Target information asymmetry and post-takeover performance

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Background

Two opposing views on information asymmetry (IA) and future performance:

- Value-creation: private information theory
  - Pre-acquisition information-gathering (Perry and Herd, 2004; Higgins and Rodriguez, 2006)
  - Competitive advantage (Makadok, 2011)
  - Positive response (Cheng et al. 2016)

- Value-destruction: adverse selection theory
  - Evaluation (Shen and Reuer, 2005)
  - Lemon problem (Akerlof, 1970; Hansen, 1987)
  - Moral hazard (Reuer et al., 2008)

Background – Cont.

Innovation

- Information asymmetry (Aboody et al., 2000; Officer et al., 2009)
- Growth opportunity (Krishnaswami et al.,1999)
- High-tech firm (Chan et al., 1990; Bena and li, 2014)

Payment method

- Target IA and acquirer's CAR in stock-only deals (Chang, 1998; Fuller et al. 2002; etc.)
- Overpayment risk (Hansen, 1987)
- Championing Culture (Burgelman, 1986).

Research Hypothesis

- H1. Information asymmetry levels of an acquired business will be related positively (private information) or negatively (adverse selection) to the acquiring firm's post-acquisition performance.
- H2. Information asymmetry levels of an acquired business will be more positively related to the acquiring firm's post-acquisition performance when:
  - H2a: The target has greater R&D intensity or is a high-tech company
  - H2b: Both the acquirer and target are high-tech companies
- H3. Information asymmetry levels of an acquired business will be more positively related to the acquiring firm's post-acquisition performance when:
  - H3a: The acquirer uses stock.
  - H3b: The acquirer uses stock to acquire R&D intensive targets or high-tech targets.

Sample

- US M&As during 1990 – 2015
- Both acquirers and targets are US listed firms
- Acquires at least 50% of the target shareholdings

Sample selection process	
All acquisitions retrieved from SDC from 1990 to 2015	84,123
The acquisition is a completed deal	69,608
The acquired firm is located inside US	55,514
The acquirer is a public firm	50,958
The acquirer has assets	40,862
The deal is majority takeover	38,818
The firm has available data of post one-year Tobin's Q	27,451
The firm has available data of total assets from Compustat	27,286
The acquirer has available data of ROA	27,111
The target has available data of ROA	3,708
The deal has available data of stockonly & cashonly	2,845
The acquirer has available data of number of analysts	2,660
The acquirer has available data of liquidity	2,654
The acquirer has available data of AFE	1,394
The target has available data of forecast stand deviation	1,247
The target has available data of target bid-ask spread	1,088
Final sample	1,088

Data

Dependent Variables:

- Industry-adjusted Tobin's Q / BHAR

Information Asymmetry Proxies:

- Analyst forecast error / Relative forecast error

Control Variables:

- Firm-level characteristics: acquirer size, leverage, liquidity, profitability, governance, acquisition experience
- Deal-level characteristics: relative size, cross-industry, high-tech industry, previous alliance, payment method, competing bidder

Data sources:

- M&As from SDC
- Company price data from CRSP
- Analyst forecast data from IBES
- Financial data from Compustat

Descriptive Statistics

	N	Mean	St.Dev	max	min	Median
Ind Adj Tobin's Q (1)	1088	.253	1.174	7.167	-1.709	.002
Ind Adj Tobin's Q (2)	1020	.22	1.082	6.718	-1.531	0
Ind Adj Tobin's Q (3)	958	.147	.97	6.013	-1.487	-.03
BHAR (1)	946	.007	.437	1.807	-.882	-.038
BHAR (2)	919	.023	.605	2.612	-.95	-.079
BHAR (3)	836	.047	.685	3.175	-.957	-.074
AFE	1088	.042	.22	5.9	-.011	.008
AFE dummy	1000	.597	.491	1	0	1
Previous alliance	1088	.011	.104	1	0	0
Relative size	1088	.566	.323	.998	.001	.505
Acquirer size	1088	7.181	1.908	13.395	2.107	7.105
Target industry growth	1088	1.779	3.506	20.201	-.015	.64
Target profitability	1088	.056	.15	.402	-1.157	.041
Acquirer profitability	1088	.074	.135	.417	-.835	.053
I(competing)	1088	.026	.158	1	0	0
Acquirer leverage	1088	.105	.176	.73	-.261	.065
Acquirer liquidity	1088	.016	.114	.591	-.174	-.007
Acquirer M&A	1088	4.827	6.013	53	0	3
Target M&A	1088	4.278	5.796	54	0	2
Divestiture experience	1088	.952	1.962	41	0	0
I(cross industry)	1088	.342	.475	1	0	0
I(both high-tech)	1088	.447	.497	1	0	0
I(cashonly))	1088	.664	.473	1	0	1
I(stockonly)	1088	.108	.311	1	0	0
I(cboard)	1088	.324	.468	1	0	0
CAR3	968	.006	.05	.209	-.157	.003
CAR5	968	.008	.067	.259	-.195	.004
CAR10	968	.009	.092	.36	-.279	.005
Target R&D intensity	1088	.049	.091	1.373	0	.01

Research Design

- Baseline Models
  - $Tobin'\ Q\ /\ BHAR_{i,t} = \alpha + \beta * \ IA\ proxy_{i,t} + \theta * \ Controls_{i,t} + Invese\ Mill\ Ratio + \varepsilon_{i,t}$
- Heckman Two-stage Model
  - Exogenous Variable
    - A dummy variable equals to 1 if there are completed deals in acquirer's industry in the past two years, where the industry is classified using two-digit SIC code.
  - Exclusion Restrictions
    - The exogenous variable is required to be significantly related to the takeover likelihood, but not affects the post-takeover performance. The results confirm that the IV we selected satisfied the restrictions.
- First-stage Model
  - $Takeover\ likelihood_{i,t} = \alpha + IV_{i,t} + \beta * \ Covariates_{i,t} + \varepsilon_{i,t}$

Table 1. First-stage regression model

	(1)	(2)
VARIABLES	Probit model	Marginal Effect
IV – I(Deal)	0.989***	0.118***
	(0.003)	(0.003)
Acquirer ROA	-0.037	-0.004
	(0.352)	(0.352)
Acquirer size	0.121***	0.015***
	(0.000)	(0.000)
Acquirer liquidity	-0.887***	-0.106***
	(0.000)	(0.000)
Acqurier leverage	0.252***	0.030***
	(0.000)	(0.000)
Market-to-book	0.017***	0.002***
	(0.000)	(0.000)
MA experience	0.073***	0.009***
	(0.000)	(0.000)
Governance	0.059***	0.007***
	(0.000)	(0.000)
Constant	-1.210**	
	(0.047)	
Observations	47,147	47,147
Year Dummy	Yes	Yes
Industry Dummy	Yes	Yes

Robust pval in brackets

*** p<0.01, ** p<0.05, * p<0.1

Empirical Results (1)

Table 2. Baseline model. target IA on post-takeover performance

$$Tobin'\ Q\ /\ BHAR_{i,t} = \alpha + \beta * \ IA\ proxy_{i,t} + \theta * \ Controls_{i,t} + Invese\ Mill\ Ratio + \varepsilon_{i,t}$$

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Ind Adj Tobin's Q (Yr 1)		Ind Adj Tobin's Q (Yr 2)		Ind Adj Tobin's Q (Yr 3)	
AFE	0.226**		0.182*		0.201**	
	(0.016)		(0.063)		(0.034)	
AFE dummy		0.315***		0.231***		0.142**
		(0.000)		(0.001)		(0.034)
IMR	-0.965*	-0.982*	-0.418	-0.398	-0.413	-0.358
	(0.052)	(0.058)	(0.199)	(0.217)	(0.196)	(0.273)
Controls	Y	Y	Y	Y	Y	Y
Observations	1,088	1,000	1,020	936	958	879
R-squared	0.183	0.211	0.170	0.195	0.148	0.171

Robust pval in brackets
*** p<0.01, ** p<0.05, * p<0.1

	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	BHAR (Yr 1)		BHAR (Yr 2)		BHAR (Yr 3)	
AFE	0.217***		0.337***		0.353***	
	(0.001)		(0.001)		(0.001)	
AFE dummy		0.032		0.030		0.004
		(0.291)		(0.492)		(0.938)
IMR	-0.258	-0.247	0.131	0.137	0.186	0.203
	(0.126)	(0.152)	(0.560)	(0.551)	(0.392)	(0.354)
Controls	Y	Y	Y	Y	Y	Y
Observations	946	913	919	889	836	809
R-squared	0.107	0.094	0.129	0.118	0.157	0.142

Robust pval in brackets
*** p<0.01, ** p<0.05, * p<0.1

Empirical Results (2)

Table 3. Moderation effect of target IA and innovation / high-tech characteristics

$$Tobin'\ Q\ /\ BHAR_{i,t} = \alpha + \beta * IA\ proxy_{i,t} + \theta * (IA\ proxy_{i,t} * moderators) + \gamma * Controls_{i,t} + Invese\ Mill\ Ratio + \varepsilon_{i,t}$$

VARIABLES	(1) Ind Adj Tobin's Q (Yr 1)	(2) Ind Adj Tobin's Q (Yr 1)	(3) Ind Adj Tobin's Q (Yr 1)
AFE dummy	0.194**	0.178**	0.171**
	(0.012)	(0.019)	(0.014)
AFE dummy * Target R&D intensity	2.695**		
	(0.038)		
Target R&D intensity	1.532*		
	(0.058)		
AFE dummy * I(Target high-tech)		0.291**	
		(0.035)	
I(target high-tech)		0.235**	
		(0.043)	
AFE dummy * I(Both high-tech)			0.325**
			(0.027)
I(both high-tech)			0.267**
			(0.037)
Controls	Y	Y	Y
IMR	-1.057*	-0.944*	-0.936
	(0.050)	(0.069)	(0.139)
Observations	1,000	1,000	1,000
R-squared	0.247	0.211	0.215

Robust pval in brackets
*** p<0.01, ** p<0.05, * p<0.1

Empirical Results (3)

Table 4. Moderation effect of target IA and payment methods

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Ind Adj Tobin's Q [Yr1]		Ind Adj Tobin's Q [Yr2]		Ind Adj Tobin's Q [Yr3]	
AFE	0.190**		0.146*		0.182**	
	(0.029)		(0.097)		(0.049)	
AFE * I(stockonly)	1.469*		1.445**		0.766	
	(0.069)		(0.032)		(0.165)	
AFE dummy		0.261***		0.172**		0.131**
		(0.000)		(0.011)		(0.048)
AFE dummy * I(stockonly)		0.634**		0.677**		0.124
		(0.034)		(0.030)		(0.682)
Controls	Y	Y	Y	Y	Y	Y
IMR	-0.966*	-0.919*	-0.419	-0.337	-0.414	-0.348
	(0.053)	(0.075)	(0.201)	(0.292)	(0.197)	(0.286)
Observations	1,088	1,000	1,020	936	958	879
R-squared	0.185	0.215	0.173	0.202	0.149	0.171

	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	BHAR[Yr1]		BHAR[Yr2]		BHAR[Yr3]	
AFE	0.180***		0.291***		0.289***	
	(0.003)		(0.006)		(0.005)	
AFE * I(stockonly)	1.412***		1.788***		2.259***	
	(0.000)		(0.000)		(0.000)	
AFE dummy		0.017		0.023		-0.006
		(0.597)		(0.607)		(0.912)
AFE dummy * I(stockonly)		0.186*		0.086		0.110
		(0.059)		(0.599)		(0.552)
Controls	Y	Y	Y	Y	Y	Y
IMR	-0.265	-0.234	0.123	0.143	0.177	0.210
	(0.121)	(0.176)	(0.581)	(0.536)	(0.407)	(0.342)
Observations	946	913	919	889	836	809
R-squared	0.122	0.097	0.141	0.119	0.173	0.142

Empirical Results (4)

Table 5. Moderation effect of target IA, R&D and payment methods

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Ind Adj Tobin's Q (Yr 1)	Ind Adj Tobin's Q (Yr 2)	Ind Adj Tobin's Q (Yr 3)	BHAR (Yr1)	BHAR (Yr 2)	BHAR (Yr 3)
AFE	0.285***	0.221*	0.222*	0.199**	0.325**	0.314**
	[0.008]	[0.068]	[0.072]	[0.022]	[0.027]	[0.031]
AFE * Target R&D	-6.008**	-4.174**	-2.086	-0.511	-1.211	-0.329
intensity	[0.017]	[0.040]	[0.425]	[0.481]	[0.270]	[0.821]
AFE * I(stockonly)	-3.664	-2.745	-1.592	-0.853	-1.313	-0.430
	[0.225]	[0.285]	[0.401]	[0.253]	[0.362]	[0.689]
I(stockonly) * Target	9.654***	10.507***	7.324***	0.401	2.222	1.876
R&D intensity	[0.002]	[0.001]	[0.000]	[0.666]	[0.120]	[0.170]
AFE * Target R&D	7.788	3.676	0.715	4.925***	6.021*	4.601*
intensity * I(stockonly)	[0.247]	[0.542]	[0.883]	[0.004]	[0.051]	[0.090]
Target R&D intensity	3.259***	2.068**	1.121	0.412	0.304	0.137
	[0.005]	[0.019]	[0.177]	[0.195]	[0.516]	[0.785]
I(stockonly)	-0.009	0.003	-0.134	-0.046	-0.165	-0.233*
	[0.966]	[0.990]	[0.445]	[0.560]	[0.164]	[0.055]
Controls	Y	Y	Y	Y	Y	Y
IMR	-1.136**	-0.585*	-0.522	-0.267	0.106	0.158
	[0.027]	[0.080]	[0.121]	[0.119]	[0.631]	[0.449]
Observations	1,088	1,020	958	946	919	836
R-squared	0.256	0.238	0.176	0.128	0.155	0.179

Robust pval in brackets

*** p<0.01, ** p<0.05, * p<0.1

	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Ind Adj Tobin's Q (Yr 1)	Ind Adj Tobin's Q (Yr 2)	Ind Adj Tobin's Q (Yr 3)	BHAR (Yr1)	BHAR (Yr 2)	BHAR (Yr 3)
AFE dummy	0.198***	0.149**	0.174**	-0.012	0.019	-0.014
	[0.009]	[0.039]	[0.016]	[0.737]	[0.706]	[0.812]
AFE dummy * Target	1.634	0.722	-0.848	0.702	0.192	0.291
R&D intensity	[0.199]	[0.489]	[0.504]	[0.103]	[0.802]	[0.708]
AFE dummy *	-0.133	0.069	0.061	-0.008	-0.277	-0.109
I(stockonly)	[0.674]	[0.846]	[0.854]	[0.953]	[0.196]	[0.592]
I(stockonly) * Target	-0.338	1.906	6.433*	-0.732	-1.163	1.098
R&D intensity	[0.879]	[0.492]	[0.098]	[0.544]	[0.582]	[0.589]
AFE dummy * Target	9.184**	6.938*	-0.806	2.469	4.919**	2.607
R&D intensity *						
I(stockonly)	[0.012]	[0.079]	[0.853]	[0.117]	[0.047]	[0.294]
Target R&D intensity	1.674**	1.355*	1.789*	-0.318	-0.038	-0.207
	[0.040]	[0.091]	[0.096]	[0.367]	[0.955]	[0.753]
I(stockonly)	0.179	0.078	-0.075	-0.109	0.007	-0.240
	[0.455]	[0.767]	[0.799]	[0.311]	[0.973]	[0.181]
Controls	Y	Y	Y	Y	Y	Y
IMR	-1.055*	-0.489	-0.475	-0.252	0.103	0.155
	[0.058]	[0.150]	[0.175]	[0.150]	[0.648]	[0.467]
Observations	1,000	936	879	913	889	809
R-squared	0.281	0.260	0.195	0.116	0.147	0.163

Robust pval in brackets

*** p<0.01, ** p<0.05, * p<0.1

Additional Analysis (1)

Table 6. Univariate tests on R&D change by payment method

	N (cash)	N (stock)	Mean (cash)	Mean (stock)	diff	St.Err	t value	p value
Acquirer R&D change	722	118	0.001	-0.007	0.007	0.003	2.4	0.016

Table 7. Examination on private information drivers

VARIABLES	(1) AFE	(2) AFE	(3) AFE dummy	(4) AFE dummy
Target R&D intensity	0.152**		-0.150	
	(0.037)		(0.827)	
Combined R&D intensity		0.141**		-0.451
		(0.020)		(0.642)
Controls	Y	Y	Y	Y
Observations	722	585	680	551
R-squared	0.107	0.125		

Robust pval in brackets

*** p<0.01, ** p<0.05, * p<0.1

Additional Analysis (2)

Table 8. Target IA predicted from innovation model on future performance

VARIABLES	(1) Ind Adj Tobin's Q [Yr1]	(2) Ind Adj Tobin's Q [Yr1]	(3) Ind Adj Tobin's Q [Yr2]	(4) Ind Adj Tobin's Q [Yr2]	(5) Ind Adj Tobin's Q [Yr3]	(6) Ind Adj Tobin's Q [Yr3]
Residual Target R&D	0.145***		0.097**		0.044	
	(0.000)		(0.014)		(0.244)	
Residual Combined R&D		0.206***		0.128***		0.052
		(0.000)		(0.008)		(0.247)
IMR	-0.760	-0.894	-0.508	-0.691	-0.646*	-0.736*
	(0.244)	(0.214)	(0.220)	(0.120)	(0.097)	(0.082)
Controls	Y	Y	Y	Y	Y	Y
Observations	680	551	638	520	604	491
R-squared	0.225	0.258	0.231	0.247	0.204	0.223

Robust pval in brackets
*** p<0.01, ** p<0.05, * p<0.1

Conclusion

- Collectively, the results support private information theory – targets with higher information asymmetry leads to superior post-takeover performance.
- Acquirer gains incremental reward when:
  - the target has higher IA and higher proportion of R&D, when :
  - both acquirers and targets are in the high-tech industry,
  - and when the acquirers uses stock to acquire a target with high IA.
- Using equity to acquire an R&D-intensive target with higher IA facilitates a value-added acquisition and further innovation inputs.
- The private information is driven by target's innovation, and we use the residuals from this regression to capture 'unexplained' or abnormal private information, which generates the same results.

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Thank you!