M&A price pressure revisited

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A B S T R A C T

We find strong evidence using two covariance decomposition methodologies that arbitrage short selling plays the relatively most important role in explaining the pure equity price effects for acquirers for M&A announcements during the 2009–2015 period. We find that the abnormal net purchase ratio of managerial insiders (i.e., managerial informedness), CSR composite ranking (i.e., interest alignment with various firm stakeholders) and the inside debt ratio (i.e., managerial conservatism) are the most important determinants of the acquirer price effects at M&A announcements both independently and through their effect on arbitrage activities at M&A announcements.

1. Introduction

When examining firm returns surrounding specific events, traditional studies assume that excess demand curves are perfectly elastic. However, some scholars (e.g., Shleifer, 1986; Harris and Gurel, 1986) suggest that demand curves may slope downwards. Mitchell et al. (2004) report evidence supporting the notion of not perfectly elastic demand curves in the short run for acquirers around M&A announcements. They estimate about 50 percent of the negative stock price reaction during the announcement window for acquirers using the stock method of payment can be attributed to downward price pressure from M&A arbitrage short selling. Since daily short selling increases with both past and contemporaneous returns, Diether et al. (2009) argue that the short-selling of generally contrarian traders does not add pressure on the decreasing prices of acquirers. Using SHO daily short interest data to deal with misalignment between the use of monthly short selling data and multi-day announcement windows, Liu and Wu (2014) demonstrate that the majority of the negative announcement returns can be attributed to price pressure induced by merger arbitrage short-selling.

This paper has two objectives. The first objective is to re-examine the effect of merger arbitrage short selling on the pure stock price effects for acquirers for M&A announcements where pure refers to the removal of equity issue stock price effects from the total stock price effects using equity issue costs for propensity matched SEO issuers when the method of payment is stock. This is based on the finding of Golubov et al. (2016) that most of the price effect for the joint investment/equity-issue M&A event is attributable to the equity-issue component when the method of M&A payment is stock. While Mitchell et al. (2004) and Liu and Wu (2014) conclude that previous estimates of merger wealth effects based on total stock price effects are biased downward for acquirers using the stock method of payment due to downward price pressure from M&A arbitrage short selling, we examine if this applies to pure stock price effects (i.e., after removing equity issue effects).

The second objective is to evaluate the contributions of various potential determinants of the announcement window pure price effects for acquirers. We are particularly interested in whether three determinants previously identified in the literature (and

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discussed in Section 3) as determinants of acquirer price effects at M&A announcements are the most important determinants of such price effects both independently and through their effect on arbitrage short-selling activities at M&A announcements. The three determinants are the abnormal net purchase ratio of managerial insiders (i.e., managerial informedness), CSR composite ranking (i.e., interest alignment with various firm stakeholders) and the inside debt ratio (i.e., managerial conservatism). We expect to find that these variables have an effect on the pure equity price effects for acquirers that is dependent on and independent of their effect on arbitrage short-selling.[1] To the best of our knowledge, the current literature has not conducted such an examination.

To do so, we extend the methodology of Mitchell et al. (2004) in two directions: First, we use two covariance decomposition methodologies to examine the proportional explanatory power of various potential determinants of the announcement window pure price effects for acquirers. Second, we use the methodology of Hou and Loh (2016) to examine if potential determinants of the announcement window pure price effects for acquirers other than arbitrage short selling are predictors of arbitrage short selling at M&A announcement, and whether these determinants have power to explain announcement window pure price effects based on the systemic and idiosyncratic components of their relations with arbitrage short selling at M&A announcement.

We find strong evidence for the importance of short selling in explaining the pure stock price effects for acquirers for M&A announcements, and for the explanatory power importance of a firm's pre-event cumulative abnormal net insider purchase ratio (*CANIPR*), CSR composite ratio (*CSRcom*) and inside debt ratio (*InsideDbtR*) where all the variables are defined in the Appendix. Although we only tabulate results for the acquirers using the stock-only method of payment, these results hold for the sample where the method of payment is mixed stock and cash, and for the full sample including all methods of payment.

The remainder of the paper is organized as follows. Section 2 provides a description of the data and sample. Section 3 presents and discusses our empirical results. In this section, we provide a theoretical development of the expectations for the three variables of primary interest and for other potential determinants of arbitrage short-selling and acquirer pure price effects at M&A announcements. Section 4 concludes.

2. Sample, data and summary statistics

Our initial sample consists of both completed and withdrawn M&As announced between August 1, 2009 and December 31, 2015 for NYSE- and NASDAQ-listed firms that are not REITs, ADRs and Closed-end funds (Diether et al., 2009). Following former studies (e.g., Mitchell et al., 2004; Liu and Wu, 2014), a record from SDC's Mergers & Acquisitions database is retained in our sample if M&A documents are available, deal value is not less than $20 million, acquirers are publicly traded domestic firms with CRSP database coverage, the percent of shares sought by the acquirer is more than 50%, and share price is above $1 on the day before the announcement date. Our final sample that includes data for all variables consists of 1,566 M&A announcements that involve 882 unique acquirers, 951 unique target firms, and cash, stock, cash&stock and other methods of payment for 1089, 259, 208 and 10 M&As, respectively.[2]

We obtain data on CEO and top executive compensations from Standard and Poor's Execucomp, insider trading data from the Thomson Financial Insiders Database (e.g., trading amounts, date and type of managerial trade, and managerial position code), short sales data from Finra,[3] accounting data from the COMPUSTAT Annual File, and shares outstanding and returns from the Center for Research in Security Prices (CRSP). Aggregation of the intraday short sales data during regular trading sessions into daily data allows us to implement more accurate examinations than are possible using short interest data at a monthly frequency.

Table 1 presents some summary statistics for various characteristics (as defined in the Appendix) of our final M&A sample. Based on Panel A, the mean number of public bidders is 1.161 and the mean percentage of stock (cash) as payment across all the different payment methods is 20.649% (79.351%). Based on Panel B for our final sample using data for the multi-day announcement window [−1, 1], the mean share (Turnover) and short turnovers (*%ShortO*) are 2.223 times and 26.112 percent, respectively, the mean market capitalization is $20.365 billion, the mean pure announcement stock return (*PCAR*) is 0.151%, and the average price of the acquirers is $43.78.[4]

Based on Panel C for the final M&A sample using data for the multi-day pre-announcement window [−200, −41], acquirers have a mean return volatility of 1.601%, and average stock price runup of 0.057%.[5] Furthermore, 79.6% of the outstanding shares are traded on average daily and shorts on average represent about 23.0% of the shares outstanding. The mean short-selling ratios of 23.002% and 26.112% for the full period and the announcement windows (Panels C and B, respectively) are comparable to the findings of Diether et al. (2009).

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[1] Hraschek et al. (2016) find a stronger anticipation effect and therefore more trading on private information on the CDS market than on the equity market for M&A transactions. This is consistent with the finding of Kryzanowski et al. (2017) that the CDS and equity markets react differently to specific information events that impact either individual firms or the entire economy, with the contribution to price discovery being higher in the CDS market.

[2] The status of the targets is 818 public targets, 492 private targets, 248 subsidiary targets and 8 other targets. The status of the deals is 1432 are completed, 16 are pending, 113 are withdrawn, and 5 are other.

[3] The Regulation SHO program requires the exchanges to publish data which contains transaction-level short trades. See the website: http://www.finra.org/industry/trf/trf-regulation-sho-2015. Although the SHO data does not indicate when short sales are covered or if a short transaction is conducted by a market maker, the latter may not be important as less than 1% of traded volume involves market makers.

[4] Except for *PCAR*, the reported means are the cross-sectional averages across all the acquirers of the time-series averages over the three-day window [−1, 1] for each acquirer.

[5] These reported means are the cross-sectional averages across all the acquirers of the time-series averages over the multi-day pre-announcement window [−200, −41] for each acquirer.

Table 1

Summary statistics for final sample of acquirers.

Panel A reports summary statistics about the number of bidders and method of payment. Panels B and C report summary statistics for various deal and acquirer variables that are defined in the Appendix for the announcement $[-1, 1]$ window and pre-announcement window. The sample consists of 1,556 acquirers.

	Mean	25%	Median	75%	Std. Dev.	Min	Max
Panel A: Final acquirer sample							
Bidders#	1.161	1.000	1.000	1.000	0.581	1.000	5.000
Cash%	79.351	11.320	100.00	100.000	46.710	0.000	100.000
Stock%	20.649	0.000	0.000	88.680	19.370	0.000	100.000
Private	0.314	0.000	0.000	1.000	0.465	0.000	1.000
Panel B: Final acquirer sample using values for announcement window [−1, 1]							
MarketValue ($billion)	20.365	2.925	14.752	18.082	19.032	1.980	128.605
Price	43.775	4.392	46.011	291.041	35.332	2.230	599.150
PCAR[−1, 1] (%)	0.151	−9.322	0.184	2.294	5.013	−38.776	31.385
%ShortO	26.112	16.344	25.503	39.104	22.329	0.000	86.005
⊿%ShortO, Cash	0.682	0.224	0.685	1.158	0.504	0.003	1.371
⊿%ShortO, Stock	1.124	0.637	1.173	1.995	1.899	0.008	2.660
Turnover	2.223	0.069	1.012	4.325	2.180	0.013	44.722
VolatR (%)	2.101	0.931	1.725	3.663	1.314	0.446	7.936
Panel C: Final acquirer sample using pre-announcement values							
Cashhld	0.091	0.021	0.037	0.112	0.037	0.000	0.158
CANIPR	0.009	−0.002	0.009	0.021	0.202	−0.008	0.053
CSRcom	0.463	0.293	0.419	0.649	0.431	0.000	1.000
Debt-to-assets	0.313	0.198	0.291	0.402	0.223	0.102	0.530
Deal Size	525.700	16.200	56.500	196.200	508.100	2.958	275.400
IndexGIM	14.674	14.000	16.000	18.000	4.102	0.000	21.000
InsideDebtR	0.215	0.019	0.232	4.058	2.614	0.000	6.401
MarketValue ($billion)	21.565	2.891	13.554	19.035	49.321	1.980	758.621
MB ratio	0.892	0.431	0.887	1.420	0.849	−1.474	2.697
RKRV_HP	0.031	−1.344	0.033	1.436	0.964	−2.623	2.991
StockPrRunup	0.057	−0.043	0.061	0.157	0.461	−0.094	0.431
PAIT	0.005	−0.070	0.005	0.023	0.195	−0.335	0.271
PUI	119.514	101.000	122.000	135.000	22.771	91.000	139.000
%ShortO	23.002	7.331	17.722	67.907	42.014	0.030	146.005
Turnover	0.796	0.028	0.756	0.917	0.721	0.023	4.721
VolatR (%)	1.601	0.916	1.602	1.803	0.945	0.424	5.028

3. Contributions of specific determinants to the mean and variability of the M&A announcement pure price effects for acquirer shareholders

We first use the two-stage regression model of Mitchell et al. (2004) to provide a base case determination of what portion of the mean $PCAR[-1, 1]$ can be attributed to M&A arbitrage short selling during the $[-1, 1]$ window. Their two-stage regression model is:

$$\Delta\%ShortO = \begin{cases} b_0 + b_1 Hostile + b_2 Relsize & \text{if } StockM\&A \\ 0 & \text{Otherwise} \end{cases} \qquad (1)$$

$$PCAR[-1, \ 1] = \beta_0{}^* CashM\&A + \beta_1{}^* StockM\&A + \beta_2{}^* Fit\Delta\%ShortO \qquad (2)$$

Where *⊿%ShortO* is the change in relative short selling; *Hostile* is a dummy variable equal to 1 if the M&A deal is viewed as being "hostile" and 0 otherwise; *Relsize* is the actual fixed exchange ratio as in Liu and Wu (2014); $PCAR[-1, 1]$ is the cumulative equity abnormal return for the three-day announcement window after expunging the price effects associated with an implicit issue of stocks based on the M&A choice of the stock payment method as in Golubov et al. (2016); *CashM&A* is a dummy variable equal to one if the method of payment is 100% cash and 0 otherwise; and *StockM&A* is a dummy variable equal to one if the method of payment is 100% stock and 0 otherwise. While our reported results are obtained using the actual fixed exchange rate (ER) as in Liu and Wu (2014), we obtain similar inferences using the relative size at deal completion as the ER proxy as in Mitchell et al. (2004).

Eq. (1) is formulated to capture changes in daily relative short selling around M&A announcements that can be attributed to M&A arbitrage trading. The estimated parameters from the estimation of Eq. (1) in the first stage that are reported in Panel A of Table 2 are used to compute fitted values of *⊿%ShortO* (i.e., *Fit⊿%ShortO*) that are used in the estimation of Eq. (2) in the second-stage. The difference in the estimated β_1 for *StockM&A* when Eq. (2) is estimated with and without the inclusion of *Fit⊿%ShortO* that is reported in Panel B of Table 2 measures the effect from M&A arbitrage short selling on mean $PCAR[-1, 1]$.

We expect to find that this proxy for short selling attributable to M&A arbitrage trading will explain a material proportion of the mean $PCAR[-1, 1]$ based on the summary statistics for *⊿%ShortO* over the 3-day window $[-1, 1]$ presented earlier in Panel B of

Table 2

Relation between acquirer PCAR and the change in abnormal short interest ratio.

Panels A and B implement the two-stage procedure of Mitchell et al. (2004) to determine how much of the mean $PCAR[-1, 1]$ for acquirers using stock as the method of payment is explained by arbitrage short selling. Panel A presents the results of applying the first stage Probit model of Mitchell et al. (2004) where $\varDelta\%ShortO$ is regressed on a constant and the dummy variables, *Hostile* and *Relsize* (as in Liu and Wu, 2014) to obtain fitted values of the daily relative short selling volume ($Fit\varDelta\%ShortO$) in the announcement period $[-1, 1]$ where 0 is the announcement date. Panel B reports the results of regressions of $PCAR[-1,1]$ against the dummy variables, *CashM&A* and *StockM&A*, with and without the inclusion of $Fit\varDelta\%ShortO$. The difference between the two coefficients for *StockM&A* represents the portion of the mean $PCAR[-1,1]$ explained by arbitrage short selling.

Panel A: First-stage regression subsequently used to obtain fitted values for $\varDelta\%ShortO$ $[-1,1]$

	Hostile	Relsize	Intercept	R^2
Coeff	−89.11*	31.92***	211.60***	0.072
t-Stat	(−1.78)	(3.12)	(2.84)	

Panel B: Second-stage regression to explain the mean $PCAR$ $[-1, 1]$ using cash-only and stock-only dummy variables

	Second-stage regression		Second-stage regression		
	CashM&A	StockM&A	CashM&A	StockM&A	Fit⊿%ShortO
Coeff	24.35***	−11.61**	29.04***	−5.21***	−59.31**
t-Stat	(2.76)	(−1.96)	(3.01)	(−4.32)	(−2.38)
R^2	0.112		0.187		

Table 1, where the daily average change of 112.4% is statistically significant (*t*-value = 6.73) for M&As using the stock method of payment while the corresponding change of 68.2% for M&As using cash as the method of payment is not significant (*t*-value = 0.61). In Panel B of Table 2, we observe that all of the estimated coefficients for *StockM&A* and *CashM&A* are significant at the 0.05 level or better and that the change in their estimated coefficients with the inclusion of $Fit\varDelta\%ShortO$ in Eq. (2) is greater for *StockM&A* than for *CashM&A*. Specifically, the estimated coefficient for *StockM&A* changes by −55.13% from −11.61 bps when $Fit\varDelta\%ShortO$ is not included in Eq. (2) to −5.21 bps when it is included. In contrast, the estimated coefficient for *CashM&A* changes by only 19.26% from 24.35 bps when $Fit\varDelta\%ShortO$ is not included in Eq. (2) to 29.04 bps when it is included. These results using pure price effects are consistent with the findings of Mitchell et al. (2004) and Liu and Wu (2014) that nearly half of the negative comingled stock price reactions for acquirers using the stock method of payment at M&A announcements reflect arbitrage short selling. However, their results assume that the price effects of other potential determinants identified in the literature are transmitted only through their effect on arbitrage short-selling activities at M&A announcements.

Since short selling attributable to M&A arbitrage trading is expected to occur when the method of M&A payment is stock, we examine the explanatory power of $Fit\varDelta\%ShortO$ and various other potential determinants of $PCAR[-1, 1]$ for the acquirers using only stock as the method of M&A payment although we obtain similar untabulated results for the full sample and for the mixed sample of acquirers using a combination of stock and cash as the method of M&A payment.[6] We proceed by presenting the results in Table 3 for each of the four stages in Hou and Loh (2016) since we are interested in examining not only the total contribution of potential determinants to explaining $PCAR[-1, 1]$ but also the parts of their explanatory power that are both dependent on and independent of their relation with $Fit\varDelta\%ShortO$. In the first stage, we regress $PCAR[-1, 1]$ against $Fit\varDelta\%ShortO$ and find, as expected, that the relation is significantly negative (coef. = −63.239; *t*-value = 23.012).[7] Based on the R-square values, $Fit\varDelta\%ShortO$ explains 17% of the variation in $PCAR[-1, 1]$ for the stock-only sample, and even less for the full and mixed-only samples (14.5% and 12.7%, respectively).

In the second stage, we add the following potential determinants that are defined in the Appendix to the multivariate regression where $PCAR[-1, 1]$ is the dependent variable and the expected signs of the potential determinants are reported in the brackets[8]:

CANIPR [+] is the cumulative abnormal net insider purchase ratio for acquirer executives cumulated over the two quarters prior to the M&A announcement day.[9] We expect a positive sign for this metric which captures the consensus belief of the executives of an acquirer about their firm's value based on the findings of various studies that insiders tend to be better informed about the true values of their firms (e.g., Jeng et al., 1999; Rozeff and Zaman, 1988; Seyhun, 1986, 1988),[10] and that such insider trades by managers are profitable,[11] and the finding of Akbulut (2013) that a dummy variable equal to one for the bottom 33% of the distribution of an analogous metric, *PAIT*, of all acquirers is negative related with *CAR* for the window $[-1, 1]$. The abnormal return on the announcement of a bid should result in some price correction based on any private information revealed about the true value of the bidder.

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[6] All untabulated results are available if requested.

[7] The estimated coefficient is −53.530 (*t*-value = 19.303) for the full sample and −48.628 (*t*-value = 7.023) for the mixed sample.

[8] Multicollinearity is not expected to be a problem since the two highest correlations are *Stock%* with *Private* (0.36) and *StockPrRunup* with *PUI* (0.31).

[9] The results for *CANIPR* and *RKRV_HP* can differ due to the degree of information asymmetry between executive insiders and outsiders using publicly available market and accounting information.

[10] Similar measures based on insider trading activities have been used by Chen et al. (2007) and Bakke and Whited (2010), amongst others.

[11] See, e.g., Agrawal and Nasser (2012), Kraft et al. (2014), Lee et al. (2014), Agrawal and Cooper (2015), Aitken et al. (2015) and Hillier et al. (2015).

Table 3

Contribution of various determinants to predicting announcement short selling and PCAR.

This table examines the power of various determinants to predict arbitrage short selling at M&A announcements and to explain the announcement price effects for acquirers *PCAR*[−1, 1]. The table includes summary statistics for the implementation of stages 2–4 of the decomposition methodology of Hou and Loh (2016), and the covariance decomposition methodologies of Bekaert et al. (2012) and Lemmon et al. (2008) for the stock-only sample. The stage one simple regression of *PCAR*[−1,1] against *Fit⊿%ShortO* has a R^2 of 17.0% and the coefficient estimated for *Fit⊿%ShortO* is a significant −63.239 (*t*-value = 23.012). All variables are as defined in the Appendix. All variables except for *PCAR*[−1,1] and *Fit⊿%ShortO* are measured pre-M&A announcement.The expected sign for each variable is reported in the table. The number of observations is 259. The standard errors of the fractions under the columns headed by LH value are determined using the multivariate delta method. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

| Variable/Statistic | Expected Sign | Stage 2 with full set of potential variables & BHZ and LRZ covariance decompositions | | | | Stage 3 with regression of *Fit⊿%ShortO* against the other determinants | | Stage 4 where stage 1 coefficient for *Fit⊿%ShortO* is decomposed | | |
		Coeff.	*t*-Stat	BHZ	LRZ	Coeff.	*t*-Stat	Coeff	LH value	*t*-Stat
CANIPR	+	105.594***	23.401	0.091	0.089	−80.704***	−14.312	−16.351	0.259***	−4.548
CANIPR_Diff	−	−36.610***	−3.734	0.041	0.049	21.452***	10.733	−4.399	0.070	−1.163
CSRcom	+	15.122***	11.071	0.075	0.070	−28.832***	−10.100	−10.226	0.162**	−3.666
CSRcom_Diff	−	−5.399*	−1.673	0.048	0.059	3.063	1.379	1.571	−0.025	0.273
AcquirerSize	−	−5.337***	−2.060	0.014	0.011	19.185***	3.035	2.113	−0.033	0.481
IndexGIM	+	−2.642**	−2.284	0.021	0.029	−7.016	−1.193	1.229	−0.019	0.255
InsideDebtR	−	−4.614***	−4.894	0.116	0.083	12.005***	4.153	9.633	−0.152***	2.800
InsideDebtR_Diff	?	2.586*	1.739	0.037	0.026	−4.063	−1.788	−2.765	0.044	−0.312
MB ratio	−	−11.847*	−1.832	0.023	0.035	−23.195*	−1.677	−4.001	0.063	−0.398
PAIT	+	33.686**	2.031	0.017	0.012	−45.899	−1.740	−2.945	0.047	−0.395
Private	+	11.980***	5.702	0.048	0.033	−16.077***	−3.852	−4.650	0.074	−0.497
PUI	+	8.286***	8.409	0.016	0.019	−5.170***	−5.746	−1.609	0.025*	−1.669
RKRV_HP	?	30.603***	3.647	0.025	0.037	−45.308**	−2.406	−7.778	0.123	−0.659
RKRV_HP_Diff	?	−8.953*	−1.728	0.014	0.010	−8.418	−1.423	1.612	−0.025	0.267
Fit⊿%ShortO	−	−293.284***	−8.071	0.384	0.411					
StockPrRunup	−	27.323***	3.867	0.026	0.027	−16.030	−1.111	−6.119	0.097	−0.217
Residual								−18.554	0.293***	−3.785
Constant		128.072*	1.718			−101.149	−0.817			
Total				1.000	1.000			−63.239	1.000***	−4.302
R^2		0.251				0.311				

CANIPR_Diff [−] is the difference in *CANIPR* for acquirers versus targets. We expect a negative sign for this metric which measures the difference in the perceived values of the acquirer and its target based on the perceptions of each party's informed insiders. The rationale is that *PCAR*[−1,1] should be lower (higher) if the acquirer is relatively more undervalued (overvalued) than its target by its managers if they are informed.

CSRcom [+] is the CSR composite rating computed for a firm. We expect a positive sign for this variable which provides a measure of managerial interest alignment with the CSR beliefs of one or more groups of firm stakeholders (e.g., Barnea and Rubin, 2010). Deng et al. (2013) report that higher CSR acquirers realize higher merger announcement returns which supports the stakeholder value maximization view over the shareholder expense view.

CSRcom_Diff [−] is the difference in *CSR* composite ratings of the acquirer and its target. We expect a negative sign for this metric since *PCAR*[−1,1] should be lower if the acquirer has a relatively higher CSR than its target.

AcquirerSize [−] is the natural log of total assets of the acquirer. We expect a negative sign for this variable since larger acquirers pay higher premiums and generate negative dollar synergies from their acquisitions (Masulis et al., 2007, with supporting evidence; Nguyen and Phan, 2017).

IndexGIM [+] is a shareholder rights metric where higher values indicate greater shareholder rights from less firm antitakeover provisions. We expect a positive sign for this variable as found by Masulis et al. (2007), which supports the hypothesis that managers are less likely to destroy shareholder value by indulging in empire-building acquisitions due to the higher disciplinary power of the market for corporate control when managers enjoy lower protection from less antitakeover provisions.

InsideDebtR [−] is equal to the CEO's debt-to-equity ratio scaled by the firm's debt-to-equity ratio. Its expected sign is negative based on the finding of Phan (2014) for this relative CEO leverage ratio which is consistent with the view that greater *InsideDebtR* motives shareholder to bondholder wealth transfers from a closer alignment of the interests of managers with those of external debtholders (Anantharaman et al., 2014). Nevertheless, the sign could be positive if managers with larger inside debt ratios are less likely to pursue risk-increasing or value-destroying M&As that could affect their deferred compensation payments (Eisdorfer et al., 2015).

InsideDebtR_Diff [?] is the difference in the inside debt ratio for an acquirer minus that for its target. As an element of corporate culture, the expected sign is indeterminate since it depends upon whether larger differences are perceived as being risk-increasing or risk decreasing. In turn, this will depend upon whether conservatism is a trait that is easily transferable to the acquired target or one that is disruptive to the corporate culture of the acquirer post-M&A.

MB ratio [−] is the ratio of market-to-book value of the equity of acquirers although as Dong et al. (2006) note this ratio has been

used as a proxy for misvaluation, growth opportunities or managerial effectiveness, and agency problems. Its expected sign is negative given the evidence reported in the more recent literature (e.g., Dong et al., 2006; Moeller et al., 2005).

PAIT [+] is the abnormal insider trading measure of Akbulut (2013). We expect a positive sign for this measure which captures the consensus beliefs of the executives of an acquirer about their firm's value based on the same rationale as for *CANIPR*.

Private [+] is a dummy variable that is equal to one for a private firm or subsidiary and zero otherwise. Its expected sign is positive based on the conjecture that a liquidity discount is captured from such M&As, which is supported empirically by Fuller et al. (2002) and Moeller et al. (2005).

PUI [+] is the policy uncertainty index. Its expected sign is positive if bidders are more prudent and delay large and risky investments during periods of high policy uncertainty (Gulen and Ion, 2016) and bidders may benefit from greater wealth transfers from the financially constrained targets during such periods, consistent with the empirical findings of Nguyen and Phan (2017).

RKRV_HP [?] is the overvaluation estimate from the accounting-variable-based model of Rhodes-Kropf, Robinson and Viswanathan (RKRV, 2005) obtained using the three-step regression procedure of Hoberg and Phillips (HP) (2010). Its expected sign is indeterminate. Some studies (e.g., Dong et al., 2006) find that acquirers benefit by using overvalued stock to buy less overvalued targets more cheaply, and when acquirer overvaluation is greater than their targets' premium-adjusted overvaluation (Ang and Cheng, 2006). In contrast, Golubov et al. (2016) report that the relation between announcement price effects and an overvaluation dummy for the acquirer is negative but insignificant at conventional levels, and Lin et al. (2018) show that overvalued acquirers often lose because they significantly overpay for purchased targets and/or the M&As under-deliver the anticipated synergy gains (also, see Fu et al., 2013).

RKRV-HP_Diff [?] is the difference in *RKRV-HP* between the acquirer and its target. Its expected sign is indeterminate. Some studies (e.g., Dong et al., 2006) find that acquirers benefit by using overvalued stock to buy less overvalued targets more cheaply. In contrast, Golubov et al. (2016) report that the relation between announcement price effects and a dummy variable based on the relative overvaluation of the acquirer to that of the target is positive but insignificant at conventional levels, and Lin et al. (2018) report that the pre-announcement substantial overvaluation of the acquirer relative to that of the target dissipates quickly with deal announcement due to a decrease (increase) in the acquirer's (target's) stock price.

Fit⊿%ShortO [−] is the fitted value of the average relative short selling volume over the event window [−1, 1] minus the median for window [−22, −6]. We expect its sign to be negative based on the conjecture of Mitchell et al. (2004) that arbitrage-motivated short selling significantly increases the effective supply of shares so much that excess demand curves for stocks are downward sloping, their finding that short interest is abnormally high surrounding merger announcements, and their finding along with that of Liu and Wu (2014) that acquirers with the highest short interest exhibit the most negative post-announcement price pressures.[12]

Stock% [−] is the percent of stock in the amount paid to a M&A target that is only included for the mixed-only and full samples. Its expected sign is negative given the various studies that find that announcement price effects are more negative for stock versus cash methods of payment.

StockPrRunup [−] is the buy-and-hold abnormal return during the [−210, −11] period prior to the M&A. Its expected sign is negative based on the findings of Masulis et al. (2007), Rosen (2006), Golubov et al. (2016), and Lin et al. (2018).

We report the summary results under the Stage 2 columns of Table 3 for the stock-only sample of acquirers and leave similar results for the full and mixed-only samples untabulated. All of the added regressors are significant and with their expected signs with the exceptions of *IndexGIM* and *StockPrRunup*. Where sign expectations are indeterminate, we find that the estimated coefficient for *RKRV_HP* is significantly positive (t-value = 3.647) consistent with Dong et al. (2006) and for *RKRV_HP_Diff* is marginally significant (t-value = −1.728) consistent with Lin et al. (2018). Similarly, the estimated coefficient for *InsideDebtR_Diff* is significantly positive which suggests, on balance, that managerial conservatism appears to be relatively easy to transfer to the acquired target. The inclusion of the additional regressors increases the R^2 from its 17.0% in stage 1 to 25.1% in stage 2. Given these results, we do not have to use the variable reduction process of Bekaert et al. (2012) where insignificant variables are removed before using two methods to gauge the relative importance of the various variables in explaining the variation in the *PCAR*[−1, 1]. The first is the method of Bekaert et al. (2012) that uses the sample analogue of the ratio of $cov(\hat{\beta}_i x_{it}, \widehat{PCAR}_t)/var(\widehat{PCAR}_t)$ where $\hat{\beta}_i$ is the estimated regression coefficient for independent variable x_i and $\widehat{PCAR}_t$ is the fitted value of the regression for *PCAR*. The second is the method of Lemmon et al. (2008) which divides the partial sum of squares for each independent variable by the aggregate partial sum of squares across all independent variables in the model. Using either approach, these ratios add to one by construction. Based on the covariance decompositions reported in the last two Stage 2 columns of Table 3, the explanatory contributions of each independent variable are somewhat similar using either covariance decomposition method. Using the LRZ method, *Fit⊿%ShortO* by far has the largest explanatory contribution of 41.1%, followed by *CANIPR* at 8.9% or 13.8% when combined with *CANIPR_Diff*, *InsideDebtR* at 8.3% or 10.9% when combined with *InsideDebtR_Diff*, and *CSRcom* at 7.0% or 12.9% when combined with *CSRcom_Diff*.[13] Thus, we find a lower power for *Fit⊿%ShortO* in explaining price than Mitchell et al. (2004) and Liu and Wu (2014), most likely due to the explanatory power of other potential determinants whose powers are incremental to their power to explain *Fit⊿%ShortO*.

Hou and Loh (2016) develop a simple decomposition methodology that can be used to evaluate a number of potential explanations (candidate variables) for the negative relation between *Fit⊿%ShortO* and *PCAR*[−1, 1]. Thus, a multivariate regression of

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[12] Diether et al. (2009) show that short-selling does not add pressure on the decreasing prices of acquirers since M&A short sellers are generally contrarian traders and daily short selling is increasing in both past and contemporaneous returns.

[13] Our results appear to suggest that investor arbitrage is associated with acquirer misvaluation, which supports the argument by Liu and Wu (2014) that the relative size at deal completion is not a clean proxy for ER as it can also proxy for overvaluation.

Fit△%ShortO on the other fifteen independent variables is conducted in stage 3. Based on the summary results for the stock-only sample reported in the Stage 3 columns of Table 3, we observe a good fit (R^2 = 31.1%) for this relation and significantly negative estimated coefficients for *CANIPR, CSRcom, MB Ratio, Private, PUI, RKRV-HP* and significantly positive estimated coefficients for *CANIPR_Diff, AcquirerSize*, and *InsideDebtR*. Thus, unlike Mitchell et al. (2004) and Liu and Wu (2014), we find that variables commonly used to explain stock-financed acquirer price effects at M&A announcements are themselves determinants of the arbitrage short-selling variable used to explain stock-financed acquirer price effects at M&A announcements.

In stage four, we examine the marginal and collective contributions of the independent or candidate variables other than *Fit△% ShortO* in explaining the relation between *Fit△%ShortO* and *PCAR*[−1, 1]. By construction, the Hou-Loh (2016) decomposition methodology ensures that the collective contribution of the candidate variables plus the unexplained contribution explains 100% of the relation between *Fit△%ShortO* and *PCAR*[−1, 1]. We observe that the collective explanatory power of the 15 candidate variables is 70.7% with the unexplained portion accounting for only 29.3%. The largest contributors are *CANIPR* which captures 25.9% of the relation between *Fit△%ShortO* and *PCAR*[−1, 1], followed by *CSRcom* which captures 16.2% of that relation and both are statistically significant (*t*-values of −4.548 and −3.666, respectively).

As pointed out by Hou and Loh (2016, p. 171) when using their decomposition methodology, a candidate variable that is highly correlated with *Fit△%ShortO* can have a small or even negative contribution if the uncorrelated component of their relation predicts *PCAR*[−1, 1] positively. *InsideDebtR* in the Stage 4 columns of Table 3 is such an example. It has a significantly negative contribution (−15.2%) because the uncorrelated component of its relation with *Fit△%ShortO* predicts *PCAR*[−1, 1] positively (coef. = 9.633). Similarly, *CANIPR* and *CSRcom* have the largest and second largest contributions of 25.9% and 16.2%, respectively, to explaining the relation of *Fit△%ShortO* with *PCAR*[−1, 1], and the uncorrelated components of the relations between *CANIPR* and *CSRcom* with *Fit△%ShortO* predict PCAR[−1, 1] positively (coef. = −16.351 & −10.226). Thus, we extend the findings of Mitchell et al. (2004) and Liu and Wu (2014) by showing that some variables commonly used to explain stock-financed acquirer price effects at M&A announcements only have an effect due to their effects on *Fit△%ShortO*, while others have an effect that is both dependent on and also independent of their effects on *Fit△%ShortO*. This is not surprising because market participants other than arbitrageurs have a role in determining price effects at M&A announcements.

4. Concluding remarks

We extend the findings of Mitchell et al. (2004) to an assessment of the contributions of various determinants for predicting arbitrage activity at M&A announcements and for explaining the announcement price effects of acquirers that is transmitted through their effects on M&A arbitrage activity. We find that determinants such as the abnormal net purchase ratio of insiders, CSR composite ranking and the inside debt ratio are important predictors of the effect of arbitrage activity at M&A announcements on acquirer price effects, and that all three predictors have effects on the announcement price effects of acquirers that are independent of their effects on arbitrage activities at M&A announcements. Thus, assessments by arbitrageurs and other market participants of managerial informedness, interest alignments with various firm stakeholders and managerial conservatism have a significant effect on acquirer pure price effects at M&A announcements. One of many extensions to this study would be to examine if CDS market activity prior to M&A announcements identified by Hraschek et al. (2016) has an effect on the announcement price effects of acquirers that is independent of its effects on arbitrage activities around M&A announcements.

Declarations of interest

None.

Appendix. Definition of the variables

AcquirerSize: Market value (i.e., number of shares outstanding times the share price) at day −64 relative to the M&A announcement day (day 0) for the acquirer.

Analyst#: Number of analysts following the firm in IBES.

AssetLn: Natural log of the assets of the acquirer.

Bidder#: Number of public bidders during the M&A process.

BM ratio: Book to market ratio.

BookValue: Book value of assets.

CAINPR: Abnormal trading of firm insiders, which is the consensus belief of the executives of an acquirer about their firm's value measured using their abnormal net insider purchase ratio (ANIPR) cumulated over the two quarters prior to the M&A announcement day. CAINPR is positive when aggregate purchases exceed aggregate sales. In our implementation of the two-step procedure of Akbulut (2013), we first obtain the abnormal ratios (residuals) for acquirer insiders for each of three dependent variables (shares

acquired through open market purchases, shares acquired through stock option excise, and shares sold through open market sales, all scaled by annual trading volume) for each quarter by estimating the following relation: *TradingRatioLn* = f (lagged *TradingRatioLn*, *PTradingRatioLn*, *AssetsLn*, *EqToComTotl*, *InsideOwned*, *Insti%*, *InstiHHI*, *InsideDebtR*, *IndexGIM*, *InsiderComTotl*, and *Analyst#*).[14] In the second step, the residuals from the first-step estimations for the three dependent variables expressed as a fraction of the trading volume for the quarter are added together.

Cap: Market Capitalization (in 000 s of dollars). Number of shares outstanding times the stock price.

CAR: Cumulative equity abnormal returns based on the following two-step estimation procedure. First, the parameters of a five-factor model of Fama and French (2015) are estimated for the window [−200, −41] where 0 is the M&A announcement day. Second, the resulting parameter estimates and the firm and factor realizations for a day in a specific announcement window are used to compute that day's AR. The five factors are: market, size, value-growth, profitability and investment.

Cash%: Percent of cash in the M&A payment.

Cashheld: Cash plus cash equivalents divided by the book value of total assets before the M&A announcement.

CashM&A: Dummy variable equal to one if the method of payment is 100% cash and 0 otherwise.

CF/EQ: (Income before extraordinary items + depreciation - dividends on common and preferred stock) / market value of equity before the M&A announcement.

CSRcom: CSR composite as in Jo and Harjoto (2011) is the arithmetic average of combined scores of KLD strengths minus concerns for the dimensions of community, environment, diversity, employee, and product. Annually for each firm equal to (Sum of all strength scores plus total maximum possible number of community concern scores minus sum of all concern scores) divided by (total maximum possible number of strength scores plus total maximum possible number of concern scores).

DealSize: Transaction value in millions of dollars for the M&A or SEO used in computing pure price effects.

Debt-to-Assets: The ratio of total debt to total assets.

EqToComTotl: Ratio of equity to total compensation for the CEO which is defined as: 1 – (Salary + Bonus)/TDC1, where TDC1 or Total Compensation is from the ExecuComp database. Akbulut (2013).

Firmage: Firm age is calculated from the beginning of the year from the CRSP database (source: CRSP).

Hostile: Dummy variable equal to 1 if deal is viewed as being "hostile"; 0 otherwise.

Income Return Ratio: Operating income before depreciation divided by the book value of total assets before the M&A announcement.

IndexGIM: Shareholder rights index with higher values indicating greater shareholder rights. Equal to 25 – GIM Index, where GIM Index is the index of Gompers et al. (2003, 2010) based on the incidence of 24 different corporate-governance provisions.

InsiderComTotl: Total insider compensation, or item "TDC1" in ExecuComp, which is calculated as the sum of salary, bonus, other annual pay, the total value of restricted stock granted that year, the Black-Scholes value of stock options granted that year, long-term incentive payouts, and all other compensation (in thousands) for the insider.

InsideDebtR is equal to the CEO's debt-to-equity ratio scaled by the firm's debt-to-equity ratio, where the CEO debt-to-equity ratio is the sum of the present value of accumulated pension benefits and deferred compensation divided by CEO's equity holdings of both stock and stock options (Cassell et al., 2012; Wei and Yermack, 2011).

InsideOwned: Shares held by the insiders divided by shares outstanding at the beginning of the year (winsorized at 1% level to remove the effects of outliers).

Insti%: Percentage of institutional share ownership (source: CDA/Spectrum 13 (f) filings).

InstiHHI: Concentration of institutional investors given by the Herfindahl index calculated over the distribution of the fraction of company stock owned by institutional investors at beginning of the current quarter.

Leverage: Total debt to total equity (source: Compustat).

MarketValue: Shares outstanding times market price.

MB ratio: Market-to-book ratio, as used in, e.g., Dong et al. (2006).

NetIncomeAbs: Absolute value of net income (source: Compustat).

NetIncomeDum: Dummy variable = 1 if *NetIncome* < 0.

PAIT: Misvaluation measure of Akbulut (2013). See CANIPR for *PAIT*'s estimation differences from *CANIPR*.

PCAR: Pure Cumulative Abnormal Returns for equity for the announcement window after expunging the price effects associated with an implicit issue of stock when the M&A payment method is stock using the method of Golubov et al. (2016). The equity issue effect to be expunged from the *CAR*[−1,1] is obtained for an M&A acquirer using m-nearest-neighbor propensity score matching where the propensity scores are obtained using a Probit regression where the dependent variable is one for an SEO and zero for an M&A using stock as the method of payment and the regressors are *TranSize, TranValue, BM ratio, Cap, Cashheld, CF/EQ, Debt-to-Assets, Income Return Ratio*, and *Volatility*.

PReturn: Stock return over the previous 4 quarters.

Private Target: Dummy variable equal to 1 if target is not listed on the stock market; 0 otherwise.

PTradingRatioLn: Natural log of shares bought (or sold) through open market purchases (or sales or exercises of stock options)

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[14] Unlike Akbulut (2013), we include inside debt (*InsDbt*) and the shareholder rights index (*IndexGI*M) but exclude past return (*PReturn*), age (*Firmage*), tenure (*Tenure*), turnover (*Turnover*) and past volatility (*VolatR*) since excluding these variables helps to avoid a multicollinearity problem. We also identify the peers using propensity score matching (PSM) instead of characteristic cell matching to correct for sample selection bias due to observable differences between the treatment and comparison groups (e.g., Dehejia and Wahba, 2002). Our PSM matching criteria are Insider ownership (*InsideOwned*), Asset, Fraction (*Insti*%) and Concentration (*InstiHHI*) of institutional investors and existence of a CSR rating as our matching criterion.

expressed as a fraction of trading volume in the year for managerial insiders of a peer identified using propensity score matching.

PUI: Policy uncertainty index obtained from website of Baker, Bloom, and Davis which has four components: (i) comprehensive measure based on number of articles about economic policy uncertainty in ten large newspapers; (ii) taxation uncertainty based on data from the Congressional Budget Office (CBO) on expiring tax provisions, (iii) taxation uncertainty, and (iv) expenditure uncertainty. Latter two components are based on the dispersions in professional analyst forecasts. Baker et al. (2016) report that the PUI captures periods of heightened policy uncertainty around such events as elections, policy debates, and government policy changes. PUI is used in various studies (e.g., Pastor and Veronesi, 2013; Gulen and Ion, 2016; and Francis et al., 2014).

Relsize: Actual fixed exchange ratio for all announced deals to capture arbitrage driven short selling, as in Liu and Wu (2014).

RKRV-HP: Mispricing measure obtained using the accounting-variable-based valuation model of Rhodes-Kropf, Robinson and Viswanathan (RKRV, 2005) and the three-step regression procedure of Hoberg and Phillips (HP) (2010) on an unbalanced, rolling ten-year panel with firm fixed effects for all firms in each industrial sector. In step 1, the following is run in logs except for Leverage: *MarketValue* = f(*BookValue, NetIncomeAbs, NetIncomeDum, Leverage*) at the industrial sector level. In step 2, the market-to-book ratio for a firm is predicted using the values of the independent variables in that year and the set of estimated coefficients obtained from the previous step for all firms in the industrial sector for which the firm is a member. In step 3, the RKRV mispricing estimate is computed as the actual ln Market Value minus the predicted value from the previous step.

%Short: Short interest ratio, or the ratio of short sales volume to total trade volume (e.g., Diether et al., 2009).

⊿%ShortO: Change in short interest ratio equal to daily short selling volume divided by shares outstanding for specific days in event window $[-1, 1]$ minus this ratio's median for window $[-22, -6]$ as in Liu and Wu (2014).

Stock%: Percent of stock in the amount paid to M&A target.

StockM&A: Dummy variable equal to one if the method of payment is 100% stock and 0 otherwise.

StockPrRunup: Buy-and-hold abnormal return during the $[-210, -11]$ period prior to the deal.

Tenure: Number of days since the insider first appeared in the insider data file under his or her current firm.

TradingRatioLn: Natural log of shares bought (or sold) through open market purchases (or sales or exercises of stock options) expressed as a fraction of trading volume in the year for managerial insiders of the acquirer.

TranSize: Transaction size given by transaction value scaled by the acquirer's market capitalization.

TranValue: Transaction value in millions of dollars.

Turnover: Trading volume in a quarter divided by shares outstanding at that quarter's beginning.

Volatility: The Black–Scholes volatility measure given by Execucomp.

VolatR: Return volatility given by standard deviation of daily returns over window $[-11, -2]$, where day 0 is the M&A announcement date.

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