement includes a target termination fee. (Source: SDC)

Toehold: The percentage of shares held by the acquirer at the announcement of the merger. (Source: SDC)

Table B2
First-stage probit regression of positive joint gains for Heckman model.
This table presents coefficient estimates from probit models in which the dependent variable equals one if both the acquirer and target announcement returns are positive. All variables are defined in Appendix A. Constant is not reported. Data are of only vertical mergers from 1980 to 2008. *p*-Values are reported in parentheses from robust standard errors. ***, **, and * indicate significance at the 1%, 5% and 10% levels.

	Forward (1)	Backward (2)
Percent cash	0.000	0.003
	(0.910)	(0.208)
Percent stock	−0.003	−0.006***
	(0.129)	(0.008)
Target defenses	−0.132	−0.510***
	(0.417)	(0.008)
Relative value	−0.091	0.162
	(0.509)	(0.210)
Acquirer size	−0.024	0.032
	(0.537)	(0.396)
Target size	−0.062	−0.104**
	(0.176)	(0.028)
Number of observations	516	568
Pseudo-R^2	0.022	0.087
p-Value (χ^2)	0.046	< 0.001

Value added: Value added as recorded by BEA input–output tables normalized by the total value of output at the BEA IO industry level. (Source: US BEA input–output data)

Appendix B

Regressions corresponding to Tables 4 and 5 that include interaction terms are shown in Table B1. The first-stage probit regression results of the Heckman selection model used in this paper are shown in Table B2.

References

Acemoglu, D., Johnson, S., Mitton, T., 2009. Determinants of vertical integration: financial development and contracting costs. Journal of Finance 64, 1251–1290.

Ahern, K.R., Harford, J., 2010. The Importance of Industry Links in Merger Waves. Unpublished working paper, University of Michigan and University of Washington, Ann Arbor, MI, Seattle, WA.

Bates, T.W., Becher, D.A., Lemmon, M.L., 2008. Board classification and managerial entrenchment: evidence from the market for corporate control. Journal of Financial Economics 87, 656–677.

Bates, T.W., Lemmon, M.L., 2003. Breaking up is hard to do? An analysis of termination fee provisions and merger outcomes. Journal of Financial Economics 69, 469–504.

Bates, T.W., Lemmon, M.L., Linck, J.S., 2006. Shareholder wealth effects and bid negotiation in freeze-out deals: Are minority shareholders left out in the cold? Journal of Financial Economics 81, 681–708.

Becker, M.J., Thomas, S., 2008. The spillover effects of changes in industry concentration. Unpublished working paper, University of Pittsburgh, Pittsburgh, PA.

Betton, S., Eckbo, B.E., Thorburn, K.S., 2008. Markup pricing revisited. Unpublished working paper, Tuck School of Business at Dartmouth, Hanover, NH (2008-45).

Bhattacharyya, S., Nain, A., 2011. Horizontal acquisitions and buying power: a product market analysis. Journal of Financial Economics 99 (1), 97–115.

Boone, A.L., Mulherin, J.H., 2006. Do termination provisions truncate the takeover bidding process? Review of Financial Studies 20 (2), 461–489.

Bradley, M., Desai, A., Kim, E.H., 1988. Synergistic gains from corporate acquisitions and their division between the stockholders of target and acquiring firms. Journal of Financial Economics 21, 3–40.
Burkart, M., 1995. Initial shareholdings and overbidding in takeover contests. Journal of Finance 50, 1491–1515.
Campello, M., 2006. Debt financing: Does it boost or hurt firm performance in product markets? Journal of Financial Economics 82, 135–172.
Chang, S., 1998. Takeovers of privately held targets, methods of payment, and bidder returns. Journal of Finance 53 (2), 773–784.
Fama, E.F., French, K.R., 1993. Common risk factors in the returns on stocks and bonds. Journal of Financial Economics 33 (1), 3–56.
Fan, J., Goyal, V.K., 2006. On the patterns and wealth effects of vertical mergers. Journal of Business 79 (2), 877–902.
Fan, J., Lang, L.H., 2000. The measurement of relatedness: an application to corporate diversification. Journal of Business 73 (4), 629–660.
Fee, C.E., Hadlock, C.J., Thomas, S.E., 2006. Corporate equity ownership and the governance of product market relationships. Journal of Finance 61, 1217–1251.
Fee, C.E., Thomas, S., 2004. Sources of gains in horizontal mergers: evidence from customer, supplier, and rival firms. Journal of Financial Economics 74, 423–460.
Field, L.C., Karpoff, J.M., 2002. Takeover defenses of IPO firms. Journal of Finance 57 (5), 1857–1889.
Fuller, K., Netter, J., Stegemoller, M., 2002. What do returns to acquiring firms tell us? Evidence from firms that make many acquisitions. Journal of Finance 57 (4), 1763–1793.
Gaspar, J.-M., Massa, M., 2005. Idiosyncratic volatility and product market competition. Journal of Business 79, 3125–3152.
Grossman, S.J., Hart, O.D., 1986. The costs and benefits of ownership: a theory of vertical and lateral integration. Journal of Political Economy 94 (4), 691–719.
Hart, O., 1995. Firms, Contracts, and Financial Structure. Clarendon Press, Oxford, England.
Hart, O., Moore, J., 1990. Property rights and the nature of the firm. Journal of Political Economy 98 (6), 1119–1158.
Hartzell, J.C., Ofek, E., Yermack, D., 2004. What's in it for me? CEOs whose firms are acquired. Review of Financial Studies 17, 37–61.
Hoberg, G., Phillips, G., 2010a. Dynamic text-based industry classifications and endogenous product differentiation. Unpublished working paper, University of Maryland, College Park, MD.
Hoberg, G., Phillips, G., 2010b. Product market synergies and competition in mergers and acquisitions: a text-based analysis. Review of Financial Studies 23 (10), 3773–3811.
Hotchkiss, E., Qian, J., Song, W., 2005. Holdups, Renegotiation, and deal protection in mergers. Unpublished working paper, Boston College, Boston, MA.
Kaufman, D.J., 1988. Factors affecting the magnitude of premiums paid to target-firm shareholders in corporate acquisitions. Financial Review 23 (4), 465–482.
Kedia, S., Ravid, S.A., Pons, V., 2008. Vertical mergers and the market valuation of the benefits of vertical integration. Unpublished working paper, Rutgers Business School, Newark, NJ.
Kim, E.H., McConnell, J.J., 1977. Corporate mergers and the co-insurance of corporate debt. Journal of Finance 32 (2), 349–365.
Kim, E.H., Singal, V., 1993. Mergers and market power: evidence from the airline industry. American Economic Review 83 (3), 549–569.
Klein, B., Crawford, R.G., Alchian, A.A., 1978. Vertical integration, appropriable rents, and the competitive contracting process. Journal of Law and Economics 21 (2), 297–326.
Lewellen, W.G., 1971. A pure financial rationale for the conglomerate merger. Journal of Finance 26, 521–537.
MacKay, P., Phillips, G.M., 2005. How does industry affect firm financial structure? Review of Financial Studies 18, 1433–1466.
Maksimovic, V., Phillips, G., 2001. The market for corporate assets: Who engages in mergers and asset sales and are there efficiency gains? Journal of Finance 56 (6), 2019–2065.
Malatesta, P.H., 1983. The wealth effect of merger activity and the objective functions of merging firms. Journal of Financial Economics 11 (1–4), 155–181.
Moeller, S.B., Schlingemann, F.P., Stulz, R.M., 2004. Firm size and the gains from acquisitions. Journal of Financial Economics 73, 201–228.
Moeller, T., 2005. Let's make a deal! How shareholder control impacts merger payoffs. Journal of Financial Economics 76 (1), 167–190.
Officer, M.S., 2003. Termination fees in mergers and acquisitions. Journal of Financial Economics 69, 431–467.
Officer, M.S., 2004. Collars and renegotiation in mergers and acquisitions. Journal of Finance 59, 2719–2743.
Peress, J., 2010. Product market competition, insider trading, and stock market efficiency. Journal of Finance 65 (1), 1–43.
Perry, M.K., 1989. Vertical integration: determinants and effects. In: Schmalensee, R., Willig, R.D. (Eds.), Handbook of Industrial Organization, vol. I. , North Holland, Amsterdam, pp. 185–255.
Povel, P., Singh, R., 2006. Takeover contests with asymmetric bidders. Review of Financial Studies 19 (4), 1399–1431.
Rhodes-Kropf, M., Robinson, D., 2008. The market for mergers and the boundaries of the firm. Journal of Finance 62, 1169–1211.
Saloner, G., 1987. Predation, mergers, and incomplete information. RAND Journal of Economics 18, 165–186.
Shahrur, H., 2005. Industry structure and horizontal takeovers: analysis of wealth effects on rivals, suppliers, and corporate customers. Journal of Financial Economics 76, 61–98.
Singh, R., 1998. Takeover bidding with toeholds: the case of the owner's curse. Review of Financial Studies 11, 679–704.
Song, M.H., Walkling, R.A., 1993. The impact of managerial ownership on acquisition attempts and target shareholder wealth. Journal of Financial and Quantitative Analysis 28 (4), 439–457.
Stulz, R., 1988. Managerial control of voting rights. Journal of Financial Economics 20, 25–54.
Stulz, R., Walkling, R.A., Song, M.H., 1990. The distribution of target ownership and the division of gains in successful takeovers. Journal of Finance 45, 817–833.
Subramanian, G., 2003. Bargaining in the shadow of takeover defenses. Yale Law Journal 113 (3), 621–686.
Varaiya, N.P., 1987. Determinants of premiums in acquisition transactions. Managerial and Decision Economics 7, 175–184.
Whinston, M.D., 2003. On the transaction cost determinants of vertical integration. Journal of Law, Economics, and Organization 19, 1–23.
Williamson, O.E., 1979. Transaction-cost economics: the governance of contractual relations. Journal of Law and Economics 22 (2), 233–261.
Wulf, J., 2004. Do CEOs in mergers trade power for premium? Evidence from "Mergers of Equals". Journal of Law, Economics, and Organization 20, 60–101.